Mr. Syed Safeer Hussain
Registrar,
National Electric Power Regulatory Authority (NEPRA),
NEPRA Tower, Attaturk Avenue (East),
G-5/1, Islamabad.

Ref No. KE/BPR/NEPRA/2022/524
December 01, 2022

SUBJECT: **K-Electric Limited – Tariff Petition for Generation plants for the period commencing from July 01, 2023 till remaining licensed useful lives of the respective plants / units**

Dear Sir,

Please find enclosed Tariff Petition ("Tariff Petition") for Generation plants for the period commencing from July 01, 2023 till remaining useful live of the respective plants / units as per KE's Generation License Modification-X (dated February 19, 2021).

Further, please find enclosed Certified True Copy of resolution passed by K-Electric Limited's Board of Directors to file said Tariff Petition along with Affidavits of the following authorized representatives:

- Syed Moonis Abdullah Alvi, Chief Executive Officer
- Muhammad Aamir Ghaziani, Chief Financial Officer
- Abbas Husain, Chief Generation & Transmission Officer

This Tariff Petition is being filed in accordance with the Rule 3 (1) of NEPRA (Tariff Standards and Procedure) Rules, 1998 along with the Cheque No. 00004934 dated November 29, 2022 amounting to Rs. 1,719,888 after withholding of income tax @ 8% of gross amount Rs. 1,869,444 (in favor of National Electric Power Regulatory Authority) being the fee for the said Tariff Petition.

It is therefore, requested to admit the Tariff Petition for determination as requested therein.

Kindly acknowledge and issue the receipt.

Sincerely

Syed Moonis Abdullah Alvi
Chief Executive Officer
K – Electric Limited

REGISTRAR OFFICE
Diary No: 12821
Date: 05-12-22

Enclosed:

- Generation Tariff Petition with plant wise tariff tables
- Supporting Documents & Annexures
- Certified True Copy (CTC) of Resolutions
- Affidavits
- Power of Attorney
- Cheque no. 00004934

Generation Plants Tariff Petition

By

K-Electric Limited (KE)

December 01, 2022

Table of Contents - Summary

Table of Contents – Main Section

Disclaimer

The projections and forecasts contained in this petition are only intended for NEPRA for the purposes of evaluating and determining KE's Plant wise Tariff petition for generation segment. The plan contained in this petition is based on expectations, estimates and projections at the time of filing of the same that could differ from actual results or events owing to business and operational risks and change in scope and circumstances.

The information contained in this petition is not intended as a solicitation or recommendation of investments. Under no circumstances should this information be relied on or treated as legal or other professional advice. Although KE has taken the greatest possible care in compiling this information, it assumes no responsibilities for any reliance for investment decisions placed thereon.

1. Details of the Petitioner

1.1. Name and Address

K-Electric Limited

Head office

KE House
39-B,
Sunset Boulevard, Phase II,
Defence Housing Authority,
Karachi, Pakistan

Registered office

KE House
39-B,
Sunset Boulevard, Phase II,
Defence Housing Authority,
Karachi, Pakistan

1.2. Representatives

- Syed Moonis Abdullah Alvi - Chief Executive Officer
- Muhammad Aamir Ghaziani – Chief Financial Officer
- Abbas Hussain – Chief Generation & Transmission Officer

1.3. Grounds giving rise to Petitioner's interests & Licensee details

K-Electric Limited (KE), is a vertically integrated electrical supply company, providing public utility services to the city of Karachi and its suburbs. KE is active in generation, transmission, and distribution (including sales) of electricity. It operates under licenses granted by the National Electric Power Regulatory Authority (NEPRA) for generation, transmission, and distribution. KE is a public limited company and is listed on the Pakistan Stock Exchange.

KE was granted an integrated Multi-Year Tariff for a control period of 7 years that will expire in June 2023. However, to align its MYT structure with ongoing changes in power sector including separation of Network and Supply business, implementation of CTBCM model, proposed country wide central economic dispatch and for better transparency KE is filing separate tariffs for Generation, Transmission, Distribution Network and Distribution Supply.

This has been further discussed in **section 5.**

Further, it is requested that KE be permitted to submit additional asks, information, documents, evidences, applications, representations in writing in future and/or further grounds that maybe required in accordance with the prescribed rules or procedures as and when notified, or even otherwise during the proceedings on instant petition.

2. Confirmation of compliance with Tariff Standards and Procedures

This petition is being filed in accordance with Part II Rule 3 of the NEPRA Tariff Standards and Procedure Rules, 1998.

The information required to be filed under the Rules can be found under the following sections:

Rules Reference		Petition Reference	Petition Reference
3 (2)	(a)	Name and address	1.1 & 1.2
		Grounds giving rise to Petitioner's interest & Licensee details	1.3
	(b)	Grounds and facts on which the petition is based	5
	(c)	Determination sought	5
	(d) / (e)	Comparison of existing and proposed tariff	6
	(f)	Summary of evidence	7

3. KE's Overview and Current Multi Year Tariff Structure

3.1. Overview

Incorporated in 1913, KE is the only vertically integrated utility (VIU) in Pakistan. The company was privatized in November 2005. KE is responsible for end-to-end planning and execution of generation, transmission, and distribution of power to its consumers within its service area which includes Karachi, Gharo in Sindh and Hub, Uthal, Vinder and Bela in Balochistan region.

3.2. KE's Integrated Multi-Year (MYT) Tariff Regime

KE was awarded an integrated Multi-Year Tariff (MYT) for a control period of 7 years, valid till June 30, 2023, which was determined on July 05, 2018, subsequently notified by Ministry of Energy (Power Division) through SRO 576(I)/2019 dated May 22, 2019 (referred as "MYT Determination"). The current tariff regime is primarily based on a fixed rate-based structure, wherein costs have been allowed as pass through based on certain benchmarks along with a Return on Regulatory Asset Base. The tariff include fuel cost for KE's power plants, cost of power purchase from external sources, O&M expenses, write off claim of bad debts, adjustment of other income, Depreciation (on cost basis). and Return on Regulatory Asset Base. Regulatory asset base is defined as Property, plant and equipment excluding surplus on revaluation (including Capital work in progress), net of Deferred revenue (Consumer funded assets) whereas Return is based on a notional debt to equity ratio of 70:30, cost of debt based on mix of foreign and local borrowings and a USD based return on equity.

Further, KE's MYT Determination includes a monthly and quarterly indexation mechanism to account for changes in fuel costs, power purchase costs, and certain other adjustments based on the defined parameters. To account for recovery loss, NEPRA has allowed claim of actual write off bad debts based on a defined criterion. MYT Determination also includes an allowed investment plan for the control period and there is a mechanism of Mid Term review / End of Term review to reassess certain assumptions including investment plan.

Within the MYT Determination 2017 – 2023 (**Current MYT**), NEPRA had allowed KE, a Return on Regulatory Asset Base based on notional debt to equity ratio of 70:30, whereas KE's actual debt to equity ratio based on debt and invested equity at the time was 24:76 (FY 16). Reason for the high invested equity was that KE needed to fund losses in past through equity. Furthermore, no such condition for actual debt-to-equity ratio was specified in the Previous MYT (Pre-2017). However, due to the application of the notional debt to equity ratio above, KE was allowed a lower effective return and its actual invested equity was not considered and the equity over and above the notional thirty percent (30%) was considered as debt for the purposes of determining the return.

The issue of applying notional 70:30 debt to equity ratio for the purpose of determining KE's Return on Regulatory Asset Base and non-consideration of actual invested equity is taken up in the Appeal filed before the NEPRA Appellate Tribunal under Section 12 (G) (1) of the NEPRA Act 1997 (as amended from time to time). KE would like to state on record that the submissions made in this petition are without prejudice to the Appeal and subject to final outcome of such Appeal, any relief granted by the NEPRA Appellate Tribunal in such proceedings, the tariff under determination/determined through the instant petition shall also be amended and or modified accordingly.

4. Generation Overview

KE's Generation segment comprises of six thermal based power plants with an aggregated installed capacity of 2,817 MW[1] including KE's 900 MW BQPS III RLNG power plant. In addition to its own generation fleet, to meet the power demand in its service area, KE also has arrangement of power purchase with IPPs and National Grid. Here it is important to note that unlike state-owned entities, KE performs the function of planning and capacity procurement on its own and enters into long-term PPAs / EPAs bilaterally, without any sovereign support.

KE was granted Generation License (GL/04/2002) on November 18, 2002 and has been modified from time to time to account changes in power plants including additions / deletions of power plants to / from KE's generation fleet. With respect to KE's generation license, the latest modification (Modification XI) was issued by NEPRA in September 2021.

Details of plants within KE's generation license are given below:

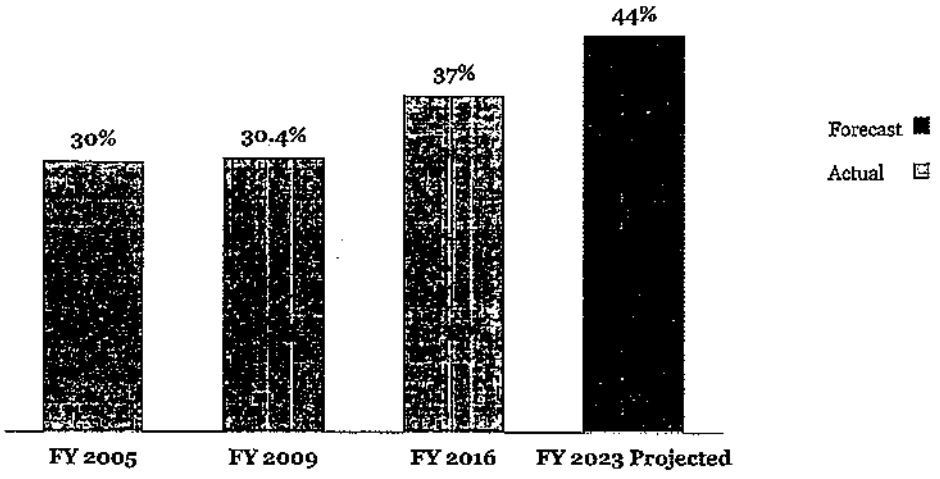
Plant	Installed Capacity (MW) ISO condition	De-rated Capacity (MW) MSC[2]	Net Capacity after Aux. Consumption	COD
BQPS-I	840.00	743.92	693.08	
Unit 1	210.00	181.20	168.32	1983
Unit 2	210.00	183.41	171.62	1984
Unit 5	210.00	188.28	175.90	1991
Unit 6	210.00	191.03	177.24	1997
BQPS-II	572.67	525.58	494.53	2012
KCCP	247.50	237.08	220.83	2008/2015[3]
KGTPS	107.31	95.51	92.05	2009/2015[4]
SGTPS	107.31	96.19	92.73	2009/2015[4]
BQPS-III	942.32	918.40	899.60	To be declared
Unit 1	471.16	459.20	449.80	
Unit 2	471.16	459.20	449.80	

Sustainable Operations and Performance

With necessary investments in the generation segment, KE has been able to improve the efficiency and reliability of Generation plants including recoupment of derated capacity of BQPS – I units. KE has invested **PKR 203,918 million** in Generation segment since privatization till **June 2022.**

1 Post decommissioning of Units 3 & 4 of BQPS – I (as per License)
2 Mean site Condition
3 Initially plant was commissioned with 4 GTs & 1 Steam turbine in 2008, and subsequently, second steam turbine was added later in 2015
4 Initially plants were commissioned with 32 Gas Engines in 2009, and subsequently a steam turbine was added later in 2015

As a result, KE's ability to serve the growing power demand in Karachi and its adjoining areas has improved which can be seen from the graph below:



KE has invested **PKR 311,566 million** across the value chain since FY 2016 out of which c. **PKR 110,231 million** (till June 2022) have been invested in generation.

Plant wise break up of these investments is summarized in the following table:

PKR Mn

Description	FY17	FY18	FY19	FY20	FY21	FY22	FY23[5]	Total
BQPS III	-	30	14	14,466	39,389	19,339	22,761	96,000
BQPS II	5,172	3,266	2,623	1,664	1,727	1,778	2,159	18,389
KCCP	1,576	379	1,002	539	2,077	1,096	308	6,978
KGTPS- 90 MW Jenbacher	387	241	115	345	545	169	86	1,889
SGTPS-90 MW Jenbacher	445	417	461	84	63	28	59	1,556
BQPS I	1,423	2,574	2,229	1,888	1,243	1,434	594	11,386
Total CAPEX	9,003	6,908	6,444	18,987	45,044	23,844	25,968	136,197

These investments have helped KE to add the state of art BQPS-III 900 and also have KE in maintenance and improvement of generation fleet. As a result, reliability, availability and generation capacity of generation fleet has improved as follows:

- Fleet reliability increased from **96% to 99.5%** (FY 2016 vs FY 2022)
- Fleet availability increased from **81% to 91%** (FY 2016 vs FY 2022)[6]
- Generation capacity increased from **1,875MW to 2,817MW**[7] (FY 2016 vs FY 2022)

[5] Projected
[6] Availability % = Available Capacity / Dependable Capacity
[7] Installed capacity including BQPS III

5. Determination Sought

This section details the tariff asks and explains the need for a separate tariff instead of integrated tariff, keeping in view the learnings of Current MYT and upcoming market changes. Tariff being field includes return structure based on including Return on Regulatory Asset base and Depreciation, in line with Current MYT.

5.1. Why Proposing a Change in Integrated MYT Structure?

Currently, the Company operates under an integrated Multi-Year-Tariff (MYT) regime which includes costs and returns for all three segments i.e. Generation (All plants), Transmission and Distribution based on Regulatory Asset Base (RAB). However, going forward KE has planned to file separate tariffs for these segments considering:

Greater transparency

While the costs for three segments are defined in the Current MYT determination, certain components such as base rate component and working capital component are not bifurcated segment wise. Similarly, Plant wise tariff bifurcation in case of Generation segment is not available. Therefore, KE understands that separate tariffs for generation, transmission, & distribution and further, separate tariffs for each plant, will not only provide greater transparency and insight regarding segment and plants performance to the company but also to the regulator and other stakeholders as well. Furthermore, this will also help to determine separate tariffs for generation plants and other segments while going into Central Dispatch system as part of the implementation of CTBCM model.

Power sector changes

Upon implementation of CTBCM model, it is proposed that the bulk power consumers (BPCs) will be able to procure power directly through bilateral contracts and will pay wheeling/open access cost charges to Transmission and Distribution Companies and the Generators, Suppliers, Traders will, to the extent of competitive arrangements, participate in the market for sale and procurement of power on real time basis through the settlement and balancing markets. The sale, supply and dispatch as well as the marginal pricing for the sale of electricity is on unit generation basis. Therefore, there is a need to determine separate tariffs for each plant for economic dispatch with a robust mechanism for indexation as well as for Transmission and Distribution network to determine wheeling charges for BPCs to ensure recovery of all prudent costs.

Accordingly, KE is filing separate tariffs for generation plants for the remaining useful life of the respective plants similar to IPPs, which would also help in any future unbundling initiatives.

Following section discusses KE's plant wise petition with respect to **generation segment** and its underlying assumptions.

5.2. What is KE Petitioning for?

This petition seeks the following determinations:

- Tariff for plants with tenor to be remaining useful life of the respective plant
- Two-part tariff structure i.e. Energy component to be recovered on units billed and Capacity component to be recovered on Available Capacity is being requested
- O&M component to cover required capex investment for maintenance as well as Revex expenditure

- Capacity amount to include Fixed O&M local, Fixed O&M foreign, Working capital, Insurance, Depreciation and Return on Regulatory Asset Base (RoRB) –for remaining useful life of the respective plants
- Capacity cost to be grossed up to cover the allowed outages
- Fuel cost to be determined based on allowed heat rate with part load, degradation, and other adjustments as allowed to IPPs
- Adjustments of degradation, ambient temperature etc. for Annual capacity to form basis for Capacity cost billing is being requested
- Component wise quarterly / annual indexation mechanism is being requested
- USD based Rate of return of 15%, as currently allowed to KE under the existing MYT and similar to IPPs, is being requested
- Working capital allowance similar to IPPs is being requested
- Other pass-through costs as allowed to IPPs including Startup costs are being requested

Details of Plant wise Tariff requests are given in next Sections.

6. Comparison of existing and proposed tariff

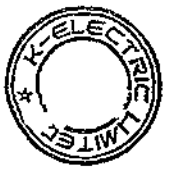
Under the existing tariff, capital nature O&M expenses, including major overhauls are allowed separately as investments, whereas, under the proposed tariff O&M component is being requested based on O&M structure allowed to IPPs i.e. accounting for capital nature items including major overhaul as well. Accordingly, the proposed O&M is benchmarked with O&M allowed to other power sector entities as detailed in each plant's Independent Consultant's O&M cost evaluation report annexed to this petition.

Further, previously no separate working capital assessment for KE was done and working capital was allowed on integrated basis. Under the proposed tariff the same has been aligned with the working capital allowed to other power sector entities.

Further, Return on Regulatory Asset Base tariff components including RoRBCoD, RoRBCoE and depreciation have been calculated based on RAB defined in line with Current MYT, with same Return on Equity i.e. USD 15% as currently allowed under the Current MYT.

7. Addition of New Plants in the KE's Generation Fleet

Based on existing plans, KE plans to procure power from external sources, including IPPs with equity stake, and doesn't plan to add any Generating Plant in its existing Fleet. However, with any change in planning in future, any power plant is planned to be added in KE's existing generation fleet, then KE would separately request for the Tariff of that power plant for Authority's approval along with a separate Tariff table for that plant, with the same modalities as detailed in section 5.2 above.

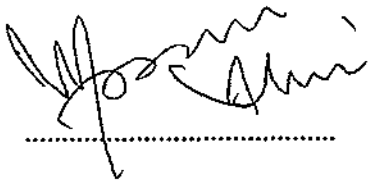


8. Summary of Evidence

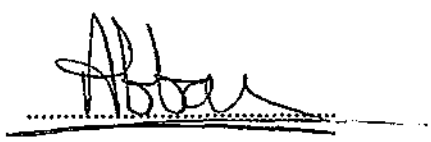
Included in body of petition and annexures.

Generation Tariff Petition
Sign by Authorized Representatives

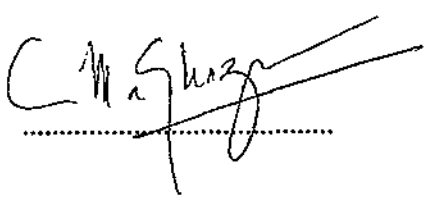
1. Syed Muhammad Moonis Alvi, Chief Executive Officer .....



2. Abbas Husain, Chief Generation & Transmission Officer .....



3. Muhammad Aamir Ghaziani, Chief Financial Officer .....



Glossary

Acronym	Definition
ACC	Air Cooled Condenser
ADC	Annual Dependable Capacity
AGP	Advance Gas Path
AMS	Asset Management System
AUT	Auxiliary Transformers
AVR	Automatic Voltage Regulator
BQPS	Bin Qasim Power Station
BSC	Black-Start Charges
BTU	British Thermal Unit
CAPEX	Capital Expenditure
CC	Combined Cycle
CCoE	Cabinet Committee of Energy
CCPP	Combined Cycle Power Plant
CCR	Central Control Room
CEMS	Continues Emission Monitoring system
CI	Combustion Inspection
COD	Commercial Operation Date
CPI	Consumer Price Index
CSA	Contractual Service Agreement
CTBCM	Competitive Trading Bilateral Contract Market
CV	Calorific Value
CWIP	Capital Work In Progress
DCP	Dry Chemical Powder
DCS	Distributed Control System
DEHG	Digital Electro-Hydraulic Governor
DOy	Degradation Output
E&IC	Electrical & Instrumentation & Control
EBH	Equivalent Baseload Hours
ECA	Export Credit Agency
eHGPI	Extended Hot Gas Path Inspection
ELSA	Emergency Life Support Apparatus
EMF	Electromotive Force
EMO	Economic Merit Order
EnMS	Energy Management System
EPA	Environmental Protection Agency
EPAs	Energy Purchase Agreements
EPC	Engineering Procurement Construction
ER	Exchange Rate
FDS	Fire Detection System
FFH	Fire Factored Hours
FFS	Fire Fighting System
FO	Furnace Oil

Acronym	Definition
FSA	Fuel Supply Agreement
FY	Fiscal Year
GCV	Gross Calorific Value
GE	General Electric
GIDC	Gas Infrastructure Development Cess
GIS	Gas Insulated System
GL	Generation License
GOC	Generator Over Current
GRS	Gas Receiving Station
GSA	Gas Supply Agreements
GT	Gas Turbine
GWh	Giga Watt hours
H.C	Hedging Cost
HEI	Harbin Electric Int. Group
HFO	Heavy Furnace Oil
HGPI	Hot Gas Path Inspection
HHV	Higher Heating Value
HITASS	Hitachi Turbine Automatic Startup System
HMI	Human Machine Interface
HRSG	Heat Recovery Steam Generators
HSD	High-Speed Diesel
HSDO	High Speed Diesel Oil
HSE	Hot Section Exchange
HSEQ	Health Safety Environment & Quality
HSFO	High Sulfur Furnace Oil (HSFO)
HTC	Harbin Turbine Co.
Hz	Hertz
I.G	Indigenous Gas
IE	Independent Engineer
IEC	International Electrotechnical Commission
IEG S.A	Istro Energo Group, A.S.
IMS	Integrated Management System
Ins	Insurance
IPPs	Independent Power Producers
ISO	International Organization For Standardization
JGS	GE Jenbacher Genset Stationary
KCCPP	Korangi Combined Cycle Power Plant
KDA	Karachi Development Authority
KE	K - Electric
KG	Kilo Gram
KIBOR	Karachi Inter Bank Offered Rate
KTGEPS	Korangi Town Gas Engine Power Station
KV	Kilo volt

Acronym	Definition
KVA	Kilovolt Ampere
KWH	Kilowatt per Hour
LF	Load Factor
LHV	Lower Heating Value
LIBOR	London Interbank Offered Rate
LOE	Loss of Excitation
LTI	Loss Time Injury
LTSA	Long Term Service Agreement
MCWP	Main Cooling Water Pump
MDI	Maximum Demand Indicator
METKA S.A	Global developer and investor for utility-scale solar energy storage and hybrid power projects
MI	Minor Inspection
MI	Major Inspection
Mm	Millimeter
MMBTU	Million British Thermal Unit
MMSCF	Million Standard Cubic Feet
MOH	Major Overhauled
MSA	Material Stream Agreement
MSC	Mean Site Conditions
MSL	Mean Sea Level
MTON	Metric Ton
MVA	Megavolt Amperes
MW	Mega Watt
MWh / MWHR	Mega Watt Hours
MYT	Multi Year Tariff
NDT	Non Destructive Testing
NEO	Net Electrical Output
NEPRA	National Electric Power Regulatory Authority
NESPAK	National Engineering Services Pakistan
NFPA	National Fire Protection Association
O&M	Operation & Maintenance
OC	Open Cycle
OD	On Demand
ODAF	Oil Directed Air Forced
OEM	Original Equipment Manufacturer
OES	Orient Energy Systems
OFC	Oil Filed Cables
OGRA	Oil & Gas Regulatory Authority
OLTC	On-Load Tap Changer
OPGW	Fiber Optic Cable
PAF	Pakistan Air Force
PBS	Pakistan Bureau Statistics

Acronym	Definition
PCB	Polychlorinated Bi phenyl
PF	Power Factor
PKR	Pakistani Rupees
PL	Part Load
PLC	Programmable Logic Controller
PLL	Pakistan LNG Limited
PMG	Permanent Magnet Generator
PPA	Power Purchase Agreement
PQA	Port Qasim Authority
PSO	Pakistan State Oil
QMS	Quality Management System
RAB	Regulatory Asset Base
REVEX	Revenue Expenditure
RLNG	Re-gasified Liquified Natural Gas
RO	Reverse Osmosis
ROE	Return on Equity
RoRB	Return on Regulatory Asset Base
RoRBCOD	Return on Regulatory Asset Base - Cost of Debt
RoRBCOE	Return on Regulatory Asset Base - Cost of Equity
RPM	Revolutions Per Minute
RSC	Reference Site Conditions
SBLC	Standby Letter of Credit
SC	Simple Cycle
SCBA	Self-Contained Breathing Apparatus
SCF	Standard Cubic Foot
SFT	Sanction for Test
SGEPS	Site Gas Engine Power Station
SGT	Siemen's Gas Turbine
SLA	Service Level Agreement
SOFR	Secured Overnight Financing Rate
SOP	Standard Operating Procedures
SSGC	Sui Southern Gas Company
SST	Siemens Steam Turbine
ST	Steam Turbine
STG	Steam Turbine Generator
SUT	Step Up Transformer
TBT	Tool Box Talk
TCDF	Tandem Compound Double Flow
TEAWC	Total Enclosed Air Water Cooled
TEWAC	Totally Enclosed Water to Air Cooled
TMOH	Turbine Major Overhauling
TPH	Total petroleum hydrocarbon
TT	Telegraphic Transfer

Acronym	Definition
UBL	United Bank Limited
US CPI	United States Consumer Price Index
VCB	Vacuum Circuit Breaker
VIU	Vertically Integrated Utility
WHRSG	Waste Heat Recovery Steam Generator
WPPF	Workers Profit Participation Fund
WWF	Workers Welfare Fund

K-ELECTRIC
Energy That Moves Life

Section F
Bin Qasim Power Station – I (BQPS-I)

Table of Contents – BQPS I

1. Bin Qasim Power Station - I (BQPS-I)

This section covers details of BQPS - I Plant (referred as "BQPS-I"), and tariff being requested.

1.1. Introduction to the Plant – BQPS - I

BPQS I is one of the key plants in KE's Generation fleet initially having an installed capacity of 1,260 MW. After decommissioning of units 3 and 4, its remaining installed capacity stands at 840 MW. BQPS-I being an old plant, its installation started between 1979 to 1994, was a major source of supply of power in Karachi.

Principal Features

1. The Power Plant is situated on PQA Mehran Highway Road, in the District of Malir, Karachi, Sindh Province.
2. The plant comprises of 4 (thermal) Hitachi steam turbines of 210 MW each coupled with Hitachi, 210 MW/2 pole/3 phase generators.
3. The project started its commercial operations in 1983 with Unit 1 while Unit 2, Unit 5 and Unit 6 commenced operations in 1984, 1991 and 1997 respectively.

Technical Capability

The installed generation capacity of BQPS-1 currently stands at 840 MW (210 MW x 4 units) while plant contributes 693 MW (net) dedicated power into the K-Electric system. The years of commencement of erection work and commercial operations of all individual units are as follows:

Unit	Installed capacity	Commencement of erection work	Commencement of commercial operation
Unit 1	210.00 MW	23-06-1979	11-12-1983
Unit 2	210.00 MW	23-06-1979	09-10-1984
Unit 5	210.00 MW	01-08-1989	16-07-1991
Unit 6	210.00 MW	01-12-1994	27-04-1997

The prime movers (Steam turbine) for the power plant were manufactured at the Hitachi's production facilities known for manufacturing of steam turbines.

Summary of Plant Performance for last 10 years

The Key Factors

The key factors of the plant performance since inception are summarized as follows:

Total Energy Supplied (Gross) (GWh)				
Fiscal Year	U-1	U-2	U-5	U-6
FY - 2013	585	659	1139	992
FY - 2014	628	650	1152	1100
FY - 2015	719	821	1079	888
FY - 2016	769	796	804	1077
FY - 2017	609	852	1009	1030
FY - 2018	1016	350	846	1125
FY - 2019	723	896	1082	660
FY - 2020	691	760	843	944
FY - 2021	1072	1047	1228	1282
FY – 2022	650	839	933	1106

Average Availability (%)[1]				
Fiscal Year	U-1	U-2	U-5	U-6
FY – 2013	91%	69%	90%	91%
FY – 2014	85%	73%	96%	92%
FY – 2015	86%	86%	88%	71%
FY – 2016	87%	73%	69%	96%
FY – 2017	59%	90%	89%	89%
FY – 2018	85%	30%	68%	94%
FY – 2019	66%	84%	93%	62%
FY – 2020	87%	89%	86%	87%
FY – 2021	92%	93%	89%	91%
FY – 2022	93%	92%	76%	86%

Modifications & Improvements

The upkeep of the plant and equipment has always been the priority; therefore, the Company has invested heavily in replacing, modifying and improving the plant equipment which has made it possible for the Company to supply power for the remaining useful life of plant.

For details of modifications and improvements since privatization, please refer **BQPS-I – Annexure A (i).**

Operation Summary

The plant has a key role in supply of power to the KE's transmission network. The power generated by the plant is transmitted through grid stations which are supplying power to major industrial and commercial customers of KE. It is for this reason it has always been the

[1] Average Availability = Available Capacity / (Gross Dependable Capacity)

aim of the Company to keep the BQ-1 in best shape in order to offer the maximum availability all year round.

During the peak summer months, the plant runs as a base load plant with dispatches as high as possible and also helps in times of Gas shortages / Gas pressure issues at other stations as the plant is dual fuel having capability of running both on Furnace oil and Gas.

Health & Safety

The facility has been operational for last 553 days without any major incident on account of Quality, Health, Process Safety and Environment. It is achieved from observing good O&M practices and having skilled plant operations team. The plant premises have a well-equipped first aid facility backed by a 24/7 ambulance.

The Company has well established Process Safety Procedures. For list of safety SOPs, please refer **BQPS-I – Annexure A (ii)** for Safety procedures.

Project Details

For project details including site details, plant reference conditions & plant machinery details, please refer **BQPS-I – Annexure A (iii).**

Fuel Source

BQ-1 is procuring HFO from PSO/BYCO and has Fuel Supply Agreements with them since April 2020 and Sep 2010, renewed from time to time, with current expiry of March 2024 and Oct 2026, which will be further renewed as per need.

Further, KE is currently getting the Gas from SSGC, where as KE is also considering alternate RLNG supplier so that the requirement of gas is fulfilled considering SSGC is not able to provide continuous gas volume/pressure as per the plant requirement.

Moreover, agreement with RLNG/ Gas supplier (existing / future) may involve Take or Pay arrangements, for which KE will need to ensure regular payments for Fuel Charges as per the Gas Supply Agreements regardless of plant operations. Accordingly, KE requests the Authority to allow these costs as pass through in the proposed tariff. Alternatively, the Authority may consider the plant as a must run under Take or Pay Gas arrangement for Economic Merit Order.

Fuel Transportation and Decanting System

Furnace oil is transported to the site through oil tanker trucks and through direct filling fuel oil pipeline and is directed into the storage tanks. There are 12 running fuel oil supply pumps available at plant site to deliver fuel from storage tanks towards boiler.

The supply pump unit transfers Furnace oil from the storage tanks to the boiler going through heating system which heats the HFO to a temperature of approximately 110°C.

SSGC provided gas is supplied through dedicated gas yard station which has capability to provide enough indigenous natural gas to run all BQ-1 units on full load at a time.

Fuel Storage

There are six (6) storage tanks (2 x 10,000 m^3 + 4 x 25000m^3). Three (3) tanks are dedicated to fuel suppliers for storage of their inventory to be supplied to BQ-1. HFO procured from local oil marketing companies is stored in 3 storage tanks having a cumulative capacity of around 65,000 Metric Ton (around 14 days storage capacity at full load per unit for four units; after excluding unpumpable stock) located at the plant site to hold HFO.

HFO / RFO Tank #	Storage Capacity (m³)	Status
1	10,000	Was Under BYCO custody, now Marked for BQPS II/III HSDO requirements
2	10,000	Under BYCO custody
3	25,000	65,000 m3 For KE stock This includes un-pumpable stock of approximately 2,772 m3 / tank.
4	25,000	
5	25,000	
6	25,000	Under PSO custody

Cooling System

The cooling water system is an open circulation condenser-based system.

The cooling water system is divided into two parts, one for condensing steam in condenser, other one for auxiliaries' cooling at plant

Minimum Loading

Minimum loading of each Unit is 90MW (Gross) based on the recommendation of OEM to maintain minimum mean temperature of 130 C at Regenerative Air Heater. Please refer **BQPS-I – Annexure A (iv)** for reference document.

Fire Protection System

The plant has a state-of-the-art Fire Protection System detail of which are given in refer **BQPS-I – Annexure A (v)**

Spares & Inventories

In order to ensure reliable operations of the power plant, inventory of worth **PKR 1,564 million** as of June 2022 is maintained by the Company.

Plant Layout

Please refer **BQPS-I – Annexure A (vi)**

Details of Major Equipment

Please refer **BQPS-I - Annexure A (vii)**

Remaining Useful Life

The plant's oldest Unit has been in operation for the last 39 years (FY84 – FY22) with unit wise remaining licensed useful given below[2]

- Unit 1 – September 2023
- Unit 2 - September 2023
- Unit 5 – September 2027
- Unit 6 – September 2023

2 As per Generation license modification dated February 19, 2021

Plant Capacity and Heat Rate

Heat rate test of the Plant was conducted in November 2019 by Independent Engineer, based on which Heat rate was determined for the control period FY 2017 to FY 2023 and plant capacity was updated in the Generation License.

Heat rate test results on Gas fuel and HFO for plant at base load were as follows:

Fuel Type	Description	Unit	Net HHV Heat Rate on Gas			
			U-1	U-2	U-5	U-6
Gas	Heat rate as per test - base load	btu / kWh	11,231	11,143	10,798	11200
	Part load factor based on commissioning data		1.026	1.012	1.044	1.042
	Heat rate at 130 MW – determined for FY 2020 to FY 2023	btu / kWh	11,525	11,277	11,277	11,667
FO	Heat rate as per test - base load	btu / kWh	10,566	10,527	10,163	10,352
	Part load factor based on commissioning data		1.026	1.012	1.044	1.042
	Heat rate at 130 MW – determined for FY 2020 to FY 2023	btu / kWh	10,844	10,653	10,614	10,785

Accordingly, Net capacity & Heat rate (Gas & HFO) for the purpose of Tariff petition has been taken from Generation license which is based on tests conducted in 2019 as per IE's heat rate test reports.

Capacities were included in Generation license based on maximum capacity achieved on Gas / FO fuel during November 2019 test.

Category	Unit 1	Unit 2	Unit 5	Unit 6
Gross De rated capacity – MW	181.2	183.41	188.28	191.03
Auxiliary consumption – MW	12.88	11.79	12.38	13.79
Net Capacity – MW	168.32	171.62	175.9	177.24
Auxiliary consumption %	7.11%	6.43%	6.58%	7.22%
Base load Net HHV heat rate – btu / kWh – Gas	11,231	11,143.1	10,798.4	11200
Base load Net HHV heat rate – btu / kWh – HFO	10,566	10,527.4	10,162.9	10,352.2

1.2. Tariff Mechanism

This section explains in detail the tariff mechanism of BQPS-I to ensure cost reflective tariffs including component wise indexation so that all prudent costs of the plant are adequately recovered.

KE is requesting a two part tariff, in line with IPPs i.e. Energy payments and Capacity payments on a Take-or-pay mechanism where Capacity payment shall be paid for the Available Capacity and Energy payments for the Net Electrical Output.

Available capacity has been calculated considering annual availability of 85% and additional outage allowance in the year in which Overhaul is occurring. Accordingly, based on expected incurrence of Overhauls, levelized availability of **83.41%** has been calculated and has been used as Plant factor for Capacity components, so that Capacity components cover the impact of outages. Details of Outages and billing mechanism have been further discussed in detail in Section 1.3.

For indexation purposes, following Indexation factors are proposed to be used sources of which given in the table below:

Indexation Factors	Sources
Local Inflation (CPI)	Pakistan Bureau of Statistics (PBS)
Foreign Inflation (US CPI)	US Bureau of Labor Statistics
Exchange rates (USD)	National Bank of Pakistan
KIBOR	State Bank of Pakistan
LIBOR / SOFR	Intercontinental Exchange /Federal Reserve Bank of New York

1.2.1. Fuel Cost

This component represents the cost of fuel for the Net Electrical Output produced by the plant at the allowed efficiency levels and shall be indexed for any fuel price variations.

Net Electrical Output: The net electrical energy expressed in kWh that is generated by the Complex (or any Unit) and delivered to the Interconnection Point as measured by the Metering system.

Fuel price

BQPS-I is currently operating on Gas fuel including Indigenous Natural Gas / RLNG and HFO.

NEO is currently recorded through meters at 220 KV bus bar and is bifurcated between Indigenous Natural Gas, RLNG and HFO as per mechanism explained below.

Each BQ-1 units sent outs is recorded through energy meters at 220 KV bus bar. The startup transformers energy meters are also installed on the same bus and records the common auxiliary consumption (Import). This imported energy is taken into consideration when computing NEO.

Measurement of Units with common auxiliaries:

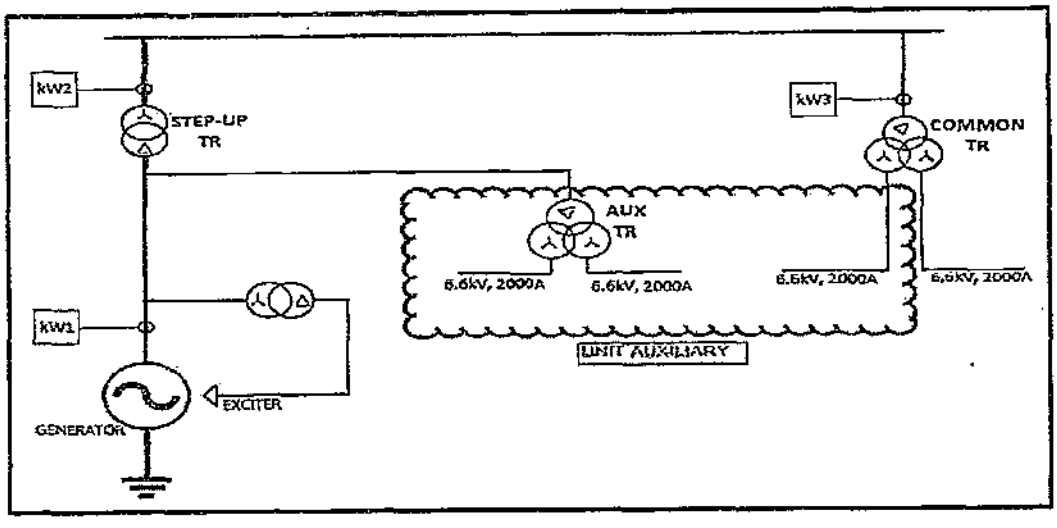
KW2: Unit Measured net power output at step-up transformer high side, kWh

KW3: Measured common auxiliary power consumption of 2 units, kWh

NEO= KW2-KW3*

* KW3 will be calculated separately for different operating scenarios. Common scenarios explained below:

1. Both units in operation: Each unit KW3*= KW3/2
2. 1 unit in operation:
    a. For Unit in operation: KW3*= (KW3-standby unit aux consumption)/2
    b. For Unit in standby: KW3*= (KW3- unit aux consumption)/2 + unit aux consumption
3. Both units standby: Each unit KW3* = (KW3- both units aux consumption)/2 + unit aux consumption



(Sample bill for April 2020 and bifurcation calculation is enclosed as **BQPS-I – Annexure B (i)**)

FO, Indigenous Natural Gas and RLNG – Mechanism of billing, pricing, and bifurcation

1. Gas / FO consumption at each Unit of BQPS 1 is recorded using stations own meters installed at each unit.
2. The Gas/FO flow values are added to get total consumption of station.
3. Values recorded through flow meters as explained above, are compared with SSGC bills and physical stock position of FO.
4. Any difference in the gas consumption recorded by SSGC and plant meters, are proportionately adjusted to ensure total cost of gas is in line with SSGC billed cost
5. Accordingly, Station Gas consumption are actualized at each month based on SSGC gas bills using below formula:
    - Unit Gas Consumption (MMCF) = {Unit Gas Consumption (MMCF) ÷ Station Total Gas Consumption (MMCF)} x SSGC Billed BQ-I Total Gas Consumption (MMCF)
6. Similarly, FO consumption is recorded by the flow meters installed on the units whereas, FO tanks dip is taken fortnightly to determine the level of stock available in tanks. Any difference in the consumptions recorded by units flow meters and established by tanks dip are proportionately adjusted to ensure that total consumption of FO is in line with physical consumption.
7. Station FO consumption are actualized fortnightly as per FO stock position as explained above and consumption is actualized using below formula:
    - Total FO Consumption (Tons) = Opening Stock (Tank Dip) + Receiving (Supplier Billed Invoice) – Closing Stock (Tank Dip)
    - Unit FO Consumption (Tons) = {Unit FO Consumption (Tons) ÷ Station Total FO Consumption (Tons)} x Total FO Consumption.

8. Unit wise Gas MMBtus are calculated based on monthly gas billed GCV and adjusted Unit wise Gas consumption as calculated in Point no. 5
9. Unit wise HFO MMBtus are calculated based on measured HFO GCV and adjusted Unit wise HFO consumption as calculated in Point no. 7
10. Units Generated / Sentout are then bifurcated unit wise in Gas and HFO based on proportion of Gas and HFO in MMBTUs
11. Finally, units generated / Sentout on Gas are bifurcated unit wise in NG and RLNG based on proportion of NG and RLNG in MMBTUs

Fuel prices

Prices of Gas

Prices for Indigenous Natural Gas and RLNG shall be calculated based on OGRA's notification. Prices of Indigenous Natural Gas are notified in PKR / mmbtu, whereas Prices of RLNG are notified by OGRA in USD / mmbtu which are then translated into PKR / mmbtu by SSGC using the daily average exchange rates issued by National bank for the month. Accordingly, SSGC mentions the rate in PKR / mmbtu on the bills.

Considering prices of Indigenous Natural Gas and RLNG are notified in per mmbtu, calorific value is not required for price conversion, unlike Furnace oil which are notified in PKR / mton.

SSGC supplies gas to KE through single pipeline based on available gas quantity and billing is done based on Indigenous Natural Gas and RLNG (Distribution tariff) based on proportion of Indigenous Natural Gas & RLNG supplied to KE (determined by SSGC based on RLNG imports).

(Sample bills for the month of April 2020 are enclosed as **BQPS-I - Annexure B (ii)**).

Gas Infrastructure Development Cess (GIDC)

Currently the matter of GIDC is sub-judice and no amount is passed onto the consumers. Subsequently, if any GIDC is paid (pertaining to prior periods) based on court verdict , the same will be included in fuel price PKR / mmbtu.

RLNG from any Dedicated Line / Alternate Supplier

In future, if RLNG is procured from any dedicated line / alternate supplier, the same will be measured through separate meters and energy will be bifurcated in supply from any dedicated line / alternate supplier based on actual MMBTUs, accordingly, to apply separate prices as per respective pricing mechanism.

HFO

HFO price is quoted in PKR / Metric Ton on price as per mutual agreement based on Fuel Supply Agreement. Accordingly, Gross Calorific value and conversion factors are required to convert the price in PKR / mmtbu. Sample calculation is provided in the table below:

Description	Unit	Calculation	Amount	Source
HFO price	PKR / M.ton	a	137,701	Weighted average price of fuel consumed for the month
Gross Calorific value	btu / lb	b	18,489	Actual GCV for the month as per test reports
Conversion factor	lb / kg	c	2.2046	Standard conversion factor
Gross Calorific value	btu / kg	d = b x c	40,761	Calculated
Conversion Factor	kg / M.ton	e	0.001	Standard conversion factor
Gross Calorific value	btu / M.ton	f = d x e	40.761	Calculated
HFO price	PKR / mmbtu	g = (a / f)	3,378	Calculated

Mechanism of Part load adjustment factor

For BQPS-I, Net HHV Heat rate for Units 1,2, 5 & 6 on Gas fuel and HFO (as shown above), were established based on IE's test where were subsequently allowed by NEPRA for the control period FY 2020 to FY 2023.

Considering separate tariff requests for each plant, central economic dispatch plan going forward as explained in **section 5** and the part load adjustment mechanism followed for IPPs, KE is proposing monthly part load adjustment based on actual operations for a month and part load adjustment factor given in the table as per the part load curve. Part load table enclosed as **BQPS-I - Annexure C(i) to C(iv)** for Gas and HFO. This mechanism of adjustment based on actual part load factor will also be consistent with other IPPs.

Part load adjustment will be based on hourly data for energy generated on plant and available capacity , based on which part loading % for each hour will be determined. Part load factor for each hour will be calculated based on part load % and part load factors given in Part load table for Gas and HFO fuels (given in as **BQPS-I - Annexure C (i) to C (iv)** for gas and HFO). Accordingly, a weighted average part load factor for the month will be calculated for Gas and HFO which shall be dominated as PL_{Gas} and PL_{HFO} (Sample calculation for a day enclosed as **BQPS-I - Annexure D**)

Degradation factor

Reference values of heat rate and capacity (Gas & HFO) are based on test conducted in 2019 for Gas and HFO and KE would request NEPRA to adjust the heat rate and output for each year based on degradation table as provided in **BQPS-I - Annexure E(i) and E(iv).**

Considering that these are old plants and degradation curves are not available, degradation curves are based on historic degradation pattern from commissioning to test in November 2019.

Summary of assumptions used for reference tariff

Description	Unit-1			Unit-2			Unit-5			Unit-6		
	I.G	RLNG	HFO	I.G	RLNG	HFO	I.G	RLNG	HFO	I.G	RLNG	HFO
Net HHV heat rate	11,231	11,231	10,566	11,143	11,143	10,527	10,798	10,798	10,163	11,200	11,200	10,352
Fuel price PKR / mmbtu	857	3,881	4,123	857	3,881	4,123	857	3,881	4,123	857	3,881	4,123
Fuel Component PKR / kWh	9.62	43.59	43.57	9.55	43.24	43.41	9.25	41.91	41.90	9.60	43.46	42.68
RLNG price												
Fuel Price PKR / mmbtu		3,880.8			3,880.8			3,880.8			3,880.8	
HFO price												
FO price per M.ton			166,376			166,376			166,376			166,376
GCV (btu / kg)			40,351			40,351			40,351			40,351

Indexation formula

The fuel cost component of tariff shall be adjusted on account of fuel price variation as per the following mechanism:

Indigenous Natural Gas

$FCCIG_{(Rev)}$	=	$FCCIG_{(Ref)} \times PIG_{(Rev)} / PIG_{(Ref)}$
Where:		
$FCCIG_{(Rev)}$	=	The revised fuel cost component on Indigenous Natural Gas in PKR / kWh
$FCCIG_{(Ref)}$	=	The reference fuel cost component for relevant unit on Indigenous Natural Gas
$PIG_{(Rev)}$	=	The revised net HHV Indigenous Natural Gas price notified by the OGRA in PKR / MMBTU
$PIG_{(Ref)}$	=	The reference net HHV Indigenous Natural Gas price of **PKR 857 / MMBtu**

RLNG

$FCCRLNG_{(Rev)}$	=	$FCCRLNG_{(Ref)} \times PRLNG_{(Rev)} / PRLNG_{(Ref)}$
Where:		
$FCCRLNG_{(Rev)}$	=	The revised fuel cost component on RLNG in PKR / kWh
$FCCRLNG_{(Ref)}$	=	The reference fuel cost component for relevant unit on RLNG
$PRLNG_{(Rev)}$	=	The revised net HHV RLNG price notified by the OGRA in USD / MMBTU multiplied by exchange rate appearing on SSGC bills
$PRLNG_{(Ref)}$	=	The reference net HHV RLNG price of **PKR 3,301 / MMBtu**

HFO (Monthly adjustment based on weighted average price for the month)

$FCCHFO_{(Rev)}$	=	$FCCHFO_{(Ref)} \times PHFO_{(Rev)} / PHFO_{(Ref)} \times CalHFO_{(Ref)} / CalHFO_{(Rev)}$
Where:		
$FCCHFO_{(Rev)}$	=	The revised fuel cost component on HFO in PKR / kWh
$FCCHFO_{(Ref)}$	=	The reference fuel cost component for relevant unit on HFO
$PHFO_{(Rev)}$	=	The revised net HHV HFO price of HFO in PKR / liter based on weighted average formula as given below
$PHFO_{(Ref)}$	=	The reference net HHV HFO price of **PKR 137,701 / M.ton**
$CalHFO_{(Ref)}$	=	The revised Calorific value of HFO for the month in btu / liter as per lab tests done by reputable labs based on frequency mechanism defined in **BQPS-I – Annexure F**
$CalHFO_{(Rev)}$	=	The reference Calorific value of HFO of **40.761 btu / ton**

Calculation of Weighted average Furnace oil price for a month

Furnace oil	Legend	Stock in Metric ton	Amount - PKR mn	Weighted average price
		i	ii	iii = ii / i x 10^6
Opening	A	26,943	3,991	
Purchases	B	27,617	3,521	
Available for consumption	C = A + B	54,559	7,513	137,701
Less: Consumption	D	(34,381)	(4,941)	
Closing	E = C - D	20,178	2,572	

The calculated $FCCIG_{(Rev)}$, $FCCRLNG_{(Rev)}$ and $FCCHFO_{(Rev)}$ shall be adjusted with weighted average part load factor for the month based on calculation as explained in *Mechanism of Part load Adjustment Factor* and degradation factor under section *Degradation Factor*.

Fuel cost components – Unit wise

$FCCIG_{(Rev)(adj)}$	=	$FCCIG_{(Rev)} \times PL_{Gas} \times D_y$
$FCCRLNG_{(Rev)(adj)}$	=	$FCCRLNG_{(Rev)} \times PL_{Gas} \times D_y$
$FCCHFO_{(Rev)(adj)}$	=	$FCCHFO_{(Rev)} \times PL_{HFO} \times D_y$
Where;		
PL_{Gas}	=	Weighted average Part load factor for the month for Gas operations as calculated on mechanism explained under section *"Mechanism of Part load Adjustment factor"*
PL_{HFO}	=	Weighted average Part load factor for the month for HFO operations as calculated on mechanism explained under section *"Mechanism of Part load Adjustment factor"*
D_y	=	Degradation factor for the year based on degradation table given in **BQPS-I - Annexure E(i) to E(iv)** for respective units

Same to be followed for all units.

1.2.2. O&M Expenses

Under the existing MYT structure, capital expenditure for maintenance of plant is allowed as investment plan and becomes part of Regulatory Asset base, whereas revenue expenses are allowed as part of O&M expenses.

However, as explained above, KE is proposing a tariff for remaining life of generation plant with structure in line with IPPs where both capex and revex nature of expenditures are allowed through Fixed and Variable O&M. This will help to have visibility and align the tariff structure with CTBCM requirement and industry practice.

Accordingly, proposed O&M expenses are bifurcated in Variable and Fixed, and then further bifurcated in Foreign and local, based on nature of expenses for applying relevant indexations.

Bifurcation of O&M is as follows:

Variable O&M local

The Variable O&M Local represents plant maintenance costs consisting of both parts and services to which are procured from local market in local currency by the Company. Being variable in nature, these costs are linked to plants' operating hours and incurred on some specific machine operating hours intervals.

For tariff calculation purposes, KE has calculated levelized Variable O&M Local keeping in view costs of FY 2022 and based on projected Variable O&M local for the remaining useful life of the respective units, including maintenance expenses being incurred at regular intervals of hours recommended by OEM, which shall be indexed with Pak CPI at the start of each quarter.

Accordingly, Unit wise levelized variable O&M cost comes out as give below, at reference CPI of **158.48** which shall be indexed with Pak CPI at the start of each quarter.

Category	Annual Amount – PKR million	Units at plant factor – GWh[3]	O&M Per unit – PKR / kWh
Unit 1	64.97	315.90	0.2057
Unit 2	58.92	322.10	0.1829
Unit 5	76.85	1,064.85	0.0722
Unit 6 (including common facilities)	91.31	1,184.90	0.0771

$Var.\ Local.\ O\&M_{(Rev)}$	=	$Var.\ Local\ O\&M_{(Ref)} \times CPI_{(Rev)} / CPI_{(Ref)}$
Where;		
Var. Local. $O\&M_{(Rev)}$	=	Revised Variable O&M local Component of Tariff
Var. Local $O\&M_{(Ref)}$	=	Reference Variable O&M local Component of Tariff
$CPI_{(Rev)}$	=	Revised CPI – notified by Pakistan Bureau of Statistics latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
$CPI_{(Ref)}$	=	Reference CPI of **158.48** average for FY 2022

Variable O&M Foreign

The Variable O&M Foreign is for imported Gas Steam Turbine capital spare parts, electrical spares and technical services required.

For tariff calculation purposes, KE has calculated levelized Variable O&M Foreign keeping in view costs of FY 2022 and based on projected Variable O&M Foreign for the remaining useful

[3] Average yearly units of remaining life

life of the respective units, including maintenance expenses being incurred at regular intervals of hours recommended by OEM which shall be indexed with US CPI and exchange rates at the start of each quarter.

Accordingly, levelized variable O&M Foreign component comes out as below at reference USD CPI of **282.03** and exchange rate of **PKR 206 / USD**, based on projected expenses which shall be indexed based on US CPI and exchange rates at the start of each quarter.

Category	Annual Amount – PKR million	Units at plant factor - GWh	O&M Per unit – PKR / kWh
Unit 1	8.09	315.90	0.0256
Unit 2	10.43	322.10	0.0324
Unit 5	102.85	1,064.85	0.0966
Unit 6 (including common facilities)	226.89	1,184.90	0.1915

Var. Foreign. O&M$_{(Rev)}$	=	**Var. Foreign O&M$_{(Ref)}$ x USCPI$_{(Rev)}$ / USCPI$_{(Ref)}$ x ER$_{(Rev)}$ / ER$_{(Ref)}$**
Where;		
Var. Foreign. O&M$_{(Rev)}$	=	Revised Variable O&M Foreign Component of Tariff
Var. Foreign O&M$_{(Ref)}$	=	Reference Variable O&M Foreign Component of Tariff
USCPI$_{(Rev)}$	=	The revised US CPI (All Urban Consumers) notified by US Bureau of Labor Statistics latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
USCPI$_{(Ref)}$	=	The reference US CPI of **282.03** average for FY 2022
ER$_{(Rev)}$	=	The Revised TT & OD selling rate of USD as notified by National bank latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
ER$_{(Ref)}$	=	The reference exchange rate of **PKR 206 / USD** as of FY2022

Fixed O&M local

Fixed costs are incurred to ensure plant's availability irrespective of its operations. This component includes both plant maintenance expenses and necessary allied costs of salaries and wages, third party services, transport etc.

For tariff calculation purposes, KE has calculated levelized Fixed O&M Local considering FY 22 costs and based on the projected Fixed O&M local for the remaining useful life of the plant which shall be indexed with Pak CPI at the start of each quarter.

Accordingly, levelized Fixed O&M local component cost per year is estimated at **PKR 1,017 million** per year translating into **PKR 0.61 / kW/h (based on units at plant factor)**at reference Pak CPI of **158.48** (Average FY 22) based on projected expenses which shall be indeed based on Pak CPI at the start of each quarter.

Category	Annual Average Amount – PKR million	Annual Average Units at plant factor - GWh	O&M Per unit – PKR / kWh
Overall plant	1,017.36	1,674.63	0.6075

Fix. Local. $O\&M_{(Rev)}$	=	Fix. Local $O\&M_{(Ref)}$ x $CPI_{(Rev)}$ / $CPI_{(Ref)}$
Where;		
Fix. Local. $O\&M_{(Rev)}$	=	Revised Fixed O&M local Component of Tariff
Fix. Local $O\&M_{(Ref)}$	=	Reference Fixed O&M local Component of Tariff
$CPI_{(Rev)}$	=	Revised CPI notified by Pakistan Bureau of Statistics latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
$CPI_{(Ref)}$	=	Reference CPI of **158.48 average FY 2022**

Fixed O&M Foreign

Fixed costs are incurred to ensure plant's availability irrespective of its operations. These costs are critical to ensure availability and continued operations of the plant.

The Fixed O&M Foreign component consists of routine maintenances.

For tariff calculation purpose, KE has calculated Fixed cost foreign based on FY 2022 costs and projected Fixed cost foreign which shall be indexed to US CPI and exchange rates at the start of each quarter.

Accordingly, levelized Fixed O&M foreign component cost per year is estimated at **PKR 340 million** per year translating into **PKR 0.20 / kW/h** at reference US CPI of **282.03** average FY 2022 based on projected expenses which shall be indexed based on USD CPI and exchange rate at the start of each quarter.

Category	Annual Average Amount – PKR million	Annual Average Units at plant factor - GWh	O&M Per unit – PKR / kWh
Overall plant	339.68	1,674.63	0.2028

Fix. Foreign. $O\&M_{(Rev)}$	=	Fix. Foreign $O\&M_{(Ref)}$ x $USCPI_{(Rev)}$ / $USCPI_{(Ref)}$ x $ER_{(Rev)}$ / $ER_{(Ref)}$
Where;		
Fix. Foreign. $O\&M_{(Rev)}$	=	Revised Fixed O&M Foreign Component of Tariff
Fix. Foreign $O\&M_{(Ref)}$	=	Reference Fixed O&M Foreign Component of Tariff
$USCPI_{(Rev)}$	=	The revised US CPI (All Urban Consumers) notified by US Bureau of Labor Statistics latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
$USCPI_{(Ref)}$	=	The reference US CPI of **282.03 average** FY 2022
$ER_{(Rev)}$	=	The Revised TT & OD selling rate of USD as notified by National bank latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
$ER_{(Ref)}$	=	The reference exchange rate of **PKR 206 / USD** as of FY2022

For break up of O&M (levelized), please refer **BQPS-I - Annexure G**

O&M costs both Variable & Fixed (local / foreign) have been validated and benchmarked by Independent Consultant, report of which is enclosed as **BQPS I – Annexure H.**

1.2.3. Insurance

KE requests an insurance premium up to 1% of EPC cost consistent with the insurance cost allowed to IPPs that shall be adjusted annually as per actual subject to maximum limit of 1% of EPC.

Unit wise Insurance cost based on EPC cost is given in **BQPS - Annexure I**

Further, Year wise Insurance components will be calculated based on remaining units in operation. Please refer **BQPS I - Annexure I** for year wise Insurance calculation.

Insurance component shall be adjusted with actual cost at start of the year.

$Ins_{(Ref)(adj)}$	=	$Ins_{(Ref)} \times P_{(Act)} / P_{(Ref)}$
Where;		
$Ins_{(Ref)(adj)}$	=	Adjusted Reference Insurance Component of Tariff
$Ins_{(Ref)}$	=	Reference Insurance Component of Tariff
$P_{(Ref)}$	=	Reference Premium in USD million at PKR 206 / USD for relevant year as given in **BQPS I - Annexure I**
$P_{(Act.)}$	=	Actual Premium in USD or Reference premium as given in **BQPS I - Annexure I** (1% of EPC cost) whichever is lower

Further, insurance component shall be adjusted quarterly based on below formula

$Ins_{(Rev)}$	=	$Ins_{(Ref)(adj)} \times ER_{(Rev)} / ER_{(Ref)}$
Where;		
$Ins_{(Ref)(adj)}$	=	Adjusted reference Insurance component of Tariff
$ER_{(Rev)}$	=	The Revised TT & OD selling rate of USD as notified by National bank latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
$ER_{(Ref)}$	=	The reference exchange rate of **PKR 206 / USD** as of FY22

1.2.4. Return on Regulatory Asset Base and Depreciation

Regulatory Asset Base

Regulatory Asset Base shall comprise of written down value of plant excluding surplus on revaluation and including Intangibles (mainly software used for regulated business) and CWIP at start of control period, which will be depreciated each year based on remaining useful life of the plant.

Regulatory asset base based on current structure at the end of FY 2023 will be locked and used as a basis for proposed MYT and further additions to RAB shall only be based on any project-based addition / modification to the plant subject to NEPRA's approval for which a onetime request will be submitted for adjustment in tariff components.

With regard to RAB, KE has projected RAB as of FY 2023 at **PKR 9,741 million for BQPS I Plant** and accordingly, requests NEPRA to actualize the same at the start of the next term i.e. July 2023 based on audited financial statements.

RAB movement is enclosed as **BQPS-I - Annexure J**. Once RAB at end of FY 2023 will be finalized post audit of financial statements, KE will file the same with updated opening RAB and accordingly related tariff components, including RoRB and Depreciation will be updated.

Return

Return shall be calculated based on Return on Equity, cost of debt and Debt to Equity ratio

Debt Equity ratio

Debt to equity ratio is proposed to be 70:30 as allowed in current MYT, subject to discussion in Main section.

Cost of Debt

Like existing MYT, cost of debt for local component will be calculated based on 3 month KIBOR plus a spread of 2.5% and cost of debt for foreign component is calculated based on 3 month LIBOR, spread 4.5% and hedging cost based on difference of 3 month KIBOR and 3 month LIBOR plus a hedging cost spread.

Accordingly, cost of debt has been calculated using reference 3 month KIBOR of **15.16% as of FY2022**, reference 3 month LIBOR of **2.29%** as of FY 2022.

Local to Foreign debt ratio

Considering no foreign debt is currently drawn for BQPS III, Debt has been taken at local for cost of debt.

KIBOR / LIBOR is proposed to be indexed each quarter going forward based on actual.

Accordingly, Return on Regulatory Asset Base – Cost of Debt (RoRBCoD) comes out to **PKR 0.33 / kW/h**, for FY 2024. For year wise tariff components, please refer Tariff table.

RoRB – Local component of Cost of debt

$RoRBCoD\ Local_{(Rev)}$	=	$RoRBCoD\ Local_{(Ref)}$ for relevant year x $CoD\ Local_{(Rev)}$ / $CoD\ Local_{(Ref)}$
Where;		
$RoRBCoD\ Local_{(Rev)}$	=	Revised Local RoRB cost of debt component of tariff
$RoRBCoD_{(Ref)}$	=	Reference Local RoRB cost of debt component of tariff
$CoD\ Local_{(Rev)}$	=	$KIBOR_{(Rev)}$ + 2.5%
$CoD\ Local_{(Ref)}$	=	$KIBOR_{(Ref)}$ + 2.5%
$KIBOR_{(Rev)}$	=	The revised 3-month KIBOR as published by State Bank of Pakistan latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
$KIBOR_{(Ref)}$	=	The reference 3-month KIBOR of **15.16%** as of FY22

Cost of Equity

Keeping in view currently allowed returns, return on equity of USD based 15% is proposed that shall be indexed based on changes in USD to PKR exchange rate at the start of each quarter.

For the purpose of Exchange rate indexation, indexation with reference to FY 2016 has been calculated considering weightage of RAB each year till FY 2023 inline with mechanism used by NEPRA in the current MYT. Accordingly, reference indexed cost of equity has been calculated using reference current exchange rate of **PKR 206 / USD.** Please refer calculation in **BQPS I - Annexure K (i).**

Accordingly, Return on Regulatory Base – Cost of Equity (RoRBCoE) comes out to **PKR 0.25/ kWh** for FY 2024 considering USD RoE of **15%** and indexed RoE of **30.99%** at exchange rate of **PKR 206 / USD.** Accordingly, KE requests the Authority to consider the actual average exchange rate of FY23 at the time of actualization of RAB at FY23 as mentioned in

"Regulatory Asset Base" section above. For year wise tariff components for Gas and HSD, please refer Tariff table.

Indexation formula is given below. Further, an illustration for RoE indexation is given in **BQPS II - Annexure K (ii).**

RoRB – Component of Cost of Equity

$RoRBCoE_{(Rev)}$	=	$RoRBCoE_{(Ref)}$ for relevant year x $ER_{(Rev)} / ER_{(Ref)}$
Where;		
$RoRBCoE_{(Rev)}$	=	Revised RoRB cost of equity component of tariff
$RoRBCoE_{(Ref)}$	=	Reference RoRB cost of equity component of tariff
$ER_{(Rev)}$	=	The Revised TT & OD selling rate of USD as notified by National bank of Pakistan latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
$ER_{(Ref)}$	=	The Reference exchange rate of **PKR 206 / USD**

Depreciation

Depreciation shall be calculated as straight line based on written down value of RAB at the end of FY 2023 (Current control period) and remaining useful life at the end of Control period.

Accordingly, Depreciation component comes out to **PKR 0.76 / kW/h** for FY 2024. For year wise tariff components, please refer Tariff table.

1.2.5. Cost of Working Capital

KE requests NEPRA for working capital mechanism based on below formula, consistent with IPPs.

Legend	Working Capital Components
A	Cost of Stores & spares inventory
B	Cost of Fuel Inventory of Furnace oil
C	Cost of Fuel in Receivable cycle based on 30 days receipt period and 15 days payment period on FO fuel with 17% sales tax – based on 60% plant factor, to be actualized every quarter.
D	Cost of SBLC (currently included based on SBLC given to SSGC allocated to BQPS I plant, will be updated in future in case of any new agreement)

Working capital component has been calculated for the control period based on current prices and reference KIBOR of 15.16% as of FY22 plus a short term spread 2%.

Cost of working capital shall be indexed with actual KIBOR and change in fuel prices, a **quarterly basis.** Further, reference component shall be updated in future through a request in case of any change in circumstances for example update in SBLC cost pursuant to any changes / addition in the arrangement(s).

Based on above, working capital component comes out to **PKR 0.56 / kW/h** for FY 2024.

Working Capital requirement shall be indexed through updating the template enclosed in **BQPS-I - Annexure L** at each quarter, including update in SBLC cost pursuant to any changes / addition in the arrangement(s).

1.2.6. Pass through items

Similar to the current MYT and as allowed to IPPs, KE proposes the following items to be allowed as pass-through costs in the new MYT.

Corporate tax and WWPF / WWF

Currently, KE is an integrated entity therefore Corporate tax and WPPF / WWF on overall company level is a pass through item within MYT.

Considering that legal structure will remain same, KE is proposing that Corporate tax and WPPF / WWF shall be passed through to consumers in Supply Tariff.

However, going forward, in case of any change in legal structure whereby a Corporate tax and WWF / WPPF is separately levied on Generation plant, same shall be passed through as done in case of IPPs.

Unrecovered cost of Current MYT

Any unrecovered cost of Current MYT shall be pass through in tariff.

Startup Charges

Startup : Any startup of a Gas / HFO Unit that is necessary for a station to comply with the Dispatch requirements / Instructions and that results in the synchronization with the grid system.

Consistent with industry practice, KE requests the Authority to allow start up, as defined below.

In any month in a financial year, KE shall be allowed to claim "Start-Up charges" based on Reference start up charges indexed with relevant indices, including fuel prices and electricity tariff as requested below.

"Start-Up Charge" shall consist of two components and is calculated as follows:

Start-Up Charge = MDI Charge+ Reference Unit Start-Up Charges.

a) **MDI Charge:** The MDI charge shall be based on maximum demand recorded during the relevant month at startup and shall be calculated based on the then applicable MDI rate in Rs/kW, from time to time,

b) **Reference Unit Start-Up Charge:** This cost will cover the consumables, fuel and equivalent operating hours consumed for the start-ups.

The Start-Up Charges payable by the Power Purchaser for each Start-Up shall be calculated as follows:

SC_M	=	$MDIR_x \times N_1 + ((SCPI_{Ref} \times SCFadjust_{PI}) + ((SCFC_{Ref} \times SCFadjust_{FC})) \times N_2$
Where:		
SC_M	=	The Start Up Charges during the Month M
$MDIR_x$	=	Total fixed charges for the month due to Distributing segment during the relevant month (based on MDI for the month and MDI charge) divided by the total number of Start Ups performed during the month.
N1	=	The number of Start ups to be claimed, unless any shutdowns claimed during the relevant month in which case this will be considered as zero.
N2	=	The number of Start ups to be claimed
$SC_{(Ref)}$	=	The Reference Start-Up Charge as given below. Consists of the following two components:
$SCPI_{Ref}$	=	The Reference Start-Up Charge for the Power Import from Transmission System during Unit Startup till Synchronization.
$SCFadjust_{PI}$	=	The Startup Charges Adjustment Factor for the hour h for the Import of Power from Transmission Network as per following formula: **$SCFadjust_{PI}$ = $WAVCT\text{-}B5_{(Rev)}$ / $WAVCT\text{-}B5_{(Ref)}$** where: **$WACT\text{-}B5_{(Rev)}$** = Weighted Average of the latest notified variable consumer tariff for the Industrial Consumer Category (B-5) based on a weightage of 4:20 for Peak & Off-Peak Rates respectively. **$WACT\text{-}B5_{(Ref)}$** = Weighted Average of the reference notified variable consumer tariff for the Industrial Consumer Category (B-5) based on a weightage of 4:20 for Peak & Off-Peak Rates (i.e. Rs. 30.33 per kWh & Rs. 23.55 per kWh) respectively **(i.e. Rs. 24.68 per kWh)**
$SCFC_{Ref}$	=	The Reference Start-Up Charge for the Fuel Consumed during Unit Startup till Synchronization.
$SCFadjust_{FC}$	=	The Startup Charges Adjustment Factor for the hour h for the consumption of fuel as per the following formula:

		For Gas[4] – $SCFadjust_{FC} = FCCG_{Rev} / FCCG_{Ref}$ For HFO – $SCFadjust_{FC} = FCCHFO_{Rev} / FCCHFO_{Ref}$ For LDO – $SCFadjust_{FC} = FCCLDO_{Rev} / FCCLDO_{Ref}$ (As per below referenced Price and Calorific Value)

TYPE OF START – Note	Reference Unit-1/2/5/6 StartUp Charges -Gas	Reference Unit-1/2/5/6 StartUp Charges -LDO
	PKR million	
Hot Start (Gas)	1.68	1.21
Warm Start (Gas)	2.30	1.66
Cold Start (Gas)	16.41	11.82

References:

LDO Price: 81.32 Rs/litre

LDO Density: 920 Kg/m3

Shutdown Cost

Shutdown: Any shutdown of a Gas / HFO Unit that is necessary for a station to comply with the Dispatch requirements / Instructions which results in the de synchronization with the grid system.

KE requests the Authority to allow shutdown charges, as defined below.

In any month, KE shall be allowed to claim "Shutdown charges" based on Reference Shutdown charges indexed with relevant indices, including fuel prices and electricity tariff as requested below.

"Shutdown Charge" shall consist of two components and is calculated as follows:

Shutdown Charge = MDI Charge+ Reference Unit Shutdown Charges.

a) **MDI Charge:** The MDI charge shall be based on maximum demand recorded during the relevant month at shutdown and shall be calculated based on the then applicable MDI rate in Rs/kW, from time to time,

b) **Reference Unit Shutdown Charge**: This cost will cover the consumables, and equivalent operating hours consumed for the shutdown.

The Shutdown Charges for each Shutdown shall be calculated as follows:

[4] Proportion of Indigenous Gas & RLNG in both Reference & Revised FCCG will be calculated based on the actual mix of Indigenous Gas & RLNG used as appearing in SSGC Bills for the relevant month in which Startup Cost is being claimed whereas Reference and Revised Fuel Cost Component will be calculated as per Section 1.2.1 above.
Furthermore, in case Gas is made available through Dedicated Line/ Alternate Supplier as discussed in Section 1.2.1 above, then separate costs will be calculated and submitted to the Authority for approval.

SHC_M	=	$MDIR_x \times N1 + ((SHCPI_{Ref} \times SHCFadjust_{PI}) + ((SHCFC_{Ref} \times SHCFadjust_{FC})) \times N2$
Where:		
SHC_M	=	The Shutdown Charges during the Month M
$MDIR_x$	=	Total fixed charges for the month due to Distributing segment during the relevant month (based on MDI for the month and MDI charge) divided by the total number of Shutdowns performed during the month.
N1	=	The number of Shutdowns to be claimed, unless any startups claimed during the relevant month in which case this will be considered as zero.
N2	=	The number of Shutdowns to be claimed
$SHC_{(Ref)}$	=	The Reference Shutdown Charge as given below. Consists of the following two components:
$SHCPI_{Ref}$	=	The Reference Shutdown Charge for the Power Import from Transmission System till Unit is in Standby mode.
$SHCFadjust_{PI}$	=	The Shutdown Charges Adjustment Factor for the hour h for the Import of Power from Transmission Network as per following formula: $SHCFadjust_{PI} = WAVCT\text{-}B5_{(Rev)} / WAVCT\text{-}B5_{(Ref)}$ where: $WACT\text{-}B5_{(Rev)}$ = Weighted Average of the latest notified variable consumer tariff for the Industrial Consumer Category (B-5) based on a weightage of 4:20 for Peak & Off-Peak Rates respectively. $WACT\text{-}B5_{(Ref)}$ = Weighted Average of the reference notified variable consumer tariff for the Industrial Consumer Category (B-5) based on a weightage of 4:20 for Peak & Off-Peak Rates (i.e. Rs. 30.33 per kWh & Rs. 23.55 per kWh) respectively **(i.e. Rs. 24.68 per kWh)**
$SHCFC_{Ref}$	=	The Reference Shutdown Charge for the Fuel Consumed during Unit De-Synchronization till Flame-Off.
$SHCFadjust_{FC}$	=	The Shutdown Charges Adjustment Factor for the hour h for the consumption of fuel as per the following formula: For Gas[5] – $SHCFadjust_{FC} = FCCG_{Rev} / FCCG_{Ref}$ For HFO – $SHCFadjust_{FC} = FCCHFO_{Rev} / FCCHFO_{Ref}$

Type of Shutdown	Reference Unit-1 /2/5/6Shutdown Charges
	PKR million
Cost	0.64

1.3. Billing Mechanism

Billing shall be based on a Take-or-pay mechanism where Capacity payment shall be paid for the Available Capacity and Energy payments for the Net Electrical Output.

Available capacity for a month shall be based on hourly Annual Dependable Capacity after considering outages in each year.

[5] Proportion of Indigenous Gas & RLNG in both Reference & Revised FCCG will be calculated based on the actual mix of Indigenous Gas & RLNG used as appearing in SSGC Bills for the relevant month in which Shutdown Cost is being claimed whereas Reference and Revised Fuel Cost Component will be calculated as per Section 1.2.1 above.
Furthermore, in case Gas is made available through Dedicated Line/ Alternate Supplier as discussed in Section 1.2.1 above, then separate costs will be calculated and submitted to the Authority for approval.

Annual Dependable Capacity shall be based on ADC Test to be carried out at start of each year, to be carried out by Plant team and results of which shall be submitted to NEPRA.

NEO will be based on energy recorded through meters as explained in above sections.

1.3.1. Capacity Payments

Capacity cost includes Fixed O&M local, Fixed O&M foreign, Insurance, Working capital, RoRB – cost of debt, RoRB – cost of equity and Depreciation which are detailed in above sections. Capacity payment shall be made on a monthly basis as per formula detailed below:

Monthly Capacity Payment

CapacityPayment	=	**CapacityPrice x [Unit 1 AvailCap$_m$ x DO$_y$ + Unit 2 AvailCap$_m$ x DO$_y$ + , Unit 5 AvailCap$_m$ x DO$_y$ + Unit 6 AvailCap$_m$ x DO$_y$]**
Where:		
CapacityPayment	=	the Capacity Payment, in Rupee, paid for a Month;
AvailCap$_m$	=	Aggregate Available capacity, in kWh, for the month based on Hourly Available capacity
CapacityPrice	=	(Fixed O&M local + Fixed O&M foreign, working capital + RoRB – cost of debt + RoRB – cost of equity + insurance) for the relevant month after indexations as explained above.
DO$_y$	=	the output degradation factor, as given in **BQPS-I - Annexure E(i)** to **E(iv)** for relevant unit

Capacity per unit components are same for HFO / Gas. Capacities for each unit will be calculated separate on Gas / HFO and summed up to make Aggregative Available capacity. For the purpose of calculation of Available capacity on HFO, capacity shall be considered based on actual operations on HFO, and remaining capacity shall be considered to be available on Gas.

Example of Capacity payment is give in **BQPS I – Annexure M**

Outages

Plant will maintain Annual Availability of 85% with

- **30 Days (720 hours)** of schedule outages Per Unit,
- **7 Days (168 hours)** of Maintenance outages Per Unit
- **17.8 Days (427.2 hours)** of forced outages Per Unit

Maintenance Outage will be required as follows:

7 Days of Condenser Washing. Further, Additional outages will be required for Overhauls as below:

- U-6 ST Major Overhaul due in FY-25, in which case the Company shall be entitled to **an additional Forty (40) days** of Scheduled Outage periods".
- U-6 DCS upgradation planned in FY-24, in which case the Company shall be entitled to **an additional Forty (45) days** of Scheduled Outage periods".

Based on annual availability of 85% and expected occurrence of Overhauls, Levelized plant factor has been calculated as 83.41%. **Please refer BQPS-I – Annexure N (i).** Further, units on Net capacity on this plant factor are given in **BQPS I – Annexure N (ii)**

1.3.2. Energy Payments

Energy cost includes:

1. Fuel cost (including Indigenous Natural Gas, RLNG & HFO), and
2. Variable O&M local & Variable O&M foreign which are detailed in above sections multiplied by degradation factor of relevant year.

The Energy Price for each unit shall be calculated using the Reference Fuel Cost Component during the year as follows:

Fuel	NEO for the month	Fuel	Variable O&M local	Variable O&M Foreign	Total Variable O&M	Output Degradation factor	Variable O&M after Degradation factor	EPP per unit	Energy payment
	A	b	c	d	e = c + d	f	g = e x f	h = b + g	i = a x h
	kWh	PKR / kWh	PKR / kWh	PKR / kWh	PKR / kWh	Factor	PKR / kWh	PKR / kWh	PKR
Natural Gas – Combined cycle	Units	$FCCIG_{(Rev)(adj)}$	Var. Local. $O\&M_{(Rev)}$	Var. Foreign. $O\&M_{(Rev)}$	Calculated	Relevant factor	Calculated	Calculated	Calculated
Natural Gas – Simple	Units	$FCCIG\text{-}SC_{(Rev)(adj)}$	Var. Local. $O\&M_{(Rev)}$	Var. Foreign. $O\&M_{(Rev)}$	Calculated	Relevant factor	Calculated	Calculated	Calculated
RLNG – Combined cycle	Units	$FCCRLNG_{(Rev)(adj)}$	Var. Local. $O\&M_{(Rev)}$	Var. Foreign. $O\&M_{(Rev)}$	Calculated	Relevant factor	Calculated	Calculated	Calculated
RLNG – Simple	Units	$FCCRLNG\text{-}SC_{(Rev)(adj)}$	Var. Local. $O\&M_{(Rev)}$	Var. Foreign. $O\&M_{(Rev)}$	Calculated	Relevant factor	Calculated	Calculated	Calculated
HSD – Combined cycle	Units	$FCCHSD_{(Rev)(adj)}$	Var. Local. $O\&M_{(Rev)}$	Var. Foreign. $O\&M_{(Rev)}$	Calculated	Relevant factor	Calculated	Calculated	Calculated
HSD – Simple cycle	Units	$FCCHSD\text{-}SC_{(Rev)(adj)}$	Var. Local. $O\&M_{(Rev)}$	Var. Foreign. $O\&M_{(Rev)}$	Calculated	Relevant factor	Calculated	Calculated	Calculated
Total	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated

1.4. O&M Sharing mechanism

KE is proposing to share the savings in O&M, if any, in proportion of 60:40 for Consumers: KE, which shall be calculated at the end life of Unit 6.

For the purpose of calculation of sharing of O&M savings/ (loss) at the completion of each major overhaul cycle, O&M expenses (O&M Expenses as per Profit & Loss Account & Addition to CWIP) as per the audited financial statements shall be used.

An illustration of sharing mechanism for one cycle is given in **BQPS-I – Annexure O** Same shall be applicable for next overhaul cycles till the end of plant life.

1.5. Other items

Items generally covered under PPA

Unlike previous MYT, KE has proposed Tariff structure in line with IPPs. In case of IPPs, certain modalities / charges are governed under the Power Purchase Agreement, which have been included in the petition. However, detailed modalities and other remaining terms will be agreed in a "Service Level Agreement" for which KE has prepared and Annexed a Head of Terms (please refer, **BQPS-I – Annexure P**. Full scope SLA will be prepared and submitted for NEPRA's approval based on Tariff determination.

Costs pursuant to Unbundling in future

KE is an integrated utility and therefore there are certain synergies in common costs. In future, if there is any legal unbundling, KE will file for a onetime adjustment for additional costs pursuant to that.

Alternate Supplier of RLNG

In case of any additional requirements on account of arranging RLNG through an Alternative Supplier as detailed in **Section 1.2.1 - Plant Capacity and Heat Rate** above, KE will submit details of the proposal separately to NEPRA for approval. Post approval of the Authority, KE will file a one-time adjustment for reference tariff components, based on allowed investment, Net capacity and heat rate impacts.

Costs pursuant to Force Majeure Events

Costs related to a Force Majeure Events are allowed to IPPs and accordingly KE also request those to be passed through in Tariff. Details and modalities of force majeure events will be included under the SLA, pursuant to the Terms of Agreements as explained in **BQPS I – Annexure P**, in line with agreements of other IPPs.

1.6. Summary of Base Tariff FY 2024 & Indexation Mechanism

In view of the foregoing and considering the significant changes in tariff structure, following component wise indexation mechanism is being requested to ensure recovery of prudent costs critical to ensure quality of service.

Energy cost

Tariff Components	RLNG PKR / kWh	HFO PKR / kWh	Indexation Mechanism	Reference Rates
Unit 1 Energy cost Fuel cost	37.07	35.69	• Indexation with fuel price & CV (for HFO) • Impact of allowed part load and degradation factor (monthly)	• Net HHV RLNG price of PKR 3,301 / MMBtu • Net HHV HFO price of PKR 137,701 / M ton • Calorific value of HFO of 40.761 btu / M. ton
Variable O&M – local	0.21	0.21	• Indexed with Pak CPI (Quarterly)	• Average CPI of 158.48 for FY 2022
Variable O&M – Foreign	0.03	0.03	• Indexed with US CPI and USD to PKR exchange rate (Quarterly)	• Average US CPI of 282.03 for FY 22 • Exchange rate of PKR 206 / USD as of FY 22
Energy cost subtotal	37.30	35.93		
Unit 2 Energy cost Fuel cost	36.78	35.56	• Indexation with fuel price & CV (for HFO) • Impact of allowed part load and degradation factor (monthly)	• Net HHV RLNG price of PKR 3,301 / MMBtu • Net HHV HFO price of PKR 137,701 / M ton • Calorific value of HFO of 40.761 btu / M. ton
Variable O&M – local	0.18	0.18	Indexed with Pak CPI (Quarterly)	• Average CPI of 158.48 for FY 2022
Variable O&M – Foreign	0.03	0.03	Indexed with US CPI and USD to PKR exchange rate (Quarterly)	• Average US CPI of 282.03 for FY 22 • Exchange rate of PKR 206 / USD as of FY 22
Energy cost subtotal	37.00	35.78		
Unit 5 Energy cost Fuel cost	35.64	34.33	• Indexation with fuel price & CV (for HFO) • Impact of allowed part load and degradation factor (monthly)	• Net HHV RLNG price of PKR 3,301 / MMBtu • Net HHV HFO price of PKR 137,701 / M ton • Calorific value of HFO of 40.761 btu / M.ton
Variable O&M – local	0.07	0.07	Indexed with Pak CPI (Quarterly)	• Average CPI of 158.48 for FY 2022
Variable O&M – Foreign	0.10	0.10	Indexed with US CPI and USD to PKR exchange rate (Quarterly)	• Average US CPI of 282.03 for FY 22 • Exchange rate of PKR 206 / USD as of FY 22
Energy cost subtotal	35.81	34.50		
Unit 6 Energy cost Fuel cost	36.97	34.97	• Indexation with fuel price & CV (for HFO) • Impact of allowed part load and degradation factor (monthly)	• Net HHV RLNG price of PKR 3,301 / MMBtu • Net HHV HFO price of PKR 137,701 / M ton • Calorific value of HFO of 40.761 btu / M.ton
Variable O&M – local	0.08	0.08	• Indexed with Pak CPI (Quarterly)	• Average CPI of 158.48 for FY 2022
Variable O&M – Foreign	0.19	0.19	• Indexed with US CPI and USD to PKR exchange rate (Quarterly)	• Average US CPI of 282.03 for FY 22 • Exchange rate of PKR 206 / USD as of FY 22
Energy cost subtotal	37.24	35.24		

Capacity cost

Tariff Components	PKR /kWh	Indexation Mechanism	Reference Rates
Capacity cost Fixed O&M – local	0.61	• Indexed with Pak CPI (Quarterly)	• Average CPI of 158.48 for FY 2022
Fixed O&M – Foreign	0.20	• Indexed with US CPI and USD to PKR exchange rate (Quarterly)	• Average US CPI of 282.03 for FY 22 • Exchange rate of PKR 206 / USD as of FY2022
Insurance	0.14	• Indexed with USD to PKR exchange rate – quarterly • Annual actualization based on capping of 1% of EPC cost	• Exchange rate of PKR 206 / USD as of FY23
Working Capital	0.52	• Indexed with KIBOR (Quarterly) and change in fuel prices.	• KIBOR of 15.16% as of FY22
RoRB – Cost of Debt Local	0.33	• Indexed with KIBOR (Quarterly)	• KIBOR of 15.16% as of FY22
RoRB – Cost of Equity	0.25	• Indexed with USD to PKR exchange rate	• Exchange rate of PKR 206 / USD as of FY2022
Depreciation	0.76	• Recalculated based on RAB changes due to addition of specific project approved by NEPRA	
Capacity cost subtotal	**2.85**		

Please refer following tariff tables for year wise tariffs.

K-Electric Limited
Generation Plants Tariff Petition
BQPS I Plant
Tariff table - FY 2024 and onwards

Unit 1 - Energy Purchase Price

Gross Capacity	181.2	MW
Net Capacity	168.3	MW
Units at full capacity	1,474.5	GWh
Exchange rate	206	PKR / USD
KIBOR	15.16%	%
LIBOR	2.29%	%

Year	FY	Energy Purchase Price (PKR / kWh)						Energy Purchase Price - Cents / kWh	
		Fuel cost - FCC - RLNG	Fuel cost - FCC - FO	Variable O&M - FCC	Variable O&M - GTPS	EPP - RLNG	EPP - FO	EPP - RLNG	EPP - FO
		a	b	c	d	a+b+c+d	a+b+c+d	a+b+c+d / 206	a+b+c+d / 206
1	2024	37.02	35.69	0.21	0.03	37.30	35.93	18.11	17.44

Fuel cost component -

Indigenous Gas	9.67

Unit 2 - Energy Purchase Price

Gross Capacity	183.4	MW
Net Capacity	171.6	MW
Units at full capacity	1,503.4	GWh
Exchange rate	206	PKR / USD
KIBOR	15.16%	%
LIBOR	2.29%	%

Year	FY	Energy Purchase Price (PKR / kWh)						Energy Purchase Price - Cents / kWh	
		Fuel cost - FCC - RLNG	Fuel cost - FCC - FO	Variable O&M - FCC	Variable O&M - GTPS	EPP - RLNG	EPP - FO	EPP - RLNG	EPP - FO
		a	b	c	d	a+b+c+d	a+b+c+d	a+b+c+d / 206	a+b+c+d / 206
1	2024	36.78	35.56	0.18	0.03	37.00	35.78	17.96	17.37

Fuel cost component -

Indigenous Gas	9.55

Unit 5 - Energy Purchase Price

Gross Capacity	188.3	MW
Net Capacity	175.9	MW
Units at full capacity	1,540.9	GWh
Exchange rate	206	PKR / USD
KIBOR	15.16%	%
LIBOR	2.29%	%

Year	FY	Energy Purchase Price (PKR / kWh)						Energy Purchase Price - Cents / kWh	
		Fuel cost - FCC - RLNG	Fuel cost - FCC - FO	Variable O&M - FCC	Variable O&M - GTPS	EPP - RLNG	EPP - FO	EPP - RLNG	EPP - FO
		a	b	c	d	a+b+c+d	a+b+c+d	a+b+c+d / 206	a+b+c+d / 206
1	2024	35.64	34.33	0.07	0.10	35.81	34.50	17.38	16.75
2	2025	35.64	34.33	0.07	0.10	35.81	34.50	17.38	16.75
3	2026	35.64	34.33	0.07	0.10	35.81	34.50	17.38	16.75
4	2027	35.64	34.33	0.07	0.10	35.81	34.50	17.38	16.75
Average tariff		35.64	34.33	0.07	0.10	35.81	34.50	17.38	16.75

Fuel cost component -

Indigenous Gas	9.25

Generation Plants Tariff Petition
BQPS I Plant
Tariff table - FY 2024 and onwards

Unit 6 - Energy Purchase Price

Gross Capacity	191.0	MW
Net Capacity	177.2	MW
Units at full capacity	1,552.6	GWh
Exchange rate	206	PKR / USD
KIBOR	15.16%	%
LIBOR	2.29%	%

		Energy Purchase Price (PKR / kWh)						Energy Purchase Price - Cents / kWh	
Year	FY	Fuel cost - FCC RLNG	Fuel cost - FCC FO	Variable O&M local	Variable O&M Foreign	EPP - RLNG	EPP - FO	EPP - RLNG	EPP - FO
		a	b	c	d	e=a+c+d	f=b+c+d	e/206	f/206
1	2024	36.97	34.97	0.08	0.19	37.24	35.24	18.08	17.11
2	2025	36.97	34.97	0.08	0.19	37.24	35.24	18.08	17.11
3	2026	36.97	34.97	0.08	0.19	37.24	35.24	18.08	17.11
4	2027	36.97	34.97	0.08	0.19	37.24	35.24	18.08	17.11
5	2028	36.97	34.97	0.08	0.19	37.24	35.24	18.08	17.11
6	2029	36.97	34.97	0.08	0.19	37.24	35.24	18.08	17.11
7	2030	36.97	34.97	0.08	0.19	37.24	35.24	18.08	17.11
8	2031	36.97	34.97	0.08	0.19	37.24	35.24	18.08	17.11
9	2032	36.97	34.97	0.08	0.19	37.24	35.24	18.08	17.11
10	2033	36.97	34.97	0.08	0.19	37.24	35.24	18.08	17.11
Average tariff		36.97	34.97	0.08	0.19	37.24	35.24	18.08	17.11

Fuel cost component -

Indigenous Gas	5.60

BPQS I - Capacity Purchase price

Exchange rate	206	PKR / USD
KIBOR	15.16%	%
LIBOR	2.29%	%

				Capacity Purchase Price PKR / kW / hour at 83.41% Plant factor									
Year	FY	Units	Net Capacity Total - MW	Fixed O&M local	Fixed O&M Foreign	Insurance	RoRB - Cost of debt - local	RoRB - Cost of debt - foreign	RoRB - Cost of Equity	Depreciation	Working Capital	CPP	Total tariff Cents / kWh
				a	b	c	d	e	f	g	h	i = sum a to h	i/206
1	2024	4	693.08	0.61	0.20	0.14	0.33	-	0.25	0.76	0.52	2.81	1.36
2	2025	2	353.14	0.61	0.20	0.14	0.32	-	0.24	0.44	0.49	2.45	1.19
3	2026	2	353.14	0.61	0.20	0.14	0.27	-	0.20	0.44	0.49	2.35	1.14
4	2027	2	353.14	0.61	0.20	0.13	0.35	-	0.26	0.54	0.53	2.62	1.27
5	2028	1	177.24	0.61	0.20	0.13	0.36	-	0.27	0.61	0.50	2.68	1.30
6	2029	1	177.24	0.61	0.20	0.13	0.28	-	0.21	0.61	0.50	2.55	1.24
7	2030	1	177.24	0.61	0.20	0.13	0.21	-	0.16	0.61	0.50	2.41	1.17
8	2031	1	177.24	0.61	0.20	0.13	0.13	-	0.10	0.61	0.50	2.28	1.11
9	2032	1	177.24	0.61	0.20	0.13	0.06	-	0.04	0.61	0.50	2.15	1.04
10	2033	1	177.24	0.61	0.20	0.13	0.04	-	0.03	0.61	0.65	2.26	1.10
Average tariff			281.59	0.61	0.20	0.13	0.23	-	0.18	0.59	0.52	2.46	1.19

CPP PKR 2.46 / kWh US Cents 1.19 / kWh

K-ELECTRIC LIMITED

BQPS-I – Annexures

List of Annexures

Annexure	Description
BQPS-I – Annexure A (i)	Modifications and Improvements Performed for Improving Performance of the Plant
BQPS-I – Annexure A (ii)	Safety procedures
BQPS-I – Annexure A (iii)	Projects details
BQPS-I – Annexure A (iv)	Minimum Loading
BQPS-I – Annexure A (v)	Fire protection system
BQPS-I – Annexure A (vi)	Plant layout
BQPS-I – Annexure A (vii)	Details of Major Equipment
BQPS-I – Annexure B (i)	Sample bill April 2020 and sample calculation of LG/RLNG & HFO
BQPS-I – Annexure C (i)	Part load Adjustment Factor table – Gas & HFO Unit 1
BQPS-I – Annexure C (ii)	Part load Adjustment Factor table – Gas & HFO Unit 2
BQPS-I – Annexure C (iii)	Part load Adjustment Factor table – Gas & HFO Unit 5
BQPS-I – Annexure C (iv)	Part load Adjustment Factor table – Gas & HFO Unit 6
BQPS-I – Annexure D	Sample calculation for weighted average part load factor – Gas
BQPS-I – Annexure E (i)	Degradation table -Net Heat rate HHV & Net output (Gas) & HFO Unit 1
BQPS-I – Annexure E (ii)	Degradation table -Net Heat rate HHV & Net output (HFO) Unit 2
BQPS-I – Annexure E (iii)	Degradation table -Net Heat rate HHV & Net output (Gas) & HFO Unit 5
BQPS-I – Annexure E (iv)	Degradation table -Net Heat rate HHV & Net output (HFO) Unit 6
BQPS-I – Annexure F	HFO Calorific value frequency mechanism
BQPS-I – Annexure G	O&M Break up (levelized)
BQPS-I – Annexure H	Consultant Report (Separate document)
BQPS I – Annexure I	Calculation of Insurance
BQPS-I – Annexure J	RAB Movement
BQPS-I – Annexure K (i)	Calculation of indexed RoE
BQPS-I – Annexure K (ii)	ROE indexation mechanism
BQPS-I – Annexure L	Calculation of working capital
BQPS-I – Annexure M	Capacity payment example
BQPS-I – Annexure N(i)	Outage Schedule and plant factor
BQPS-I – Annexure N(ii)	Units on Net capacity
BQPS-I – Annexure O	O&M Sharing Mechanism
BQPS-I – Annexure P	Head of Terms

BQPS-I – Annexure A (i)

Modifications and Improvement Works Performed for Improving Performance of the Plant for last 10 years

S #	Job Description	Unit	Execution Year
1	Replacement of Steam Coil Air Heaters Panels.	1	2016-17
2	Rehabilitation / Replacement of Soot blower system with PLC	1	2016-17
3	HP Heater-5 and 6 Replacement	1	2016-17
4	Complete rehabilitation of flue gas and air ducts with bellows.	1	2016-17
5	Combustion system parts replacement and tuning on Gas and HFO.	1	2016-17
6	Regenerative air Heater Seals replacement	1	2016-17
7	Boiler Drum and Super heaters Safety valves overhauling	1	2016-17
8	Continues emission monitoring system (CEMS) installation	1	2017-18
9	Replacement of boiler Super heater and Re heater coils	1	2017-18
10	Turbine Efficiency Overhaul & Life Assessment	1	2016-17
11	Main Cooling Water pump replacement	1	2018-19
12	Main Cooling Water pump discharge valves replacement	1	2016-17
13	$FeSO_4$ Station Rehabilitation	1	2016-17
14	Unit 1 DCS installation	1	2016-17
15	Replacement of Steam Coil Air Heaters Panels.	2	2016-17
16	Rehabilitation / Replacement of Soot blower system with PLC	2	2016-17
17	Combustion system parts replacement and tuning on Gas and HFO.	2	2015-16
18	Replacement of boiler Super heater and Re heater coils	2	2015-16
19	Boiler Drum and Super heaters Safety valves overhauling	2	2015-16
20	Continues emission monitoring system (CEMS) installation	2	2015-16
21	Main Cooling Water pump discharge valves replacement	2	2015-16
22	Complete rehabilitation of flue gas and air ducts with bellows.	2	2017-18
23	Turbine major overhaul	2	2017-18
24	Boiler Drum and Super heaters Safety valves overhauling	5	2015-16
25	Generator Excitation System replacement	5	2016-17
26	Complete rehabilitation of flue gas and air ducts with bellows.	5	2017-18
27	Complete replacement of steam trace lines with steam traps.	5	2017-18
28	Replacement of boiler Super heater and Re heater coils	5	2017-18
29	Replacement of Steam Coil Air Heaters Panels.	5	2017-18
30	Combustion system parts replacement and tuning on Gas and HFO.	5	2017-18
31	Continues emission monitoring system (CEMS) installation	5	2018-19
32	Turbine major overhaul	5	2021-22
33	$FeSO_4$ Station Rehabilitation	5	2015-16
34	HP Heater # 5 Replacement	5	2017-18
35	Unit 5 DCS installation	5	2021-22
36	HP/ LP bypass system replacement	5	2020-21
37	Turbine major overhaul	6	2018-19
38	HP/ LP bypass system replacement	6	2018-19
39	DEHG HITASS System replacement	6	2018-19
40	Boiler Protection System replacement	6	2018-19
41	Installation of BWRO	6	2015-16
42	Continues emission monitoring system (CEMS) installation	6	2018-19
43	Complete replacement of steam trace lines with steam traps.	6	2016-17
44	Replacement of boiler Super heater and Re heater coils	6	2018-19
45	Debris Filter + Ball Cleaning System installation	6	2018-19
46	Generator overhaul	6	2018-19
47	Complete rehabilitation of flue gas and air ducts with bellows.	6	2018-19

S. #	Job Description	Unit	Execution Year
48	Replacement of Steam Coil Air Heaters Panels.	6	2018-19
49	Combustion system parts replacement and tuning on Gas and HFO.	6	2018-19
50	Boiler Drum and Super heaters Safety valves overhauling	6	2018-19
51	Turbine major overhaul	5	2015-16
52	Installation of Lower Bank of Economizer and inlet Header of Boiler	1	2016-17
53	Boiler Feed water pump motor installation	1	2016-17
54	Battery chargers / banks replacement	1	2019-20
55	Battery chargers / banks replacement	2	2016-17
56	Battery chargers / banks replacement	5	2016-17
57	Condenser tube inserts installation	6	2019-20
58	Battery chargers / banks replacement	6	2016-17
59	Installation of Lower Bank of Economizer and inlet Header of Boiler	2	2017-18
60	Generator rewinding	2	2017-18
61	Generator overhaul (precise inspection)	1	2018-19
62	0.4 KV ABJG Bus bar replacement	1	2018-19
63	6.6 KV VCBs replacement	1	2018-19
64	LP Turbine L-0 blade replacement	2	2018-19
65	0.4 KV BJE busbar replacement	1	2019-20
66	Implementation software for replacement of 1200 points based online SOE/ DLS	2	2019-20
67	HP Heater # 5 Replacement	2	2019-20
68	Generator overhaul (precise inspection)	2	2019-20
69	0.4 KV BJA busbar replacement	2	2019-20
70	Installation of Lower Bank of Economizer and inlet Header of Boiler	5	2019-20
71	Generator protection system installation	6	2019-20
72	HP Heater # 5 Replacement	6	2019-20
73	DEG-01 overhaul	1	2020-21
74	Auxiliary transformer refurbishment	2	2020-21
75	6.6 KV VCBs replacement	2	2020-21
76	Generator overhaul (precise inspection)	5	2020-21
77	Rehabilitation of 220 KV oil filled cable trenches	2	2021-22
78	Upgradation of boiler protection system	2	2021-22
79	DEHG HITASS and RSE system installation	2	2021-22
80	220 KV GIS ADA 12 bay restoration	6	2021-22
81	Replacement of boiler Super heater and Re heater coils	1	2015-16
82	Generator overhaul	1	2009-10
83	Up gradation of DEHG/ HITASS System with Hitachi Technical Advisor	1	2009-10
84	Turbine major overhaul	2	2009-10
85	Installation, testing and commissioning of 1ABCT Startup Transformer	1	2010-11
86	Installation and Commissioning of new Inverters	5	2010-11
87	Installation and Testing of 24 Volts new Battery Bank	5	2010-11
88	Installation, testing & commissioning work of New Modified MCWP-1	1	2011-12
89	Complete rehabilitation of HFO Unloading Area	1	2011-12
90	Installation, Testing and Commissioning of 36 MVA Aux. Transformer after rewinding	1	2011-12
91	Replacement of Arch Panel tubes	2	2012-13
92	Installation, Testing and Commissioning of Newly supplied 0.4 KV ABJK	2	2012-13
93	220V DC BTB batteries replacement is performed with New ALCAD batteries	5	2012-13
94	Generator overhaul	2	2013-14
95	Repair and relocation of 24 tertiary super heater tubes of boiler	6	2013-14
96	Turbine major overhaul	1	2009-10
97	Turbine major overhaul	5	2015-16

Sr.	Job Description	Unit	Execution Year
98	Turbine major overhaul	6	2009-10
99	0.4 KV ABJK busbar replacement	2	2011-12
100	0.4 KV BJE busbar replacement	2	2009-10
101	Installation and Commissioning of new Inverters	2	2011-12

BQPS-I – Annexure A (ii)

Safety procedures

INDEX	NO	TITLE
1	HSEQ-SOP-0001	HSEQ COMMITTEE AND THEIR FUNCTIONS
2	HSEQ-SOP-0002	HSE HAZARD ASPECT IDENTIFICATION & RISK ASSESSMENT
3	HSEQ-SOP-0002A	ENVIRONMENTAL ASPECTS & THEIR IMPACTS
4	HSEQ-SOP-0003	SETTING HSE OBJECTIVES AND TARGETS
5	HSEQ-SOP-0004	HSEQ LAWS & REGULATIONS
6	HSEQ-SOP-0005	HSE RESPONSIBILITIES & ACCOUNTABILITIES
7	HSEQ-SOP-0006	TRAINING , AWARENESS AND COMPETENCE
8	HSEQ-SOP-0007	COMMUNICATION AND CONSULTATION
9	HSEQ-SOP-0010	EMERGENCY RESPONSE PLAN
10	HSEQ-SOP-0010A	EMERGENCY PREPARADNESS & BUSINESS CONTINUITY PLAN
11	HSEQ-SOP-0010 A2	BQPS I ACTION PREVENTION PLAN
12	HSEQ-SOP-0011	CALIBRATION OF MEASURING AND MONITORING DEVICES
13	HSEQ-SOP-0012	MEASUREMENT & MONITORING OF HSEQ MANAGEMENT SYSTEM
14	HSEQ-SOP-0014	MANAGEMENT REVIEW
15	HSEQ-SOP-0017	PERSONAL PROTECTIVE EQUIPMENT (PPE)
16	HSEQ-SOP-0019	CONTROL OF HAZARDOUS SUBSTANCES
17	HSEQ-SOP-0020	CONTROL OF CONTRACTOR
18	HSEQ-SOP-0021	ASBESTOS MANAGEMENT
19	HSEQ-SOP-0022	NOISE
20	HSEQ-SOP-0023	WASTE MANAGMENT
21	HSEQ-SOP-0024	ILLUMINATION
22	HSEQ-SOP-0025	SF-6 SAFE HANDLING
23	HSEQ-SOP-0026	POLYCHLORINATED BIPHENYL (PCB) MANAGEMENT
24	HSEQ-SOP-0028	CHEMICAL AND HAZARDOUS MATERIAL SPILL PREVENTION PROCEDURE
25	HSEQ-SOP-0029	WORKING OVER WATER
26	HSEQ-SOP-0030	SAFETY OF PLANT VISITORS
27	HSEQ-SOP-0031	EMF
28	HSEQ-SOP-0032	ANIMAL INFESTATION
29	HSEQ-SOP-0033	ENERGY, WATER AND MATERIAL CONSERVATION
30	HSEQ-SOP-0034	FIRST AID
31	HSEQ-SOP-0035	FIRE FIGHTING PROCEDURE
32	HSEQ-SOP-0036	BQPS-1 EVACUATION PROCEDURE
33	HSEQ-SOP-0037	FIRE PROTECTION SYSTEM IMPAIRMENT PROGRAM
34	HSEQ-SOP-0038	FIREFIGHTING INSPECTION PROGRAM
35	HSEQ-SOP-0040	INDOOR QUALITY
36	IMS-SOP-0001	CONTEXT OF THE ORGANIZATION
37	IMS-SOP-0002	CONTROL OF DOCUMENT & RECORD
38	IMS-SOP-0003	INTERNAL AUDIT
39	IMS-SOP-0004	CHANGE MANAGEMENT
40	IMS-SOP-0005	CUSTOMER PROPERTY

BQPS-I – Annexure A (iii)

Project Details

Site Details

1. The Plant is located off coastal belt of Karachi, at PQA Mehran Highway Road, in the District of Karachi Malir, Sindh Province.
2. The area is characterized as 44,882 m². Average rainfall is 250 mm per year.
3. A maximum earthquake design factor of 1/10 g to 1/20 g and the design wind speed at a height of 61 meters the wind speed reaches to 9 m/s. the wind mostly remains directed towards south-west is used in the design of the plant buildings and structures.
4. The site is at elevation of 25 m above mean sea level (MSL).

Plant Reference Condition

Reference Conditions at the Plant Site are:

1. Ambient Air Temperature = 30 deg. C
2. Total Barometric Pressure = p_T = 1010 mbar
3. Relative Humidity = 70%
4. Sea water temperature = 28 deg C

Plant Configuration

Description	Unit 1	Unit 2	Unit 5	Unit 6
Technology	Thermal	Thermal	Thermal	Thermal
Type of fuel	Heavy Fuel Oil, Indigenous Natural Gas	Heavy Fuel Oil, Indigenous Natural Gas	Heavy Fuel Oil, Indigenous Natural Gas	Heavy Fuel Oil, Indigenous Natural Gas
Equipment	Boiler, Turbo/Gen	Boiler, Turbo/Gen	Boiler, Turbo/Gen	Boiler, Turbo/Gen
Units	210 MW	210 MW	210 MW	210 MW
Output	Boiler (Babcock, Hitachi, Japan), Turbo/Gen (Hitachi, Japan)	Boiler (Babcock, Hitachi, Japan), Turbo/Gen (Hitachi, Japan)	Boiler (Babcock, Hitachi, Japan), Turbo/Gen (Hitachi, Japan)	Boiler (Babcock, Hitachi, Japan), Turbo/Gen (Hitachi, Japan)
Make	"TCDF-26" steam turbines	"TCDF-26" steam turbines	"TCDF-26" steam turbines	"TCDF-26" steam turbines

Plant Characteristics

Description	Unit 1	Unit 2	Unit 5	Unit 6
Gross installed capacity at mean site conditions	210 MW	210 MW	210 MW	210 MW
Auxiliary Consumption	13 MW	13 MW	13 MW	13 MW
Net Plant capacity	197 MW	197 MW	197 MW	197 MW
Generation voltage	21 KV	21 KV	18 KV	18 KV
Grid voltage	220 KV	220 KV	220 KV	220 KV
Frequency	50 Hz	50 Hz	50 Hz	50 Hz
Power factor	Lead 0.95 / Lag 0.85	Lead 0.95 / Lag 0.85	Lead 0.95 / Lag 0.85	Lead 0.95 / Lag 0.85
Ramp up rate of generators	Hot start:1%/min Cold start: 5% / min	Hot start:1 % / min Cold start: 5 % / min	Hot start: 1 % / min Cold start: 5 % / min	Hot start: 1 % / min Cold start: 5 % / min
Time required to reach full load	20 mins (from zero to full load)	20 mins (from zero to full load)	20 mins (from zero to full load)	20 mins (from zero to full load)
Time required to synchronization to grid at full load (min)	1440 / 170 (Cold/Hot)	1440 / 170 (Cold/Hot)	1440 / 170 (Cold/Hot)	1440 / 170 (Cold/Hot)

Frequency Limits

The generators are capable of maintaining constant output for system frequency of 50 Hz in accordance with the requirements. Note that allowable frequency range is not provided by OEM. OEM has only recommended protection values of frequencies.

Voltage Limits

The plant is capable to operate continuously within the voltage range of 18 / 21 kV +/- 10%.

(Unit 1,2 generator output = 21 KV, unit 5,6 generator output = 18 KV)

Reactive Power

Reactive capability range is not provided by OEM.

As per generator capability curve though we can calculate the readings of reactive power for all individual units (unit 1,2,5,6) as:

@Power factor 0.85(Lagging) = 130MVAR @hydrogen pressure 3 bar

@Power factor 0.95(Leading) = 80MVAR @hydrogen pressure 3 bar

Noise

The noise level is less than 85 dB(A) which fall within the EPA prescribed environmental limits.

Water Resources

Raw water for water treatment is imported from Karachi Water and Sewerage Board and Pakistan Steel Mills Ltd. This imported water is then treated to convert to demin water for supply to BQ-1 boilers for steam generation.

BQPS-I – Annexure A (iv)

Minimum loading details

Minimum load of 90 MW is maintained at units. In BQPS-I boilers, High Sulfur Fuel Oil (HSFO) is used which contains 3.5% Sulfur. Sulfuric acid (H2SO4) is formed at sulfur dew point which is reached at a temp of 130OC. To avoid dew point, mean temperature of gas regenerative air heater ((air inlet and gas outlet)/2) should be greater than 130OC as per manual (reference attached below).

At lower load, flue gas temperature falls to level where sulfur dew starts forming which causes corrosion in gas path and air heaters, affecting the reliability and availability of the unit. Furthermore, any system surge may open HP/LP bypass causing unstable operations causing the risk to trip the unit.

Extract from Plant manual

1. What is the function of SAH?
   SAH is provided to heating up the combustion air before enter the AH to prevent the corrosion by H_2SO_4 (in fuel oil, 2~2.5%S is existing).
   The average temperature(AH inlet air temperature and AH outlet gas temperature) should be maintained to 130℃.

BQPS-I – Annexure A (v)

Fire Protection System

Fire Protection System has following main measures:

1. **Fire area, fire escape and evacuation passage**

   Every building of the plant has been provided with a specific and dedicated "Emergency Evacuation Map" at the entrance and other conspicuous locations to warn and update the entrants of the buildings about the route to be taken to assembly point, in case of any emergency.

   Also, every building has been provided with the adequate number of emergency evacuations passageways (exit doors) which are always kept healthy and unobstructed to be easily accessible during any emergency.

2. **Evacuation Channels**

   Plant has dedicated emergency warning (siren, buddy system, walkie-talkie, hot lines) system, while actions from every employee are clearly documented in the plant Emergency Response Procedure on what to do when they hear the alarm / observe an emergency situation.

   Moreover, dedicated Fire Wardens are assigned against individual buildings who will ensure (in case of any emergency) the complete evacuation of the workers in the dedicated building.

   Plant has also dedicated assembly points, where every individual has to report after hearing the emergency siren and then a robust headcount management system is followed.

   In case of any off-site evacuation need (due to any injury), dedicated emergency vehicle (ambulance) is also available at plant, which will support prompt evacuation of injured individual to the nearest medical facility.

3. **Fire-fighting system and fire extinguisher**

   Advanced firefighting & fire protection systems are available at plant (including fire hydrant network, water deluge system)

   Adequate number of fire extinguishers have also been installed across the plant premises (indoor as well as outdoor) and different training sessions are imparted among the team for its operation throughout the year.

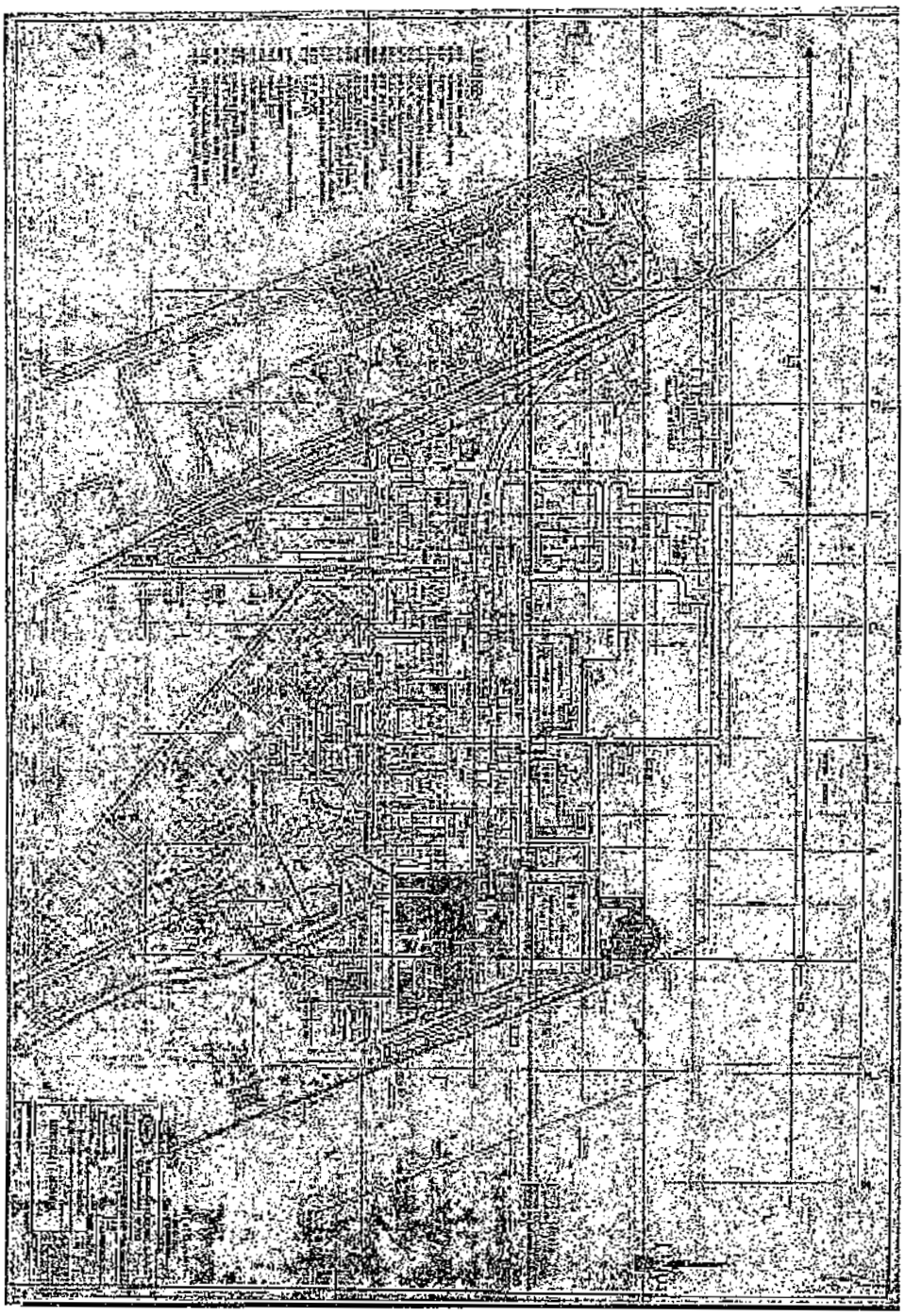
4. **Fire pump and alarm monitoring**

   Plant has a dedicated firefighting water network (covering whole plant premises).

   Early detection of the fire is given the paramount importance which ensures that fire is detected at the incipient stage. These (smoke detectors) are widespread across the plant and integrated with plant fire siren system. Multiple manual call points are also installed across the plant for actuation of the fire siren, upon observing any fire emergency.

BQPS-I – Annexure A (vi)

Plant Layout



BQPS-I – Annexure A (vii)

Details of Major Equipment

Boilers

Description	Unit	Parameter
Type		Single drum, natural circulation, double pass
Capacity	t/h	680
Number of ignition burners	No.	12
Operating pressure	Bar	140
Operating temperature	Deg C	530
Identical for all individual boilers		

Generator

Description	Units	U1	U2	U5	U6
Type		TFLQQ-KD	TFLQQ-KD	TFLQQ-KD	TFLQQ-KD
Rated capacity	kVA	248,300	247,060	248,300	248,300
Rated voltage	kV	21	21	18	18
Rated current	A	6827	6827	7964	7964
Frequency	Hz	50	50	50	50
Rated speed	Rpm	3000	3000	3000	3000
Power factor	PF	0.85(Lag)	0.85(Lag)	0.85(Lag)	0.85(Lag)
Number of phases	No.	3	3	3	3
Excitation device		Static	Static	Static	Static
Stator winding connection		Star	Star	Star	Star
Number of stator winding terminal leads	No.	6	6	6	6
Insulation class		F	F	F	F
Running duty		Continues	Continues	Continues	Continues
Protection class		A1/A2	A1/A2	A1/A2	A1/A2
Efficiency	%				
Ambient temperature	C°	40	40	40	40

Transformers

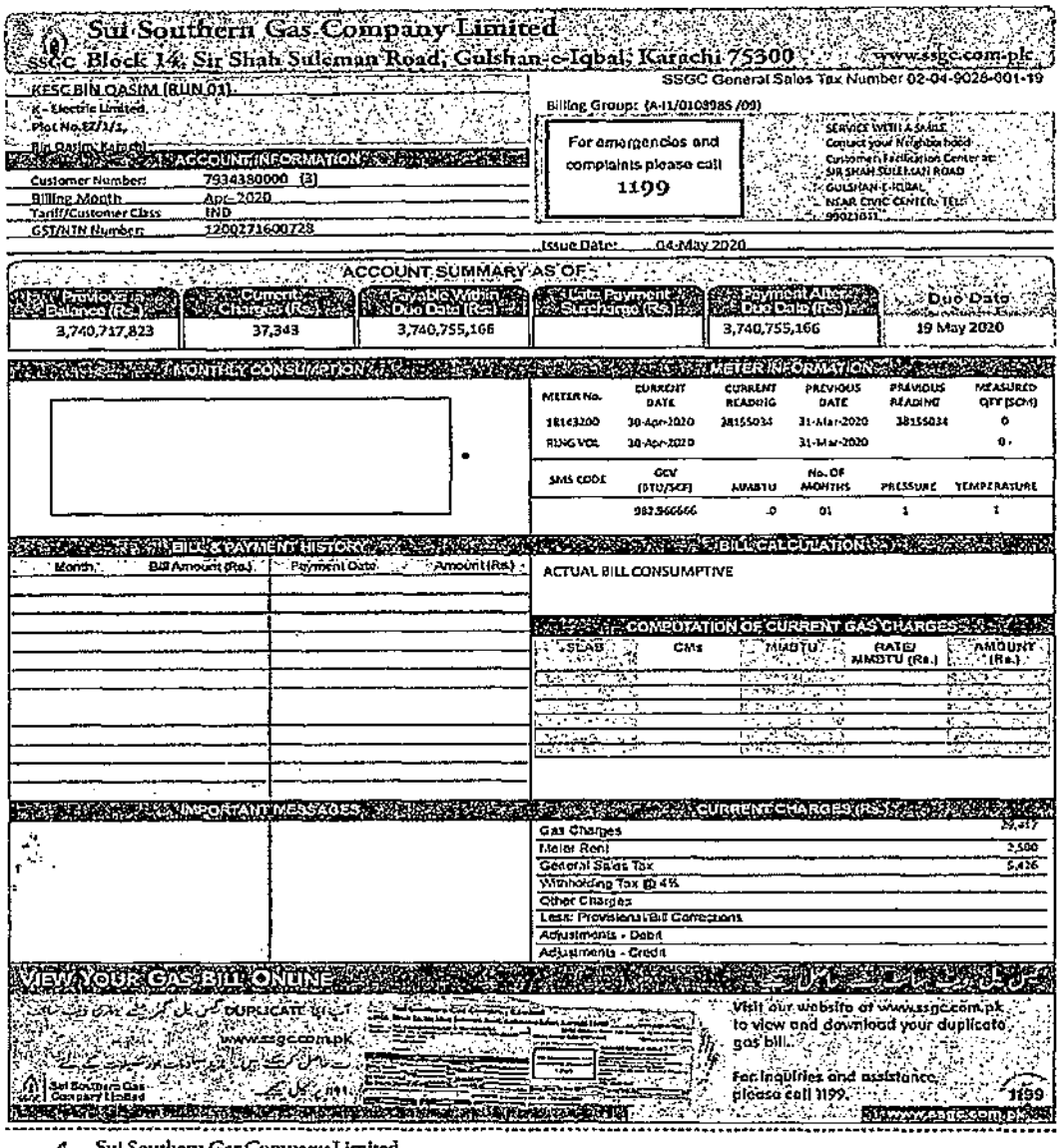
Description	Unit	U1	U2	U5	U6
Type		Oil Immersed Outdoor Use	Oil Immersed Outdoor Use	Oil Immersed Outdoor Use	Oil Immersed Outdoor Use
Quantity		1	1	1	1
Rated capacity	MVA	148/247	148/247	150/250	150/250
Rated voltage	KV	220/ 21	220/ 21	220/ 18	220/ 18
Cooling		ONAF/OFAF	ONAF/OFAF	ONAF/OFAF	ONAF/OFAF
Temperature rise, oil/winding	°C	50/55 above ambient	50/55 above ambient	50/55 above ambient	50/55 above ambient
Impedance voltage	%	14.47	14.40	14.38	14.38
Rated frequency	Hz	50	50	50	50
Connection group		YNd1	YNd1	YNd1	YNd1

BQPS-I – Annexure B (i)

Sample bill April 2020 and sample calculation of I.G/RLNG & HFO

Sr.	Description	Unit	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	BQ1
1	HFO Consumption Unit Wise	Mt	2274.86	3281	1129.93	0	8025.88	4043.31	18754.98
2	HFO Consumption Unit Wise (1 Mt = 2.205 x 1000 lb)	lb	5016066	7234605	2491496	0	17697065	8915499	41354731
3	HFO GCV	BTU/lb	18300	18300	18300	18300	18300	18300	18300
4	HFO MMBTUs (3 x 2) / 1000000	MMBTUs	91794	132393	45594	0	323856	163154	756792
5	Gas Consumption Through Station Flow Meter (Unadjusted)	Tons	911	691	236	38	3737	16330	21943
6	Gas Consumption Through Station Flow Meter (Unadjusted) (1 Tons x 1000 / 0.709 = 1410) (5 x 1410)	SCM	1284385	974930	332116	53580	5269506	23024885	30939402
7	Gas Consumption Through Station Flow Meter (Unadjusted) (1 SCM = 35.49390658 SCF) (6 x 35.49390658)	SCF	45587824	34604089	11788081	1901764	187035339	817243134	1098160229
8	% of Gas Consumption Unit Wise (Unadjusted) (7 / Total Gas Cons.)	%	4.2%	3.2%	1.1%	0.2%	17.0%	74.4%	100.00%
9	Gas Consumption Unit Wise (After adjustment with gas bills) (8 x Total Gas Billed Consumption / 10 ^6)	MMCF	47	36	12	2	194	847	1138548124
10	GCV in Gas Bills	BTU/SCF	983.0	983.0	983.0	983.0	983.0	983.0	983.0
11	GAS MMBTUs (9 x 10)	MMBTUs	46459	35266	12013	1938	190611	832867	1119155
12	% Contribution of HFO (4 / 4+11)	%	66%	79%	79%	0%	63%	16%	40%
13	Total MWh Generated as per Energy Meter (HFO+Gas)	MWh	12467	15582	4845	0	50207	97908	181009
14	MWh Generated on HFO (12 x 13)	MWh	8278	12304	3835	0	31605	16038	72060
15	% Contribution of Gas (100% - 8)	%	34%	21%	21%	100%	37%	84%	60%
16	MWh Generated on Gas (13 x 15)	MWh	4189	3278	1010	0	18602	81870	108949
17	Total MMBTUs of RLNG in Gas Bills	MMBTUs							334775
18	Total % of RLNG (17 / 11)	%							30%
19	MWh Generated on RLNG (16 x 17)	MWh	1253	980	302	0	5564	24490	32590
20	MWh Generated on NG (16 - 19)	MWh	2936	2297	708	0	13037	57380	76359

Indigenous Natural Gas Sample Bills April 2020



Sui Southern Gas Company Limited
SSGC Block 14, Sir Shah Suleman Road, Gulshan-e-Iqbal, Karachi 75300 www.ssgc.com.pk
SSGC General Sales Tax Number 02-04-9028-001-19

KESC BIN QASIM (RUN 01)
K - Electric Limited
Plot No.E2/1/1,
Bin Qasim, Karachi

Billing Group: (A-11/0108985 /03)

For emergencies and complaints please call 1199

SERVICE WITH A SMILE
Contact your Neighborhood Customer Facilitation Center at: SIR SHAH SULEMAN ROAD GULSHAN-E-IQBAL NEAR CIVIC CENTER. TEL: 99021851

ACCOUNT INFORMATION

Customer Number	7934380000 (3)
Billing Month	Apr-2020
Tariff/Customer Class	IND
GST/NTN Number	1200271600728

Issue Date: 04-May-2020

ACCOUNT SUMMARY AS OF

Arrears (Previous Balance (Rs.))	Current Charges (Rs.)	Payable Within Due Date (Rs.)	Late Payment Surcharge (Rs.)	Payment After Due Date (Rs.)	Due Date
3,740,717,823	37,343	3,740,755,166		3,740,755,166	19 May 2020

MONTHLY CONSUMPTION

METER INFORMATION

METER No.	CURRENT DATE	CURRENT READING	PREVIOUS DATE	PREVIOUS READING	MEASURED QTY (SCM)
18143200	30-Apr-2020	38155034	31-Mar-2020	38155034	0
RING VOL	30-Apr-2020		31-Mar-2020		0

SMS CODE	GCV (BTU/SCF)	MMBTU	No. OF MONTHS	PRESSURE	TEMPERATURE
	982.566666	.0	01	1	1

BILL & PAYMENT HISTORY

Month	Bill Amount (Rs.)	Payment Date	Amount (Rs.)

BILL CALCULATION

ACTUAL BILL CONSUMPTIVE

COMPUTATION OF CURRENT GAS CHARGES

SLAB	CM's	MMBTU	RATE/ MMBTU (Rs.)	AMOUNT (Rs.)

IMPORTANT MESSAGES

CURRENT CHARGES (RS.)

Gas Charges	37,317
Meter Rent	2,500
General Sales Tax	5,426
Withholding Tax @ 4%	
Other Charges	
Less: Provisional Bill Corrections	
Adjustments - Debit	
Adjustments - Credit	

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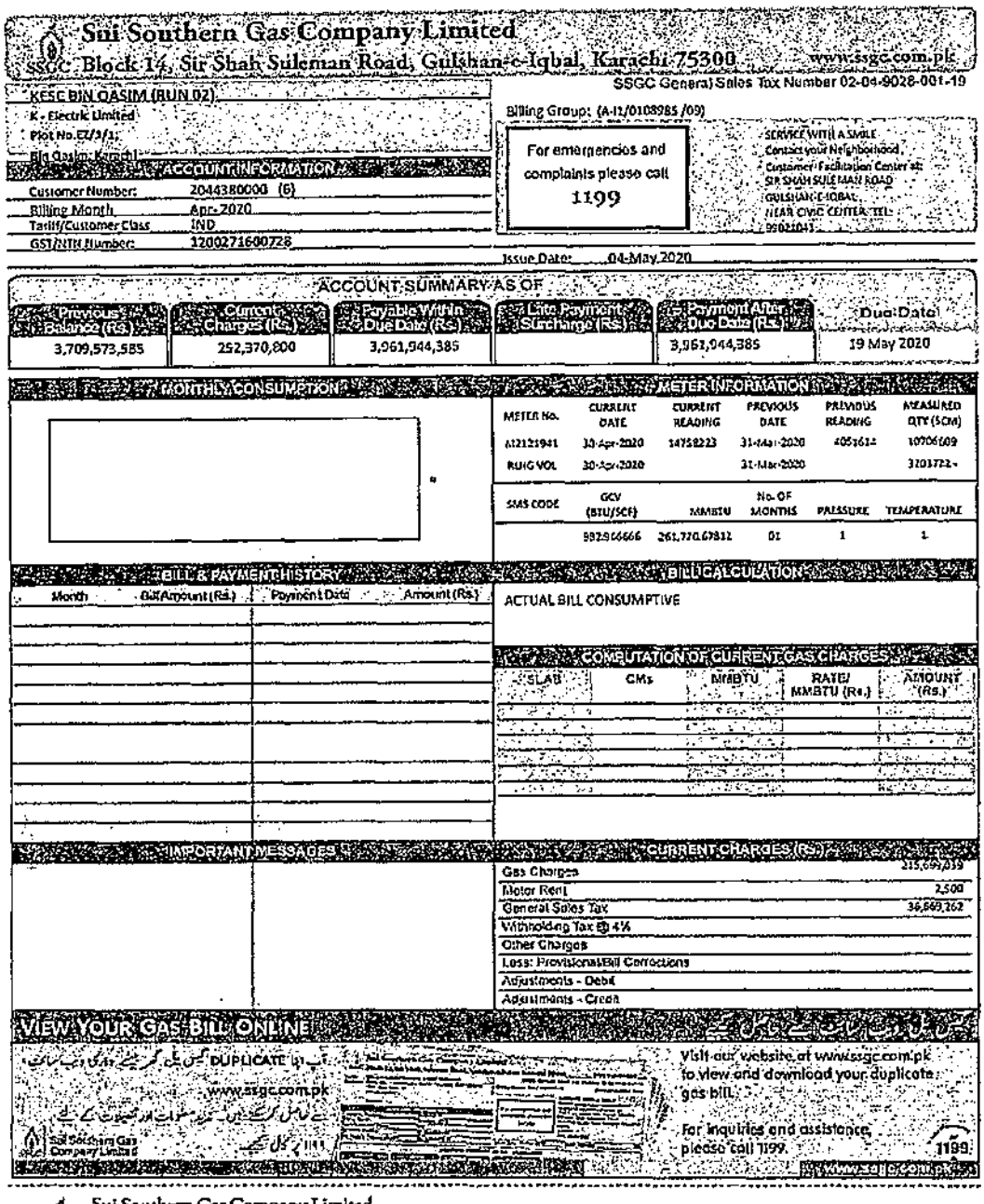
M/S KESC BIN QASIM (RUN 01)
K-Electric Limited
Plot No.E2/1/1,

Customer Number	Total Amount Due	Due Date	After Due Date
7934380000 (3)	3,740,755,166	19 May 2020	3,740,755,166

K-ELECTRIC LIMITED



Sui Southern Gas Company Limited
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SSGC General Sales Tax Number 02-04-9028-001-19

KESC BIN QASIM (RUN 02)
K - Electric Limited
Plot No.EZ/3/1,
Bin Qasim, Karachi

Billing Group: (A-11/0108985 /09)

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Contact your Neighborhood Customer Facilitation Center at:
SIR SHAH SULEMAN ROAD
GULSHAN-E-IQBAL
(NEAR CIVIC CENTER) TEL: 99021043

ACCOUNT INFORMATION

Customer Number:	2044380000 (6)
Billing Month	Apr-2020
Tariff/Customer Class	IND
GST/NTN Number:	1200271600728

Issue Date: 04-May-2020

ACCOUNT SUMMARY AS OF

Previous Balance (Rs.)	Current Charges (Rs.)	Payable Within Due Date (Rs.)	Late Payment Surcharge (Rs.)	Payment After Due Date (Rs.)	Due Date
3,709,573,585	252,370,800	3,961,944,385		3,961,944,385	19 May 2020

MONTHLY CONSUMPTION

METER INFORMATION

METER No.	CURRENT DATE	CURRENT READING	PREVIOUS DATE	PREVIOUS READING	MEASURED QTY (SCM)
A12121941	30-Apr-2020	14758223	31-Mar-2020	4053614	10704609
RLNG VOL	30-Apr-2020		31-Mar-2020		3203722

SMS CODE	GCV (BTU/SCF)	MMBTU	No. OF MONTHS	PRESSURE	TEMPERATURE
	982966666	261,770.67832	01	1	1

BILL & PAYMENT HISTORY

Month	Bill Amount (Rs.)	Payment Date	Amount (Rs.)

BILL CALCULATION

ACTUAL BILL CONSUMPTIVE

COMPUTATION OF CURRENT GAS CHARGES

SLAB	CMs	MMBTU	RATE/ MMBTU (Rs.)	AMOUNT (Rs.)

IMPORTANT MESSAGES

CURRENT CHARGES (Rs.)

Gas Charges	215,097,619
Meter Rent	2,500
General Sales Tax	36,869,262
Withholding Tax @ 4%	
Other Charges	
Less: Provisional/Bill Corrections	
Adjustments - Debit	
Adjustments - Credit	

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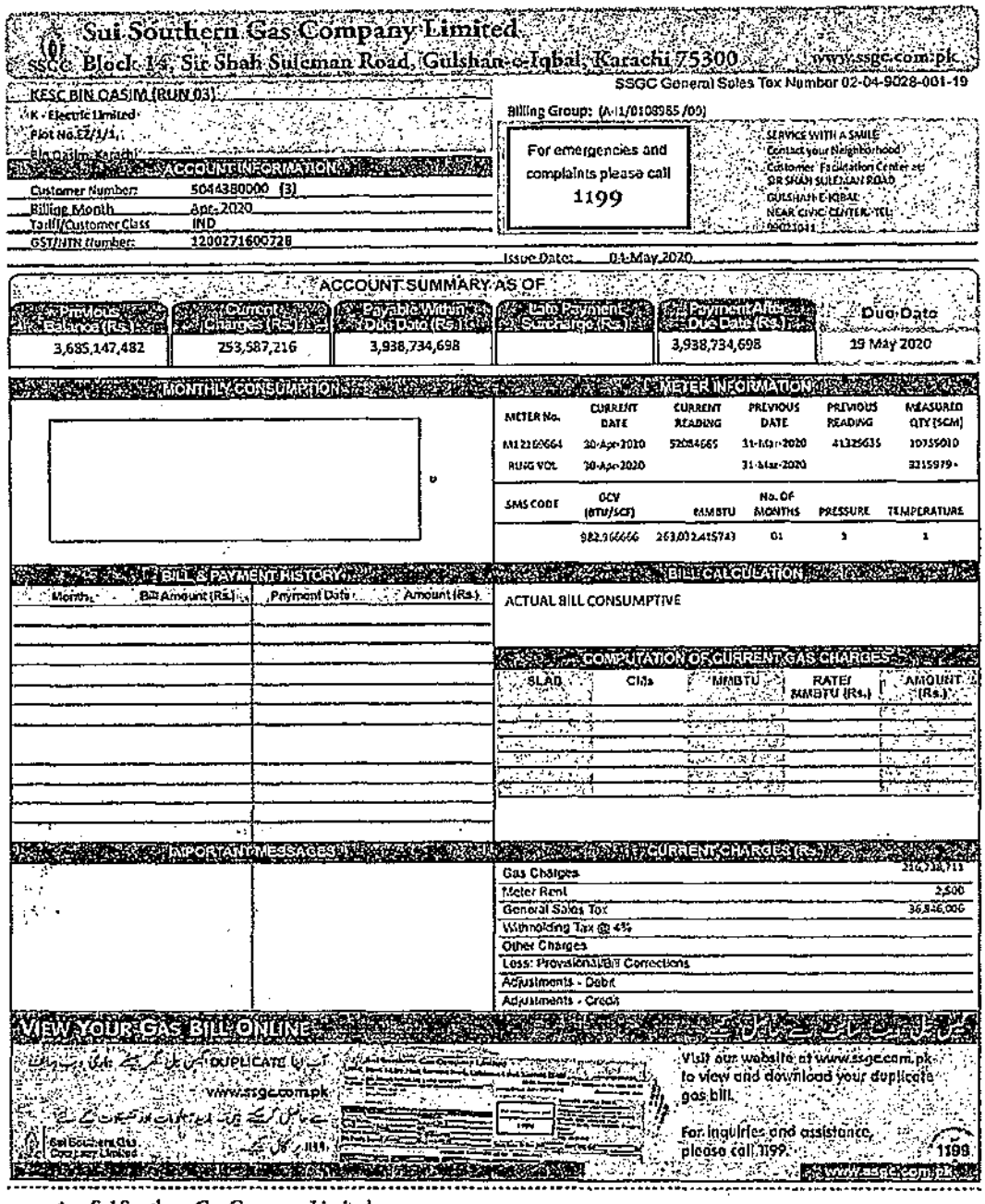
M/S KESC BIN QASIM (RUN 02)
K - Electric Limited
Plot No.EZ/3/1,

Customer Number	Total Amount Due	Due Date	After Due Date
2044380000 (6)	3,961,944,385	19 May 2020	3,961,944,385

K-ELECTRIC LIMITED



Sui Southern Gas Company Limited
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SSGC General Sales Tax Number 02-04-9028-001-19

KESC BIN QASIM (RUN 03)
K - Electric Limited
Plot No.EZ/I/1,
Bin Qasim Karachi

Billing Group: (A-11/0108985 /03)

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SERVICE WITH A SMILE
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GULSHAN E IQBAL
NEAR CIVIC CENTER, TEL 99231011

ACCOUNT INFORMATION

Customer Number:	5044380000 [3]
Billing Month	Apr-2020
Tariff/Customer Class	IND
GST/NTN Number:	1200271600728

Issue Date: 04-May-2020

ACCOUNT SUMMARY AS OF

Previous Balance (Rs.)	Current Charges (Rs.)	Payable Within Due Date (Rs.)	Late Payment Surcharge (Rs.)	Payment After Due Date (Rs.)	Due Date
3,685,147,482	253,587,216	3,938,734,698		3,938,734,698	19 May 2020

MONTHLY CONSUMPTION

METER INFORMATION

METER No.	CURRENT DATE	CURRENT READING	PREVIOUS DATE	PREVIOUS READING	MEASURED QTY (SCM)
M1216664	30-Apr-2020	52084665	31-Mar-2020	41325635	10759030
RUNG VOL	30-Apr-2020		31-Mar-2020		3215979

SMS CODE	GCV (BTU/SCF)	MMBTU	No. OF MONTHS	PRESSURE	TEMPERATURE
	982.066666	263,002,415743	01	1	1

BILL & PAYMENT HISTORY

Month	Bill Amount (Rs.)	Payment Date	Amount (Rs.)

BILL CALCULATION

ACTUAL BILL CONSUMPTIVE

COMPUTATION OF CURRENT GAS CHARGES

SLAB	Cbtu	MMBTU	RATE/ MMBTU (Rs.)	AMOUNT (Rs.)

IMPORTANT MESSAGES

CURRENT CHARGES (Rs.)

Gas Charges	216,738,713
Meter Rent	2,500
General Sales Tax	36,846,006
Withholding Tax @ 4%	
Other Charges	
Less: Provisional/Int Corrections	
Adjustments - Debit	
Adjustments - Credit	

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M/S KESC BIN QASIM (RUN 03)
K - Electric Limited
Plot No.EZ/I/1,

Customer Number	Total Amount Due	Due Date	After Due Date
5044380000 [3]	3,938,734,698	19 May 2020	3,938,734,698

K-ELECTRIC LIMITED

Sui Southern Gas Company Limited

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SSGC General Sales Tax Number 02-04-9028-001-19

KESC BIN QASIM (RUN 04)
K-Electric Limited
Plot No.E2/1/1,
Bin Qasim, Karachi

Billing Group: (A-11/0108985/09)

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Contact your Neighborhood Customer Facilitation Center At: SIR SHAH SULEMAN ROAD GULSHAN-E-IQBAL NEAR CIVIC CENTER, TEL: 99021041

ACCOUNT INFORMATION

Customer Number:	1044380000 (7)
Billing Month	Apr-2020
Tariff/Customer Class	IND
GST/NTN Number:	1200271600728

Issue Date: 04-May-2020

ACCOUNT SUMMARY AS OF

Previous Balance (Rs.)	Current Charges (Rs.)	Payable Within Due Date (Rs.)	Late Payment Surcharge (Rs.)	Payment After Due Date (Rs.)	Due Date
1,449,095,196	34,678	1,449,129,873		1,449,129,873	19 May 2020

MONTHLY CONSUMPTION

METER INFORMATION

METER No.	CURRENT DATE	CURRENT READING	PREVIOUS DATE	PREVIOUS READING	MEASURED QTY (SCM)
18143201	30-Apr-2020	48331135	31-Mar-2020	48329812	1323
RUG VOL	30-Apr-2020		31-Mar-2020		379-

SMS CODE	GCV (BTU/SCF)	MMBTU	No. OF MONTHS	PRESSURE	TEMPERATURE
	982.966666	32.935525	01	1	1

BILL & PAYMENT HISTORY

Month	Bill Amount (Rs.)	Payment Date	Amount (Rs.)

BILL CALCULATION

ACTUAL BILL CONSUMPTIVE

COMPUTATION OF CURRENT GAS CHARGES

SLAB	CMs	MMBTU	RATE/ MMBTU (Rs.)	AMOUNT (Rs.)

IMPORTANT MESSAGES

CURRENT CHARGES (RS.)

Gas Charges	27,139
Meter Rent	2,500
General Sales Tax	5,039
Withholding Tax @ 4%	
Other Charges	
Less: Provisional/Bill Corrections	
Adjustments - Debit	
Adjustments - Credit	

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M/S KESC BIN QASIM (RUN 04)
K-Electric Limited
Plot No.E2/1/1,

Customer Number	Total Amount Due	Due Date	After Due Date
1044380000 (7)	1,449,129,873	19 May 2020	1,449,129,873

K-ELECTRIC LIMITED

Sui Southern Gas Company Limited

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SSGC General Sales Tax Number 02-04-9028-001-19

KESC BIN QASIM (RUN 05)
K - Electric Limited
Plot No.EZ/I/1,
Bin Qasim, Karachi

Billing Group: (A-II/0103985/09)

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Contact your Neighborhood Customer Facilitation Center at:
SIR SHAH SULEMAN ROAD
GULSHAN-E-IQBAL
NEAR CIVIC CENTER. TEL: 99021041

ACCOUNT INFORMATION

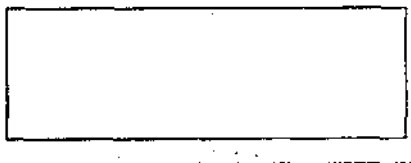
Customer Number	4044380000 (4)
Billing Month	Apr-2020
Tariff/Customer Class	IND
GST/NTN Number	1200271600728

Issue Date: 04-May-2020

ACCOUNT SUMMARY AS OF

Previous Balance (Rs.)	Current Charges (Rs.)	Payable Within Due Date (Rs.)	Late Payment Surcharge (Rs.)	Payment After Due Date (Rs.)	Due Date
3,518,031,461	37,343	3,518,068,804		3,518,068,804	19 May 2020

MONTHLY CONSUMPTION



METER INFORMATION

METER No.	CURRENT DATE	CURRENT READING	PREVIOUS DATE	PREVIOUS READING	MEASURED QTY (SCM)
M2121940	30-Apr-2020	62261636	31-Mar-2020	61261636	0
RING VOL	30-Apr-2020		31-Mar-2020		0

SMS CODE	GCV (BTU/SCF)	MMBTU	No. OF MONTHS	PRESSURE	TEMPERATURE
	982.666666	.0	01	1	1

BILL & PAYMENT HISTORY

Month	Bill Amount (Rs.)	Payment Date	Amount (Rs.)

BILL CALCULATION

ACTUAL BILL CONSUMPTIVE

COMPUTATION OF CURRENT GAS CHARGES

SLAB	CMs	MMBTU	RATE/ MMBTU (Rs.)	AMOUNT (Rs.)

IMPORTANT MESSAGES

CURRENT CHARGES (Rs.)

Gas Charges	29,417
Meter Rent	2,500
General Sales Tax	5,426
Withholding Tax @ 4%	
Other Charges	
Less: Provisional/Bill Corrections	
Adjustments - Debit	
Adjustments - Credit	

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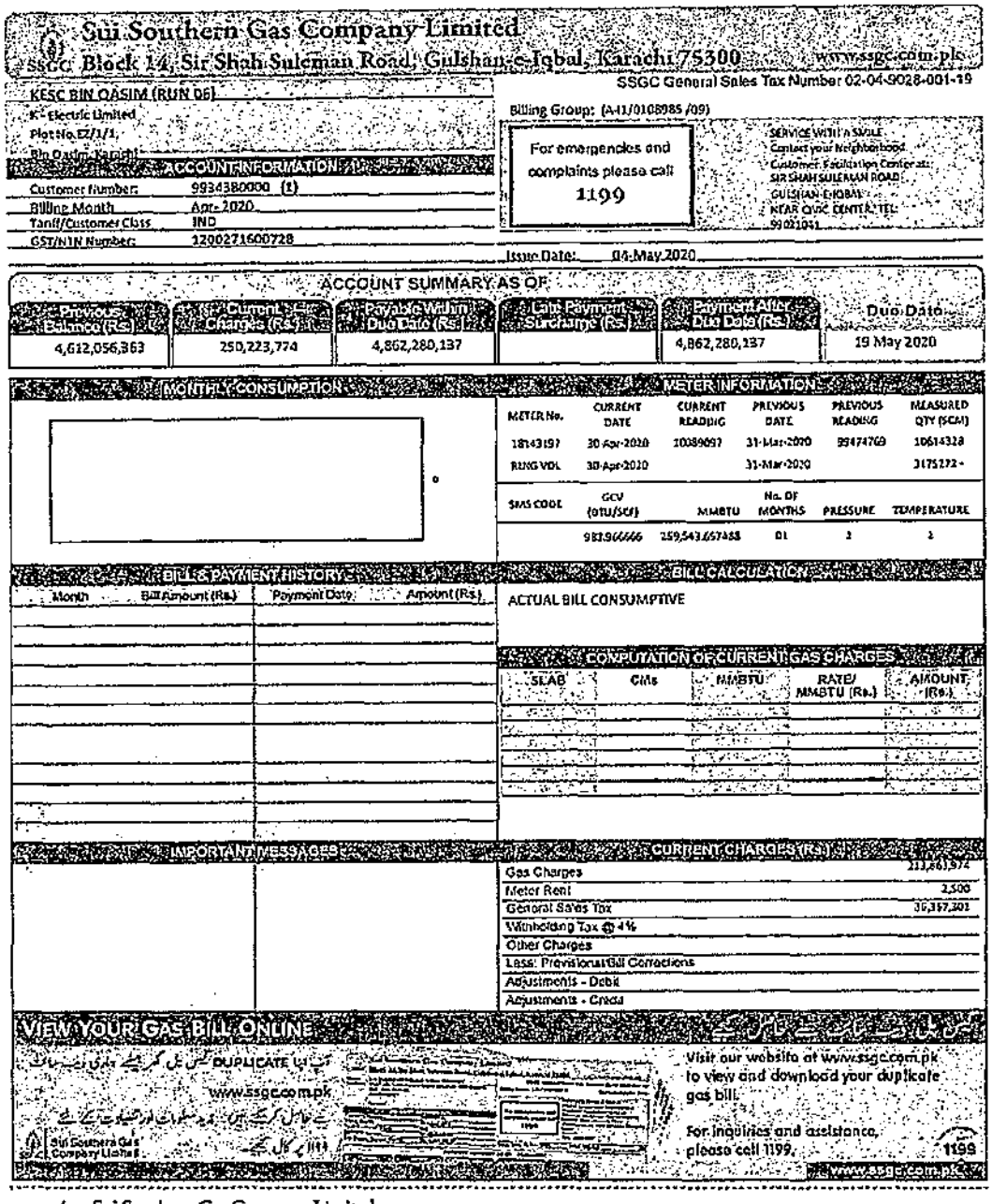
SSGC www.ssgc.com.pk

M/S KESC BIN QASIM (RUN 05)
K - Electric Limited
Plot No.EZ/I/1,

Customer Number	Total Amount Due	Due Date	After Due Date
4044380000 (4)	3,518,068,804	19 May 2020	3,518,068,804

K-ELECTRIC



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KESC BIN QASIM (RUN 06)
K - Electric Limited
Plot No.EZ/1/1,
Bin Qasim, Karachi

Billing Group: (A-11/0108985 /09)

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GULSHAN-E-IQBAL
KIAR QUIC DENTAL TEL
99021041

ACCOUNT INFORMATION

Customer Number	9934380000 (1)
Billing Month	Apr-2020
Tariff/Customer Class	IND
GST/NTN Number	1200271600728

Issue Date: 04-May-2020

ACCOUNT SUMMARY AS OF

Previous Balance (Rs.)	Current Charges (Rs.)	Payable Within Due Date (Rs.)	Late Payment Surcharge (Rs.)	Payment After Due Date (Rs.)	Due Date
4,612,056,363	250,223,774	4,862,280,137		4,862,280,137	19 May 2020

MONTHLY CONSUMPTION

METER INFORMATION

METER No.	CURRENT DATE	CURRENT READING	PREVIOUS DATE	PREVIOUS READING	MEASURED QTY (SCM)
18143197	30-Apr-2020	10089097	31-Mar-2020	99474769	10614328
RUNG VOL	30-Apr-2020		31-Mar-2020		3175272 -

SAS CODE	GCV (BTU/SCF)	MMBTU	No. OF MONTHS	PRESSURE	TEMPERATURE
	983.966666	259,543.657488	01	1	1

BILL PAYMENT HISTORY

Month	Bill Amount (Rs.)	Payment Date	Amount (Rs.)

BILL CALCULATION

ACTUAL BILL CONSUMPTIVE

COMPUTATION OF CURRENT GAS CHARGES

SLAB	CMs	MMBTU	RATE/ MMBTU (Rs.)	AMOUNT (Rs.)

IMPORTANT MESSAGES

CURRENT CHARGES (Rs.)

Gas Charges	213,861,974
Meter Rent	2,500
General Sales Tax	36,357,301
Witholding Tax @ 4%	
Other Charges	
Less: Provisional Bill Corrections	
Adjustments - Debit	
Adjustments - Credit	

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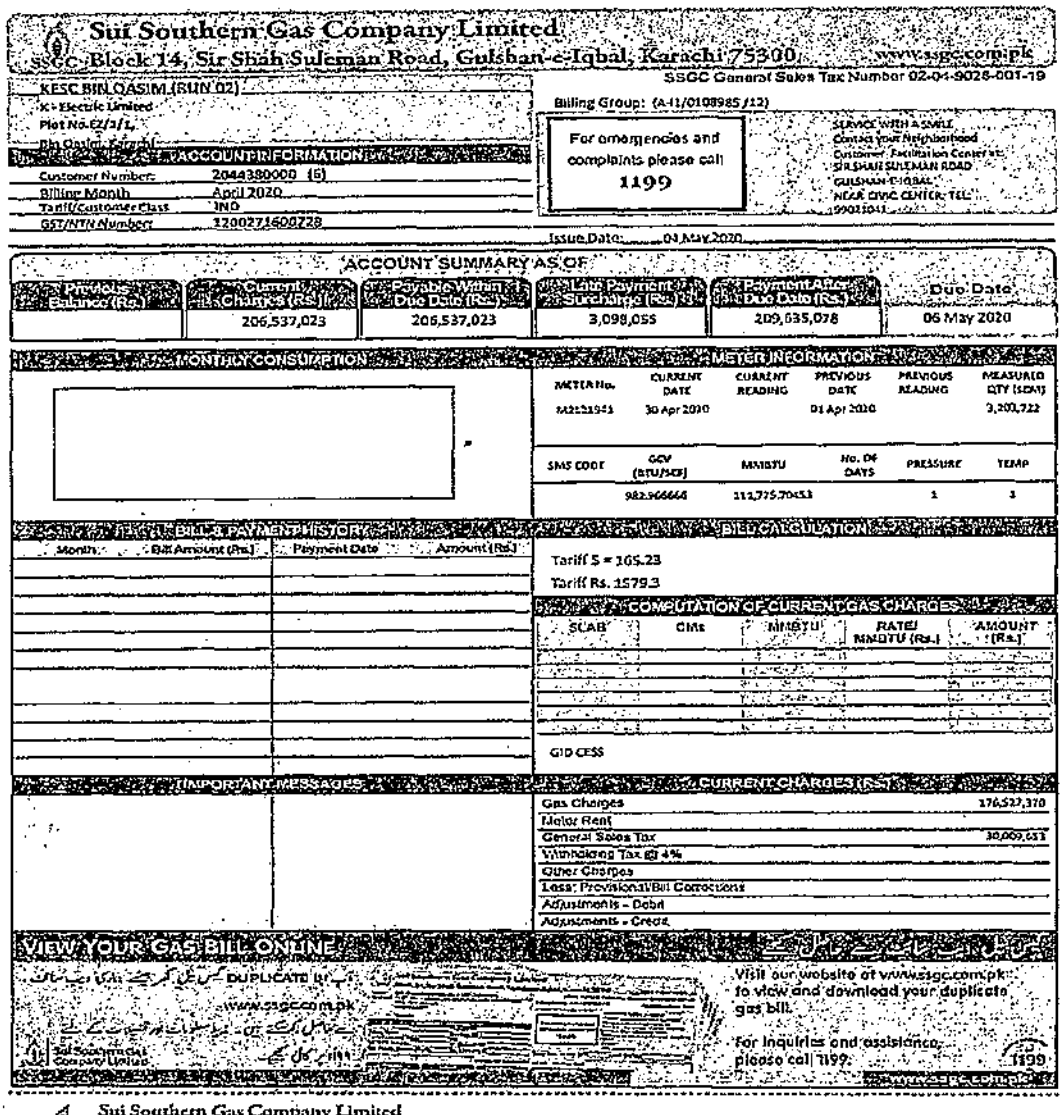
M/S KESC BIN QASIM (RUN 06)
K - Electric Limited
Plot No.EZ/1/1,

Customer Number	Total Amount Due	Due Date	Amount Payable After Due Date
9934380000 (1)	4,862,280,137	19 May 2020	4,862,280,137

K-ELECTRIC LIMITED

RLNG Sample Bills April 2020



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KESC BIN QASIM (RUN 02)
K-Electric Limited
Plot No.E2/3/1,
Bin Qasim, Karachi

Billing Group: (A-1)/0108985/12)

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SERVICE WITH A SMILE
Contact your Neighborhood Customer Facilitation Center at: SIR SHAH SULEMAN ROAD, GULSHAN-E-IQBAL, NEAR CIVIC CENTER. TEL: 99031041

ACCOUNT INFORMATION

Customer Number:	2044380000 (6)
Billing Month	April 2020
Tariff/Customer Class	IND
GST/NTN Number	1200271600728

Issue Date: 04 May 2020

ACCOUNT SUMMARY AS OF

Payable Within Due Date (Rs.)	Current Charges (Rs.)	Payable Within Due Date (Rs.)	Late Payment Surcharge (Rs.)	Payment After Due Date (Rs.)	Due Date
	206,537,023	206,537,023	3,098,055	209,635,078	06 May 2020

MONTHLY CONSUMPTION

METER INFORMATION

METER No.	CURRENT DATE	CURRENT READING	PREVIOUS DATE	PREVIOUS READING	MEASURED QTY (SCM)
M2151945	30 Apr 2020		01 Apr 2020		9,200,722

SMS CODE	GCV (BTU/SCF)	MMBTU	No. OF DAYS	PRESSURE	TEMP
	982.966666	111,775.70453		1	1

BILL PAYMENT HISTORY

Month	Bill Amount (Rs.)	Payment Date	Amount (Rs.)

BILL CALCULATION

Tariff S = 165.23
Tariff Rs. 1579.3

COMPUTATION OF CURRENT GAS CHARGES

SLAB	CMs	MMBTU	RATE/ MMBTU (Rs.)	AMOUNT (Rs.)
GID CESS				

IMPORTANT MESSAGES

CURRENT CHARGES (Rs.)

Gas Charges	176,527,370
Meter Rent	
General Sales Tax	30,009,653
Witholding Tax @ 4%	
Other Charges	
Less: Provisional/Bill Corrections	
Adjustments - Debit	
Adjustments - Credit	

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SSGC www.ssgc.com.pk

M/S KESC BIN QASIM (RUN 02)
K-Electric Limited
Plot No.E2/3/1,

Customer Number	Total Amount Due	Due Date	After Due Date
2044380000 ()	206,537,023	06 May 2020	209,635,078

K-ELECTRIC LIMITED

Sui Southern Gas Company Limited

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KESC BIN QASIM (RUN 03)
K-Electric Limited
Plot No.EZ/1/1,
Bin Qasim, Karachi

Billing Group: (A41/0103985 /12)

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ACCOUNT INFORMATION

Customer Number:	5044380000 (3)
Billing Month	April 2020
Tariff/Customer Class	IND
GST/NTN Number:	1200271600728

Issue Date: 04 May 2020

ACCOUNT SUMMARY AS OF

Previous Balance (Rs.)	Current Charges (Rs.)	Payable Within Due Date (Rs.)	Late Payment Surcharge (Rs.)	Payment After Due Date (Rs.)	Due Date
	207,327,205	207,327,205	3,109,908	210,437,113	06 May 2020

MONTHLY CONSUMPTION

METER INFORMATION

METER No.	CURRENT DATE	CURRENT READING	PREVIOUS DATE	PREVIOUS READING	MEASURED QTY (SCM)
M12169664	30 Apr 2020		01 Apr 2020		3,215,979

SMS CODE	GCV (BTU/SCF)	MMBTU	No. OF DAYS	PRESSURE	TEMP
	982.966666	112,703.34301		1	1

BILL & PAYMENT HISTORY

Month	Bill Amount (Rs.)	Payment Date	Amount (Rs.)

BILL CALCULATION

Tariff $ = 165.23

Tariff Rs. 1579.3

COMPUTATION OF CURRENT GAS CHARGES

SLAB	CMs	MMBTU	RATE/ MMBTU (Rs.)	AMOUNT (Rs.)

GID CESS

IMPORTANT MESSAGES

CURRENT CHARGES (Rs.)

Gas Charges	177,202,740
Meter Rent	
General Sales Tax	30,124,466
Withholding Tax @ 4%	
Other Charges	
Less: Provisional Bill Corrections	
Adjustments - Debit	
Adjustments - Credit	

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Sui Southern Gas Company Limited
Block 14, Sir Shah Suleman Road
Gulshan-e-Iqbal, Karachi 75300
SSGC www.ssgc.com.pk

M/S KESC BIN QASIM (RUN 03)
K-Electric Limited
Plot No.EZ/1/1,

Customer Number	Total Amount Due	Due Date	After Due Date
5044380000 ()	207,327,205	06 May 2020	210,437,113

K-ELECTRIC LIMITED

Sui Southern Gas Company Limited
SSGC Block 14, Sir Shah Suleman Road, Gulshan-e-Iqbal, Karachi 75300 www.ssgc.com.pk
SSGC General Sales Tax Number 02-04-9028-001-19

KESC BIN QASIM (RUN 04)
K-Electric Limited
Plot No.E2/1/1,
Bin Qasim, Karachi

Billing Group: (A-11/0108985 /12)

For emergencies and complaints please call **1199**

SERVICE WITH A SMILE
Contact your Neighborhood Customer Facilitation Center at: SIR SHAH SULEMAN ROAD GULSHAN-E-IQBAL NEAR CIVIC CENTER. TEL: 99021041

ACCOUNT INFORMATION

Customer Number:	2044380000 (7)
Billing Month	April 2020
Tariff/Customer Class	IND
GST/NTN Number:	1200271600728

Issue Date: 04 May 2020

ACCOUNT SUMMARY AS OF

Previous Balance (Rs.)	Current Charges (Rs.)	Payable Within Due Date (Rs.)	Late Payment Surcharge (Rs.)	Payment After Due Date (Rs.)	Due Date
	24,433	24,433	366	24,800	06 May 2020

MONTHLY CONSUMPTION

METER INFORMATION

METER No.	CURRENT DATE	CURRENT READING	PREVIOUS DATE	PREVIOUS READING	MEASURED QTY (SCM)
18141201	30 Apr 2020		01 Apr 2020		379

SMS CODE	GCV (BTU/SCF)	MMBTU	No. OF DAYS	PRESSURE	TEMP
	982.966666	13.223055		1	1

BILL & PAYMENT HISTORY

Month	Bill Amount (Rs.)	Payment Date	Amount (Rs.)

BILL CALCULATION

Tariff $ = 165.23
Tariff Rs. 1579.3

COMPUTATION OF CURRENT GAS CHARGES

SLAB	CMs	MMBTU	RATE/ MMBTU (Rs.)	AMOUNT (Rs.)

GID CESS

IMPORTANT MESSAGES

CURRENT CHARGES (RS.)

Gas Charges	20,883
Meter Rent	
General Sales Tax	3,550
Withholding Tax @ 4%	
Other Charges	
Less. Provisional/Bill Corrections	
Adjustments - Debit	
Adjustments - Credit	

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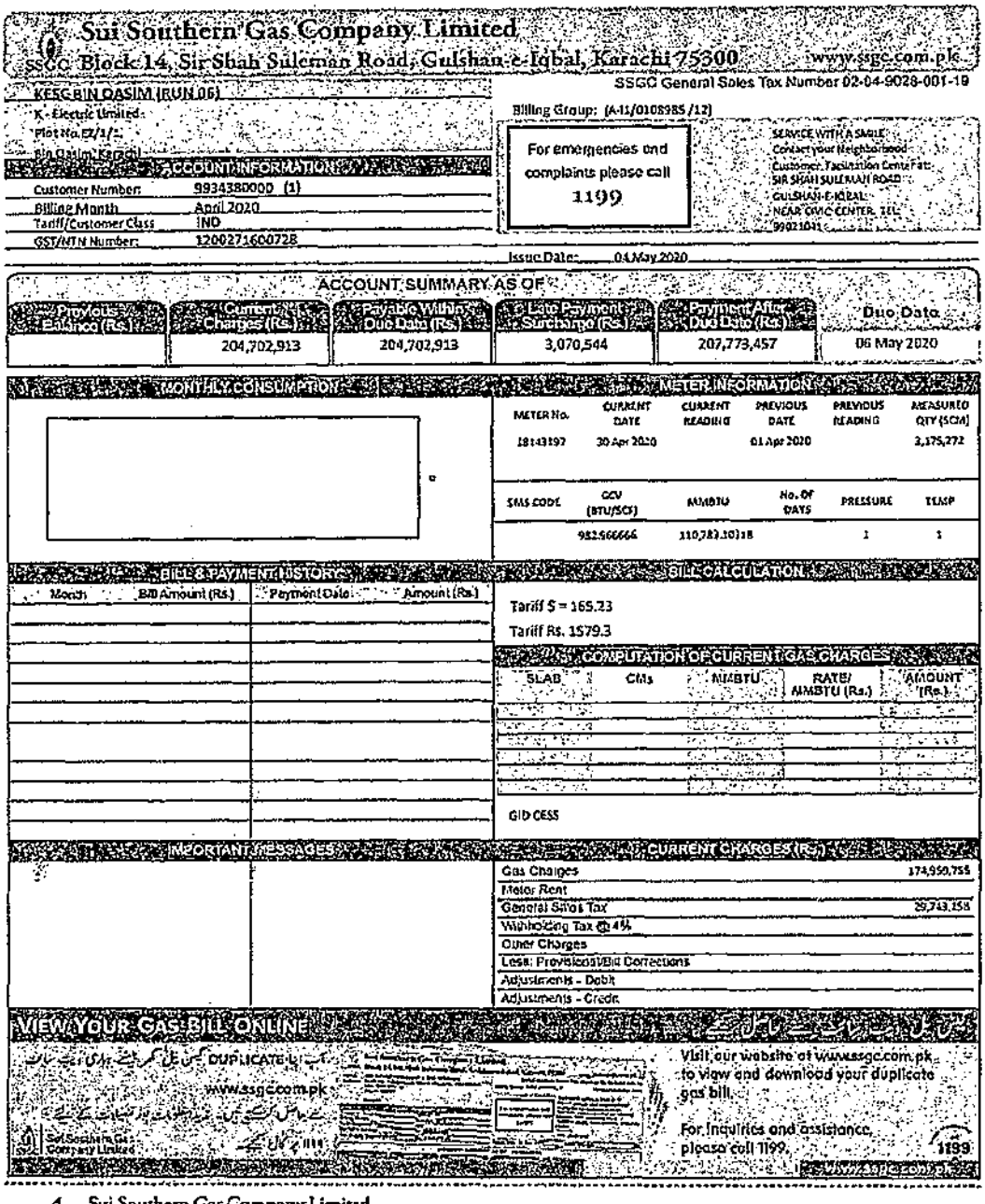
Sui Southern Gas Company Limited
Block 14, Sir Shah Suleman Road
Gulshan-e-Iqbal, Karachi 75300
SSGC www.ssgc.com.pk

M/S KESC BIN QASIM (RUN 04)
K-Electric Limited
Plot No.E2/1/1,

Customer Number	Total Amount Due	Due Date	After Due Date
1044380000 ()	24,433	06 May 2020	24,800

K-ELECTRIC LIMITED



Sui Southern Gas Company Limited
SSGC Block 14, Sir Shah Suleman Road, Gulshan-e-Iqbal, Karachi 75300 www.ssgc.com.pk
SSGC General Sales Tax Number 02-04-9028-001-19

KESC BIN QASIM (RUN 06)
K - Electric Limited
Plot No.EZ/1/1,
Bin Qasim, Karachi

Billing Group: (A-11/0108985 /12)

For emergencies and complaints please call 1199

SERVICE WITH A SMILE
Contact your Neighborhood
Customer Facilitation Centre at:
SIR SHAH SULEMAN ROAD
GULSHAN-E-IQBAL
NEAR CIVIC CENTER. TEL
99021041

ACCOUNT INFORMATION

Customer Number:	9934380000 (1)
Billing Month	April 2020
Tariff/Customer Class	IND
GST/NTN Number:	1200271600728

Issue Date: 04 May 2020

ACCOUNT SUMMARY AS OF

Previous Balance (Rs.)	Current Charges (Rs.)	Payable Within Due Date (Rs.)	Late Payment Surcharge (Rs.)	Payment After Due Date (Rs.)	Due Date
	204,702,913	204,702,913	3,070,544	207,773,457	06 May 2020

MONTHLY CONSUMPTION

METER INFORMATION

METER No.	CURRENT DATE	CURRENT READING	PREVIOUS DATE	PREVIOUS READING	MEASURED QTY (SCM)
18143197	30 Apr 2020		01 Apr 2020		3,175,272

SMS CODE	GCV (BTU/SCF)	MMBTU	No. Of DAYS	PRESSURE	TEMP
	982.666666	110,783.30118		1	1

BILL & PAYMENT HISTORY

Month	Bill Amount (Rs.)	Payment Date	Amount (Rs.)

BILL CALCULATION

Tariff $ = 165.23
Tariff Rs. 1579.3

COMPUTATION OF CURRENT GAS CHARGES

SLAB	CMs	MMBTU	RATE/ MMBTU (Rs.)	AMOUNT (Rs.)

GID CESS

IMPORTANT MESSAGES

CURRENT CHARGES (Rs.)

Gas Charges	174,959,755
Meter Rent	
General Sales Tax	29,743,158
Withholding Tax @ 4%	
Other Charges	
Less: Provision/Bill Corrections	
Adjustments - Debit	
Adjustments - Credit	

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Block 14, Sir Shah Suleman Road
Gulshan-e-Iqbal, Karachi 75300
SSGC www.ssgc.com.pk

M/S KESC BIN QASIM (RUN 06)
K - Electric Limited
Plot No.EZ/1/1,

Customer Number	Total Amount Due	Due Date	After Due Date
9934380000 ()	204,702,913	06 May 2020	207,773,457

BQPS-I – Annexure C (i)

Part load Adjustment Factor table – Gas & HFO Unit 1

Percent Load Factor	Correction Factor
100%	1.0000
95%	1.0016
90%	1.0050
85%	1.0108
80%	1.0195
75%	1.0317
70%	1.0482
65%	1.0694
60%	1.0959
55%	1.1285
50%	1.1677
45%	1.2140
40%	1.2682

Note : Use linear interpolation when the load variation values fall between the stated values.

BQPS-I – Annexure C (ii)

Part load Adjustment Factor table – Gas & HFO Unit 2

Percent Load Factor	Correction Factor
100%	1.0000
95%	1.0010
90%	1.0023
85%	1.0043
80%	1.0073
75%	1.0118
70%	1.0180
65%	1.0263
60%	1.0370
55%	1.0505
50%	1.0671
45%	1.0873
40%	1.1112

Note : Use linear interpolation when the load variation values fall between the stated values.

BQPS-I – Annexure C (iii)

Part load Adjustment Factor table – Gas & HFO Unit 5

Percent Load Factor	Correction Factor
100%	1.0000
95%	1.0033
90%	1.0085
85%	1.0159
80%	1.0259
75%	1.0389
70%	1.0550
65%	1.0748
60%	1.0985
55%	1.1265
50%	1.1592
45%	1.1969
40%	1.2398

Note: Use linear interpolation when the load variation values fall between the stated values.

BQPS-I – Annexure C (iv)

Part load Adjustment Factor table – Gas & HFO Unit 6

Percent Load Factor	Correction Factor
100%	1.0000
95%	1.0030
90%	1.0083
85%	1.0160
80%	1.0260
75%	1.0383
70%	1.0529
65%	1.0699
60%	1.0892
55%	1.1109
50%	1.1349
45%	1.1612
40%	1.1899

Note : Use linear interpolation when the load variation values fall between the stated values.

K-Electric Limited
Generation Plants Tariff Petition
BQPS I Plant
Unit 1
Annexure D - Part Load Adjustment Example

Partial Load Sample Calculation of a DAY

BQI-U1

Time	Date	Net Dependable Capacity MW	Forced Outage MW	Planned Outage MW	Forced Derated MW	Planned Derated MW	Available Capacity (post planned and forced outages) MW	Hourly Net Load MW (from energy meters) MW	Partial Load Correction Factor	Oil Firing Percentage %	Gas Firing Percentage %	Oil - Adjusted Net Heat Rate	Gas - Adjusted Net Heat Rate	Oil mmbtu	Gas mmbtu
		Asl*(Reference Oil Net Load)+(1-Asl)*(Reference gas Net Load)	B	C	D	E	F=A-B-C-D-E	G	H	I	J	Ksh*(Reference Oil Net HR)	Lsh*(Reference Gas Net HR)	M=G*H*I/1000	N=L*G*J/1000
1:00:00 AM	1-Jul	168					168	90	1.1397	95%	5%	12042	12800	1030	58
2:00:00 AM	1-Jul	168					168	90	1.1397	95%	5%	12042	12800	1030	58
3:00:00 AM	1-Jul	164					164	120	1.0384	40%	60%	10971	11662	527	840
4:00:00 AM	1-Jul	164					164	120	1.0384	40%	60%	10971	11662	527	840
5:00:00 AM	1-Jul	164					164	151	1.0038	40%	60%	10606	11273	641	1021
6:00:00 AM	1-Jul	164					164	151	1.0038	40%	60%	10606	11273	641	1021
7:00:00 AM	1-Jul	164					164	151	1.0038	40%	60%	10606	11273	641	1021
8:00:00 AM	1-Jul	164					164	151	1.0038	40%	60%	10606	11273	641	1021
9:00:00 AM	1-Jul	164					164	151	1.0038	40%	60%	10606	11273	641	1021
10:00:00 AM	1-Jul	164					164	151	1.0038	40%	60%	10606	11273	641	1021
11:00:00 AM	1-Jul	164					164	151	1.0038	40%	60%	10606	11273	641	1021
12:00:00 PM	1-Jul	164					164	151	1.0038	40%	60%	10606	11273	641	1021
1:00:00 PM	1-Jul	162					162	151	1.0028	0%	100%	10595	11262	0	1701
2:00:00 PM	1-Jul	164					164	151	1.0038	40%	60%	10606	11273	641	1021
3:00:00 PM	1-Jul	164					164	151	1.0038	40%	60%	10606	11273	641	1021
4:00:00 PM	1-Jul	164					164	151	1.0038	40%	60%	10606	11273	641	1021
5:00:00 PM	1-Jul	164					164	151	1.0038	40%	60%	10606	11273	641	1021
6:00:00 PM	1-Jul	164					164	151	1.0038	40%	60%	10606	11273	641	1021
7:00:00 PM	1-Jul	164					164	151	1.0038	40%	60%	10606	11273	641	1021
8:00:00 PM	1-Jul	164					164	151	1.0038	40%	60%	10606	11273	641	1021
9:00:00 PM	1-Jul	164					164	151	1.0038	40%	60%	10606	11273	641	1021
10:00:00 PM	1-Jul	164					164	151	1.0038	40%	60%	10606	11273	641	1021
11:00:00 PM	1-Jul	164					164	151	1.0038	40%	60%	10606	11273	641	1021
12:00:00 AM	1-Jul	164					164	151	1.0038	40%	60%	10606	11273	641	1021
Total		3951					3951	3440		43%	57%			15284	22901
													Heat Rate	10353	11663
													Weighted Average Partial Load Adjustment Factor	0.9798	1.0384

Reference					
HFO			NG		
Load	Net Eff	Net HR	Load	Net Eff	Net HR
168.32	32.9	10566.00429	161.83	30.4	11230.94507

K-ELECTRIC LIMITED

K-Electric Limited
Generation Plants Tariff Petition
BQPS I Plant
Unit 2
Annexure D – Part Load Adjustment Example

Partial Load Sample Calculation of a DAY

BQI-U2															
Time	Date	Net Dependable Capacity MW A= (Reference Oil Net Load)/(Reference Gas Net Load)	Forced Outage MW B	Planned Outage MW C	Forced Derated MW D	Planned Derated MW E	Available Capacity (post planned and forced outages) MW F=A-B-C-D-E	Hourly Net Load MW (from energy meters) MW G	Partial Load Correction Factor H	Oil Firing Percentage %	Gas Firing Percentage %	Oil - Adjusted Net Heat Rate KxH*(Reference Oil Net HR)	Gas - Adjusted Net Heat Rate Lx H*(Reference Gas Net HR)	Oil mmbtus M=K*G*1000	Gas mmbtus N=L*G*1000
1:00:00 AM	1-Jul	170					170	90	1.0576	95%	5%	11134	11785	952	53
2:00:00 AM	1-Jul	170					170	90	1.0576	95%	5%	11134	11785	952	53
3:00:00 AM	1-Jul	171					171	120	1.0178	40%	60%	10715	11341	514	817
4:00:00 AM	1-Jul	171					171	120	1.0178	40%	60%	10715	11341	514	817
5:00:00 AM	1-Jul	171					171	151	1.0030	40%	60%	10559	11176	638	1013
6:00:00 AM	1-Jul	171					171	151	1.0030	40%	60%	10559	11176	638	1013
7:00:00 AM	1-Jul	171					171	151	1.0030	40%	60%	10559	11176	638	1013
8:00:00 AM	1-Jul	171					171	151	1.0030	40%	60%	10559	11176	638	1013
9:00:00 AM	1-Jul	171					171	151	1.0030	40%	60%	10559	11176	638	1013
10:00:00 AM	1-Jul	171					171	151	1.0030	40%	60%	10559	11176	638	1013
11:00:00 AM	1-Jul	171					171	151	1.0030	40%	60%	10559	11176	638	1013
12:00:00 PM	1-Jul	171					171	151	1.0030	40%	60%	10559	11176	638	1013
1:00:00 PM	1-Jul	171					171	151	1.0030	40%	60%	10559	11176	638	1013
2:00:00 PM	1-Jul	171					171	151	1.0030	40%	60%	10559	11176	638	1013
3:00:00 PM	1-Jul	171					171	151	1.0030	40%	60%	10559	11176	638	1013
4:00:00 PM	1-Jul	171					171	151	1.0030	40%	60%	10559	11176	638	1013
5:00:00 PM	1-Jul	171					171	151	1.0030	40%	60%	10559	11176	638	1013
6:00:00 PM	1-Jul	171					171	151	1.0030	40%	60%	10559	11176	638	1013
7:00:00 PM	1-Jul	171					171	151	1.0030	40%	60%	10559	11176	638	1013
8:00:00 PM	1-Jul	171					171	151	1.0030	40%	60%	10559	11176	638	1013
9:00:00 PM	1-Jul	171					171	151	1.0030	40%	60%	10559	11176	638	1013
10:00:00 PM	1-Jul	171					171	151	1.0030	40%	60%	10559	11176	638	1013
11:00:00 PM	1-Jul	171					171	151	1.0030	40%	60%	10559	11176	638	1013
12:00:00 AM	1-Jul	171					171	151	1.0030	40%	60%	10559	11176	638	1013
Total		4104					4104	3440		45%	55%			15687	21930
													Heat Rate	10229	11535
													Weighted Average Partial Load Adjustment Factor	0.9716	1.0352

Reference					
	HFO			NG	
Load	Net Eff	Net HR	Load	Net Eff	Net HR
170.22	32.4	10527.39972	171.62	30.6	11143.1109

K-Electric Limited
Generation Plants Tariff Petition
BQPS I Plant
Unit 5
Annexure D - Part Load Adjustment Example

Partial Load Sample Calculation of a DAY

Time	Date	A=(Net Dependable Capacity MW) * (Reference Oil Net Load)/ (Reference Gas Net Load)	Forced Outage MW B	Planned Outage MW C	Forced Derated MW D	Planned Derated MW E	Available Capacity (post planned and forced outages) MW F=A-B-C-D-E	Hourly Net Load MW (from energy meters) MW G	Partial Load Correction Factor H	Oil Firing Percentage % I	Gas Firing Percentage % J	Oil - Adjusted Net Heat Rate K=H*(Reference Oil Net HR)	Gas - Adjusted Net Heat Rate L=H*(Reference Gas Net HR)	Oil mmbtu M=K*G*/1000	Gas mmbtu N=L*G*//1000
1:00:00 AM	1-Jul	176					176	90	1.1516	95%	5%	11704	12436	1001	56
2:00:00 AM	1-Jul	176					176	90	1.1516	95%	5%	11704	12436	1001	56
3:00:00 AM	1-Jul	176					176	120	1.0624	40%	60%	10797	11472	518	826
4:00:00 AM	1-Jul	176					176	120	1.0624	40%	60%	10797	11472	518	826
5:00:00 AM	1-Jul	176					176	152	1.0148	40%	60%	10314	10959	623	993
6:00:00 AM	1-Jul	176					176	151	1.0148	40%	60%	10314	10959	623	993
7:00:00 AM	1-Jul	176					176	152	1.0148	40%	60%	10314	10959	623	993
8:00:00 AM	1-Jul	176					176	151	1.0148	40%	60%	10314	10959	623	993
9:00:00 AM	1-Jul	176					176	152	1.0148	40%	60%	10314	10959	623	993
10:00:00 AM	1-Jul	176					176	151	1.0148	40%	60%	10314	10959	623	993
11:00:00 AM	1-Jul	176					176	151	1.0148	40%	60%	10314	10959	623	993
12:00:00 PM	1-Jul	176					176	151	1.0148	40%	60%	10314	10959	623	993
1:00:00 PM	1-Jul	176					176	151	1.0148	40%	60%	10314	10959	623	993
2:00:00 PM	1-Jul	176					176	151	1.0148	40%	60%	10314	10959	623	993
3:00:00 PM	1-Jul	176					176	151	1.0148	40%	60%	10314	10959	623	993
4:00:00 PM	1-Jul	176					176	151	1.0148	40%	60%	10314	10959	623	993
5:00:00 PM	1-Jul	176					176	151	1.0148	40%	60%	10314	10959	623	993
6:00:00 PM	1-Jul	176					176	151	1.0148	40%	60%	10314	10959	623	993
7:00:00 PM	1-Jul	176					176	151	1.0148	40%	60%	10314	10959	623	993
8:00:00 PM	1-Jul	176					176	151	1.0148	40%	60%	10314	10959	623	993
9:00:00 PM	1-Jul	176					176	151	1.0148	40%	60%	10314	10959	623	993
10:00:00 PM	1-Jul	176					176	151	1.0148	40%	60%	10314	10959	623	993
11:00:00 PM	1-Jul	176					176	151	1.0148	40%	60%	10314	10959	623	993
12:00:00 AM	1-Jul	176					176	151	1.0148	40%	60%	10314	10959	623	993
Total		4226					4226	3440		45%	55%			15497	21621
													Net Heat Rate	10104	11342
													Weighted Average Partial Load Adjustment Factor	0.9942	1.0503

Reference					
	HFO			NG	
Load	Net Eff	Net HR	Load	Net Eff	Net HR
175.9	33.6	10162.86943	176.24	31.6	10798.38998

K-Electric Limited
Generation Plants Tariff Petition
BQPS I Plant
Unit 6
Annexure D - Part Load Adjustment Example

Partial Load Sample Calculation of a DAY

BQ1-U6															
Time	Date	Net Dependable Capacity MW a = i*(Reference Oil Net Load)+j*(Reference gas Net Load)	Forced Outage MW b	Planned Outage MW c	Forced Derated MW d	Planned Derated MW e	Available Capacity (post planned and forced outages) MW f=a-b-c-d-e	Hourly Net Load MW (from energy meters) MW g	Partial Load Correction Factor h	Oil Firing Percentage % i	Gas Firing Percentage % j	Oil - Adjusted Net Heat Rate k=h*(Reference Oil Net HR)	Gas - Adjusted Net Heat Rate l=h*(Reference Gas Net HR)	Oil mmbtus m=k*g*i/1000	Gas mmbtus n=l*g*j/1000
1:00:00 AM	1-Jul	176					176	90	1.1300	95%	5%	11698	12656	1000	57
2:00:00 AM	1-Jul	176					176	90	1.1300	95%	5%	11698	12656	1000	57
3:00:00 AM	1-Jul	177					177	120	1.0603	40%	60%	10976	11875	527	855
4:00:00 AM	1-Jul	177					177	120	1.0603	40%	60%	10976	11875	527	855
5:00:00 AM	1-Jul	177					177	151	1.0154	40%	60%	10512	11373	635	1030
6:00:00 AM	1-Jul	177					177	151	1.0154	40%	60%	10512	11373	635	1030
7:00:00 AM	1-Jul	177					177	151	1.0154	40%	60%	10512	11373	635	1030
8:00:00 AM	1-Jul	177					177	151	1.0154	40%	60%	10512	11373	635	1030
9:00:00 AM	1-Jul	177					177	151	1.0154	40%	60%	10512	11373	635	1030
10:00:00 AM	1-Jul	177					177	151	1.0154	40%	60%	10512	11373	635	1030
11:00:00 AM	1-Jul	177					177	151	1.0154	40%	60%	10512	11373	635	1030
12:00:00 PM	1-Jul	177					177	151	1.0154	40%	60%	10512	11373	635	1030
1:00:00 PM	1-Jul	177					177	151	1.0154	40%	60%	10512	11373	635	1030
2:00:00 PM	1-Jul	177					177	151	1.0154	40%	60%	10512	11373	635	1030
3:00:00 PM	1-Jul	177					177	151	1.0154	40%	60%	10512	11373	635	1030
4:00:00 PM	1-Jul	177					177	151	1.0154	40%	60%	10512	11373	635	1030
5:00:00 PM	1-Jul	177					177	151	1.0154	40%	60%	10512	11373	635	1030
6:00:00 PM	1-Jul	177					177	151	1.0154	40%	60%	10512	11373	635	1030
7:00:00 PM	1-Jul	177					177	151	1.0154	40%	60%	10512	11373	635	1030
8:00:00 PM	1-Jul	177					177	151	1.0154	40%	60%	10512	11373	635	1030
9:00:00 PM	1-Jul	177					177	151	1.0154	40%	60%	10512	11373	635	1030
10:00:00 PM	1-Jul	177					177	151	1.0154	40%	60%	10512	11373	635	1030
11:00:00 PM	1-Jul	177					177	151	1.0154	40%	60%	10512	11373	635	1030
12:00:00 AM	1-Jul	177					177	151	1.0154	40%	60%	10512	11373	635	1030
Total		4245					4245	3440		45%	55%			15752	22431
Heat Rate														10271	11767
Weighted Average Partial Load Adjustment Factor														0.9922	1.0506

Reference					
HFO			NG		
Load	Net Eff	Net HR	Load	Net Eff	Net HR
176.38	33.0	10352.21476	277.24	30.5	11199.7619

K-ELECTRIC LIMITED

BQPS-I – Annexure E (i) (Gas) & HFO Unit 1

Degradation table – Net Heat Rate HHV

	Net Efficiency (HFO)		Net Efficiency (Gas)		
Fiscal year	Tested	Revised	Tested	Revised	Correction factor
FY-20 (Test date)	32.3%	32.3%	30.4%	30.4%	1.00000
FY-21	32.3%	32.2%	30.4%	30.3%	1.00370
FY-22	32.3%	32.1%	30.4%	30.2%	1.00556
FY-23	32.3%	32.0%	30.4%	30.1%	1.00844
FY-24	32.3%	32.0%	30.4%	30.1%	1.00917

Degradation table – Net Output

Net Output - MW	Unit-1 Tested	Unit-1 Revised	Correction Factor
FY-20 (Test date)	168.32	168.32	1.0000
FY-21	168.32	167.09	1.0073
FY-22	168.32	166.56	1.0106
FY-23	168.32	165.74	1.0156
FY-24	168.32	164.92	1.0206

License capacity taken as reference.

Notes

- FY-20: 3rd Party Heat Rate Test Results
- FY21-22: As per actual operating hours
- FY23-24: As per 85% Utilization

BQPS-I – Annexure E (ii) (Gas) & HFO Unit 2

Degradation table –Net Heat rate HHV

	Net Efficiency (HFO)		Net Efficiency (Gas)		
Fiscal year	Tested	Revised	Tested	Revised	Correction Factor
FY-20 (Test date)	32.4%	32.4%	30.6%	30.6%	1.00000
FY-21	32.4%	32.3%	30.6%	30.5%	1.00371
FY-22	32.4%	32.2%	30.6%	30.4%	1.00622
FY-23	32.4%	32.1%	30.6%	30.3%	1.00918
FY-24	32.4%	32.1%	30.6%	30.3%	1.00993

Degradation table – Net Output

Net Output - MW	Unit-2 Tested	Unit-2 Revised	Correction Factor
FY-20 (Test date)	171.62	171.62	1.0000
FY-21	171.62	170.43	1.0070
FY-22	171.62	169.73	1.0111
FY-23	171.62	168.86	1.0163
FY-24	171.62	168.00	1.0216

License capacity taken as reference.

Notes

- FY-20: 3rd Party Heat Rate Test Results
- FY21-22: As per actual operating hours
- FY23-24: As per 85% Utilization

BQPS-I – Annexure E (iii) (Gas) & HFO Unit 5

Degradation table –Net Heat rate HHV

	Net Efficiency (HFO)		Net Efficiency (Gas)		
Fiscal year	Tested	Revised	Tested	Revised	Correction Factor
FY-20 (Test date)	33.6%	33.6%	31.6%	31.6%	1.00000
FY-21	33.6%	33.5%	31.6%	31.5%	1.00280
FY-22	33.6%	33.4%	31.6%	31.5%	1.00445
FY-23	33.6%	33.4%	31.6%	31.4%	1.00643
FY-24	33.6%	33.3%	31.6%	31.3%	1.00842
FY-25	33.6%	33.2%	31.6%	31.3%	1.01040
FY-26	33.6%	33.2%	31.6%	31.2%	1.01238
FY-27	33.6%	33.1%	31.6%	31.2%	1.01287

Degradation table – Net Output

Net Output - MW	Unit-5 Tested	Unit-5 Revised	Correction Factor
FY-20 (Test date)	175.90	175.90	1.0000
FY-21	175.90	174.54	1.0078
FY-22	175.90	173.86	1.0117
FY-23	175.90	173.04	1.0166
FY-24	175.90	172.21	1.0214
FY-25	175.90	171.39	1.0263
FY-26	175.90	170.57	1.0312
FY-27	175.90	169.75	1.0362

License capacity taken as reference.

- FY-20: 3rd Party Heat Rate Test Results
- FY21-22: As per actual operating hours
- FY23-24: As per 85% Utilization

BQPS-I – Annexure E (iv) (Gas) & HFO Unit 6

Degradation table –Net Heat rate HHV

	Net Efficiency (HFO)		Net Efficiency (Gas)		
Fiscal year	Tested	Revised	Tested	Revised	Correction Factor
FY-20 (Test date)	33.0%	33.0%	30.5%	30.5%	1.00000
FY-21	33.0%	32.8%	30.5%	30.3%	1.00601
FY-22	33.0%	32.6%	30.5%	30.2%	1.01003
FY-23	33.0%	32.5%	30.5%	30.0%	1.01398
FY-24	33.0%	32.4%	30.5%	29.9%	1.01793
FY-25	33.0%	32.3%	30.5%	29.8%	1.02188
FY-26	33.0%	32.1%	30.5%	29.7%	1.02583
FY-27	33.0%	32.0%	30.5%	29.6%	1.02977
FY-28	33.0%	31.9%	30.5%	29.5%	1.03373
FY-29	33.0%	31.8%	30.5%	29.4%	1.03768
FY-30	33.0%	31.6%	30.5%	29.2%	1.04162
FY-31	33.0%	31.5%	30.5%	29.1%	1.04557
FY-32	33.0%	31.4%	30.5%	29.0%	1.04953
FY-33	33.0%	31.4%	30.5%	29.0%	1.05052

Degradation table – Net Output

Net Output - MW	Unit -6 Tested	Unit -6 Revised	Correction Factor
FY-20 (Test date)	177.24	177.24	1.0000
FY-21	177.24	175.80	1.0082
FY-22	177.24	174.99	1.0129
FY-23	177.24	174.06	1.0183
FY-24	177.24	173.13	1.0238
FY-25	177.24	172.19	1.0293
FY-26	177.24	171.26	1.0349
FY-27	177.24	170.33	1.0406
FY-28	177.24	169.40	1.0463
FY-29	177.24	168.46	1.0521
FY-30	177.24	167.53	1.0580
FY-31	177.24	166.60	1.0639
FY-32	177.24	165.67	1.0699
FY-33	177.24	164.73	1.0759

License capacity taken as reference.

- FY-20: 3rd Party Heat Rate Test Results
- FY21-22: As per actual operating hours
- FY23-24: As per 82.5% Utilization

BQPS-I – Annexure F - HFO Calorific value mechanism

Storage Tank # 6 has been dedicated for the supplier (PSO).

- Oil is transferred from this tank to the service storage tank # 3,4 & 5 for utilization in the units.
- Before the transferring of fuel, sample is taken from Tank # 6 and tested in BQPS-1 chemical laboratory.
- At the end of the month, a weighted average of all samples results according to the pumping quantity will be taken and incorporated in monthly calculation of heat rate.

BQPS-I – Annexure G – O&M break up

Unit 1

BQPS-I Unit 1 O&M - Note

PKR million

Major Activities	Variable		Total
	Foreign	local	
Plant O&M Cost	0.81	6.48	7.28
Overhead Cost	-	0.02	0.02
Total	**0.81**	**6.50**	**7.31**

Note: BQPS I remaining useful life as per license is ending in October 2023, accordingly, expenses are shown for remaining period only

Unit 2

BQPS-I O&M Unit 2 - Note

PKR million

Major Activities	Variable		Total
	Foreign	local	
Plant O&M Cost	1.04	5.87	6.91
Overhead Cost	-	0.03	0.03
Total	**1.04**	**5.90**	**6.94**

Note: BQPS I remaining useful life as per license is ending in October 2023, accordingly, expenses are shown for remaining period only

Unit 5

BQPS-I Unit 5 O&M Levelized per year

PKR million

Major Activities	Variable		Total
	Foreign	local	
Plant O&M Cost	41.14	30.45	71.59
Overhead Cost	-	0.29	0.29
Total	**41.14**	**30.74**	**71.88**

Unit 6

BQPS-I Unit 6 O&M Levelized per year

PKR million

Major Activities	Variable		Total
	Foreign	local	
Plant O&M Cost	226.89	90.96	317.85
Overhead Cost	-	0.35	0.35
Total	226.89	91.31	318.20

BQPS I

BQPS-I O&M Levelized per year

PKR million

Major Activities	Fixed		Total
	Foreign	Local	
Plant O&M Cost	339.68	347.75	687.43
Overhead Cost	-	669.62	669.62
Total	339.68	1,017.37	1,357.05

K-Electric Limited
Generation Plants Tariff Petition
BQPS I Plant
Annexure I - Insurance

Description	Legend	Unit	FY-24	FY-25	FY-26	FY-27	FY-28	FY-29	FY-30	FY-31	FY-32	FY-33
EPC cost												
Unit 1	a	USD mn	92.55	92.55	92.55	92.55	92.55	92.55	92.55	92.55	92.55	92.55
Unit 2		USD mn	66.96	66.96	66.96	66.96	66.96	66.96	66.96	66.96	66.96	66.96
Unit 5		USD mn	102.14	102.14	102.14	102.14	102.14	102.14	102.14	102.14	102.14	102.14
Unit 6		USD mn	79.29	79.29	79.29	79.29	79.29	79.29	79.29	79.29	79.29	79.29
Total		USD mn	340.94	340.94	340.94	340.94	340.94	340.94	340.94	340.94	340.94	340.94
1% of EPC cost												
Unit 1	b = a x 1%	USD mn	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Unit 2		USD mn	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
Unit 5		USD mn	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Unit 6		USD mn	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Total		USD mn	3.41	3.41	3.41	3.41	3.41	3.41	3.41	3.41	3.41	3.41
Reference USD rate	c	PKR / USD	206	206	206	206	206	206	206	206	206	206
Total Days	d	Days	365	365	365	365	365	365	365	365	365	365
Days for which units planned to be in operation												
Unit 1	e	Days	92.00	-	-	-	-	-	-	-	-	-
Unit 2		Days	92.00	-	-	-	-	-	-	-	-	-
Unit 5		Days	365.00	365.00	365.00	92.00	-	-	-	-	-	-
Unit 6		Days	365.00	365.00	365.00	365.00	365.00	365.00	365.00	365.00	365.00	92.00
1% of EPC cost with respect to days in operation												
Unit 1	f = b x e / d	USD mn	0.23	-	-	-	-	-	-	-	-	-
Unit 2		USD mn	0.17	-	-	-	-	-	-	-	-	-
Unit 5		USD mn	1.02	1.02	1.02	0.26	-	-	-	-	-	-
Unit 6		USD mn	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.20
Total	f total	USD mn	2.22	1.81	1.81	1.05	0.79	0.79	0.79	0.79	0.79	0.20
Insurance cost based on 1% of EPC cost												
Unit 1	g = f x c	PKR mn	48.06	-	-	-	-	-	-	-	-	-
Unit 2		PKR mn	34.77	-	-	-	-	-	-	-	-	-
Unit 5		PKR mn	210.42	210.42	210.42	53.04	-	-	-	-	-	-
Unit 6		PKR mn	163.33	163.33	163.33	163.33	163.33	163.33	163.33	163.33	163.33	41.17
Total	g total	PKR mn	456.57	373.75	373.75	216.36	163.33	163.33	163.33	163.33	163.33	41.17
Units on Net Capacity - Annexure NII	h	GWh	3,228	2,590	2,590	1,611	1,281	1,281	1,281	1,281	1,281	323
Insurance	I = g total / h	PKR / kWh	0.1414	0.1443	0.1443	0.1343	0.1275	0.1275	0.1275	0.1275	0.1275	0.1275
Reference premium	= f total	USD mn	2.216	1.814	1.814	1.050	0.793	0.793	0.793	0.793	0.793	0.200

K-Electric Limited
Generation Plants Tariff Petition
BQPS I Plant
Annexure J - RAB Movement

	Description	Working	Unit	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031	FY 2032	FY 2033
a	Total RAB Movement													
	Cost - Without surplus on revaluation													
	Opening		PKR Mn		37,231	37,231	37,231	37,231	37,231	37,231	37,231	37,231	37,231	37,231
	Capitalization		PKR Mn		-	-	-	-	-	-	-	-	-	-
	Disposal		PKR Mn		-	-	-	-	-	-	-	-	-	-
	Closing	a	PKR Mn	37,231	37,231	37,231	37,231	37,231	37,231	37,231	37,231	37,231	37,231	37,231
	Accumulated Depreciation													
	Opening		PKR Mn		27,490	29,954	31,098	32,241	33,115	33,899	34,683	35,467	36,251	37,035
	Depreciation for the year		PKR Mn		2,464	1,144	1,144	874	784	784	784	784	784	196
	Depreciation - Disposal		PKR Mn		-	-	-	-	-	-	-	-	-	-
	Closing	b	PKR Mn	27,490	29,954	31,098	32,241	33,115	33,899	34,683	35,467	36,251	37,035	37,231
	Net Book Value - Fixed Assets	c=a-b	PKR Mn	9,741	7,277	6,133	4,990	4,116	3,332	2,548	1,764	980	196	-
	Capital Work in Progress													
	Opening		PKR Mn		-	-	-	-	-	-	-	-	-	-
	Capex		PKR Mn		-	-	-	-	-	-	-	-	-	-
	Transfer to Fixed Assets		PKR Mn		-	-	-	-	-	-	-	-	-	-
	Closing	d	PKR Mn	-	-	-	-	-	-	-	-	-	-	-
	Net RAB	e=c+d	PKR Mn	9,741	7,277	6,133	4,990	4,116	3,332	2,548	1,764	980	196	-
	Average RAB - PKR	f=average of e	PKR Mn		8,509	6,705	5,562	4,553	3,724	2,940	2,156	1,372	588	98
b	RoRB Break up													
	Equity Portion	g	%		30%	30%	30%	30%	30%	30%	30%	30%	30%	30%
	Debt Portion	h	%		70%	70%	70%	70%	70%	70%	70%	70%	70%	70%
	Local Component	i	%		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Foreign Component	j	%		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	KIBOR	k	%		15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%
	Spread on KIBOR	l	%		2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%
	Cost of Debt - Local borrowing	m=k+l	%		17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%
	LIBOR	n	%		2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%
	Hedge	o	%		15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%
	Spread	p	%		4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
	Cost of Debt - Foreign borrowing	q=n+o+p	%		22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%
	KIBOR	r	%		15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%
	LIBOR	s	%		-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%
	Hedging spread	t	%		2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%
	Hedging cost	u=r+s+t	%		15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%
	Return on Equity	v	%		15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%
	Indexed Return on Equity	z	%		30.99%	30.99%	30.99%	30.99%	30.99%	30.99%	30.99%	30.99%	30.99%	30.99%
	RoRB and Depreciation amounts													
	Cost of Debt - Local	aa=fxhxixm	PKR Mn		1,052	829	688	563	460	363	267	170	79	12
	Cost of Debt - Foreign	ab=fxhxjxq	PKR Mn		-	-	-	-	-	-	-	-	-	-
	Cost of Equity	ac=fxgxz	PKR Mn		791	623	517	423	346	275	200	128	55	9
	Depreciation	ad=b for the year	PKR Mn		2,464	1,144	1,144	874	784	784	784	784	784	196
	Calculation of Tariff components													
	Units on Net capacity - Annexure _	ae	GWh		3,218	2,590	2,590	1,611	1,281	1,281	1,281	1,281	1,281	323
	Tariff components on Gas													
	Cost of Debt - Local	aa / ae	PKR / kWh		0.3269	0.3200	0.2654	0.3494	0.3593	0.2838	0.2091	0.1324	0.0618	0.0375
	Cost of Debt - Foreign	ab / ae	PKR / kWh		-	-	-	-	-	-	-	-	-	-
	Cost of Equity	ac / ae	PKR / kWh		0.2460	0.2406	0.1996	0.2628	0.2703	0.2134	0.1565	0.0996	0.0427	0.0282
	Depreciation	ad / ae	PKR / kWh		0.7658	0.4415	0.4415	0.5425	0.6122	0.6122	0.6122	0.6122	0.6122	0.6072

K-Electric Limited
Generation Plants Tariff Petition
BQPS I Plant
Annexure K (i) - Calculation of Indexed RoE

Particulars		FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2023 - Jan'23
		Actualized							Forecasted	
Average Exchange rates	PKR / USD	104.82	104.81	110.01	136.17	158.38	160.21	178.03	206.00	206.00
RAB amount - Generation	PKR mn	8,285	9,282	10,491	11,102	11,258	11,257	11,305	9,741	9,741
Additions during the year	PKR mn		997	1,210	611	156	(1)	49	(1,564)	-

Year wise indexation based on exchange rates (A)

FY 2016	%		-0.01%	4.95%	29.91%	51.10%	52.84%	69.84%	96.53%	96.53%
FY 2017	%			4.96%	29.92%	51.11%	52.86%	69.86%	96.55%	96.55%
FY 2018	%				23.78%	43.97%	45.63%	61.83%	87.26%	87.26%
FY 2019	%					16.31%	17.65%	30.74%	51.28%	51.28%
FY 2020	%						1.16%	12.41%	30.07%	30.07%
FY 2021	%							11.12%	28.58%	28.58%
FY 2022	%								15.71%	15.71%
FY 2023	%									0.00%

Calculated with reference to exchange rate of a relevant year vs exchange rate of base year for example 16.31% in FY 2019 calculated as PKR 158.38 / USD divided by PKR 136.17 / USD

Year wise break up of RAB

FY 2016	PKR mn	8,285	8,285	8,285	8,285	8,285	8,285	8,285	8,285	8,285
FY 2017	PKR mn		997	997	997	997	997	997	997	997
FY 2018	PKR mn			1,210	1,210	1,210	1,210	1,210	1,210	1,210
FY 2019	PKR mn				611	611	611	611	611	611
FY 2020	PKR mn					156	156	156	156	156
FY 2021	PKR mn						(1)	(1)	(1)	(1)
FY 2022	PKR mn							49	49	49
FY 2023	PKR mn								(1,564)	(1,564)
Total RAB	PKR mn	8,285	9,282	10,491	11,102	11,258	11,257	11,305	9,741	9,741

Weightage of RAB (B)

FY 2016	PKR mn	100%	89%	79%	75%	74%	74%	73%	85%	85%
FY 2017	PKR mn	-	11%	10%	9%	9%	9%	9%	10%	10%
FY 2018	PKR mn	-	-	12%	11%	11%	11%	11%	12%	12%
FY 2019	PKR mn	-	-	-	6%	5%	5%	5%	6%	6%
FY 2020	PKR mn	-	-	-	-	1%	1%	1%	2%	2%
FY 2021	PKR mn	-	-	-	-	-	0%	0%	0%	0%
FY 2022	PKR mn	-	-	-	-	-	-	0%	1%	1%
FY 2023	PKR mn	-	-	-	-	-	-	-	-16%	-16%
Total	PKR mn	100%	100%	100%	100%	100%	100%	100%	100%	100%

Year wise indexation - considering RAB weightage (A x B)

FY 2016	%		0.0%	3.9%	22.3%	37.6%	38.9%	51.2%	82.1%	82.1%
FY 2017	%		-	0.5%	2.7%	4.5%	4.7%	6.2%	9.9%	9.9%
FY 2018	%		-	-	2.6%	4.7%	4.9%	6.6%	10.8%	10.8%
FY 2019	%		-	-	-	0.9%	1.0%	1.7%	3.2%	3.2%
FY 2020	%		-	-	-	-	0.0%	0.2%	0.5%	0.5%
FY 2021	%		-	-	-	-	-	0.0%	0.0%	0.0%
FY 2022	%		-	-	-	-	-	-	0.1%	0.1%
FY 2023	%		-	-	-	-	-	-	-	-
Total Indexation	%		0.0%	4.4%	27.6%	47.7%	49.5%	65.8%	106.6%	106.6%

RoE - USD based	15.0%
Indexation	106.6%
RoE - Indexed at PKR 206 / USD	30.99%

K-Electric Limited
Generation Plants Tariff Petition
BQPS I Plant
Annexure I (ii) - Illustration for RoE Indexation

Indexation for the quarter	Q1 - FY 2024
Date of indexation	July 3, 2023

Description	Unit	Legend	BQPS I
Reference RoRB Cost of Equity component for FY 2024	PKR / kWh	a	0.2450
TT & OD selling rate of USD as notified by National bank of Pakistan at June 30, 2023	PKR / USD	b	250
Reference exchange rate	PKR / USD	c	206.00
Indexed RoRB Cost of Equity component for FY 2024	PKR / kWh	d = a x b / c	0.2974

K-Electric Limited
Generation Plants Tariff Petition
BQPS-I Plant
Annexure L - Calculation of Working Capital

Description	Reference	Unit	Oct'16	Nov'16	Dec'16	Jan'17	Feb'17	Mar'17	Apr'17	May'17	Jun'17	Jul'17	Total
1 Cost of Borrowing													
KIBOR	a	%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	
Spread for Short term borrowing	b	%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	
Cost of Borrowing	c=a+b	%	17.16%	17.16%	17.16%	17.16%	17.16%	17.16%	17.16%	17.16%	17.16%	17.16%	
Units on Net capacity - Annexure II (ii)													
Unit 1	d	GWh	316	-	-	-	-	-	-	-	-	-	316
Unit 2		GWh	322	-	-	-	-	-	-	-	-	-	322
Unit 5		GWh	1,310	1,310	1,310	310	-	-	-	-	-	-	4,259
Unit 6		GWh	1,281	1,281	1,281	1,281	1,281	1,281	1,281	1,281	1,281	323	13,843
Total		GWh	3,228	2,590	2,590	1,611	1,281	1,281	1,281	1,281	1,281	323	18,740
2 Fuel cost receivable cycle - on furnace oil													
Receivable days	e	No.	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	
Furnace oil payment days	f	No.	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	
Net days	g=e-f	No.	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	
Outstanding fuel amount (Furnace oil at 60% load factor)													
Units at 60% load factor													
Unit 1	h=dx 60%	GWh	190	-	-	-	-	-	-	-	-	-	
Unit 2		GWh	193	-	-	-	-	-	-	-	-	-	
Unit 5		GWh	786	786	786	186	-	-	-	-	-	-	
Unit 6		GWh	768	768	768	768	768	768	768	768	768	194	
Total		GWh	1,937	1,554	1,554	966	768	768	768	768	768	194	
Allowed Heat Rate for the Quarter - Furnace oil													
Unit 1	i	btu / kWh	10,566	10,566	10,566	10,566	10,566	10,566	10,566	10,566	10,566	10,566	
Unit 2		btu / kWh	10,527	10,527	10,527	10,527	10,527	10,527	10,527	10,527	10,527	10,527	
Unit 5		btu / kWh	10,163	10,163	10,163	10,163	10,163	10,163	10,163	10,163	10,163	10,163	
Unit 6		btu / kWh	10,352	10,352	10,352	10,352	10,352	10,352	10,352	10,352	10,352	10,352	
Reference price - Furnace oil	j	PKR / mmbtu	3,378	3,378	3,378	3,378	3,378	3,378	3,378	3,378	3,378	3,378	
Furnace oil amount													
Unit 1	k=hxixj/10^6	PKR mn	6,766	-	-	-	-	-	-	-	-	-	
Unit 2		PKR mn	6,873	-	-	-	-	-	-	-	-	-	
Unit 5		PKR mn	26,981	26,981	26,981	6,401	-	-	-	-	-	-	
Unit 6		PKR mn	26,873	26,873	26,873	26,873	26,873	26,873	26,873	26,873	26,873	6,774	
Total		PKR mn	67,493	53,854	53,854	33,274	26,873	26,873	26,873	26,873	26,873	6,774	
Days applicable													
Unit 1	l	No.	91	-	-	-	-	-	-	-	-	-	
Unit 2		No.	92	-	-	-	-	-	-	-	-	-	
Unit 5		No.	365	365	365	92	-	-	-	-	-	-	
Unit 6		No.	365	365	365	365	365	365	365	365	365	92	
Total days in a year	m	No.	366.0	365.0	365.0	365.0	366.0	365.0	365.0	365.0	366.0	365.0	
Amount for outstanding days													
Unit 1	n=kxg/l	PKR mn	882	-	-	-	-	-	-	-	-	-	882
Unit 2		PKR mn	896	-	-	-	-	-	-	-	-	-	896
Unit 5		PKR mn	887	887	887	887	-	-	-	-	-	-	3,548
Unit 6		PKR mn	884	884	884	884	884	884	884	884	884	884	8,835
Total		PKR mn	3,550	1,771	1,771	1,771	884	884	884	884	884	884	14,162
Amount for outstanding days with safety tax													
Unit 1	o=nx2.17	PKR mn	1,032	-	-	-	-	-	-	-	-	-	1,032
Unit 2		PKR mn	1,049	-	-	-	-	-	-	-	-	-	1,049
Unit 5		PKR mn	1,038	1,038	1,038	1,038	-	-	-	-	-	-	4,151
Unit 6		PKR mn	1,034	1,034	1,034	1,034	1,034	1,034	1,034	1,034	1,034	1,034	10,337
Total		PKR mn	4,153	2,072	2,072	2,072	1,034	1,034	1,034	1,034	1,034	1,034	16,570
Cost of working capital on outstanding amount													
Unit 1	p=oxixc/m	PKR mn	45	-	-	-	-	-	-	-	-	-	45
Unit 2		PKR mn	45	-	-	-	-	-	-	-	-	-	45
Unit 5		PKR mn	178	178	178	45	-	-	-	-	-	-	579
Unit 6		PKR mn	177	177	177	177	177	177	177	177	177	45	1,640
Total		PKR mn	444	355	355	222	177	177	177	177	177	45	2,308
3 Cost of HFO Inventory													
Full inventory - full storage	q	M ton	65,000	65,000	65,000	65,000	65,000	65,000	65,000	65,000	65,000	65,000	
Total units	r	No.	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	
Units in operation	s	No.	2.50	2.00	2.00	1.25	1.00	1.00	1.00	1.00	1.00	0.25	
Required inventory	t=qxs/r	M ton	40,625	32,500	32,500	20,313	16,250	16,250	16,250	16,250	16,250	4,063	
Reference price - FO	u	PKR / M ton	137,701	137,701	137,701	137,701	137,701	137,701	137,701	137,701	137,701	137,701	
Amount of inventory	v=txu	PKR mn	5,594	4,475	4,475	2,797	2,238	2,238	2,238	2,238	2,238	559	
Cost of working capital for inventory	w=cxv	PKR mn	960	768	768	480	384	384	384	384	384	96	
4 Cost of Other Inventory													
Inventory amount													
Unit 1	x	PKR mn	391	-	-	-	-	-	-	-	-	-	
Unit 2		PKR mn	391	-	-	-	-	-	-	-	-	-	
Unit 5		PKR mn	391	391	391	391	-	-	-	-	-	-	
Unit 6		PKR mn	391	391	391	391	391	391	391	391	391	391	
Total		PKR mn	1,564	782	782	782	391	391	391	391	391	391	
Cost	y=xxc	PKR mn	269	134	134	134	67	67	67	67	67	67	

K-Electric Limited
Generation Plants Tariff Petition
BQPS I Plants
Annexure L - Calculation of Working Capital

Description		Unit	FY23	FY24	Oct-24	FY25	Nov	Dec	Jan	Feb	Mar	Apr
4 Cost of SBLC												
(i) Cost of 60 days RLNG												
Heat rate - Gas												
Unit 1	z	btu / kWh	11,231	11,231	11,231	11,231	11,231	11,231	11,231	11,231	11,231	11,231
Unit 2		btu / kWh	11,143	11,143	11,143	11,143	11,143	11,143	11,143	11,143	11,143	11,143
Unit 5		btu / kWh	10,798	10,798	10,798	10,798	10,798	10,798	10,798	10,798	10,798	10,798
Unit 6		btu / kWh	11,200	11,200	11,200	11,200	11,200	11,200	11,200	11,200	11,200	11,200
Reference RLNG price	aa	PKR / mmbtu	3,301	3,301	3,301	3,301	3,301	3,301	3,301	3,301	3,301	3,301
RLNG amount - 60 days												
Unit 1	abcdxzxaax60 /1x3/10^6	PKR mn	7,636	-	-	-	-	-	-	-	-	-
Unit 2		PKR mn	7,726	-	-	-	-	-	-	-	-	-
Unit 5		PKR mn	7,674	7,674	7,674	7,674	-	-	-	-	-	-
Unit 6		PKR mn	7,783	7,783	7,783	7,783	7,783	7,783	7,783	7,783	7,783	7,783
Total		PKR mn	30,823	15,457	15,457	15,457	7,783	7,783	7,783	7,783	7,783	7,783
(ii) Actual SBLC given (min of total PKR 6 Bn, reported to BOPS)												
Unit 1	ac	PKR mn	-	-	-	-	-	-	-	-	-	-
Unit 2		PKR mn	-	-	-	-	-	-	-	-	-	-
Unit 5		PKR mn	1,025	1,025	1,025	1,025	-	-	-	-	-	-
Unit 6		PKR mn	1,030	1,030	1,030	1,030	2,055	2,055	2,055	2,055	2,055	514
Total		PKR mn	2,055	2,055	2,055	2,055	2,055	2,055	2,055	2,055	2,055	514
SBLC Cost - 60 days or actual, whichever is lower	ad = min (aa,ab)	PKR mn	2,055	2,055	2,055	2,055	2,055	2,055	2,055	2,055	2,055	514
Cost of SBLC 0.5%	ae = adx 0.5%	PKR mn	10.28	10.28	10.28	10.28	10.28	10.28	10.28	10.28	10.28	2.57
Calculation of working capital component												
Cost of working capital on Receivable	af	PKR mn	444	355	355	222	177	177	177	177	177	45
Cost of working capital on RFO Inventory	ag	PKR mn	960	768	768	480	384	384	384	384	384	96
Cost of working capital on Other Inventory	ah	PKR mn	268	134	134	134	67	67	67	67	67	67
SBLC cost	ai	PKR mn	10.28	10.28	10.28	10.28	10.28	10.28	10.28	10.28	10.28	2.57
Total	aj	PKR mn	1,683	1,268	1,268	847	638	639	639	639	638	210
Units x Net Capacity	ak	GWh	3,228	2,590	2,590	1,613	1,281	1,281	1,281	1,281	1,281	323
Working capital Component	aj / ak	PKR / kWh	0.5213	0.4894	0.4894	0.5250	0.4984	0.4987	0.4987	0.4987	0.4984	0.6517

K-Electric Limited
Generation Plants Tariff Petition
BQPS I Plant
Annexure M - Capacity Sample Calculation

Partial Load Sample Calculation of a DAY

BQ1 (Unit - 6)										
Time	Date	Net Dependable Capacity* MW	Forced Outage MW	Planned Outage MW	Forced Derated MW	Planned Derated MW	Available Capacity (post planned and forced outages) MW	Capacity Tariff Rs/kWh	Capacity Payment PKR - Mn
		A	B	C	D	E	F=A-B-C-D-E	H	I=H*F*1000/10^6
1:00:00 AM	1-Jul	177					177	2.46	0.44
2:00:00 AM	1-Jul	177					177	2.46	0.44
3:00:00 AM	1-Jul	177					177	2.46	0.44
4:00:00 AM	1-Jul	177					177	2.46	0.44
5:00:00 AM	1-Jul	177	177				0	2.46	0.00
6:00:00 AM	1-Jul	177					177	2.46	0.44
7:00:00 AM	1-Jul	177					177	2.46	0.44
8:00:00 AM	1-Jul	177		177			0	2.46	0.00
9:00:00 AM	1-Jul	177					177	2.46	0.44
10:00:00 AM	1-Jul	177			80		97	2.46	0.24
11:00:00 AM	1-Jul	177					177	2.46	0.44
12:00:00 PM	1-Jul	177					177	2.46	0.44
1:00:00 PM	1-Jul	177					177	2.46	0.44
2:00:00 PM	1-Jul	177				80	97	2.46	0.24
3:00:00 PM	1-Jul	177					177	2.46	0.44
4:00:00 PM	1-Jul	177					177	2.46	0.44
5:00:00 PM	1-Jul	177					177	2.46	0.44
6:00:00 PM	1-Jul	177					177	2.46	0.44
7:00:00 PM	1-Jul	177					177	2.46	0.44
8:00:00 PM	1-Jul	177					177	2.46	0.44
9:00:00 PM	1-Jul	177					177	2.46	0.44
10:00:00 PM	1-Jul	177					177	2.46	0.44
11:00:00 PM	1-Jul	177					177	2.46	0.44
12:00:00 AM	1-Jul	177					177	2.46	0.44
Total							3739	2.46	9.18

* as per license

K-ELECTRIC LIMITED

K-Electric Limited
Generation Plants Tariff Petition
BQPS I Plant
Annexure N (i) - Outage Schedule and Plant factor

Description	Legend	Unit	FY-24	FY-25	FY-26	FY-27	FY-28	FY-29	FY-30	FY-31	FY-32	FY-33	Total
Hours	a	No.	24	24	24	24	24	24	24	24	24	24	24
Days		No.	366	365	365	365	366	365	365	365	366	365	3,653
U-1	b	No.	92	-	-	-	-	-	-	-	-	-	92
U-2		No.	92	-	-	-	-	-	-	-	-	-	92
U-5		No.	366	365	365	92	-	-	-	-	-	-	1,188
U-6		No.	366	365	365	365	366	365	365	365	366	92	3,380
Hours in a year		No.	8,784	8,760	8,760	8,760	8,784	8,760	8,760	8,760	8,784	8,760	87,672
U-1	c = a x b	No.	2,208	-	-	-	-	-	-	-	-	-	2,208
U-2		No.	2,208	-	-	-	-	-	-	-	-	-	2,208
U-5		No.	8,784	8,760	8,760	2,208	-	-	-	-	-	-	28,512
U-6		No.	8,784	8,760	8,760	8,760	8,784	8,760	8,760	8,760	8,784	2,208	81,120
1 Annual outages													
Gross Capacity - MW													
U-1	d	MW	181.2	-	-	-	-	-	-	-	-	-	18.1
U-2		MW	183.4	-	-	-	-	-	-	-	-	-	18.3
U-5		MW	188.3	188.3	188.3	188.3	-	-	-	-	-	-	75.3
U-6		MW	191.0	191.0	191.0	191.0	191.0	191.0	191.0	191.0	191.0	191.0	191.0
Plant		MW	743.9	379.3	379.3	379.3	191.0	191.0	191.0	191.0	191.0	191.0	302.8
Scheduled outage days													
U-1	e	No.	3.0	-	-	-	-	-	-	-	-	-	3.0
U-2		No.	3.0	-	-	-	-	-	-	-	-	-	3.0
U-5		No.	37.0	37.0	37.0	3.0	-	-	-	-	-	-	114.0
U-6		No.	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	3.0	336.0
Forced outage days													
U-1	f	No.	10.8	-	-	-	-	-	-	-	-	-	10.8
U-2		No.	10.8	-	-	-	-	-	-	-	-	-	10.8
U-5		No.	17.8	17.8	17.8	10.8	-	-	-	-	-	-	64.2
U-6		No.	17.8	17.8	17.8	17.8	17.8	17.8	17.8	17.8	17.8	10.8	171.0
Total Annual outage days													
U-1	g = e + f	No.	13.8	-	-	-	-	-	-	-	-	-	13.8
U-2		No.	13.8	-	-	-	-	-	-	-	-	-	13.8
U-5		No.	54.8	54.8	54.8	13.8	-	-	-	-	-	-	178.2
U-6		No.	54.8	54.8	54.8	54.8	54.8	54.8	54.8	54.8	54.8	13.8	507.0
Plant		No.	137.2	109.6	109.6	68.6	54.8	54.8	54.8	54.8	54.8	13.8	712.8
Total Annual outage %													
U-1	h = g / b	%	15.0%	-	-	-	-	-	-	-	-	-	15.0%
U-2		%	15.0%	-	-	-	-	-	-	-	-	-	15.0%
U-5		%	15.0%	15.0%	15.0%	15.0%	-	-	-	-	-	-	15.0%
U-6		%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
Plant	i = w. average g / b	%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
Annual Availability %													
U-1	100% - h	%	85.0%										85.0%
U-2		%	85.0%										85.0%
U-5		%	85.0%	85.0%	85.0%	85.0%							85.0%
U-6		%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
Plant	j = 100% - i	%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
2 Overhauls													

Cumulative hours											
U-1	Hours	276,041	283,487	285,364	-	-	-	-	-	-	-
U-2	Hours	274,995	282,441	284,318	-	-	-	-	-	-	-
U-5	Hours	234,269	241,715	249,181	256,627	264,073	265,950	-	-	-	-
U-6	Hours	184,566	192,012	199,478	206,924	214,370	222,816	229,283	236,729	244,175	251,621

Overhauls										
U-1										
U-2										
U-5										
U-6	DCS Upgradation	TMOH								

Overhauls are included based on factored fired hours. Accordingly, these events will occur when respective factored fired hours will be achieved

DCS= Distributed Control System
TMOH= Turbine Major Overhauling

K-Electric Limited
Generation Plants Tariff Petition
BQPS I Plant
Annexure N (I) - Outage Schedule and Plant factor

Description	Unit	Jul-24	Aug-24	Sep-24	Oct-24	Nov-24	Dec-24	Jan-25	Feb-25	Mar-25	Apr-25	May-25	Total
Overhaul - days													
U-1		Days	-	-	-	-	-	-	-	-	-	-	-
U-2	k	Days	-	-	-	-	-	-	-	-	-	-	-
U-5		Days	-	-	-	-	-	-	-	-	-	-	-
U-6		Days	45	40	-	-	-	-	-	-	-	-	85
Plant		Days	45	40	-	-	-	-	-	-	-	-	85
Overhaul - %													
U-1		%	-	-	-	-	-	-	-	-	-	-	-
U-2	l=k/b	%	-	-	-	-	-	-	-	-	-	-	-
U-5		%	-	-	-	-	-	-	-	-	-	-	-
U-6		%	12.3%	11.0%	-	-	-	-	-	-	-	-	2.5%
Plant	m= w. average k/b	%	3.16%	5.52%	-	-	-	-	-	-	-	-	1.59%
Annual outages + Overhaul													
Outage days - Annual + Overhaul													
U-1		Days	14	-	-	-	-	-	-	-	-	-	14
U-2	n=g+k	Days	14	-	-	-	-	-	-	-	-	-	14
U-5		Days	55	55	55	14	-	-	-	-	-	-	178
U-6		Days	100	95	55	55	55	55	55	55	55	14	592
Plant		Days	182	150	110	69	55	55	55	55	55	14	798
Outage % - Annual + Overhaul													
U-1		%	15.0%	-	-	-	-	-	-	-	-	-	15.0%
U-2	o=n/b	%	15.0%	-	-	-	-	-	-	-	-	-	15.0%
U-5		%	15.0%	15.0%	15.0%	15.0%	-	-	-	-	-	-	15.0%
U-6		%	27.3%	26.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	17.5%
Plant	p=n/bw average	%	18.1%	20.5%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	16.0%
Availability		%											
U-1		%	85.000%										85.000%
U-2	100% - o	%	85.000%										85.000%
U-5		%	85.027%	84.986%	84.986%	85.000%							85.000%
U-6		%	72.732%	74.027%	84.986%	84.986%	85.027%	84.986%	84.986%	84.986%	85.027%	85.000%	82.485%
Plant	q=100% - p	%	81.9%	79.5%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	83.41%

K-ELECTRIC LIMITED

K-Electric Limited
Generation Plants Tariff Petition
BQPS I Plant
Annexure N (ii) - Units on Net Capacity

Description	Legend	Unit	FY-24	FY-25	FY-26	FY-27	FY-28	FY-29	FY-30	FY-31	FY-32	FY-33	Total
Hours	a	No.	24	24	24	24	24	24	24	24	24	24	24
Days	b	No.	365	365	365	365	365	365	365	365	365	365	3,650
Days for which Unit will be available till end of life													
Unit 1	c	No.	92	-	-	-	-	-	-	-	-	-	92
Unit 2		No.	92	-	-	-	-	-	-	-	-	-	92
Unit 5		No.	365	365	365	92	-	-	-	-	-	-	1,187
Unit 6		No.	365	365	365	365	365	365	365	365	365	92	3,377
Net Capacity - MW													
Unit 1	d	MW	168.3	-	-	-	-	-	-	-	-	-	16.8
Unit 2		MW	171.6	-	-	-	-	-	-	-	-	-	17.2
Unit 5		MW	175.9	175.9	175.9	175.9	-	-	-	-	-	-	70.4
Unit 6		MW	177.2	177.2	177.2	177.2	177.2	177.2	177.2	177.2	177.2	177.2	177.2
Total		MW	693.1	353.1	353.1	353.1	177.2	177.2	177.2	177.2	177.2	177.2	281.6
Plant factor - Annexure N (i)													
Unit 1	e	MW	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%
Unit 2		MW	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%
Unit 5		MW	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%
Unit 6		MW	82.49%	82.49%	82.49%	82.49%	82.49%	82.49%	82.49%	82.49%	82.49%	82.49%	82.49%
Units on Net Capacity													
U-1	f=axcxdxe/ 1000	GWh	316	-	-	-	-	-	-	-	-	-	316
U-2		GWh	322	-	-	-	-	-	-	-	-	-	322
U-5		GWh	1,310	1,310	1,310	330	-	-	-	-	-	-	4,259
U-6		GWh	1,281	1,281	1,281	1,281	1,281	1,281	1,281	1,281	1,281	323	11,849
Total		GWh	**3,228**	**2,590**	**2,590**	**1,611**	**1,281**	**1,281**	**1,281**	**1,281**	**1,281**	**323**	**16,746**

K-Electric Limited
Generation Plants Tariff Petition
BQPS I Plant
Annexure O - O&M Sharing mechanism

Description	Reference	Unit	FY 22-23	FY 23-24	FY 24-25	FY 25-26	FY 26-27	FY 27-28	FY 28-29	FY 29-30	FY 30-31	FY 31-32
Hours	a	no.	24	24	24	24	24	24	24	24	24	24
Days	b	no.	365	365	365	365	365	365	365	365	365	365
Hours in a year	c=axb	no.	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760
Days for which units will be in operation												
Unit 1	d	no.	92	-	-	-	-	-	-	-	-	-
Unit 2		no.	92	-	-	-	-	-	-	-	-	-
Unit 5		no.	365	365	365	92	-	-	-	-	-	-
Unit 6		no.	365	365	365	365	365	365	365	365	365	92
Recovery under tariff - Variable O&M												
Unit 1												
[Shall be replaced with actual quarterly indexed tariff components]												
Variable - local	e	PKR / kWh	0.2057	0.2057	0.2057	0.2057	0.2057	0.2057	0.2057	0.2057	0.2057	0.2057
Variable - Foreign		PKR / kWh	0.0256	0.0256	0.0256	0.0256	0.0256	0.0256	0.0256	0.0256	0.0256	0.0256
Net Capacity	f	MW	168.3	-	-	-	-	-	-	-	-	-
Availability factor [Shall be replaced with Actual]	g	%	85.0%	-	-	-	-	-	-	-	-	-
Available capacity	h=fxgxaxd/1000	GWh	315.9	-	-	-	-	-	-	-	-	-
Dispatch factor [Shall be replaced with Actual]	i	%	100%	-	-	-	-	-	-	-	-	-
Units sent out	J=hxi	GWh	316	-	-	-	-	-	-	-	-	-
Recovery in tariff												
Variable - local	k=exj	PKR mn	65	-	-	-	-	-	-	-	-	-
Variable - Foreign		PKR mn	8	-	-	-	-	-	-	-	-	-
Total	k total	PKR mn	73	-	-	-	-	-	-	-	-	-
Unit 2												
[Shall be replaced with actual quarterly indexed tariff components]												
Variable - local	l	PKR / kWh	0.1829	0.1829	0.1829	0.1829	0.1829	0.1829	0.1829	0.1829	0.1829	0.1829
Variable - Foreign		PKR / kWh	0.0324	0.0324	0.0324	0.0324	0.0324	0.0324	0.0324	0.0324	0.0324	0.0324
Net Capacity	m	MW	171.6	-	-	-	-	-	-	-	-	-
Availability factor [Shall be replaced with Actual]	n	%	85.0%	-	-	-	-	-	-	-	-	-
Available capacity	o=mxnxaxd/1000	GWh	322.1	-	-	-	-	-	-	-	-	-
Dispatch factor [Shall be replaced with Actual]	p	%	100%	-	-	-	-	-	-	-	-	-
Units sent out	q=oxp	GWh	322	-	-	-	-	-	-	-	-	-
Recovery in tariff												
Variable - local	r=qxl	PKR mn	59	-	-	-	-	-	-	-	-	-
Variable - Foreign		PKR mn	10	-	-	-	-	-	-	-	-	-
Total	r total	PKR mn	69	-	-	-	-	-	-	-	-	-
Unit 5												
[Shall be replaced with actual quarterly indexed tariff components]												
Variable - local	s	PKR / kWh	0.0722	0.0722	0.0722	0.0722	0.0722	0.0722	0.0722	0.0722	0.0722	0.0722
Variable - Foreign		PKR / kWh	0.0966	0.0966	0.0966	0.0966	0.0966	0.0966	0.0966	0.0966	0.0966	0.0966
Net Capacity	t	MW	175.9	175.9	175.9	175.9	-	-	-	-	-	-
Availability factor [Shall be replaced with Actual]	u	%	85.0%	0.8	0.8	0.9	-	-	-	-	-	-
Available capacity	v=txuxaxd/1000	GWh	1,310.2	1,309.5	1,309.5	330.1	-	-	-	-	-	-
Dispatch factor [Shall be replaced with Actual]	w	%	100%	100%	100%	100%	-	-	-	-	-	-
Units sent out	X=vxw	GWh	1,310	1,309.54	1,309.54	330.13	-	-	-	-	-	-
Recovery in tariff												
Variable - local	y=Xxs	PKR mn	95	95	95	24	-	-	-	-	-	-
Variable - Foreign		PKR mn	127	126	126	32	-	-	-	-	-	-
Total	y total	PKR mn	221	221	221	56	-	-	-	-	-	-

Description	Ref	Unit	FY-24	FY-25	FY-26	FY-27	FY-28	FY-29	FY-30	FY-31	FY-32	FY-33
Unit 6												
(Shall be replaced with actual quarterly indexed tariff components)												
Variable - local	z	PKR / kWh	0.0771	0.0771	0.0771	0.0771	0.0771	0.0771	0.0771	0.0771	0.0771	0.0771
Variable - Foreign		PKR / kWh	0.1915	0.1915	0.1915	0.1915	0.1915	0.1915	0.1915	0.1915	0.1915	0.1915
Net Capacity	aa	MW	177.2	177.2	177.2	177.2	177.2	177.2	177.2	177.2	177.2	177.2
Availability factor (Shall be replaced with Actual)	ab	%	72.7%	0.7	0.8	0.8	0.9	0.8	0.8	0.8	0.9	0.9
Available capacity	ac = aa x ab x a x d / 1000	GWh	1,129.3	1,149.4	1,319.5	1,319.5	1,320.2	1,319.5	1,319.5	1,319.5	1,320.2	332.6
Dispatch factor (Shall be replaced with Actual)	ad	%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Units sent out	ae = ac x ad	GWh	1,129	1,149.37	1,319.52	1,319.52	1,320.15	1,319.52	1,319.52	1,319.52	1,320.15	332.64
Recovery in tariff												
Variable - local	af = ae x z	PKR mn	686	698	802	802	802	802	802	802	802	202
Variable - Foreign		PKR mn	229	233	268	268	268	268	268	268	268	67
Total	af total	PKR mn	915	931	1,069	1,069	1,070	1,069	1,069	1,069	1,070	270
Recovery under tariff - Fixed O&M												
Fixed O&M - Plant												
(Shall be replaced with actual quarterly indexed tariff components)												
Fixed - local	ag	PKR / kWh	0.6075	0.6075	0.6075	0.6075	0.6075	0.6075	0.6075	0.6075	0.6075	0.6075
Fixed - Foreign		PKR / kWh	0.2028	0.2028	0.2028	0.2028	0.2028	0.2028	0.2028	0.2028	0.2028	0.2028
Available Capacity												
Unit 1	= h	GWh	315.9	-	-	-	-	-	-	-	-	-
Unit 2	= q	GWh	322.1	-	-	-	-	-	-	-	-	-
Unit 5	= v	GWh	1,310.2	1,309.5	1,309.5	320.1	-	-	-	-	-	-
Unit 6	= ac	GWh	1,129.3	1,149.4	1,319.5	1,319.5	1,320.2	1,319.5	1,319.5	1,319.5	1,320.2	332.6
Total	ah	GWh	3,077.4	2,458.9	2,629.1	1,649.6	1,320.2	1,319.5	1,319.5	1,319.5	1,320.2	332.6
Recovery in tariff												
Fixed - local	al = ah x ag	PKR mn	1,870	1,494	1,597	1,002	802	802	802	802	802	202
Fixed - Foreign		PKR mn	624	499	533	335	268	268	268	268	268	67
Total	al total	PKR mn	2,494	1,993	2,130	1,337	1,070	1,069	1,069	1,069	1,070	270
Calculation of Over / (Under) recovery												
Total recovery of O&M												
Variable - local	aj = k + r + y + af	PKR mn	904	793	896	825	802	802	802	802	802	202
Variable - Foreign		PKR mn	374	360	394	300	268	268	268	268	268	67
Fixed - local	aj1 = al	PKR mn	1,870	1,494	1,597	1,002	802	802	802	802	802	202
Fixed - Foreign		PKR mn	624	499	533	335	268	268	268	268	268	67
Total	aj2	PKR mn	3,772	3,145	3,421	2,462	2,140	2,139	2,139	2,139	2,140	539
Cost												
(Shall be replaced with actual cost incurred)												
O&M expenses as per Financial statements		PKR mn	2,331	1,935	2,118	1,547	1,362	1,364	1,371	1,378	1,389	351
Addition to CWIP as per Financial statements		PKR mn	1,540	1,290	1,412	1,031	908	910	914	918	926	234
Total	ak	PKR mn	3,852	3,225	3,530	2,579	2,270	2,274	2,285	2,296	2,314	584
Over / (Under) Recovery	al = aj2 - ak	PKR mn	(78)	(80)	(109)	(117)	(131)	(135)	(146)	(157)	(175)	(45)
Over / (Under) Recovery - Movement												
Opening		PKR mn	-	(78)	(159)	(268)	(385)	(515)	(651)	(797)	(955)	(1,129)
Addition		PKR mn	(78)	(80)	(109)	(117)	(131)	(135)	(146)	(157)	(175)	(45)
Closing		PKR mn	(78)	(159)	(268)	(385)	(515)	(651)	(797)	(955)	(1,129)	(1,175)

Sharing Timeline - end of life			Sharing at end of life
Over / (Under Recovery)		PKR mn	(1,175)
In case of (Under recovery) - carry forward		PKR mn	(1,175)
In case of Over recovery - sharing		PKR mn	-
- Consumer - 60%		PKR mn	-
- KE - 40%		PKR mn	-

Sharing of consumer to be credited in next invoice.

BQPS I – Annexure P

Head of Terms

POWER PURCHASE AGREEMENT

TERM SHEET

This Term Sheet dated xxx (the "Date of Signing") is a summary of the principal and indicative terms for inclusion in the Power Purchase Agreement (the "PPA") to be entered into between XX Generating Station (Plant) which is part of KE's generation fleet, and Transmission/Load Dispatch Center (LDC) of KE (individually a "Party" and together the "Parties") in relation to the sale and purchase of electrical energy. The terms and conditions contained in this non-binding term sheet are indicative and non-binding in nature. Any such obligation or agreement will be created only by the execution of a definitive power purchase agreement (the "PPA") by Seller and Buyer (as defined below, and collectively the "Parties"), the provisions of which, if so executed, will supersede this Term Sheet and all other agreements, if any, related to this document and the proposed transaction.

Sr.#	Terms	Description
1)	Seller	BQPS-1
2)	Buyer	Load Dispatch Center (LDC) / Supply
3)	Purpose of PPA	The Plant shall sell all electrical energy generated by it to the Buyer based on the dispatch instructions issued by Buyer and the fuel available with Seller to meet such dispatch in line with the agreed availability plan between buyer and seller
4)	Plant	[.] *Description of plant to be added*
5)	Product	The "**Product**" to be delivered and sold by Seller and received and purchased by Buyer consists of: (a) all energy, or Buyer's applicable portion, expressed in MWh, generated by the Plant and delivered to the delivery point/interconnection point ("**Delivered Energy**") b) all other plant output including capacity and ancillary services c) Black start facility, if applicable
6)	Term	The term of the PPA shall be effective on the **Effective Date** (to be defined in the PPA) and shall terminate XX Contract Years or the expiry of the regulatory license of the Plant, whichever is earlier, following the Effective Date ("**Term**"). "**Contract Year**" means each consecutive 12-month period during the Term that commences on the first day of July following the Effective Date, and every July 1st thereafter. The first Contract Year shall be a partial year, commencing on the Effective Date.
7)	Contract Capacity	The Contract Capacity shall be XX MW (net, at reference condition)
8)	Sale and Purchase of Energy and Capacity	Buyer shall have exclusive right of energy and capacity of the Plant. Subject to terms of PPA, The Seller shall: (i) Make available to the Buyer the Declared Available Capacity up to the Contract Capacity (ii) Deliver and sell to Buyer at the interconnection point, the dispatched net electrical output Subject to the terms of PPA, the Buyer shall, in accordance with NEPRA approved tariff: (i) Pay Declared Available Capacity (Take or Pay mechanism) (ii) Pay for the dispatched and delivered net electrical output

Sr #	Terms	Description
9)	Metering	Buyer's share of the Delivered Energy shall be measured using electric metering devices. The Metering System shall be in place prior to the delivery of net electrical output to the interconnection point. Seller shall maintain and Buyer shall inspect such electric metering devices In accordance with the agreed terms and conditions between buyer and seller and approved by NEPRA.
10)	Billing	The PPA shall contain provisions pursuant to which Seller shall send Buyer monthly invoices in form and method determined by the Parties, showing the amount due to the Seller for the relevant month, specifying MWs supplied, all billing parameters, rates and factors and all other data relevant to the calculation of payments.
11)	Net Heat Rate	The Plant shall perform at a Net Heat Rate (NHR) of XXXX as witnessed and/or approved by NEPRA. Necessary Corrections shall be applicable on part load operations.
12)	Annual Operational Plan	At the beginning of each Year, the Plant shall submit to the Buyer, its Annual Operational Plan, which shall include but not be limited to the following: - Planned Outage Schedule - Maintenance Outage Schedule - Forced Outages Allowance - Annual Availability - *Minimum Dispatch requirements as per technical limits* - Fuel allocation as available from the Fuel Supplier Upon receipt of the Plants' Annual Operational Plan, the Buyer shall review and provide timely feedback on the operational plan based on the following: - The Year's demand forecast - Economic Merit Order Projection (tentative) to be provided to the seller - *System constraints including planned outages in the network if any, to* be provided to the Seller. - Annual Dispatch Plan (tentative) - to be provided to the Seller annually. Upon review of the Plant's Annual Operational Plan, both Parties shall mutually agree to the final plan for the upcoming contract year
13)	Plant Availability and Dispatch	Seller shall achieve availability of no less than XX%, The Plant shall be responsible for the availability of the Complex for Dispatch by the Buyer. Upon receipt of a notice of Dispatch from the Buyer, the Seller shall generate and deliver the Net Electrical Output at the Interconnection Point in accordance with the technical limits as per grid code and all applicable standards/prudent practices. The Seller shall give prompt notice to the Buyer regarding any changes to availability of the Complex caused by events such as: (i) Force Majeure Event; (ii) Scheduled Outage; (iii) Forced Outage; (iv) Partial Forced Outage; and (v) Any other event which causes alteration in availability

K-ELECTRIC LIMITED

Sr #	Terms	Description
14)	Operation and Maintenance Costs	Seller will bear all costs and expenses for Operations and Maintenance of the Plant and any other costs up to the delivery /interconnection point for the performance of Seller's obligations under the PPA (collectively, the "Seller Costs"). Any ancillary services costs to be excluded from the Seller Costs shall be discussed in the PPA.
15)	Others	The PPA will also include, among other things, the following covenants, terms, and/or conditions: • Seller will insure operate, maintain, manage, replace, repair, study, test, and otherwise use the Plant up to its battery limits in accordance with (i) Seller's obligations in the PPA, and the OEM Manual(s), (ii) Prudent electrical and utility practices, and (iii) all applicable laws (including environmental laws), consents, and governmental approvals, including all applicable standards and guidelines adopted from time to time by governmental authorities • Seller will schedule and perform required maintenance according to the PPA • Seller will insure against all insurable risks with coverage in an amount not less than full replacement cost and on terms specified in the PPA.
16)	Fuel Supply	The Seller shall make its best efforts for the availability and allocation of Main fuel to the Gen Station to maintain guaranteed availability and to meet dispatch notifications. The Seller shall also make its best efforts to maintain the inventory of Back-up Fuel for xx days and ensure the readiness of Plant to operate on Back-up Fuel to maintain guaranteed availability and meet dispatch notifications. The Seller shall also be responsible to obtain consent from the Buyer, prior to operations based on Back-up Fuel. In no event the Seller shall be required to operate the Plant on HSD for a period exceeding xx hours in any Year, provided that prior consent has been solicited from Buyer for any additional hours.
17)	Start-ups and Minimum Load	The Seller shall make technical references available to the Buyer concerning the required times for Start-Ups and minimum complex/machine loading
18)	Billing	Relevant Payment Terms for Energy shall be 30 days. The Buyer shall pay the Seller the Capacity Payments for the available capacity for each month (70% in advance and 30% immediately after month end) and energy payments for dispatched and delivered net electrical output for the relevant month.
19)	Liquidated Damages	To be discussed between the Parties
20)	Force Majeure	Force Majeure Events and the obligations, duties, compensation, and recourse available to each Party during such events including but not limited to **PPFME** (Pakistan Political Events that occur inside or directly involve Pakistan) and **CLFME** (any Change in Law to the extent of Force Majeure Event) shall be negotiated and finalized in the PPA. The PPA will also include a termination right for extended force majeure that impacts Party's ability to perform under the contract.
21)	Events of Default	The PPA will include standard events of default, as appropriate.
22)	Termination	The PPA will include standard terms for Termination. However, Parties agree that there shall not be any Termination for Convenience in the PPA.

Sr #	Terms	Description
23)	Dispute Resolution	In the event of any disputes between the Parties, the Parties shall seek to resolve the same in the following order: 1. Through mutual discussion involving Steering Committee 2. If the dispute in question is not resolved through mutual discussions, then senior management of KE shall resolve the disputes. Other terms & conditions for settlement of disputes shall be mutually agreed between the Parties
25)	Indemnification	Seller shall indemnify Buyer against any damages (unless resulting from Buyer's gross negligence or willful misconduct). Buyer shall indemnify Seller against any damages (unless resulting from Seller's gross negligence or willful misconduct).
26)	Governing Law	Laws of Pakistan
27)	Confidentiality	Each Party shall be required to keep the terms and provisions, of the PPA and this Term Sheet, confidential and prohibited from disclosing such terms to any third party, subject to certain limited exceptions specified in the PPA.

K-Electric Limited

IC Report on O&M cost evaluation – Bin Qasim Power Station – I ("BQPS I") Plant

30 November 2022

Consortium of Independent Consultant

OMS

EY

Building a better working world

Reliance Restricted

Chief Financial Officer
K-Electric Limited
KE House, 39-B
Sunset Boulevard, D.H.A. Phase 2
Karachi, Pakistan

Project Power– IC Report on O&M cost evaluation of BQPS I **30 November 2022**

Dear Sir

In accordance with your instructions, we have performed the work set out in our Purchase Order (No: 7500048189) dated 29 March 2022 (the "Engagement Agreement") in connection with the evaluation of forecast of operations and maintenance cost of owned power generation plants prepared by K-Electric Limited ("KE" or the "Client" or "you"), as part of seeking stand-alone tariff for each power plant under IPP mode from National Electric Power Regulatory Authority ("NEPRA") ("the Project" or "Project Power" or the "Transaction").

Purpose of our report and restrictions on its use

This engagement is of due diligence in nature and accordingly this due diligence report ("Report") on Bin Qasim Power Station – I ("BQPS I") has been prepared by consortium comprising OMS (Private) Limited ("OMS" or "Technical cum lead consultant") and EY Ford Rhodes ("EY" or "Financial Consultant") (hereinafter jointly referred as "Independent Consultant" or "IC", "We" or "Our") based on their respective technical and commercial analysis performed in accordance with the scope agreed vide Engagement Agreement. The supplementary analysis performed by IC during the course of this engagement has been compiled and submitted to KE separately.

This Report has been prepared on the specific instructions of KE, solely for the purpose of the Transaction and should not be used or relied upon for any other purpose. This Report (or any portion or summary of it) may not be quoted, referred to or shown to any other parties except as provided in the Engagement Agreement.

We accept no responsibility or liability to any person other than to KE, or to such party to whom we have agreed in writing to accept our responsibility in respect of this Report, and accordingly if such other persons choose to rely upon any of the contents of this Report they do so at their own risk.

Nature and scope of the services and limitations

The nature and scope of the services, including the basis and limitations, are detailed in the Engagement Agreement.

Whilst each part of our Report addresses different aspects of our work, the entire Report together with Appendices should be read for a full understanding of our findings and advice.

"Banner headlines" used in this Report are intended only to act as an introduction to the page concerned and should be read in conjunction with rest of the page. They are not intended to represent any recommendation, conclusion or finding.

Our work was completed on 30 November 2022. Therefore, our Report does not take account of events or circumstances arising after that date and we have no responsibility to update the Report for such events or circumstances.

This Report has been finalized based on the data, explanations and feedback provided by the Client during the course of engagement.

Nature and scope of the services and limitations (cont'd)

IC highlights that our Report do not include any recommendation to you on your future course of action. Any decision to proceed with tariff petition may entail consideration of several factors, some of which IC may not be aware of. The evaluation of these factors or advising you on any business decision does not form part of scope of our work of this Report. You should therefore consider the appropriateness of the Report in light of your own objectives and financial situation.

While EY has performed a review of the Operations and Maintenance ("O&M") cost model, we have not assessed the contents of the model i.e. the financial statements or roll-forward for their appropriateness for financial reporting (as per applicable framework) or taxation authorities. Further, as summarized in section 2 of the Report, our review is based on the data and agreements / quotations of the respective power plants made available to IC during the course of the engagement. Reasonableness of O&M costs has been performed by OMS in detail based on substantial review of relevant supporting documents, wherever available. Additionally, we perform our work in the capacity of IC and have not assessed any agreements for their authenticity / legality from a legal and tax perspective.

IC has reported broadly on matters, which Consortium members have noted and which appear significant to us for the purpose of technical and commercial due diligence. In addition, please note that:

a) Our work in connection with this engagement is of a different nature to that of an audit or a review of information, as those terms are understood in applicable international auditing standards. Consequently, we give no assurance on such information.

b) Our scope of work was limited to the review and analysis of information made available to EY by the management of KE, physical site visit and discussions with key management personnel of KE.

c) We have relied on the information provided during the course of engagement and have assumed the genuineness of all the documents and the signatures thereon as if they were originals and also assumed that the scanned or soft copies conform to the original.

d) Transactions, data and events which were not recorded and which were not disclosed to us may not have been identified during our due diligence.

Detailed findings of technical due diligence performed by OMS have been placed in the appendices to this Report with summary findings and considerations highlighted in different sections of the Report.

The contents of our Report have been reviewed by KE management, who have confirmed to us their factual accuracy. Further, feedback provided on the draft Report has been duly addressed, wherever deemed appropriate.

We appreciate the co-operation extended by the KE team during the course of this engagement. Please do not hesitate to contact us if you have any questions about this engagement or if we may be of any further assistance.

Yours faithfully

For and on behalf of OMS (Private) Limited (Technical cum lead consultant)

Abu Adil (Senior General Manager)

For and on behalf of EY Ford Rhodes (Financial consultant)

Rana Nadeem Idrees (Partner)

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1 Key considerations

Key considerations

Key consideration	Commentary	Findings / Recommendation	Pg. no.
Plant operating profile and availability / utilization factor assumption	▸ Under an integrated MYT regime, KE had a consolidated O&M tariff component based on projected operating profile and load factor of its plants. ▸ Since, KE is planning to seek standalone O&M cost tariff for each plant, including BQPS I, therefore, Management has assumed projected plant availability / utilization factor[1] of 83.41% (i.e. the maximum achievable average availability / utilization factor during remaining plant life). ▸ Aforementioned assumption of projected plant utilization to match projected plant availability has been kept aligned with other IPPs, for the sake of tariff petition. ▸ BQPS I configuration includes 04 conventional Steam Turbines ▸ Since NEPRA determined the performance of complex through 3rd party test i.e., Gross Capacity: 743.9 MW (Unit 1 - 181.2 MW, Unit 2 - 183.4 MW, Unit 5 - 188.3 MW and Unit 6 - 191.0 MW), Net Output: 693.1 MW and auxiliary consumption of 50.8 MW (Unit 1 – 7.11%, Unit 2 – 6.43%, Unit 5 – 6.58% and Unit 6 – 7.22%), therefore, it is implied that the same shall stand accepted as such.	▸ Major cost events and the variable cost annual spend profile during the requested tariff control period has been assessed keeping in view forecast availability/utilization. ▸ Since variable costs, including event based costs, are claimed based on actual utilization of the plant, risk of claiming any extra cost for lower actual utilization is negligible. ▸ The availability/utilization/load factor assumed by KE is reflective of the brownfield nature of the plant and expected maintenance requirements over its remaining useful life.	n.a.
Methodology applied for preparing O&M tariff	▸ KE intends to submit its petition for each of its owned power generation plant under IPP mode. ▸ Previously, NEPRA has considered the Revex component of O&M cost for the immediately preceding year (reference year) and accordingly determined the O&M tariff component. In this particular case, KE is submitting its petition in advance for tariff period commencing from FY24 in the current fiscal year. Therefore, for the purpose of O&M cost estimation, FY22 audited numbers have been used.	▸ KE would need to assess its readiness to address any additional information required during tariff determination process. ▸ The findings of this Report are also expected to provide comfort around O&M cost estimation of KE, during the tariff determination process.	n.a.

Key considerations

Key consideration	Commentary	Findings / Recommendation	Pg. no.

Reclassification of expenses in foreign and local components	▸ The adjustments mainly reflect the impact of:
	  ▸ update of exchange rate assumption by KE from PKR 185 to PKR 206 in case of foreign components of VOM and FOM costs (i.e. with a cumulative increase of PKR 0.28b in VOM foreign and PKR 0.35b in FOM foreign).
	  ▸ reclassification/revisit of costs suggested by IC in local and foreign components of VOM and FOM.
	▸ These adjustments translated into a net cumulative reduction of PKR 1.39b in FOM and a net cumulative addition of PKR 1.03b in VOM over the requested tariff control period. Consequently, average per kWh VOM cost increased by PKR 0.0618 and average per kWh FOM cost decreased by PKR 0.0828.
		▸ KE has evaluated and concurred with the identified adjustments of IC and accordingly reflected those in its adjusted average tariff computation.
		▸ The adjusted average tariff has been included in the later sections of this Report.
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Basis used for estimating O&M costs	▸ Basis of estimations can be summarized in three broad categories:
	  ▸ Linked to latest available POs/quotations;
	  ▸ Management estimate/past experience; and
	  ▸ Based on FY22 values and SAP history.
	▸ IC has substantiated the reasonableness of assumptions on sample basis (covering ~91.0% of value) through checking of POs, quotations, SAP history, underlying agreements and / other relevant data / basis considered by the Management.
		▸ Estimation basis used by the management were found reasonable / consistent with the historical benchmarks, underlying agreements and / or historical basis.
		▸ As highlighted above, some re-classification adjustments (between local / foreign and variable / fixed components) and cost reductions were identified by IC. These have been agreed with KE and accordingly have been addressed in the adjusted average tariff computation of KE, shown in later sections of this Report.
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Key considerations

Key consideration	Commentary	Findings / Recommendation	Pg. no.
Benchmarking of O&M costs PKR/kWh BQPS I (Unit 6): 1.0789 TPS - Jamshoro: 3.2734 TPS - Muzaffargarh : 2.5238 HUBCO: 0.8560	▸ From technical compatibility perspective, TPS – Jamshoro, TPS – Muzaffargarh and HUBCO were explored as potential benchmarks for BQPS I average tariff. Considering recent tariff determinations for TPS – Jamshoro / Muzaffargarh as per their historical utilization pattern (~26%) and on "take and pay" basis, they may not be considered as most appropriate for benchmarking purposes. Accordingly, HUBCO being an IPP, is considered a close benchmark. ▸ FOM cost component in BQPS I is 75.1%, as compared to 63.4% for HUBCO. ▸ Foreign cost component of BQPS I is 36.5% as compared to 59.7% for HUBCO. **Enabling cost benchmarking:** ▸ Due to lack of publicly available data about benchmark projects, enabling costs were analyzed at FOM local level.	▸ Overall O&M tariff of BQPS I is substantially lower than TPS – Jamshoro / Muzaffargarh, however, it is higher than HUBCO mainly due to fixed O&M cost (~PKR 1.0b over the assumed tariff control period) linked to one time activities at unit-6 such as water wall panels replacement, IP Turbine diaphragm replacement, Generator/Turbine rotor inspection/ balancing and LV switchgear busbar replacement etc. which may not have been considered relevant by HUBCO. ▸ Higher enabling costs of BQPS I may be attributable to different operating model / governance structure being followed at benchmark power plant. KE would need to firm up its enabling cost allocation basis to BQPS I to support its case.	36

O&M cost indexations	▸ BQPS I levelized tariff is expected to be indexed as follows:
	  ▸ Local costs: Pak CPI Quarterly
	  ▸ Foreign costs: US CPI and Exchange rate Quarterly variation
		▸ The requested indexations are aligned with benchmark projects and recent determinations by NEPRA for other thermal power projects.	37

Key considerations

Key consideration	Commentary	Findings / Recommendation	Pg. no.
Unbundling consideration	► BQPS I plant is currently operating under the umbrella of overall KE system. Accordingly, cost structure may change going forward, in case Management decides to unbundle the utility into distinct business segments.	► KE is suggested to seek adequate openers (e.g. those related to the recovery of legitimate incremental O&M costs that may arise in future due to potential unbundling of the utility) in its tariff petition.	n.a.
Other commercial considerations	► Since KE is using an in-house model for O&M operations, opportunity of embedding certain costs and risks (as part of third-party O&M contractor scope) with performance guarantee mechanism and indirect reflection in fixed or variable O&M charge is not available to KE. Consequently, such costs and risks are being parked with/borne by KE instead of a third party and hence bear a cost recovery challenge. However, KE does not envisage any cost increase due to continuation of an in-house operating model.	► KE, in consultation with its legal team, should consider reiterating the legitimate cost recovery principal enshrined within the prevalent tariff regulatory framework while finalizing and framing request for the O&M cost components of the tariff.	n.a.

2 Project background and scope of work

KE has hired consortium of OMS and EY for the independent evaluation of projected O&M costs for BQPS I

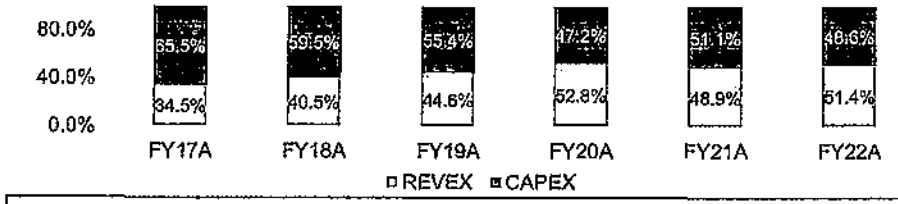
Background

- K-Electric Limited ("KE") is the only vertically integrated power utility of Pakistan.
- KE carries out operations and maintenance of its power generation plants, including major overhauls, under service contracts with OEMs and/or in-house (with or without vendors support), as applicable.
- KE's existing integrated-Multi Year Tariif ("MYT") period is due to expire on 30 June 2023.
- As part of its preparatory work for next MYT petition, KE has internally decided to opt out of MYT for generation component of its business and is in the process of applying separate generation tariff for the following owned power generation plants, covering their remaining useful economic lives as tariff control period:
  - Bin Qasim Power Station – I ("BQPS I")
  - Bin Qasim Power Station – II ("BQPS II")
  - Bin Qasim Power Station – III ("BQPS III")
  - S.I.T.E Gas Engine Power Station ("SGEPS")
  - Korangi Town Gas Engine Power Station ("KTGEPS")
  - Korangi Combined Cycle Power Plant ("KCCPP")
- KE has prepared an O&M cost forecast for each of these power plants for the purpose of tariff petioning. For this purpose, O&M costs have been derived keeping in view historical and forecast revenue expenditure ("REVEX") and capital expenditure ("CAPEX") for each plant.
- KE hired a consortium comprising OMS (Private) Limited ("Technical cum lead consultant") and EY ("Financial Consultant") (hereinafter together referred to as "Independent Consultant" or "IC") for assistance in the evaluation of the aforesaid projected O&M costs.

O&M costs related to generation segment are reflected in audited financial statements as expenses incurred in generation and additions to CWIP – generation segment

Historical generation O&M cost – KE system

Figures in PKRm		FY17A	FY18A	FY19A	FY20A	FY21A	FY22A
REVEX	A	4,751	4,695	5,195	5,054	5,322	4,770
CAPEX	B	9,003	6,877	6,429	4,521	5,656	4,505
Total		13,754	11,572	11,624	9,575	10,978	9,275



Reconciliation with audited financial statements

Figures in PKRm	FY17A	FY18A	FY19A	FY20A	FY21A	FY22A
O&M expenditure	4,751	4,695	5,195	5,054	5,322	4,770
Add: Depreciation & Amortization	7,648	9,061	9,878	11,729	11,436	11,657
O&M expenditure total	**12,399**	**13,756**	**15,073**	**16,783**	**16,758**	**16,427**
O&M expenditure support cost	1,089	920	1,138	986	1,223	1,273
Add: Depreciation & Amortization support dept	43	55	68	82	85	212
O&M expenditure total	**1,132**	**974.56**	**1,206**	**1,068**	**1,308**	**1,485**
Expenses incurred in generation as per AFS	**13,531**	**14,731**	**16,279**	**17,851**	**18,066**	**17,912**

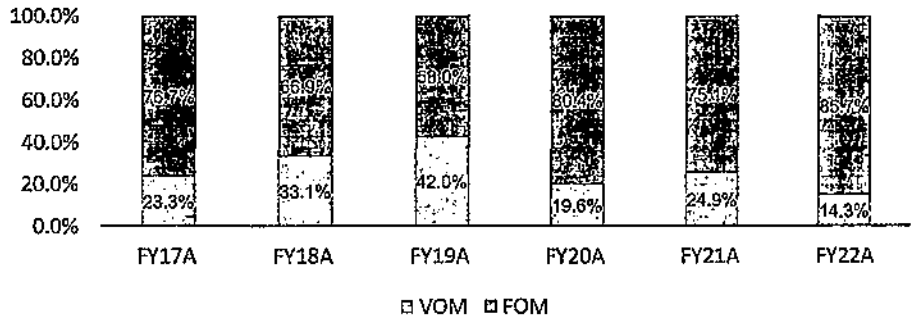
Figures in PKRm	FY17A	FY18A	FY19A	FY20A	FY21A	FY22A
Generation – Plant and machinery additions	7,509	6,385	6,857	4,234	5,059	4,162
Generation – Others	1,494	492	-428	287	597	343
Sub-total	**9,003**	**6,877**	**6,429**	**4,521**	**5,656**	**4,505**
Add: BQPS III Project Cost	0	30	14	16,625	45,372	21,819
CWIP additions as per AFS	**9,003**	**6,907**	**6,443**	**21,146**	**51,028**	**26,324**

Source: Management data and KE Annual Reports

Snapshot of historical O&M cost of BQPS I (figures in PKR million)

Financial year	FY17A	FY18A	FY19A	FY20A	FY21A	FY22A
REVEX	1,710	2,059	1,890	1,947	1,817	1,709
CAPEX	1,423	2,573	2,228	1,888	1,243	1,434
Total O&M	3,133	4,632	4,118	3,835	3,060	3,143

Source: Management data



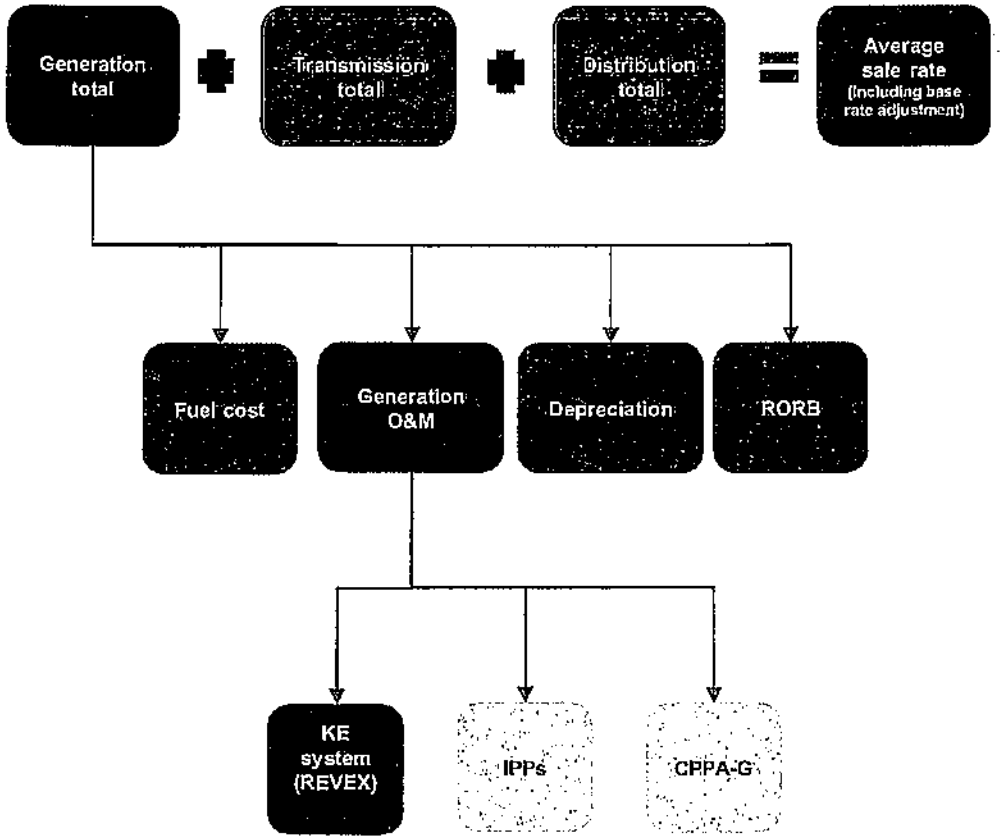
Breakdown of BQPS I O&M cost in variable and fixed components

Financial year	FY17A	FY18A	FY19A	FY20A	FY21A	FY22A
Variable O&M local	247	234	272	252	289	285
Variable O&M foreign	482	1,298	1,460	500	474	165
Sub-total variable O&M	729	1,532	1,731	752	762	450
Fixed O&M local	1,418	1,638	1,418	1,567	1,575	1,906
Fixed O&M foreign	986	1,462	969	1,516	723	786
Sub-total fixed O&M	2,404	3,100	2,387	3,084	2,298	2,693
Total	3,133	4,632	4,118	3,835	3,060	3,143

- Per management, since existing MYT does not bifurcate O&M into variable and fixed costs and accordingly, therefore costs are being maintained in the form of REVEX and CAPEX only. According to the Management, for the purposes of comparison with the proposed O&M bifurcation into fixed and variable cost going forward, historical O&M costs have been bifurcated based on assumptions similar to that of projected O&M costs.

Composition and comparability limitations of existing MYT

Current Integrated Multi-Year Tariff structure determined by NEPRA



- KE's current Multi Year Tariff is an Integrated MYT which includes costs and returns for all three segments i.e. Generation (all plants), Transmission and Distribution based on Regulatory Asset Base (RAB).
- While the underlying costs for three segments are defined in the current MYT determination, certain components such as base rate component and working capital component are not bifurcated segment wise.
- Similarly, plant wise tariff bifurcation in case of generation segment is not available within the MYT.
- Current MYT includes below components:
  - Fuel cost based on allowed benchmarks (indexed value for the month of June 2022 was PKR 21.72/kWh*);
  - RoRB and Depreciation components which cover for Returns on Regulatory Asset base (indexed value for the month of June 2022 was PKR 1.13/kWh* for generation); and
  - Operation and maintenance costs for generation, that are covered through:
    - O&M component allowed for Revex expenses (indexed value for the month of June 2022 was PKR 0.59/kWh*); and
    - Capital nature expenses allowed as investments and included in Regulatory Asset Base
- As explained above, base rate and working capital components are given on Company level, which include coverage for Generation segment as well.
- Accordingly, MYT in its current form is not comparable with the O&M cost tariff being requested under IPP mode.

Source: Management data

* Tariff values based on total units sold basis

Scope of work of IC

Scope of work	Responsibility	
	OMS (Lead cum Technical Consultant)	**EY** (Financial Consultant)
Comment on the historical and projected operating profile of plant	✓	
Review and evaluate grouping of O&M activities under fixed and variable components	✓	✓
Review bifurcation of expenses in foreign and local components	✓	✓
Review and evaluate completeness of O&M costs	✓	
Review and evaluate assumptions used for projecting O&M costs	✓	✓
Evaluate enabling / associated cost loading over O&M cost component of isolated plant	✓	✓
Identify gaps in costing and provide estimates to fill those gaps	✓	
Benchmarking of O&M costs against those of comparable projects	✓	✓
Consider inventory in hand and consider its periodic depletion till end of term	✓	

3 Technical specifications of the plant

Key technical specification and plant configuration of BQPS I

Key technical specification of BQPS I power plant

Bin Qasim Power Station - I (BQPS I)

- BQPS I is a 840 MW conventional thermal power generation plant.
- BQPS I is situated at Port Qasim, Karachi.
- The plant comprises of 4 units having following specifications:
  - Unit 1,2,5 & 6 containing steam turbine having Tandem Compound Double Flow manufactured by Hitachi having gross capacity of 210MW.
  - Unit 3&4 containing steam turbine having Tandem Compound Double Flow manufactured by Ansaldo having gross capacity of 210MW. (Decommissioned)
- The project has commission on following dates:
  - Unit 1 (1983) having useful life of 32 years from COD
  - Unit 2 (1984) having useful life of 32 years from COD
  - Unit 3 (1989) having useful life of 32 years from COD
  - Unit 4 (1990) having useful life of 32 years from COD
  - Unit 5 (1991) having useful life of 32 years from COD
  - Unit 6 (1997) having useful life of 32 years from COD
- NEPRA issued Generation License # GL/04/2002 to K-Electric on November 18, 2002 and subsequent modifications time to time for distinctly placed six power generation stations. The latest GL modification approved on February 19, 2021 i.e., NEPRA/R/LAG-05/8872-76 to the Company in accordance with the prevailing regulatory regime & project useful life is determined as 32 years from commercial operation date (COD)
- It has been in operation for the last 39 years, and operations of its unit # 3&4 have been discontinued while operations of Unit # 1&2 will discontinue in FY24, Unit-5 will discontinue in FY-27, whereas, plant will be decommissioned by FY-33.

Category	Description
Technology	Conventional thermal power generation plant
Type of fuel	Natural Gas & HFO
Equipment	Steam Turbines
Units	4 x 210 MW Steam turbine
Capacity	840 MW (Operational) of 1,260 MW
Make	Steam Turbine – Hitachi

Plant performance | Unit 5

Unit 5

The performance test conducted to determine the capacity and heat rate of unit-5 of K-Electric's Bin Qasim power station-1 at maximum achievable load and 110MW on HFO & NG. The objective of the performance test was to verify the current gross & net capacity and gross & net heat rate of unit 5 of BQPS-1.

The performance test parties were as follows:

- K-Electric : Utility company licensed to generate, transmit and distribute electricity in the city of Karachi.
- NEPRA : Regulatory authority (attending and witness).
- KEPCO KPS : 3rd party (independent engineer) from South Korea.

The test was conducted in accordance with the test procedure approved by NEPRA and mutually agreed prior to the test by all parties. The heat rate test was required to be conducted as per international codes and standards. The test procedure was based on ASME PTC-46 and approved by NEPRA. Unit-5 was tested on HFO & NG on 13th / 15th November 2019.
The results of the test were shared with NEPRA & subsequent capacities as included in Generation License are as follows:

Output (MW)		
BQPS I , Unit #5, Maximum	Unit	Corrected Results
Gross Power Output	MW	188.28
Net Power Output	MW	175.9

Auxiliary Consumption (MW)			
BQPS I, Unit #5, Maximum	Unit	At Max. Load	Percentage
Auxiliary Power Consumption	MW	12.38	6.58%

Plant performance | Unit 5

Unit 5 (Maximum Load)

Heat Rate & Efficiency Fuel: HFO				
S. No.	Parameters	Unit	HHV Corrected	LHV Corrected
1	Gross Heat Rate	kJ/kWh	10016.93	9413.32
2	Gross Heat Rate	Btu/kWh	9494.22	8922.11
3	Net Heat Rate	kJ/kWh	10722.4	10076.28
4	Net Heat Rate	Btu/kWh	10162.88	9550.47
5	Gross Efficiency	%	35.94	38.24
6	Net Efficiency	%	33.57	35.73

Heat Rate & Efficiency Fuel: NG				
S. No.	Parameters	Unit	HHV Corrected	LHV Corrected
1	Gross Heat Rate	kJ/kWh	10667.6	9624.63
2	Gross Heat Rate	Btu/kWh	10110.93	9122.39
3	Net Heat Rate	kJ/kWh	11392.91	10279.03
4	Net Heat Rate	Btu/kWh	10798.4	9742.64
5	Gross Efficiency	%	33.75	37.4
6	Net Efficiency	%	31.6	35.02

Plant performance | Unit 6

Unit 6

The Performance test conducted to determine the capacity and heat rate of Unit-6 of K-Electric's Bin Qasim Power Station-1 at maximum achievable load and 110MW on HFO & NG. The objective of the performance test is to verify the current gross & net capacity and gross & net heat rate of Unit 6 of BQPS-1.

The Performance Test Parties were as follows :

- K-Electric : Utility company licensed to generate, transmit and distribute Electricity in the city of Karachi.
- NEPRA : Regulatory Authority (Attending and Witness).
- KEPCO KPS : 3rd Party (Independent Engineer) from South KOREA.

The test was conducted in accordance with the test procedure approved by NEPRA and mutually agreed prior to the test by all parties. The heat rate test was required to be conducted as per international codes and standards. The test procedure is based on ASME PTC-46 and approved by NEPRA. Unit-6 was tested on HFO & NG on 14th/15th November 2019.

The results of the test were shared with NEPRA & subsequent capacities as included in Generation License are as follows:

Output (MW)		
BQPS I, Unit #6, Maximum	Unit	Corrected Results
Gross Power Output	MW	191.03
Net Power Output	MW	177.24

Auxiliary Consumption (MW)			
BQPS I, Unit #6, Maximum	Unit	At Max. Load	Percentage
Auxiliary Power Consumption	MW	13.79	7.22%

Plant performance | Unit 6

Unit 6 (Maximum Load)				
Heat Rate & Efficiency Fuel: HFO				
S. No.	Parameters	Unit	HHV Corrected	LHV Corrected
1	Gross Heat Rate	kJ/kWh	10117.83	9517.92
2	Gross Heat Rate	Btu/kWh	9589.85	9021.25
3	Net Heat Rate	kJ/kWh	10922.17	10274.57
4	Net Heat Rate	Btu/kWh	10352.22	9738.41
5	Gross Efficiency	%	35.58	37.82
6	Net Efficiency	%	32.96	35.04

Heat Rate & Efficiency Fuel: NG				
S. No.	Parameters	Unit	HHV Corrected	LHV Corrected
1	Gross Heat Rate	kJ/kWh	10963.37	9892.15
2	Gross Heat Rate	Btu/kWh	10391.27	9375.95
3	Net Heat Rate	kJ/kWh	11816.38	10661.82
4	Net Heat Rate	Btu/kWh	11199.77	10105.45
5	Gross Efficiency	%	32.84	36.39
6	Net Efficiency	%	30.46	33.76

BQ-1 Unit wise accumulated operating hours and maintenance strategy

Fired hours
Below table reflects unit wise accumulated fired hours till 30 June 2022

Operational hours (cumulative) until 30 June 2022			
Unit 1	**Unit 2**	**Unit 5**	**Unit 6**
276041	274995	234269	184566

Maintenance strategy
As per the table given below, Maintenance Strategy of Major equipment is reflected as per OEM recommendations and site conditions
Steam Turbine is scheduled for minor outage on annual basis & for major outage on 5 yearly basis, however, major activities to be carried out on Unit-5&6 for remaining useful life are reflected below

Outage type	Major activities
Unit-6 Major Outage	Condenser Full length Sleeving, DCS upgradation / replacement, Excitation System swap / replacement, Upgrade of burner flame scanners, Fire detection system replacement, RAH elements replacement, Economizer check valve replacement, LV switch gear bus bar replacement, LP rotor replacement, Water walls replacement. Turbine Major Overhaul with IP diaphragms and low speed balancing, Generator Major Overhaul, Boiler water wall repair / replacement, Generator protection system maintenance, LP heater # 02 & 03 Tube bundle replacement, MV switchgear critical parts replacement, Inverters replacement.
Unit-6 Minor Outage	BFP overhaul, Batteries bank replacement 220 VDC (BTA & BTB), Bona pipes butterfly valves repairing/coating
Unit-5 Minor Outage	Hydrogen coolers maintenance, .4 KV 51BJB switchgear replacement, Bona pipes butterfly valves repairing/coating.
Unit-5/6 Minor Outage	HFO Storage Tank Rehab., DEG control and protection system replacement and overhaul. DEG overhaul, RO membranes replacement.

Plant operational history

Unit wise availability and reliability figures are reflected below

Availability (%)[1]				
Year	Unit 1	Unit 2	Unit 5	Unit 6
FY-17	58.60%	90.10%	89.10%	88.60%
FY-18	85.20%	29.80%	67.80%	94.20%
FY-19	65.80%	84.20%	93.20%	61.90%
FY-20	86.80%	89.50%	85.70%	87.20%
FY-21	92.40%	92.50%	88.70%	91.30%
FY-22	92.50%	92.00%	75.60%	86.10%

Reliability (%)[2]				
Year	Unit 1	Unit 2	Unit 5	Unit 6
FY-17	92.75%	98.18%	98.47%	97.04%
FY-18	88.91%	90.56%	97.37%	96.79%
FY-19	88.69%	96.39%	98.84%	92.60%
FY-20	94.84%	96.48%	98.44%	97.67%
FY-21	99.53%	98.07%	99.82%	98.52%
FY-22	99.13%	96.75%	99.23%	98.89%

1. Availability = Available Capacity / Gross Dependable Capacity
2. Reliability = (Period Hours – Forced Outage Hours) / Period Hours

Scheduled outage history

Scheduled outage history

Units	Description	Year
Unit-1	Turbine Major Overhaul	FY - 2017
	Generator Overhaul	FY - 2019
Unit-2	Generator Rewinding + Turbine Major Overhaul	FY - 2018
Unit-5	Major Boiler Maintenance	FY - 2018
	Generator Overhaul	FY - 2020
	Turbine Major Overhaul + DCS Installation	FY - 2022
Unit-6	Turbine Major Overhaul + Generator Overhaul	FY - 2019

Note:

Routine Annual Maintenance of each unit was carried out every year

Plant projected outage plan

Projected outage

Unit # 5	Maintenance type	Shutdown days	FY
ST	Minor	30 days	FY-24
ST	Minor	30 days	FY-25
ST	Minor	30 days	FY-26
ST	Decommission	-	FY-27
ST	Decommission	-	FY-28
ST	Decommission	-	FY-29
ST	Decommission	-	FY-30
ST	Decommission	-	FY-31
ST	Decommission	-	FY-32

Unit # 6	Maintenance type	Shutdown days	FY
ST	DCS Installation	75 days	FY-24
ST	Major	70 days	FY-25
ST	Minor	30 days	FY-26
ST	Minor	30 days	FY-27
ST	Minor	30 days	FY-28
ST	Minor	30 days	FY-29
ST	Minor	30 days	FY-30
ST	Minor	30 days	FY-31
ST	Minor	30 days	FY-32

Strategic spares and inventory available in the warehouse

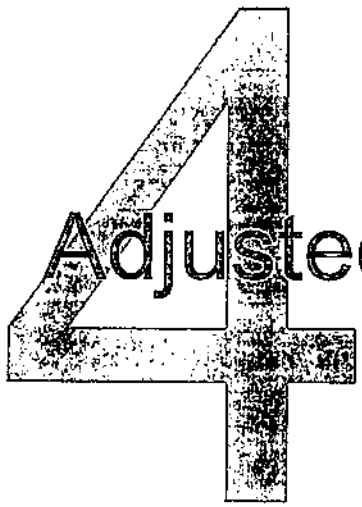
Strategic spares and inventory balances as at 30 June 2022

S. No.	Department	No. of Items	Amount Worth (PKR)
1	Mechanical	263	394,720,529
2	Electrical	72	124,431,340
3	Instrument and maintenance	55	76,953,899
4	Contractual spares	14,294	160,324,708
5	Revex / Other consumables	8,253	1,614,103,856
Total		**22,937**	**2,370,534,332**

- Total inventory given in the inventory list is carried at **PKR 2,370,534,332** which requires regular replenishment for smooth O&M of plant during its remaining useful life.

Key findings

Overall spares availability and inventory management was found reasonable to ensure the plant availability / maintenance requirement



Adjusted O&M cost and levelized tariff

Key assumptions

Key assumptions

- O&M costs have been projected for period FY24 – FY33 ("BQPS I PP").This is unit wise broken down as follows:
  - Unit 1 – For FY24 only;
  - Unit 2 – For FY24 only;
  - Unit 5 – From FY24 – FY27;
  - Unit 6 – From FY24 – FY33.
- Projected (FY24 – FY33) availability / utilization factor and availability during FY17 – FY22 and assumed during BQPS I PP (keeping in view the anticipated maintenance requirements) is as follows:

Unit No.	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	Projected (FY24 to FY33)	Availability (FY17-FY22)
Unit 1	85.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	85.00%	80.22%
Unit 2	85.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	85.00%	79.68%
Unit 5	85.03%	84.99%	84.99%	85.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	85.00%	83.35%
Unit 6	72.73%	74.03%	84.99%	84.99%	85.03%	84.99%	84.99%	84.99%	85.03%	85.00%	82.49%	84.88%

- The average utilization/load factor is reflective of the brownfield nature of the plant and expected maintenance requirements over its remaining useful life.
- Foreign currencies other than USD are first converted to equivalent USD based on their respective exchange rate parity with USD (assumed 1.05, 1.21, 0.15 and 1.0 for EUR, GBP, CNY and USD respectively). Subsequently, USD based values are converted to equivalent PKR using assumed PKR to USD conversion rate of 206.0.
- The projected O&M costs originally estimated by the management of KE was based on PKR to USD exchange rate of 185. Towards the finalization of IC work, this assumption has been updated to PKR 206 for each USD. Accordingly, the adjusted reference tariff is also reflective of exchange rate assumption update.
- VOM tariff has been computed for stand alone units (i.e. Unit 1,2,5 and 6).
- FOM tariff has been computed at plant level (i.e. consolidated for respective units assumed to be in operation respectively for each financial year).

Adjusted reference cumulative O&M cost (un-indexed) for all units combined is PKR 15.7b (excluding enabling)

Adjusted O&M cost (FY24 – FY33) (excluding enabling cost)

Total O&M cost | PKR 15.7b

Variable | PKR 4.0b (25.8%)

- Local PKR 1.3b (33.3%)
- Foreign PKR 2.7b (66.7%)

Fixed | PKR 11.7b (74.2%)

- Local PKR 8.3b (70.9%)
- Foreign PKR 3.4b (29.1%)

Summary of identified adjustments reflected in the adjusted O&M cost

Total O&M cost: PKR - 0.35b
A: PKR - 0.97b | B: PKR +0.62b

Total VOM cost: PKR + 1.09b
A: PKR +0.73b | B: PKR +0.36b

- Local: PKR - 1.47b; A: PKR - 1.47b
- Foreign: PKR + 2.51b; A: PKR + 2.23b; B: + 0.28b

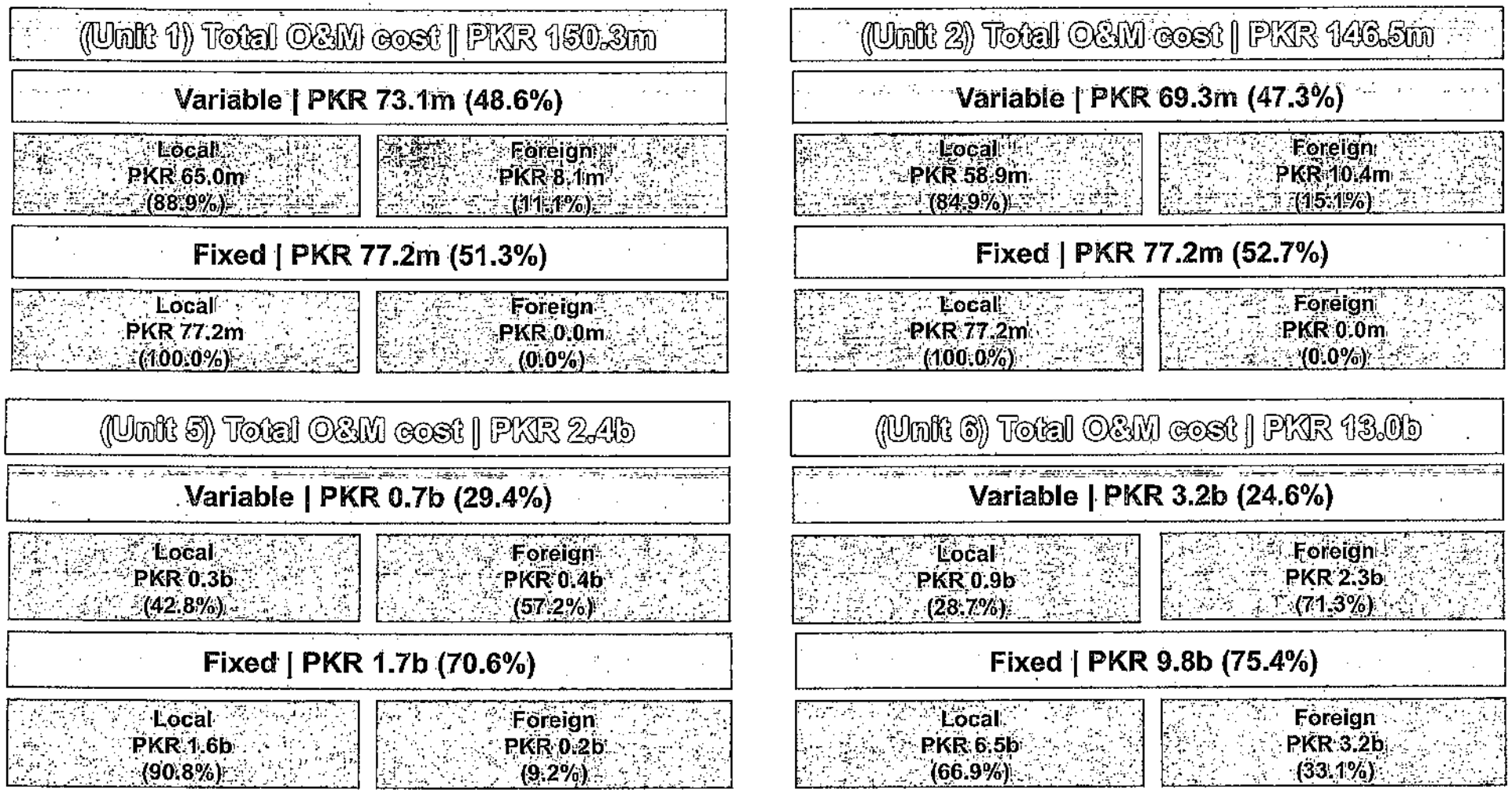
Total FOM cost: PKR - 1.39b
A: PKR - 1.73b | B: PKR +0.35b

- Local: PKR - 0.51b; A: PKR - 0.51b
- Foreign: PKR - 0.87; A: PKR - 1.22; B: + 0.35b

Source: Management data

Legend: Cost reduction | Cost increase | A: Estimated cumulative adjustments identified by IC | B: Estimated exchange rate update impact

Adjusted reference cumulative O&M cost (un-indexed) – Unit wise breakdown (excluding enabling cost)

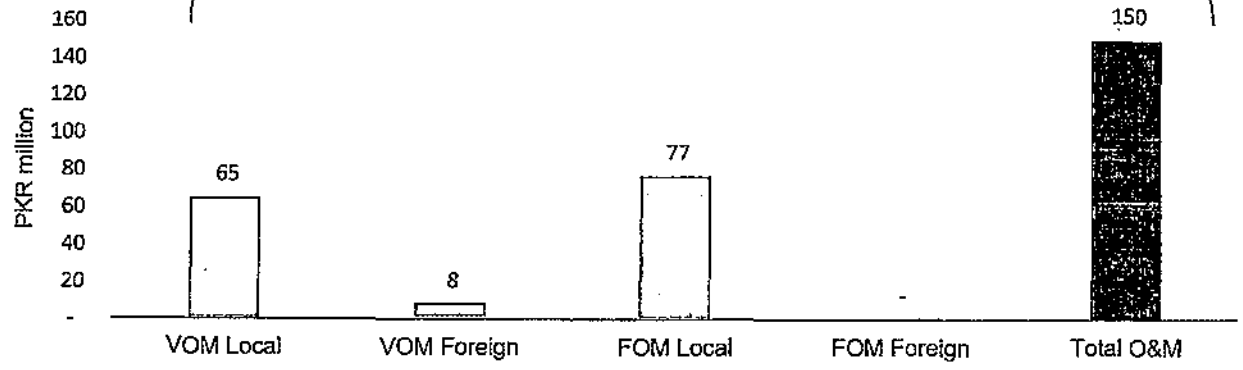


Source: Management data

Adjusted total O&M costs mix and trend (Unit 1 and 2) (excluding enabling cost)

Total adjusted reference O&M cost (un-indexed) Unit 1

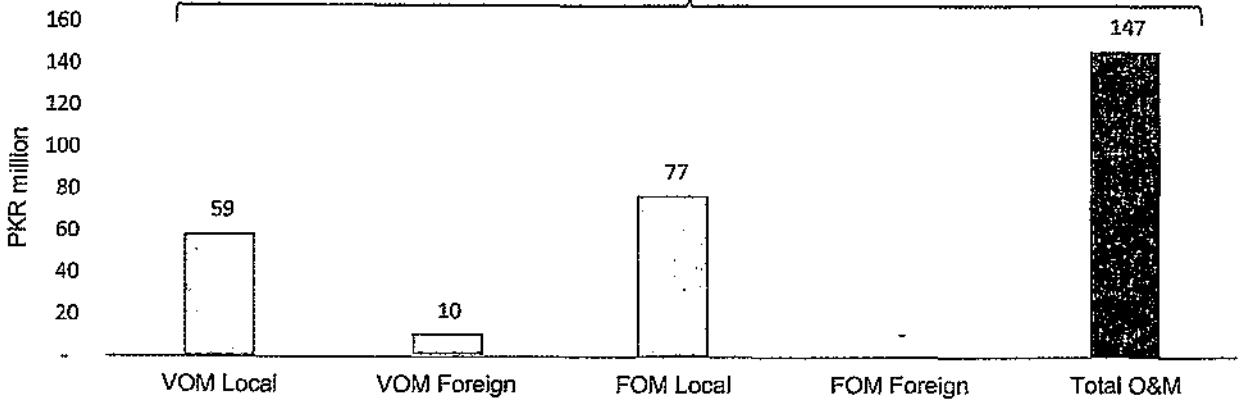
Average availability / utilization: 85.0%



Historical analysis (FY 17 – 22) Unit 1	
Average availability (%)	80.2
Average utilization (%)	48.9
Average annual total O&M (PKR million)	867.7

Total adjusted reference O&M cost (un-indexed) Unit 2

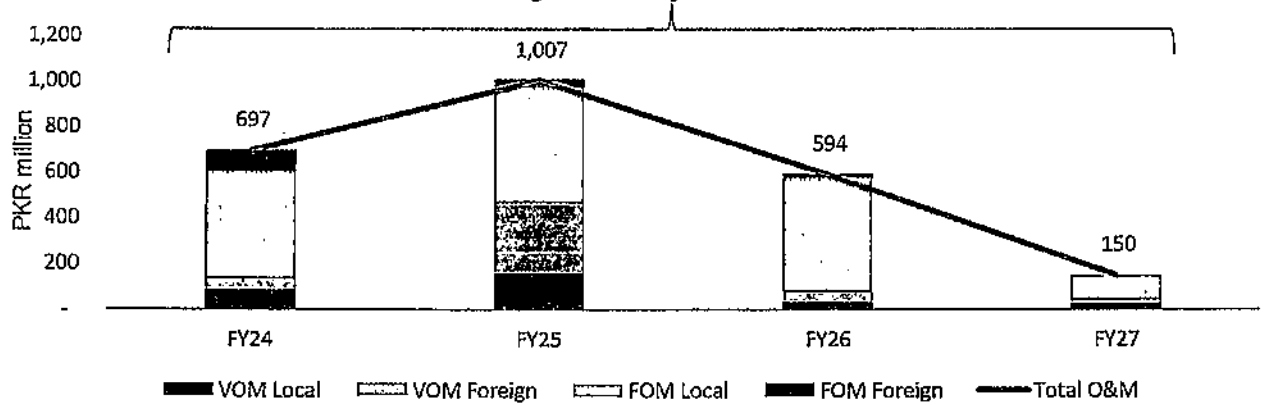
Average availability / utilization : 85.0%



Historical analysis (FY 17 – 22) Unit 2	
Average availability (%)	79.7
Average utilization (%)	48.1
Average annual total O&M (PKR million)	702.3

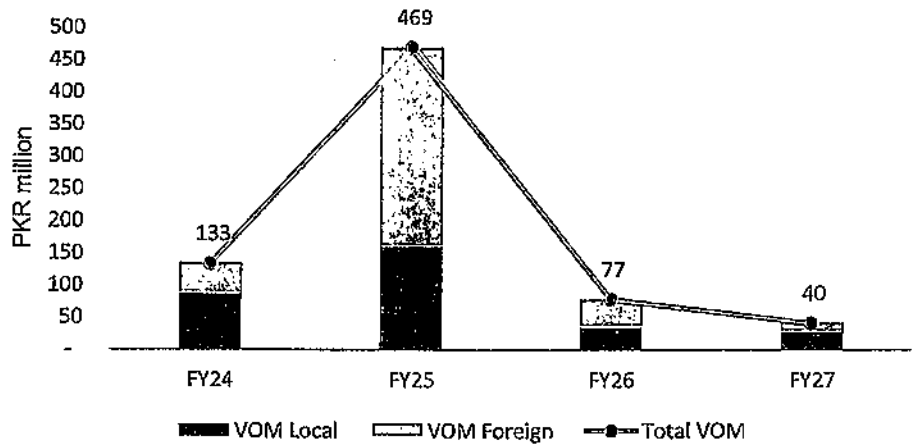
Adjusted total O&M costs mix and trend (Unit 5) (excluding enabling cost)

Total adjusted reference O&M cost (un-indexed)
Average availability / utilization : 85.0%

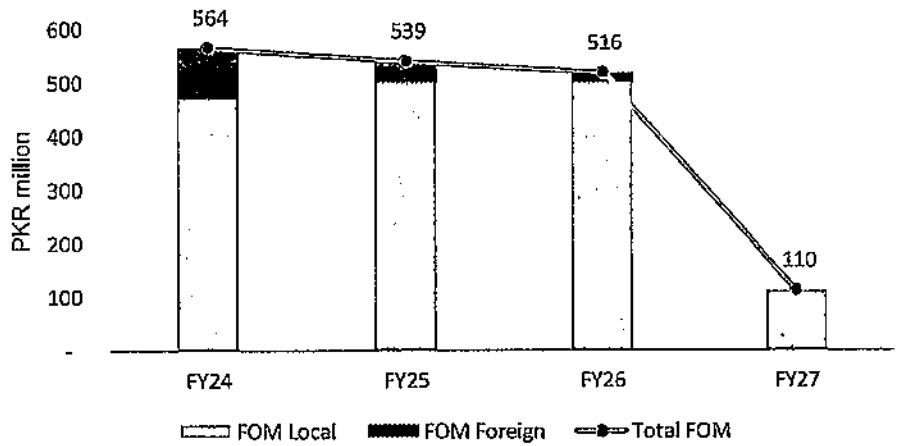


Historical analysis (FY 17 – 22) Unit 5	
Average availability (%)	83.4
Average utilization (%)	59.3
Average annual total O&M (PKR million)	553.5

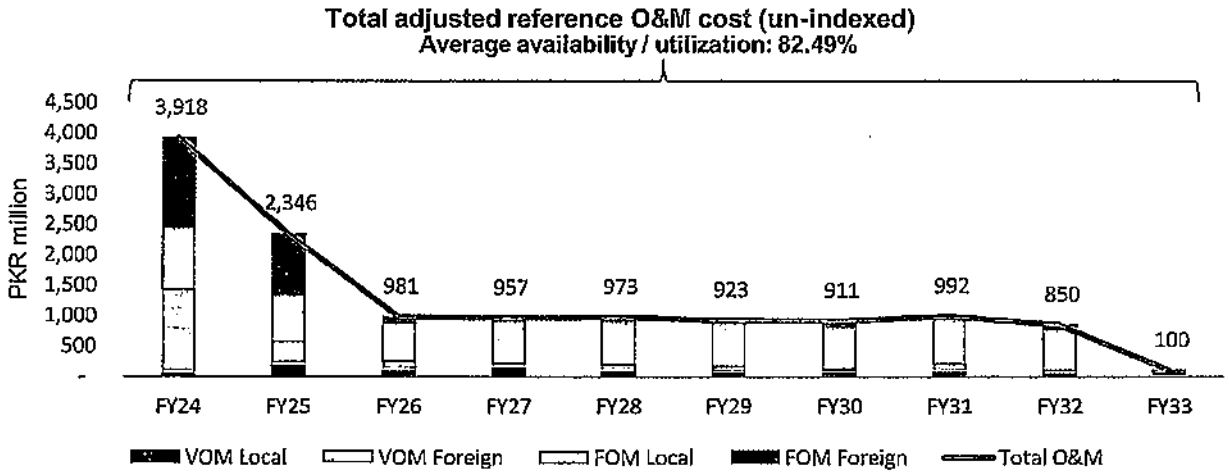
Total adjusted reference VOM cost (un-indexed)



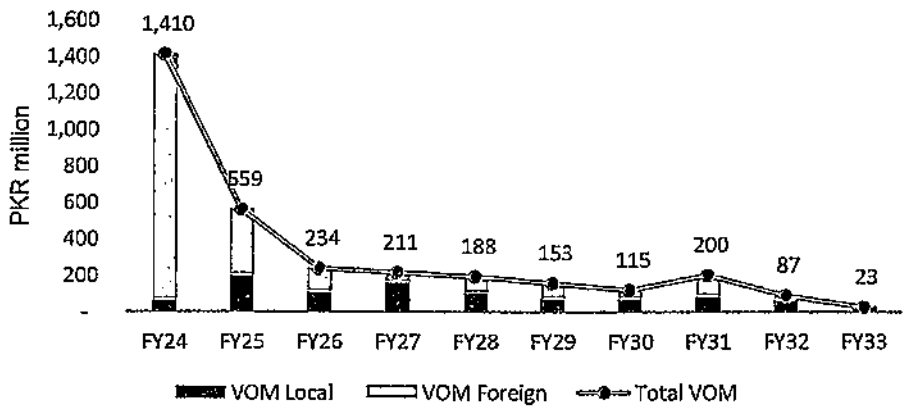
Total adjusted reference FOM cost (un-indexed)

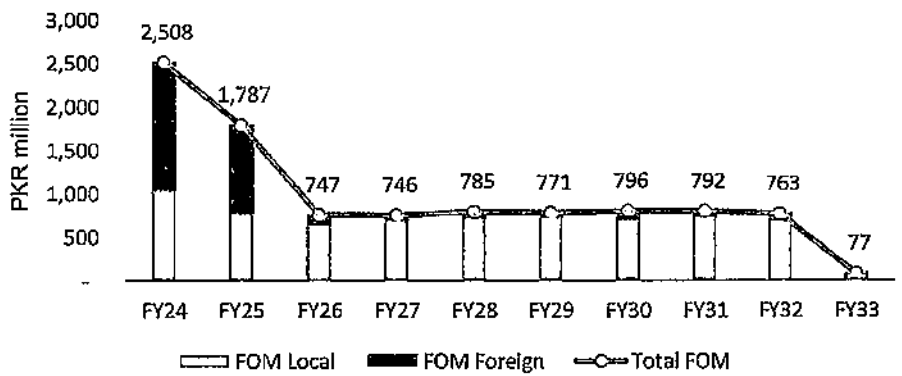


Adjusted total O&M costs mix and trend (Unit 6) (excluding enabling cost)



Historical analysis (FY 17 – 22) Unit 6	
Average availability (%)	84.9
Average utilization (%)	60.3
Average annual total O&M (PKR million)	780.2





Computation of tariff based on projected plant availability for both FOM and VOM components

Plant availability / Load factor used for both variable and fixed components:

FY	24
Factor	85.0%

Unit 1 Revised O&M tariff (without CPI adjustment and using fixed USD rate of 206.0)

Year	Variable O&M			Fixed O&M			Total
	Local	Foreign	Total	Local	Foreign	Total	
FY24	0.2057	0.0256	0.2313	0.4931	0.2028	0.6959	0.9272
Weighted average	0.2057	0.0256	0.2313	0.4931	0.2028	0.6959	0.9272
Add: Enabling charge (for details, please see pages that follow)				0.1144	-	0.1144	0.1144
Total tariff	0.2057	0.0256	0.2313	0.6075	0.2028	0.8103	1.0416

Plant availability / utilization factor used for both variable and fixed components:

FY	24
Factor	85.0%

Unit 2 Revised O&M tariff (without CPI adjustment and using fixed USD rate of 206.0)

Year	Variable O&M			Fixed O&M			Total
	Local	Foreign	Total	Local	Foreign	Total	
FY24	0.1828	0.0324	0.2152	0.4931	0.2028	0.6959	0.9111
Weighted average	0.1828	0.0324	0.2152	0.4931	0.2028	0.6959	0.9111
Add: Enabling charge (for details, please see pages that follow)				0.1144	-	0.1144	0.1144
Total tariff	0.1828	0.0324	0.2152	0.6075	0.2028	0.8103	1.0255

Since KE is a vertically integrated power utility and carry a unique position due to brown field nature of its power plants with entity level consumption, it intends to follow a billing regime for capacity payment based on available (net of outage allowances) basis. Accordingly, in order to recover projected fixed costs, Management has computed capacity part at respective availability/ utilization factor across all power plants of KE. In terms of total fixed cost recovery on an annual basis, KE's proposed Fixed cost component is expected to be indifferent from tariff computation being practiced under Take or Pay regime for other IPPs.

Computation of tariff based on projected plant availability for both FOM and VOM components

Plant availability / utilization factor used for both variable and fixed components:

FY	24	25	26	27
Factor	85.0%	85.0%	85.0%	85.0%

Unit 5 Revised O&M tariff (without CPI adjustment and using fixed USD rate of 206.0)

Year	Variable O&M			Fixed O&M			Total
	Local	Foreign	Total	Local	Foreign	Total	
FY24	0.0657	0.0358	0.1014	0.4931	0.2028	0.6959	0.7973
FY25	0.1220	0.2357	0.3577	0.4931	0.2028	0.6959	1.0536
FY26	0.0265	0.0326	0.0590	0.4931	0.2028	0.6959	0.7549
FY27	0.0205	0.0401	0.0606	0.4931	0.2028	0.6959	0.7565
Weighted average	0.0722	0.0966	0.1688	0.4931	0.2028	0.6959	0.8647
Add: Enabling charge (for details, please see pages that follow)				0.1144	0.0000	0.1144	0.1144
Total tariff	0.0722	0.0966	0.1688	0.6075	0.2028	0.8103	0.9791

Plant availability / utilization factor used for both variable and fixed components:

FY	24	25	26	27	28	29	30	31	32	33
Factor	72.7%	74.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%

Unit 6 Revised O&M tariff (without CPI adjustment and using fixed USD rate of 206.0)

Year	Variable O&M			Fixed O&M			Total
	Local	Foreign	Total	Local	Foreign	Total	
FY24	0.0550	1.1939	1.2489	0.4931	0.2028	0.6959	1.9448
FY25	0.1716	0.3151	0.4866	0.4931	0.2028	0.6959	1.1825
FY26	0.0791	0.0986	0.1777	0.4931	0.2028	0.6959	0.8736
FY27	0.1202	0.0399	0.1600	0.4931	0.2028	0.6959	0.8559
FY28	0.0737	0.0689	0.1426	0.4931	0.2028	0.6959	0.8385
FY29	0.0488	0.0669	0.1158	0.4931	0.2028	0.6959	0.8117
FY30	0.0498	0.0373	0.0872	0.4931	0.2028	0.6959	0.7831
FY31	0.0629	0.0887	0.1516	0.4931	0.2028	0.6959	0.8475
FY32	0.0459	0.0202	0.0661	0.4931	0.2028	0.6959	0.7620
FY33	0.0591	0.0109	0.0700	0.4931	0.2028	0.6959	0.7659
Weighted average	0.0771	0.1915	0.2685	0.4931	0.2028	0.6959	0.9644
Add: Enabling charge (for details, please see pages that follow)				0.1144	0.0000	0.1144	0.1144
Total tariff	0.0771	0.1915	0.2685	0.6075	0.2028	0.8103	1.0789

Since KE is a vertically integrated power utility and carry a unique position due to brown field nature of its power plants with entity level consumption, it intends to follow a billing regime for capacity payment based on available (net of outage allowances) basis. Accordingly, in order to recover projected fixed costs, Management has computed capacity part at respective availability/ utilization factor across all power plants of KE. In terms of total fixed cost recovery on an annual basis, KE's proposed Fixed cost component is expected to be indifferent from tariff computation being practiced under Take or Pay regime for other IPPs .

Since KE operates as VIU company, it has a central enabling/support function serving all three business segments of the business. Central costs are allocated to each business segment (generation, transmission and distribution)

Allocation of enabling charge to O&M tariff

Average Enabling cost (per annum)	Weighted average tariff component (per kWh)
PKR 191.7m	**PKR 0.1144**

- Per Management, enabling costs represent costs apportioned to BQPS I by departments, such as Human Resource Management, Information Technology, Marcom, Business Development (including IPP department), Security, Corporate Affairs, CFO Office and CEO Office etc., for provision of shared services to BQPS I.
- The aforementioned costs are directly incurred by the respective departments and subsequently are re-allocated to the generation, transmission and distribution segments, using re-allocation basis provided by the respective departments (generally based on their own assessment of time spent or relevance of cost between generation, transmission and distribution segments).
- Ultimately, projected cost assigned to generation segment is spread between six plants based on the numbers of unit sent out.
- Such costs are generally covered as part of the administrative costs claim in the fixed O&M local component of the tariff allowed to IPPs.

Key findings

TPS - Jamshoro, TPS - Muzaffargarh and HUBCO were explored for benchmarking of enabling costs pertaining to BQPS I. Due to data limitation, IC is not in a position to benchmark overall enabling cost allocation to BQPS I. Accordingly, these have been analyzed at FOM local level.

Source: Management data

Overall O&M tariff of BQPS I is substantially lower than TPS – Jamshoro / Muzaffargarh, however, it is higher than HUBCO power plant

Tariff components	BQPS I (Unit 6)		(A) TPS – Jamshoro[1]		(B) TPS – Muzaffargarh[1]		(C) HUBCO[1] (Based on KE data)		Average of A - C	
	PKR / kWh	%share	PKR / kWh	%share	PKR / kWh	%share	PKR / kWh	%share	PKR / kWh	%share
Variable O&M – Local	0.0771	7.1%	0.1098	3.4%	0.1625	6.4%	0.1527	17.8%	0.1417	7.9%
Variable O&M – Foreign	0.1915	17.8%	-	-	-	-	0.1604	18.7%	0.1604	2.5%
Sub-total	**0.2686**	**24.9%**	**0.1098**	**3.4%**	**0.1625**	**6.4%**	**0.3131**	**36.6%**	**0.1951**	**10.4%**
Fixed O&M – Local	0.6075	56.3%	0.0000	-	2.3613	93.6%	0.1922	22.5%	1.2767	57.6%
Fixed O&M – Foreign	0.2028	18.8%	0.0000	-	-	-	0.3507	41.0%	-	-
Sub-total	**0.8103**	**75.1%**	**3.1636**	**96.6%**	**2.3613**	**93.6%**	**0.5429**	**63.4%**	**2.0226**	**89.6%**
Total O&M tariff	**1.0789**	**100.0%**	**3.2734**	**100.0%**	**2.5238**	**100.0%**	**0.8560**	**100.0%**	**2.2177**	**100.0%**

Key technical specifications	BQPS I	TPS – Jamshoro	TPS – Muzaffargarh	HUBCO
Net capacity (MW)	693	649	1,085	1,200
Fuel	NG/RLNG & HFO	Natural Gas & HFO	Natural Gas & HFO	HFO
Technology	Steam Turbine 4 X 210 MW	Steam Turbine 3 X200 MW 1 X250 MW	Steam Turbine 5 X200 MW 1 X320 MW	Steam Turbine 4X 324 MW
Plant configuration	4 steam turbines	4 steam turbines	6 steam turbines	4 steam turbines
Generation license period	32 Years	30 years	30 years	30 years
Average availability / utilization factor for tariff benchmarking	83.41%[2]	83.41%[1]	83.41%[1]	83.41%[1]

Source: Management data and NEPRA website

[1] Revised indexed tariff for April to June 2022 quarter adjusted for PKR to USD exchange rate of 206 and latest available CPI of June 2020 (i.e. 269.27 as per NEPRA determinations), adjusted for CPI of 8.9% (FY21) and 9.0% (FY22) respectively. Further, fixed O&M components have been grossed up at 83.41% (representing average projected availability of BQPS I).

[2] Average availability takes into consideration the annual availability of 90% (covering annual scheduled outage & forced outage allowance) along with the impact of periodic major / minor overhauls of GTs / STs in line with outages allowance given to IPPs under applicable Power Policies

Key findings

From technical compatibility perspective, TPS – Jamshoro, TPS – Muzaffargarh and HUBCO were explored as potential benchmarks for BQPS I average tariff. Considering recent tariff determinations for TPS – Jamshoro / Muzaffargarh as per their historical utilization pattern (~26%) and on "take and pay" basis, they may not be considered as most appropriate for benchmarking purposes. Accordingly, HUBCO being an IPP, is considered a close benchmark.

Overall O&M tariff of BQPS I is substantially lower than TPS – Jamshoro / Muzaffargarh, however, it is **higher than HUBCO** mainly due to fixed O&M cost (~PKR 1.0b over the assumed tariff control period) linked to one time activities at unit-6 such as water wall panels replacement, IP Turbine diaphragm replacement, Generator/Turbine rotor inspection/ balancing and LV switchgear busbar replacement etc, which may not have been considered relevant by HUBCO.

Cost mix alignment:

Foreign cost component of BQPS I is 36.5% as compared to 59.7% for HUBCO.

Enabling cost benchmarking:

Enabling costs when analyzed at FOM local level appear on a higher side. This may be attributable to different operating model / governance structure being followed at benchmark power plant.

Indexations being requested by BQPS I are aligned with recent determinations of NEPRA for thermal power plants.

Indexation	BQPS I	TPS - Jamshoro	TPS – Muzaffargarh	HUBCO
Variable O&M – Local	Indexed with Pak CPI (Quarterly)	Indexed with NCPI (Biannually)	Indexed with NCPI (Biannually)	Not available
Variable O&M – Foreign	Indexed with US CPI and USD to PKR exchange rate (Quarterly)	Not applicable	Not applicable	Not available
Fixed O&M – Local	Indexed with Pak CPI (Quarterly)	Indexed with NCPI (Biannually)	Indexed with NCPI (Biannually)	Not available
Fixed O&M – Foreign	Indexed with US CPI and USD to PKR exchange rate (Quarterly)	Not applicable	Not applicable	Not available

5 Abbreviations

Abbreviations

Periods

Historical period	FY17 and FY22
Budgeted period	FY23
Forecast period	FY24 – FY33

Abbreviations

AGP	Advanced Gas Path
b	Billion
BQPS I	Bin Qasim Power Station – I
BQPS II	Bin Qasim Power Station – II
BQPS III	Bin Qasim Power Station – III
BTU	British Thermal Unit
CY	Calendar Year
CAPEX	Capital Expenditure
CI	Carbon Intensity
CEO	Chief Executive Officer
CFO	Chief Financial Officer
COD	Commercial Operations Date
CSA	Comprehensive Services Agreement
Financial Consultant	EY Ford Rhodes
FFH	Factored Fired Hours
FY	Financial Year
FOM	Fixed Operations & Maintenance
BQPS I PP	FY24 – FY33
GT	Gas Turbine
GE	General Electric
HSE	Health, Safety and Environment
HRSG	Heat Recovery Steam Generator
HVAC	Heating, Ventilating and Air-Conditioning
HSD	High Speed Diesel
HSDO	High Speed Diesel Oil
HV	High voltage
HGPI	Hot Gas Path Inspection
IC	Independent Consultant
IE	Independent Engineer
IPP	Independent Power Producer
I&C	Instrumentation and controls)
JV	Joint Venture
KE	K-Electric Limited
KV	Kilovolt
kWH	kilowatt Hour
KCCPP	Korangi Combined Cycle Power Plant
KTGEPS	Korangi Town Gas Engine Power Station

Abbreviations

LV	Low voltage
LHV	Lower Heating Value
MI	Major Inspection
MW	Megawatt
m	Million
MYT	Multi-year Tariff
NEPRA	National Electric Power Regulatory Authority
NESPAK	National Engineering Services Pakistan
NGC	Natural Gas Compressors
Technical cum lead consultant	Operation and Maintenance Solutions (Private) Limited
O&M	Operations and Maintenance
Pak CPI	Pakistan Consumer Price Index
PKR	Pakistani Rupee
PKRm	PKR Millions
POs	Purchase Orders
RLNG	Regassified Liquefied Natural Gas
RAB/WDV	Regulatory Asset Base/Written Down Value
REVEX	Revenue Expenditure
RSC	Rotor Side Converter
SGEPS	S.I.T.E Gas Engine Power Station
ST	Steam Turbine
k	Thousand
US CPI	United States Consumer Price Index
USD	United States Dollar
VOM	Variable Operation & Maintenance
WTP	Water Treatment Plant
WPI	Word Price Index

K-ELECTRIC
Energy That Moves Life

Section A
Bin Qasim Power Station II – (BQPS-II)

Table of Contents – BQPS II

1. Bin Qasim Power Station – II (BQPS II)

This section covers details of BQPS II Plant (referred as "BQPS II") and tariff being requested.

1.1. Introduction to the Plant – BQPS II

BPQS II is one of the key plants in KE's Generation fleet having installed capacity of 572.67 MW (Gross). Situated at Port Qasim, this plant serves as a base load plant.

BQPS-II having ISO capacity of 572.67 MW was set-up at Bin Qasim between 2009 to 2012, at the time when the Company was going through difficult times and was in desperate need of addition of new efficient generation capacity along with other improvements. As a result, Company made a loan arrangement with renowned financial institutions such as Asian Development Bank and expedited and completed the project within a period of 36 months. This project had a significant impact on the overall fleet efficiency and proved to be a milestone in the history of KE as it was in FY 2012 that KE turned profitable for the first time after 17 years.

Principal Features

1. The Power Plant is situated at Port Qasim Karachi South at coordinates 24°46'48.660" N67°21'39.103"E
2. The plant comprises of 3GTs of 127.8 MW each, 01 ST of 189.27 MW and 3 HRGS (Gross ISO Installed Capacity) making a total installed capacity of **572.67 MW**
3. The project started its commercial operations on Feb 15, 2012 initially with 3 GTs (Unit 1-3) and subsequently, steam turbine (Unit 4) was added that commenced operations on May 7, 2012
4. In August 2013, NEPRA issued Modification IV to the Generation License no. GL/04/2002 to the Company in accordance with the prevailing regulatory regime, adding BQPS II in the fleet.

Technical Capability

The installed generation capacity of BQPS II is 572.67 MW (Gross ISO) with Gross capacity of 525.58[1] MW (Corrected at RSC) dedicated power into the K-Electric system. The project construction was started in 2009 and was completed at a fast track in just 36 months, starting its commercial operations on Feb 15, 2012.

The project was initially conceived and brought to fruition by coordinated efforts of KE, GE, HEI (Harbin Electric Int. Group – EPC Contractor)

The Gas turbine and steam turbine for the power plant were manufactured at the General Electric (GE) and HTC Harbin Turbine Co. China's production facilities, which is known for manufacturing of Combined cycle power plant. The GE 9E frame machines installed at the power plant are well designed, reliable, and economical in operation.

- 3 Gas turbines (GE Frame 9E) PG9171E
- 3 HRSG (No. 703 Research Institute of CSIC make (China)
- 1 Steam turbine LN190-8.396/0.75/536/273

The EPC contractor was Harbin Electric Int. and Owner engineer was O&M solutions.

Operation and maintenance of the plant is carried by technical team of the Company for the last 10 years along with CSA agreements with GE for providing parts and repairing services

[1] As per Generation license

for the maintenance of certain power plant equipment and planned / unplanned maintenance to ensure availability and continued operations of the plant.

The plant has completed 10 years of continuous operations, successfully supplying power according to the load requirements of the consumers.

Summary of Plant Performance Since Inception

The Key Factors

The key factors of the plant performance for the last 10 years are summarized as follows:

Fiscal Year	Total Energy Supplied (Gross) (GWh)	Average Plant Availability (%)[2]
2013	3,567	87%
2014	3,639	90%
2015	3,907	93%
2016	4,119	93%
2017	3,921	91%
2018	3,751	95%
2019	4,066	93%
2020	4,278	95%
2021	4,173	95%
2022	3,821	96%

For Major Overhaul details, please refer table given in **BQPS-II – Annexure A (i)**

Modifications & Improvements

The upkeep of the plant and equipment has always been the priority; therefore, the Company has invested heavily in replacing, modifying, and improving the plant equipment which has made it possible to operate reliably and will help to continue smoothly for the remaining useful life of plant.

For details of Major activities performed on plant, please refer **BQPS II – Annexure A (i)**

Operation Summary

The plant has a key role in supply of power to the city of Karachi. It is for this reason it has always been the aim of the Company to keep the plant in best shape in order to offer the maximum availability all year round. The year wise load pattern of dispatch (as shown above) from the Company better explains its contribution during the year and the plant's role as part of the total generation projects of KE.

BQPS II is one of the most efficient plants of KE and generally ranks higher in EMO.

Health & Safety

The facility has been operational for last 10+ years without any major incident on account of Quality, Health, Process Safety and Environment. It is achieved from observing good O&M practices and having skilled plant operations team since its inception. The plant premises have a well-equipped first aid facility backed by a 24/7 ambulance.

[2] Average Plant Availability = Available Capacity / (Gross Dependable Capacity)

The Company has well established Process Safety Procedures covering:

i. Chemical Handling

ii. CO2 Flooding System Operations

iii. Contractor Safety Management

Safety Procedures

The health and safety measures adopted by the Company are also commended by the independent consultant IMS (IMS: ISO-9001:2015, ISO-14001:2015, ISO-450012018, Green Office, ISO-50001:2018).

Please refer **BQPS II – Annexure A (ii)** for Safety procedures.

Project Details

For project details including site details, plant reference conditions & plant machinery details, please refer **BQPS II – Annexure A (iii)**

Fuel Source

Currently, KE is getting the Gas from SSGC at pressure of 6-7 bar, which is then compressed as per the requirement of the gas turbine. BQPS-II GTs required gas pressure is 28 bar for which compressors are used which is a significant contributor to the auxiliary consumption of the plant i.e. around 31.05 MW.

Further, KE is also considering alternate RLNG supplier so that the requirement of gas pressure is fulfilled considering SSGC is not able to provide gas pressure up to the mark. High pressure RLNG usage will result in saving of auxiliary consumption of 16.6 MW if two Natural Gas Compressors are shut down and saving of 8.3 MW if one Natural Gas compressor is shutdown (based on Independent Engineer's heat rate test report conducted in 2018). Impact of the same on Net efficiency has been discussed in below under *Plant Capacity and Heat rate.*

Moreover, agreement with RLNG/ Gas supplier may involve Take or Pay arrangements, for which KE will be required to ensure regular payments for Fuel Charges as per the Gas Supply Agreements regardless of plant operations. Accordingly, KE requests the Authority to allow these costs as pass through in the proposed tariff. Alternatively, the Authority may allow KE to consider the plant as a must run under the Economic Merit Order (EMO) to the extent of Take or Pay Gas arrangements.

KE as part of Authority's direction had commissioned HSD at KCCP and is also planning to commission BQPS II plant on HSD fuel as a back up to ensure continued operation of the plant in the event of shortage of gas supply. Currently, KE has Fuel Supply Agreement with PSO for supply of HSD at another plant (KCCP). Once HSD is commissioned at BQPS II, KE will also cover the requirements of BQPS II HSD through current / new FSA.

Cooling System

The cooling water system is an open circulation-based system therefore, the estimated consumption of cooling water is about approx. 50,000 m3/h during the normal operations of the power plant.

The cooling water system is designed for Gas turbine and steam turbine cooling system and cycle is divided into open and closed cycle.

Minimum Loading

Minimum loading of each GT is 90 MW (Gross) based on GE's recommendations (on Combined Cycle Operations). Please refer **BQPS II – Annexure A (iv)** for reference document.

Fire Protection System

The plant has a state-of-the-art Fire Protection System detail of which are given in refer **BQPS II – Annexure A (v)**

Spares & Inventories

In order to ensure reliable operations of the power plant, inventory of worth **PKR 1,865 million** as at June 2022 is maintained by the Company.

Plant Layout

For plant layout, please refer **BQPS II – Annexure A (vi).**

Details of Major Equipment

For details of Major Equipment, please refer **BQPS II – Annexure A (vii)**

Remaining Useful Life

The plant has been in operation for the last 10 years (FY12 ~ FY-22).

Factored Fired Hours operated for each gas turbine is given in the table below:

Gas Turbines	Hours Operated as of 30th June, 2022
1	85,638
2	84,591
3	84,344
Average	**84,858**

With necessary investments and history of safe operations during last 10 years, based on internal assessment, the plant can safely operate for remaining licensed useful life ending by October 2042.

Plant Capacity and Heat Rate

Heat rate and capacity test was conducted for the plan by Independent Engineer in 2018, based on which Heat rate was determined for the Current MYT 2017 – 2023 and plant capacity was updated in the Generation License.

Test results on Gas fuel for plant at base load were as follows:

Description	BQPS-II
Gross Capacity – MW (RSC)	525.584
Auxiliary – MW	31.052
Net Capacity – MW (RSC)	**494.532**
Auxiliary	5.908%
Net Heat Rate LHV Basis – btu / kWh	7,449.314
Net Efficiency LHV Basis	45.805%
Gross Heat rate LHV Basis – btu / kWh	7,008.94
Gross Efficiency LHV Basis	**48.683%**
Net Heat Rate HHV Basis – btu / kWh	**8,255.255**
Net Efficiency HHV Basis	41.333%
Gross Heat rate HHV Basis – btu / kWh	7,767.237
Gross Efficiency HHV Basis	**43.930%**

Accordingly, Net capacity & Heat rate (Combined cycle – Gas) for the purpose of Tariff petition has been taken from Generation license which is based on tests conducted in 2018 as per IE's heat rate test reports.

Further, capacity & Heat rate at Open cycle on Gas has been calculated from the 3rd party combined cycle test result, whereas capacity & Heat rate on HSD (combined cycle and open cycle) have been estimated. Further, Heat rate and capacity on HSD shall be adjusted based on test at the time of HSD commissioning. Accordingly, relevant reference tariff components shall be adjusted.

Category	Gas fuel		HSD fuel	
	Combined cycle	Open cycle	Combined cycle	Open cycle
Gross De rated capacity – MW	525.58	345.76	480.00	325.50
Auxiliary consumption – MW	31.05	19.88	16.55	6.08
Net Capacity – MW	494.53	325.88	463.46	319.42
Auxiliary consumption %	5.91%	5.75%	3.45%	1.87%
Net HHV heat rate – btu / kWh	8,255.26	12,311.06	8,031.40	11,738.19

In case if RLNG is arranged from any dedicated line / alternate supplier, and compressors are not required, auxiliary consumption and heat rate will accordingly be adjusted based on impacts provided in IE's report as summarized below, please refer **BQPS II - Annexure B** for detailed extract from IE's report.

Description	Combined cycle (with 2 compressors)	Combined cycle (with 1 compressor)	Combined cycle (with no compressor)
Gross De rated capacity – MW	525.584	525.584	525.584
Auxiliary consumption – MW	31.052	22.509	13.967
Net Capacity – MW	494.532	503.075	511.617
Auxiliary consumption %	5.91%	4.28%	2.66%
Heat rate btu / kwh	8255.26	8115.07	7979.57

In addition to above, in case if there is any opportunity to improve the plant capacity, efficiency and performance through incurrence of capital expenditure and/or increase in O&M, the same shall be separately submitted to the Authority along with detailed feasibility for approval. Upon approval of the Authority the impact of same shall be incorporated in the tariff.

1.2. Tariff Mechanism

This section explains in detail the tariff mechanism of all BQPS II to ensure cost reflective tariffs including component wise indexation so that all prudent costs of the plant are adequately recovered.

KE is requesting for a two-part tariff, in line with IPPs i.e. Energy payments and Capacity payments on a Take-or-pay mechanism where Capacity payment shall be paid for the Available Capacity and Energy payments for the Net Electrical Output.

Available capacity has been calculated considering annual availability of 90% and additional outage allowance in the year in which Overhaul is occurring. Accordingly, based on expected incurrence of Overhauls, levelized availability of 88.41% has been calculated and has been used as Plant factor for Variable O&M and Capacity components, so that Capacity components cover the impact of outages. Details of Outages and billing mechanism have been further discussed in detail in Section 1.3.

For indexation purposes, following Indexation factors are proposed to be used sources of which given in the table below:

Indexation Factors	Sources
Local Inflation (CPI)	Pakistan Bureau of Statistics (PBS)
Foreign Inflation (US CPI	US Bureau of Labor Statistics,
Exchange rates (USD, Euro, JPY)	National Bank of Pakistan
KIBOR	State Bank of Pakistan
LIBOR / SOFR	Intercontinental Exchange /Federal Reserve Bank of New York

1.2.1. Fuel Cost

This component represents the cost of fuel for the Net Electrical Output produced by the plant at the allowed efficiency levels and shall be indexed for any fuel price variations.

Net Electrical Output: The net electrical energy expressed in kWh that is generated by the Complex (or any Unit) and delivered to the Interconnection Point as measured by the Metering system.

Fuel price

BQPS II is currently using Gas fuel including Indigenous Natural Gas and RLNG as the primary fuel. Further, KE also plans to commission the plant on HSD as a backup fuel, for which capital investment has been separately requested from NEPRA.

NEO is currently recorded through meters at 220 KV bus bar and is bifurcated between Indigenous Natural Gas / RLNG as per mechanism explained below. Further, once HSD will be commissioned, units on HSD will be recorded through the same meters at bus bar. However, for mix operations on Gas & HSD, Separate readings will be taken for GTs fired on respective fuels, whereas ST generation on HSD & Gas will be bifurcated considering the proportion of Gas Turbine generation on HSD & Gas to the Total Gas Turbine Generation. This will be further clarified at the time of commissioning & Testing of plant on HSD fuel.

Indigenous Natural Gas / RLNG – Mechanism of billing, pricing, and bifurcation

Prices for Natural Gas and RLNG shall be calculated based on OGRA's notification. Prices of Natural Gas are notified in PKR / mmbtu, whereas Prices of RLNG are notified by OGRA in USD / mmbtu which are then translated into PKR / mmbtu by SSGC using the daily average exchange rates issued by National bank for the month. Accordingly, SSGC mentions the rate in PKR / mmbtu on the bills.

Considering prices of Natural Gas and RLNG are notified in per mmbtu, calorific value is not required for price conversion, unlike Furnace oil and HSD which are notified in PKR / mton and liters respectively.

At present, SSGC supplies gas to KE through single pipeline based on available gas quantity and billing is done based on Indigenous Natural Gas and RLNG (Distribution tariff) based on proportion of Indigenous Natural Gas & RLNG supplied to KE (determined by SSGC based on RLNG imports).

(Sample bills for the month of April 2020 are enclosed as **BQPS II - Annexure C (i)**).

Units Generated by the plant are recorded through Energy Meters at the plant and then are bifurcated in Indigenous Natural Gas and RLNG based on proportion of Indigenous Natural Gas and RLNG in MMBTUs. MMBTUs for Indigenous Natural Gas and RLNG are calculated using consumption appearing in SCF on bills and actual calorific value (btu / scf) appearing on the bills (Sample calculation enclosed as **BQPS II - Annexure C (ii)**)

Gas Infrastructure Development Cess (GIDC)

Currently the matter of GIDC is sub-judice and no amount is passed onto the consumers. Subsequently, if any GIDC is paid (pertaining to prior periods) based on court verdict, the same will be included in fuel price PKR / mmbtu.

RLNG from any Dedicated Line / Alternate Supplier

In future, if RLNG is procured from any dedicated line / alternate supplier, the same will be measured through separate meters and energy will be bifurcated in supply from any dedicated line / alternate supplier based on actual MMBTUs, accordingly, to apply separate prices as per respective pricing mechanism.

HSD

HSD price is quoted in PKR / liter on price as per mutual agreement based on Fuel Supply Agreement. Accordingly, Gross Calorific value and conversion factors are required to convert the price in PKR / mmbtu. Sample calculation is provided in the table below:

Description	Unit	Calculation	Amount	Source
HSD price	PKR / liter	a	219.94	Weighted average price of fuel consumed for the month
Gross Calorific value	btu / lb	b	19,731	Actual GCV for the month as per test reports
Conversion factor	lb / kg	c	2.2046	Standard conversion factor
Gross Calorific value	btu / kg	d = b x c	43,499	Calculated
Density	kg / liter	e	0.833	Actual Density for the month as per test reports
Gross Calorific value	btu / liter	f = d x e	36,252	Calculated
HSD price	PKR / mmbtu	g = (a / f) x 10^6	6,066.91	Calculated

Mechanism of Part load adjustment factor

For BQPS II, Net HHV Heat rate of 8,225.26 btu / kWh on Gas fuel - combined cycle, was established based on IE's test. Considering separate tariff requests for each plant, central economic dispatch plan going forward as explained in **section 5** and the part load adjustment mechanism followed for IPPs, KE is proposing monthly part load adjustment based on actual operations for a month and part load adjustment factor given in the table as per the part load curve. Part load table is enclosed as **BQPS II - Annexure D (i) to D (ii)** for Gas whereas Part load table for HSD open cycle and combined cycle will be submitted post commission of HSD fuel. This mechanism of adjustment based on actual part load factor will also be consistent with other IPPs.

Part load adjustment will be based on hourly data for energy generated on plant and available capacity on Gas and HSD fuel separately, based on which part loading % for each hour will be determined for Gas and HSD fuels. Part load factor for each hour will be calculated based on part load % and part load factors given in Part load table for Gas and HSD fuels (given in **BQPS II - Annexure D(i) to D(ii)** for gas and same for HSD will be submitted post commissioning). Accordingly, a weighted average part load factor for the month will be calculated for Gas and HSD which shall be denominated as PL_{Gas} and PL_{HSD} (Sample calculation for a day enclosed as **BQPS II - Annexure E** for Gas. Calculation for HSD will be submitted post commissioning.).

Degradation factor

Reference values of heat rate and capacity (Gas – combined cycle) are based on test conducted in 2018 for Gas and KE would request NEPRA to adjust the heat rate and output for each year based on degradation table as provided in **BQPS II - Annexure F(i) and F(ii)** which is based on degradation curve given in IE's report.

Further, for the purpose HSD, KE will submit the degradation table at the time of commissioning, based on degradation curve for heat rate and output post commissioning of the plant on HSD and would request NEPRA to adjust the heat rate and output for each year based on degradation table.

Moreover, KE requests that degradation be allowed as per degradation curve consistent with the practice followed for other IPPs.

Simple cycle operations

Although BQPS II is generally run on combined cycle operations, however, in case if Steam Turbine is on outage and the outage is within the allowed outage allowance, as detailed in section *Outage Allowance* and the plant is required to operate to fulfill demand based on Economic Merit Order on pricing of simple cycle operations, KE should be allowed the fuel cost at simple cycle operations.

Further, plant must be operated on simple cycle during startups when GT is synchronized, and ST is under start up. Accordingly, KE requests that fuel cost on units produced during that period shall also be allowed on simple cycle whereas Startup costs should be reduced by fuel cost claimed on units produced during start up as these will be claimed under Fuel cost.

Cost of simple cycle operations is requested to be allowed on both Gas and HSD fuels based on operations if plant is operated due to dispatch based on EMO Ranking on pricing of simple cycle operations. However, for allowing cost of simple cycle operations during startups, EMO ranking of combined cycle shall be relevant considering the intended use.

Heat rates for different conditions are given under *Plant capacity and heat rate* above. KE requests that part load and degradation adjustment factor shall be applied in same manner as for combined cycle, based on Part load and degradation curve on simple cycle for Gas and HSD.

Energy generated on simple cycle mode will be separately recorded through logs for application of simple cycle heat rate.

Summary of assumptions used for reference tariff

Description	Indigenous Natural Gas		RLNG		HSD	
	Combined cycle	Simple cycle	Combined cycle	Simple cycle	Combined cycle	Simple cycle
Net HHV heat rate	8,255	12,311	8,255	12,311	8,031	11,738
Fuel price PKR / mmbtu	857	857	3,301	3,301	6,067	6,067
Fuel Component PKR / kWh	7.07	10.55	27.25	40.64	48.73	71.21
RLNG price						
Fuel Price PKR / mmbtu			3,300.82	3,300.82		
HSD price						
HSD price per liter					219.94	219.94
GCV (btu / liter) – please refer section HSD					36,252	36,252

Indexation formula

The fuel cost component of tariff shall be adjusted on account of fuel price variation as per the following mechanism:

Indigenous Natural Gas

$FCCIG_{(Rev)}$	=	$FCCIG_{(Ref)} \times PIG_{(Rev)} / PIG_{(Ref)}$
Where:		
$FCCIG_{(Rev)}$	=	The revised fuel cost component on Indigenous natural gas in PKR / kWh
$FCCIG_{(Ref)}$	=	The reference fuel cost component of **PKR 7.07 / kWh** on Indigenous Natural Gas for Combined cycle and **PKR 10.55 / kWh** on Simple cycle
$PIG_{(Rev)}$	=	The revised net HHV Indigenous natural gas price notified by the OGRA in PKR / MMBTU
$PIG_{(Ref)}$	=	The reference net HHV Indigenous natural gas price of **PKR 857 / MMBtu**

RLNG

$FCCRLNG_{(Rev)}$	=	$FCCRLNG_{(Ref)} \times PRLNG_{(Rev)} / PRLNG_{(Ref)}$
Where:		
$FCCRLNG_{(Rev)}$	=	The revised fuel cost component on RLNG in PKR / kWh
$FCCRLNG_{(Ref)}$	=	The reference fuel cost component of **PKR 27.25 / kWh** on RLNG for combined cycle and **PKR 40.64 / kWh** on Simple cycle
$PRLNG_{(Rev)}$	=	The revised net HHV RLNG price notified by the OGRA in USD / MMBTU multiplied by exchange rate appearing on SSGC bills
$PRLNG_{(Ref)}$	=	The reference net HHV RLNG price of **PKR 3,300.82 / MMBtu**

HSD (Monthly adjustment based on weighted average price for the month)

$FCCHSD_{(Rev)}$	=	$FCCHSD_{(Ref)} \times PHSD_{(Rev)} / PHSD_{(Ref)} \times CalHSD_{(Ref)} / CalHSD_{(Rev)}$
Where:		
$FCCHSD_{(Rev)}$	=	The revised fuel cost component on HSD in PKR / kWh
$FCCHSD_{(Ref)}$	=	The reference fuel cost component or **PKR 48.73 / kWh** on HSD for combined cycle and **PKR 71.21 / kWh** for simple cycle
$PHSD_{(Rev)}$	=	The revised net HHV HSD price of HSD in PKR / liter based on weighted average formula as given below
$PHSD_{(Ref)}$	=	The reference net HHV HSD price of **PKR 219.94/ liter**
$CalHSD_{(Ref)}$	=	The revised Calorific value of HSD for the month in btu / liter as per lab tests done by reputable labs based on a frequency mechanism. KE will submit the same after HSD commissioning.
$CalHSD_{(Rev)}$	=	The reference Calorific value of HSD of **36,252 btu / liter**

Calculation of Weighted Average HSD price for a month

HSD	Legend	Stock in Litres	Amount - PKR mn	Weighted average price
		I	ii	iii = ii / i x 10^6
Opening	A	4,824,108	1,061	
Purchases	B	-	-	
Available for consumption	C = A + B	4,824,108	1,061	219.94
Less: Consumption	D	(440,080)	(97)	
Closing	E = C - D	4,384,027	964	

The calculated $FCCIG_{(Rev)}$, $FCCRLNG_{(Rev)}$ and $FCCHSD_{(Rev)}$ shall be adjusted with weighted average part load factor for the month based on calculation as explained in *Mechanism of Part load Adjustment Factor* and degradation factor under section *Degradation Factor*.

Fuel Cost Components

$FCCIG_{(Rev)(adj)}$	=	$FCCIG_{(Rev)} \times PL_{Gas} \times D_y$
$FCCIG\text{-}SC_{(Rev)(adj)}$	=	$FCCIG\text{-}SC_{(Rev)} \times PL_{Gas} \times D_y$
$FCCRLNG_{(Rev)(adj)}$	=	$FCCRLNG_{(Rev)} \times PL_{Gas} \times D_y$
$FCCRLNG\text{-}SC_{(Rev)(adj)}$	=	$FCCRLNG\text{-}SC_{(Rev)} \times PL_{Gas} \times D_y$
$FCCHSD_{(Rev)(adj)}$	=	$FCCHSD_{(Rev)} \times PL_{HSD} \times D_y$
$FCCHSD\text{-}SC_{(Rev)(adj)}$	=	$FCCHSD\text{-}SC_{(Rev)} \times PL_{HSD} \times D_y$
Where;		
SC	=	Simple cycle
PL_{Gas}	=	Weighted average Part load factor for the month for Gas operations as calculated on mechanism explained under section *"Mechanism of Part load Adjustment factor"* for combined cycle and simple cycle operations, respectively
PL_{HSD}	=	Weighted average Part load factor for the month for HSD operations as calculated on mechanism explained under section *"Mechanism of Part load Adjustment factor"* for combined cycle and simple cycle operations, respectively
D_y	=	Degradation factor for the year based on degradation table given in **BQPS II - Annexure F (i) to F (ii)**

1.2.2. O&M Expenses

Under the existing MYT structure, capital expenditure for maintenance of plant is allowed as investment plan and becomes part of Regulatory Asset base, whereas revenue expenses are allowed as part of O&M expenses.

However, as explained above, KE is proposing a tariff for remaining life of generation plant with structure in line with IPPs where both capex and revex nature of expenditures are allowed through Fixed and Variable O&M. This will help to have visibility and align the tariff structure with CTBCM requirement and industry practice.

Regulatory asset base based on current structure at the end of FY 2023 will be locked and used as a basis for new MYT and further additions to RAB will not be made except for addition to the plant infrastructure for HSD infrastructure at BQPS II, for which a onetime request will be submitted for adjustment in tariff component post HSD commissioning. KE has requested for investment of HSD infrastructure as detailed in section 1.5.

Accordingly, proposed O&M expenses are bifurcated in Variable and Fixed, and then further bifurcated in Foreign and local, based on nature of expenses for applying relevant indexations.

Bifurcation of O&M is as follows:

Variable O&M local

The Variable O&M Local represents plant maintenance costs consisting of both parts and services which are procured in local currency by the Company. Being variable in nature, these costs are linked to plants' operating hours and incurred on some specific machine operating hours intervals.

For tariff calculation purposes, KE has calculated levelized Variable O&M Local keeping in view costs of FY 2022 and based on projected Variable O&M local for the remaining useful life of the plant, including maintenance expenses being incurred at regular intervals of hours recommended by OEM, which shall be indexed with Pak CPI at the start of each quarter.

Accordingly, levelized variable O&M cost per year **PKR 135 million per year** (Gas based) translating into **PKR 0.04 / kWh** at reference CPI of **158.48** as follows:

Category	Amount – PKR million	Units at plant factor – GWh	O&M Per unit – PKR / kWh
Gas	135	3,830.17	0.0352
HSD	136	3,589.53	0.0379

The same shall be indexed at the start of each quarter as follows:

$Var.\ Local.\ O\&M_{(Rev)}$	=	$Var.\ Local\ O\&M_{(Ref)} \times CPI_{(Rev)} / CPI_{(Ref)}$
Where;		
$Var.\ Local.\ O\&M_{(Rev)}$	=	Revised Variable O&M local Component of Tariff
$Var.\ Local\ O\&M_{(Ref)}$	=	Reference Variable O&M local Component of Tariff
$CPI_{(Rev)}$	=	Revised CPI – National notified by Pakistan Bureau of Statistics latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
$CPI_{(Ref)}$	=	Reference CPI of **158.48** average for FY 2022

Variable O&M Foreign

The Variable O&M Foreign is for imported Gas Turbine capital spare parts, electrical spares and technical services required. Further, KE has a CSA/LTSA with GE whereby GE provides planned / unplanned parts and repair services for the maintenance of GTs which mainly include AGP and MI. Further, guaranteed level of availability has to be ensured by GE under the contract.

KE is contractually bound for paying quarterly payment to GE for above services, fee of which is Fixed & Variable in nature. Variable Fee is linked with Plant running hours whereas, fixed fee is payable on quarterly basis.

For tariff calculation purposes, KE has calculated levelized Variable O&M Foreign keeping in view costs of FY 2022 and based on projected Variable O&M Foreign for the remaining useful life of the plant, including maintenance expenses being incurred at regular intervals of hours recommended by OEM which shall be indexed with US CPI and exchange rates at the start of each quarter.

Accordingly, levelized variable O&M Foreign component cost per year is estimated at **PKR 1,520 million** per year (Gas based) translating into **PKR 0.40 / kWh** at reference USD CPI of **282.03** and exchange rate of **PKR 206/ USD** as follows:

Category	Amount – PKR million	Units at plant factor – GWh	O&M Per unit – PKR / kWh
Gas –	1,520	3,830.19	0.3969
HSD	2,689	3,589.53	0.7491

The same shall be indexed at the start of each quarter as follows:

Var. Foreign. O&M$_{(Rev)}$	=	Var. Foreign O&M$_{(Ref)}$ x USCPI$_{(Rev)}$ / USCPI$_{(Ref)}$ x ER$_{(Rev)}$ / ER$_{(Ref)}$
Where;		
Var. Foreign. O&M$_{(Rev)}$	=	Revised Variable O&M Foreign Component of Tariff
Var. Foreign O&M$_{(Ref)}$	=	Reference Variable O&M Foreign Component of Tariff
USCPI$_{(Rev)}$	=	The revised US CPI (All Urban Consumers) notified by US Bureau of Labor Statistics latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
USCPI$_{(Ref)}$	=	The reference US CPI of **282.03** average for FY 2022
ER$_{(Rev)}$	=	The Revised TT & OD selling rate of USD as notified by National bank latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
ER$_{(Ref)}$	=	The reference exchange rate of **PKR 206 / USD** as of FY2022

Fixed O&M local

Fixed costs are incurred to ensure plant's availability irrespective of its operations. This component includes both plant maintenance expenses and necessary allied costs of salaries and wages, third party services, transport etc.

For tariff calculation purposes, KE has calculated levelized Fixed O&M Local considering FY 22 costs and based on the projected Fixed O&M local for the remaining useful life of the plant which shall be indexed with Pak CPI at the start of each quarter.

Accordingly, levelized Fixed O&M local component cost per year is estimated at **PKR 1,419 million** per year (Gas based) translating into **PKR 0.37 / kW/h** (based on units **at plant factor)** at reference Pak CPI of **158.48** (Average FY 22) based on projected expenses as follows:

Category	Amount – PKR million	Units at plant factor – GWh	O&M Per unit – PKR / kWh
Gas	1,419	3,830.19	0.3704
HSD	1,419	3,589.53	0.3953

The same shall be indexed at the start of each quarter as follows:

Fix. Local. O&M$_{(Rev)}$	=	Fix. Local O&M$_{(Ref)}$ x CPI$_{(Rev)}$ / CPI$_{(Ref)}$
Where;		
Fix. Local. O&M$_{(Rev)}$	=	Revised Fixed O&M local Component of Tariff
Fix. Local O&M$_{(Ref)}$	=	Reference Fixed O&M local Component of Tariff
CPI$_{(Rev)}$	=	Revised CPI notified by Pakistan Bureau of Statistics latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
CPI$_{(Ref)}$	=	Reference CPI of **158.48 average FY 2022**

Fixed O&M Foreign

Fixed costs are incurred to ensure plant's availability irrespective of its operations. These costs are critical to ensure availability and continued operations of the plant.

The Fixed O&M Foreign component consists of CSA / LTSA fee along with routine maintenances of balance of plant.

For tariff calculation purpose, KE has calculated Fixed cost foreign based on FY 2022 costs and projected Fixed cost foreign which shall be indexed to US CPI and exchange rates at the start of each quarter.

Accordingly, levelized Fixed O&M foreign component cost per year is estimated at **PKR 1,438 million** per year (Gas based) translating into **PKR 0.38 / kW/h** at reference US CPI of **282.03** average FY 2022 based on projected expenses as follows:

Category	Amount – PKR million	Units at plant factor – GWh	O&M Per unit – PKR / kWh
Gas	1,438	3,830.19	0.3754
HSD	1,438	3,589.53	0.4006

The same shall be indexed at the start of each quarter as follows:

$Fix.\ Foreign.\ O\&M_{(Rev)}$	=	$Fix.\ Foreign\ O\&M_{(Ref)} \times USCPI_{(Rev)} / USCPI_{(Ref)} \times ER_{(Rev)} / ER_{(Ref)}$
Where;		
$Fix.\ Foreign.\ O\&M_{(Rev)}$	=	Revised Fixed O&M Foreign Component of Tariff
$Fix.\ Foreign\ O\&M_{(Ref)}$	=	Reference Fixed O&M Foreign Component of Tariff
$USCPI_{(Rev)}$	=	The revised US CPI (All Urban Consumers) notified by US Bureau of Labor Statistics latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
$USCPI_{(Ref)}$	=	The reference US CPI of **282.03 average** FY 2022
$ER_{(Rev)}$	=	The Revised TT & OD selling rate of USD as notified by National bank latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
$ER_{(Ref)}$	=	The reference exchange rate of **PKR 206 / USD** as of FY22

For break up of O&M (levelized), please refer **BQPS II - Annexure G**

O&M costs both Variable & Fixed (local / foreign) have been validated and benchmarked by Independent Consultant, report of which is enclosed as **BQPS II – Annexure H.**

1.2.3. Insurance

KE requests an insurance premium up to 1% of EPC cost consistent with the insurance cost allowed to IPPs that shall be adjusted annually as per actual subject to maximum limit of 1% of EPC.

Insurance cost based on EPC cost

EPC Cost	USD 375 Mn
1% of EPC cost	USD 3.75 Mn
Reference exchange rate	PKR 206 / USD
1% of EPC Cost	PKR 772.5 Mn
Ins(Ref) Gas at 88.41% plant factor	PKR 0.2017 / kWh
Ins(Ref) HSD at 88.41% plant factor	PKR 0.2152 / kWh

Insurance component shall be adjusted with actual cost at start of the year

$Ins_{(Ref)(adj)}$	=	$Ins_{(Ref)} \times P_{(Act)} / P_{(Ref.)}$
Where;		
$Ins_{(Ref)(adj)}$	=	Adjusted Reference Insurance Component of Tariff
$Ins_{(Ref)}$	=	Reference Insurance Component of Tariff
$P_{(Ref)}$	=	Reference Premium USD 3.75 million at PKR 206 / USD
$P_{(Act.)}$	=	Actual Premium in USD or USD 3.75 million (1% of EPC cost) whichever is lower

Further, insurance component shall be adjusted quarterly based on below formula

$Ins_{(Rev)}$	=	$Ins_{(Ref)(adj)} \times ER_{(Rev)} / ER_{(Ref)}$
Where;		
$Ins_{(Ref)(adj)}$	=	Adjusted reference Insurance component of Tariff
$ER_{(Rev)}$	=	The Revised TT & OD selling rate of USD as notified by National bank latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
$ER_{(Ref)}$	=	The reference exchange rate of **PKR 206 / USD** as of FY22

1.2.4. Return on Regulatory Asset Base and Depreciation

Regulatory Asset Base

Regulatory Asset Base shall comprise of written down value of plant excluding surplus on revaluation and including Intangibles (mainly software used for regulated business) and CWIP at start of control period, which will be depreciated each year based on remaining useful life of the plant.

Under the existing MYT, Capex expenditure is allowed as part of RAB. However, in the next term KE proposes that any specific project based on NEPRA's approval (For e.g. HSD infrastructure) will form part of RAB, while remaining routine capex investments will be covered through O&M expenses in line with IPPs. In case of addition in RAB (For e.g. HSD infrastructure), KE will file for a onetime adjustment in reference tariff.

With regard to RAB, KE has projected RAB as of FY 2023 at **PKR 40,268 million** and accordingly, requests NEPRA to actualize the same at the start of the next term i.e. July 2023 based on audited financial statements.

RAB movement is enclosed as **BQPS II - Annexure I**. Once RAB at end of FY 2023 will be finalized post audit of financial statements, KE will file **BQPS II - Annexure I** with updated opening RAB and accordingly related tariff components, including RoRB and Depreciation will be updated.

Similarly, after addition of HSD infrastructure, Annexure I will be filed with updated numbers.

Return

Return shall be calculated based on Return on Equity, cost of debt and Debt to Equity ratio

Debt Equity ratio

Debt to equity ratio is proposed to be 70:30 as allowed in current MYT, subject to discussion in Main Section, para 3.2.

Cost of Debt

Like existing MYT, cost of debt for local component will be calculated based on 3 month KIBOR plus a spread of 2.5% and cost of debt for foreign component is calculated based on 3 month LIBOR, spread 4.5% and hedging cost based on difference of 3 month KIBOR and 3 month LIBOR plus a hedging cost spread of 2.5%.

Accordingly, cost of debt has been calculated using reference 3 month KIBOR of **15.16%** as of FY22 reference 3 month LIBOR of **2.29%** as of FY22.

Local to Foreign Debt Ratio

Considering no foreign debt is currently drawn for BQPS II, Debt has been taken at local for cost of debt.

KIBOR / LIBOR is proposed to be indexed each quarter going forward based on actual.

Accordingly, , Return on Regulatory Base – Cost of Debt (RoRBCoD) (local) comes out to **PKR 1.27 / kW/h** (based on units at plant factor) for FY 2024. For year wise tariff components for Gas and HSD, please refer Tariff table.

RoRB – Local component of Cost of Debt

$RoRBCoD\ Local_{(Rev)}$	=	$RoRBCoD\ Local_{(Ref)}$ for relevant year x $CoD\ Local_{(Rev)}$ / $CoD\ Local_{(Ref)}$
Where;		
$RoRBCoD\ Local_{(Rev)}$	=	Revised Local RoRB cost of debt component of tariff
$RoRBCoD_{(Ref)}$	=	Reference Local RoRB cost of debt component of tariff
$CoD\ Local_{(Rev)}$	=	$KIBOR_{(Rev)}$ + 2.5%
$CoD\ Local_{(Ref)}$	=	$KIBOR_{(Ref)}$ + 2.5%
$KIBOR_{(Rev)}$	=	The revised 3 month KIBOR as published by State Bank of Pakistan latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
$KIBOR_{(Ref)}$	=	The reference 3 month KIBOR of **15.16%** as of FY22

Cost of Equity

Keeping in view currently allowed returns, return on equity of USD based 15% is proposed that shall be indexed based on changes in USD to PKR exchange rate at the start of each quarter.

For the purpose of Exchange rate indexation, indexation with reference to FY 2016 has been calculated considering weightage of RAB each year till FY 2023 inline with mechanism used by NEPRA in the current MYT. Accordingly, reference indexed cost of equity has been calculated using reference current exchange rate of **PKR 206 / USD.** Please refer calculation in **BQPS II - Annexure J (i).**

Accordingly, Return on Regulatory Base – Cost of Equity (RoRBCoE) comes out to **PKR 0.93 / kWh** for FY 2024 considering USD RoE of **15%** and indexed RoE of **30.39%** at exchange rate of **PKR 206 / USD**. Accordingly, KE requests the Authority to consider the actual average exchange rate of FY23 at the time of actualization of RAB at FY23 as mentioned in **"Regulatory Asset Base"** section above. For year wise tariff components for Gas and HSD, please refer Tariff table.

Indexation formula is given below. Further, an illustration for RoE indexation is given in **BQPS II - Annexure J (ii).**

RoRB – Component of Cost of Equity

$RoRBCoE_{(Rev)}$	=	$RoRBCoE_{(Ref)}$ for relevant year x $ER_{(Rev)}$ / $ER_{(Ref)}$
Where;		
$RoRBCoE_{(Rev)}$	=	Revised RoRB cost of equity component of tariff
$RoRBCoE_{(Ref)}$	=	Reference RoRB cost of equity component of tariff
$ER_{(Rev)}$	=	The Revised TT & OD selling rate of USD as notified by National bank of Pakistan latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
$ER_{(Ref)}$	=	The Reference exchange rate of **PKR 206 / USD as of FY22**

Depreciation

Depreciation shall be calculated as straight line based on written down value of RAB at the end of FY 2023 (Current control period) and remaining useful life at the end of Control period.

Further, any additions relating to any specific capital expenditure during the period will accordingly be added to the RAB and depreciation schedule will be recalculated.

Further, in the event of change in RAB due to addition of any specific project approved by the Authority, then KE will request for adjustment in reference tariff for remaining life of the plant.

Accordingly, Depreciation component comes out to **PKR 0.54 / kW/h** for FY 2024. For year wise tariff components for Gas and HSD, please refer Tariff table.

1.2.5. Cost of Working Capital

KE requests NEPRA for working capital mechanism based on below formula, consistent with IPPs.

Legend	Working Capital Components
A	Cost of Stores & spares inventory
B	Cost of Fuel Inventory (currently not included, will be requested post commissioning of HSD)
C	Cost of Fuel in Receivable cycle based on 30 days receipt period and 7 days payment period on RLNG fuel with 17% sales tax – based on units at plant factor, to be actualized every quarter.
D	Cost of SBLC (currently included based on SBLC given to SSGC allocated to BQPS II plant, will be updated in future in case of any new agreement)

Working capital component has been calculated for the control period based on projected movement of balances year on year and reference KIBOR of 15.16% as of FY22 plus a short term spread **2%**.

Cost of working capital shall be indexed with actual KIBOR and change in fuel prices, on **quarterly basis.** Further, reference component shall be updated in future through a request in case of any change in circumstances for example introduction of HSD inventory.

Based on above, working capital component comes out to **PKR 0.43 / kW/h as of FY 2024.** For year wise tariff components for Gas and HSD, please refer Tariff table.

Working Capital requirement shall be indexed through updating the template enclosed in **BQPS II - Annexure K** at each quarter, including addition of HSD inventory and update in SBLC cost pursuant to any changes / addition in the arrangement(s).

1.2.6. Pass through items

Similar to the current MYT and as allowed to IPPs, KE proposes the following items to be allowed as pass-through costs in the new MYT.

Corporate tax and WWPF / WWF

Currently, KE is an integrated entity therefore Corporate tax and WPPF / WWF on overall company level is a pass through item within MYT.

Considering that legal structure will remain same, KE is proposing that Corporate tax and WPPF / WWF shall be passed through to consumers in Supply Tariff.

However, going forward, in case of any change in legal structure whereby a Corporate tax and WWF / WPPF is separately levied on Generation plant, same shall be passed through as done in case of IPPs.

Unrecovered cost of Current MYT

Any unrecovered cost of Current MYT shall be pass through in tariff.

Startup Charges

Startup : Any startup of a Gas / HSD Unit that is necessary for a station to comply with the Dispatch requirements / Instructions and that results in the synchronization with the grid system.

Consistent with industry practice, KE requests the Authority to allow start up charges, as defined below.

In any month, if a startup occurs in a Financial year, KE shall be allowed to claim "Start-Up charges" based on Reference start up charges indexed with relevant indices, including fuel prices and electricity tariff as requested below.

"Start-Up Charge" shall consist of two components and is calculated as follows:

Start-Up Charge = MDI Charge+ Reference Unit Start-Up Charges.

a) **MDI Charge:** The MDI charge shall be based on maximum demand recorded during the relevant month at startup and shall be calculated based on the then applicable MDI rate in Rs/kW, from time to time,

b) **Reference Unit Start-Up Charge:** This cost will cover the consumables, fuel and equivalent operating hours consumed for the start-ups.

The Start-Up Charges for each Start-Up shall be calculated as follows:

SC_M	=	$MDIR_x \times N_1 + ((SCPI_{Ref} \times SCFadjust_{PI}) + ((SCFC_{Ref} \times SCFadjust_{FC})) \times N_2$
Where:		
SC_M	=	The Start Up Charges during the Month M
$MDIR_x$	=	Total fixed charges for the month due to Distributing segment during the relevant month (based on MDI for the month and MDI charge) divided by the total number of Start Ups performed during the month.
N_1	=	The number of Start ups to be claimed, unless any shutdowns claimed during the relevant month in which case this will be considered as zero.
N_2	=	The number of Start ups to be claimed
$SC_{(Ref)}$	=	The Reference Start-Up Charge as given below. Consists of the following two components:
$SCPI_{Ref}$	=	The Reference Start-Up Charge for the Power Import from Transmission System during GT Startup till Synchronization.
$SCFadjust_{PI}$	=	The Startup Charges Adjustment Factor for the hour h for the Import of Power from Transmission Network as per following formula: **$SCFadjust_{PI}$ = $WAVCT\text{-}B5_{(Rev)}$ / $WAVCT\text{-}B5_{(Ref)}$** where: **$WACT\text{-}B5_{(Rev)}$** = Weighted Average of the latest notified variable consumer tariff for the Industrial Consumer Category (B-5) based on a weightage of 4:20 for Peak & Off-Peak Rates respectively. **$WACT\text{-}B5_{(Ref)}$** = Weighted Average of the reference notified variable consumer tariff for the Industrial Consumer Category (B-5) based on a weightage of 4:20 for Peak & Off-Peak Rates (i.e. Rs. 30.33 per kWh & Rs. 23.55 per kWh) respectively **(i.e. Rs. 24.68 per kWh)**
$SCFC_{Ref}$	=	The Reference Start-Up Charge for the Fuel Consumed during GT Startup till Synchronization including ST Synchronization, if applicable.
$SCFadjust_{FC}$	=	The Startup Charges Adjustment Factor for the hour h for the consumption of fuel as per the following formula:

		For Gas[3] – $SCFadjust_{FC} = FCCG_{Rev} / FCCG_{Ref}$ For HSD – $SCFadjust_{FC} = FCCHSD_{Rev} / FCCHSD_{Ref}$

TYPE OF START (Gas) – Note	Reference Single GT StartUp Charges	Reference one-third Complex StartUp Charges (1GTxST)	Reference two-third Complex Start Up Charges(2GTsxST)	Reference Complex Start-Up Charges(3GTsxST) – Note
	PKR million			
Hot Start: Total Cost	0.64	3.70	7.35	11.01
Recovery based on Simple Cycle	-	(2.41)	(4.93)	(7.75)
Net Claim	0.64	1.29	2.42	3.26
Warm Start: Total Cost	0.64	12.34	25.04	38.80
Recovery based on Simple Cycle	-	(9.64)	(19.74)	(31.00)
Net Claim	0.64	2.70	5.31	7.80
Cold Start: Total Cost	0.64	19.21	39.10	60.89
Recovery based on Simple Cycle	-	(15.38)	(31.50)	(49.49)
Net Claim	0.64	3.83	7.60	11.40

Note: Costs relating to HSD will be provided post commissioning. Furthermore, recovery on units sent to grid has been based on simple cycle tariff, to be allowed separately for NEO.

Black Start Cost

Black Start : Any startup of a Gas / HSD Unit having black startup facility, that is necessary for the Company to comply with a Dispatch Instruction or a Revised Dispatch Instruction, that results in restoring power supply to the respective power plant, and to a part of an electric grid without relying on the external electric power transmission network to recover from a total or partial shutdown of the transmission network. KE requests the Authority to allow black start charges, as defined below.

In any month, KE shall be allowed to claim "Black-start charges" based on Reference Black-start charges indexed with relevant indices, including fuel prices as requested below.

"Black-start Charges" shall consist of consumables, fuel and equivalent operating hours consumed for the black-start.

[3] Proportion of Indigenous Gas & RLNG in both Reference & Revised FCCG will be calculated based on the actual mix of Indigenous Gas & RLNG used as appearing in SSGC Bills for the relevant month in which Startup Cost is being claimed whereas Reference and Revised Fuel Cost Component will be calculated as per Section 1.2.1 above.
Furthermore, in case Gas is made available through Dedicated Line/ Alternate Supplier as discussed in Section 1.2.1 above, then separate costs will be calculated and submitted to the Authority for approval.

The Black-start Charges payable by the Power Purchaser for each Start-up shall be calculated as follows:

BSC_M	=	$(BSC_{Ref} \times BSCFadjust_h) \times N)$
Where:		
BSC_M	=	the Black-start Charges during the Month M;
BSC_{Ref}	=	the Reference Black-Startup Charge as given in the table below.
N	=	The number of black startups to be claimed
$BSC_{(Ref)}$	=	The Reference Black-Startup Charge as given below.
$BSCFadjust_h$	=	The Black-start Charges Adjustment Factor for the hour h; where, For HSD – $SHCFadjust_h = FCCHSD_{Rev} / FCCHSD_{Ref}$

Description	Cost – PKR million
Total Cost	1.19

Note: Costs will be updated post commissioning of HSD as explained in point 1.1 above.

Shutdown Cost

Shutdown : Any shutdown of a Gas / HSD Unit that is necessary for a station to comply with the Dispatch requirements / Instructions which results in the de synchronization with the grid system.

KE requests the Authority to allow shutdown charges, as defined below.

In any month, KE shall be allowed to claim "Shutdown charges" based on Reference Shutdown charges indexed with relevant indices, including fuel prices and electricity tariff as requested below.

"Shutdown Charge" shall consist of two components and is calculated as follows:

Shutdown Charge = MDI Charge+ Reference Unit Shutdown Charges.

a) **MDI Charge:** The MDI charge shall be based on maximum demand recorded during the relevant month at shutdown and shall be calculated based on the then applicable MDI rate in Rs/kW, from time to time,

b) **Reference Unit Shutdown Charge:** This cost will cover the consumables, fuel and equivalent operating hours consumed for the shutdown.

The Shutdown Charges payable by the Power Purchaser for each Shutdown shall be calculated as follows:

SHC_M	=	$MDIR_x \times N_1 + ((SHCPI_{Ref} \times SHCFadjust_{PI}) + (SHCFC_{Ref} \times SHCFadjust_{FC})) \times N_2$
Where:		
SHC_M	=	The Shutdown Charges during the Month M
$MDIR_x$	=	Total fixed charges for the month due to Distributing segment during the relevant month (based on MDI for the month and MDI charge) divided by the total number of Shutdowns performed during the month.
N_1	=	The number of Shutdowns to be claimed, unless any startups claimed during the relevant month in which case this will be considered as zero.
N_2	=	The number of Shutdowns to be claimed
$SHC_{(Ref)}$	=	The Reference Shutdown Charge as given below. Consists of the following two components:
$SHCPI_{Ref}$	=	The Reference Shutdown Charge for the Power Import from Transmission System till GT & ST are in Standby mode.
$SHCFadjust_{PI}$	=	The Shutdown Charges Adjustment Factor for the hour h for the Import of Power from Transmission Network as per following formula: **$SHCFadjust_{PI} = WAVCT\text{-}B5_{(Rev)} / WAVCT\text{-}B5_{(Ref)}$** where: **$WACT\text{-}B5_{(Rev)}$** = Weighted Average of the latest notified variable consumer tariff for the Industrial Consumer Category (B-5) based on a weightage of 4:20 for Peak & Off-Peak Rates respectively. **$WACT\text{-}B5_{(Ref)}$** = Weighted Average of the reference notified variable consumer tariff for the Industrial Consumer Category (B-5) based on a weightage of 4:20 for Peak & Off-Peak Rates (i.e. Rs. 30.33 per kWh & Rs. 23.55 per kWh) respectively **(i.e. Rs. 24.68 per kWh)**
$SHCFC_{Ref}$	=	The Reference Shutdown Charge for the Fuel Consumed during GT & ST (if applicable) De-Synchronization till Flame-Off.
$SHCFadjust_{FC}$	=	The Shutdown Charges Adjustment Factor for the hour h for the consumption of fuel as per the following formula: For Gas[4] – $SHCFadjust_{FC} = FCCG_{Rev} / FCCG_{Ref}$ For HSD – $SHCFadjust_{FC} = FCCHSD_{Rev} / FCCHSD_{Ref}$

Type of Shutdown (Gas)	Reference Single GT Shutdown Charges	Reference one third Complex Shutdown Charges(1 GTxST)	Reference two third Complex Shutdown Charges(2GTsxST)	Reference Complex Shutdown Charges (3GTsxST)
	PKR million			
Amount	0.46	1.29	2.36	2.58

Costs pursuant to Import of Power during Non-Operational Hours

Costs of Import of Power for the period when plant is stand-by but not in operation, in accordance with EMO is requested to be passed through in Tariff.

The Power Import Charges for each month shall be based on actual amount billed by the Supply business based on Import readings recorded, including monthly MDI / Fixed Charges paid to Supply Business for fixed capacity dedicated for plant startup operations. Amount

[4] Proportion of Indigenous Gas & RLNG in both Reference & Revised FCCG will be calculated based on the actual mix of Indigenous Gas & RLNG used as appearing in SSGC Bills for the relevant month in which Shutdown Cost is being claimed wherens Reference and Revised Fuel Cost Component will be calculated as per Section 1.2.1 above.
Furthermore, in case Gas is made available through Dedicated Line/ Alternate Supplier as discussed in Section 1.2.1 above, then separate costs will be calculated and submitted to the Authority for approval.

billed shall be reduced by any MDI Charges recovered under Startup & Shutdown Costs as per mechanism explained in this petition.

1.3. Billing Mechanism

Billing shall be based on a Take-or-pay mechanism where Capacity payment shall be paid for the Available Capacity and Energy payments for the Net Electrical Output.

Available capacity for a month shall be based on hourly Annual Dependable Capacity after considering outages in each year.

Annual Dependable Capacity shall be based on ADC Test to be carried out at start of each year, to be carried out by Plant team and results of which shall be submitted to NEPRA.

NEO will be based on energy recorded through meters as explained in above sections.

1.3.1. Capacity Payments

Capacity cost includes Fixed O&M local, Fixed O&M foreign, Insurance, Working capital, RoRB – cost of debt, RoRB – cost of equity and Depreciation which are detailed in above sections. Capacity payment shall be made on a monthly basis as per formula detailed below:

Monthly Capacity Payment

$CapacityPayment$	=	$CapacityPrice \times AvailCap_m \times DO_y$
Where:		
CapacityPayment	=	the Capacity Payment, in Rupee, paid for a Month;
$AvailCap_m$	=	Aggregate Available capacity, in kWh, for the month based on Hourly Available capacity
CapacityPrice	=	(Fixed O&M local + Fixed O&M foreign, working capital + RoRB – cost of debt + RoRB – cost of equity + insurance) for the relevant month after indexations as explained above.
DO_y	=	the output degradation factor, as given in **BQPS II - Annexure F(ii)** for Gas, for the relevant year. (For HSD will be submitted post HSD commissioning)

Capacity payment shall be separately calculated for Gas and HSD based on Available capacity, in kWh on HSD / Gas and their respective Capacity components. For the purpose of calculation of Available capacity on HSD, capacity shall be considered based on actual operations on HSD, and remaining capacity shall be considered to be available on Gas.

Further, available capacity shall also be adjusted with ambient temperature as per the table given in **BQPS-II – Annexure L.** Moreover, example for calculation of hourly available capacity payment of Gas is also given in **BQPS II – Annexure M.** Ambient temperature table example of HSD will be submitted once commissioned.

Outages

Plant will maintain an overall Annual Availability of 90% considering annual outages of 10%. In addition, in case of periodic overhauls, following GT / ST wise maintenance outage days shall be allowed;

- **20 Days (480 hours)** of schedule outages Per GT & ST,
- **6.5 Days** of Maintenance outages per GT & ST
- **10 Days (240 hours)** of forced outages Per GT & ST

Maintenance Outage will be required as follows:

- **1.5 Days / GT** for compressor offline water washing (Every 2000 Hours in summers / 1000 Hours in winter), additionally the outage also covers filter replacement, a total of 4.5 Days in a year.
- **2 Days / GT** for Borescope (Every 6000 Hours)

Further, Additional outages will be required as below:

- ST Major Overhaul at every 5 years in which case the Company shall be entitled to **Sixty (60) days** of Scheduled Outage periods.
- ST Minor Overhaul at every 3 years of ST Major Overhaul in which case the Company shall be entitled to **Thirty (30) days** of Scheduled Outage periods.
- GT Major Overhaul at every 64,000 hours, in which case the Company shall be entitled to **Thirty-Seven (37) days** of Scheduled Outage periods.
- GT HGPI at every 32,000 hours, in which case the Company shall be entitled to **Seventeen (17) days** of Scheduled Outage periods

These overhauls will be required when plant will reach the required Factored Fired hours. Based on annual availability of 90% and expected occurrence of Overhauls, Levelized Plant Availability has been calculated as 88.41%. **Please refer BQPS II - Annexure N**

For the purpose of calculation of Availability, 10% annual operation on HSD has been assumed with remaining capacity on Gas, and outage schedule has been made accordingly. In case if HSD operations exceed 10% in a year impacting average availability over the life, KE will file a one time adjustment to adjust the availability % used in the tariff.

Although, BQPS II gas pressure situation is better than other plants at Korangi and Site, however, acute low supplies have been witnessed in recent years in winters from SSGC resulting in sometimes lower supplies at BQPS II. Considering that this is not under KE's control, KE would request that plant should be considered as available when plant is standby however, cannot be dispatched due to non-availability of Gas or Gas pressure.

1.3.2 Energy Payments

Energy cost includes

- Fuel cost (including Natural Gas, RLNG & HSD),
- Variable O&M local & Variable O&M foreign which are detailed in above sections multiplied by degradation factor of relevant year.

The Energy Price shall be calculated using the Reference Fuel Cost Component during the year as follows:

Fuel	NEO for the month	Fuel	Variable O&M Local	Variable O&M Foreign	Total Variable O&M	Output Degradation factor	Variable O&M after Degradation factor	EPP per unit	Energy payment
	A	b	c	d	e=c+d	f	g=exf	h=b+g	i=axh
	kWh	PKR / kWh	PKR / kWh	PKR / kWh	PKR / kWh	Factor	PKR / kWh	PKR / kWh	PKR
Natural Gas – Combined cycle	Units	$FCCIG_{(Rev)(adj)}$	Var. Local. $O\&M_{(Rev)}$	Var. Foreign. $O\&M_{(Rev)}$	Calculated	Relevant factor	Calculated	Calculated	Calculated
Natural Gas – Simple	Units	$FCCIG\text{-}SC_{(Rev)(adj)}$	Var. Local. $O\&M_{(Rev)}$	Var. Foreign. $O\&M_{(Rev)}$	Calculated	Relevant factor	Calculated	Calculated	Calculated
RLNG – Combined cycle	Units	$FCCRLNG_{(Rev)(adj)}$	Var. Local. $O\&M_{(Rev)}$	Var. Foreign. $O\&M_{(Rev)}$	Calculated	Relevant factor	Calculated	Calculated	Calculated
RLNG – Simple	Units	$FCCRLNG\text{-}SC_{(Rev)(adj)}$	Var. Local. $O\&M_{(Rev)}$	Var. Foreign. $O\&M_{(Rev)}$	Calculated	Relevant factor	Calculated	Calculated	Calculated
HSD – Combined cycle	Units	$FCCHSD_{(Rev)(adj)}$	Var. Local. $O\&M_{(Rev)}$	Var. Foreign. $O\&M_{(Rev)}$	Calculated	Relevant factor	Calculated	Calculated	Calculated
HSD – Simple cycle	Units	$FCCHSD\text{-}SC_{(Rev)(adj)}$	Var. Local. $O\&M_{(Rev)}$	Var. Foreign. $O\&M_{(Rev)}$	Calculated	Relevant factor	Calculated	Calculated	Calculated
Total	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated

1.4. O&M Sharing mechanism

KE is proposing to share the savings in O&M, if any, in proportion of 60:40 for Consumers : KE, which shall be calculated at completion of Overhaul cycle.

Overhaul cycle shall include

- One Major Overhaul for each GT
- One HGPI for each GT
- One Minor overhaul for ST
- One Major overhaul for ST

At completion of Overhaul cycle, any savings in O&M shall be shared in 60:40 for Consumers: KE, where is in case of Loss, it shall be carried forward to future years to set off with expenses of future years.

For the purpose of calculation of sharing of O&M savings/ (loss) at the completion of each major overhaul cycle, O&M expenses (O&M Expenses as per Profit & Loss Account & Addition to CWIP) as per the audited financial statements shall be used.

An illustration of sharing mechanism for one cycle is given in **BQPS - II - Annexure O**. Same shall be applicable for next overhaul cycles till the end of plant life.

1.5. Other items

HSD Commissioning/ Alternate Supplier of RLNG

KE will submit details of HSD commissioning to NEPRA separately for approval. Post approval of investments for HSD commissioning, HSD infrastructure will be built. Further, post HSD commissioning, KE will submit a one-time adjustment for reference tariff components, based on allowed investment, Net capacity and heat rate on HSD.

Similarly, in case of any additional requirements on account of arranging RLNG through an Alternative Supplier as detailed in **Section 1.1 - Plant Capacity and Heat Rate** above, KE will submit details of the proposal separately to NEPRA for approval. Post approval of the

Authority, KE will file a one-time adjustment for reference tariff components, based on allowed investment, Net capacity and heat rate impacts.

Other Items generally covered under PPA

Unlike Current MYT, KE has proposed Tariff structure in line with IPPs. In case of IPPs, certain modalities / charges are governed under the Power Purchase Agreement, which have been included in the petition. However, detailed modalities and other remaining terms will be agreed in a "Service Level Agreement" for which KE has prepared and Annexed a Head of Terms (please refer, **BQPS II – Annexure P**). Full scope SLA will be prepared and submitted for NEPRA's approval based on Tariff determination.

Costs pursuant to Unbundling in future

KE is an integrated utility and therefore there are certain synergies in common costs. In future, if there is any legal unbundling, KE will file for a onetime adjustment for additional costs pursuant to that.

Costs pursuant to Force Majeure Events

Costs related to a Force Majeure Events are allowed to IPPs and accordingly KE also request those to be passed through in Tariff. Details and modalities of force majeure events will be included under the SLA, pursuant to the Terms of Agreements as explained in **BQPS II – Annexure P**, in line with agreements of other IPPs.

1.6. Summary of Base Tariff FY 2024 & Indexation Mechanism

In view of the foregoing and considering the significant changes in tariff structure, following component wise indexation mechanism is being requested to ensure recovery of prudent costs critical to ensure quality of service.

Tariff Components	RLNG PKR/kWh	HSD PKR/kWh	Indexation Mechanism	Reference Rates
Energy cost Fuel cost	27.25	48.73	• Indexation with fuel price & CV (for HSD) • Impact of allowed part load and degradation factor (monthly)	• Net HHV RLNG price of PKR 3,300.82 / MMBtu • Net HHV HSD price of PKR 219.94/ liter • Calorific value of HSD of 36,252 btu / liter
Variable O&M – local	0.04	0.04	• Indexed with Pak CPI (Quarterly)	• CPI of 158.48 for FY 2022 average
Variable O&M - Foreign	0.40	0.75	• Indexed with US CPI and USD to PKR exchange rate (Quarterly)	• US CPI of 282.03 for FY 22 average • Exchange rate of PKR 206 / USD as of FY22
Energy cost subtotal	**27.68**	**49.51**		
Capacity cost Fixed O&M - local	0.37	0.40	• Indexed with Pak CPI (Quarterly)	• CPI of 158.48 for FY 2022 average
Fixed O&M - Foreign	0.38	0.40	• Indexed with US CPI and USD to PKR exchange rate (Quarterly)	• US CPI of 282.03 for FY 22 average • Exchange rate of PKR 206 / USD as of FY22
Insurance	0.20	0.22	• Indexed with USD to PKR exchange rate – quarterly • Annual actualization based on capping of 1% of EPC cost (in USD terms)	• Exchange rate of PKR 206/ USD as of FY22
Working Capital	0.43	0.46	• Indexed with KIBOR (Quarterly) and change in fuel prices.	• KIBOR of 15.16% as of FY22
RoRB - Cost of Debt Local	1.27	1.35	• Indexed with KIBOR (Quarterly) • Recalculated based on RAB changes due to addition of specific project approved by NEPRA	• KIBOR of 15.16% as of FY22
RoRB - Cost of Equity	0.93	1.00	• Indexed with USD to PKR exchange rate • Recalculated based on RAB changes due to addition of specific project approved by NEPRA	• Exchange rate of PKR 206 / USD as of FY22
Depreciation	0.54	0.58	• Recalculated based on RAB changes due to addition of specific project approved by NEPRA	
Capacity cost subtotal	**4.12**	**4.40**		
Total Base Tariff – FY 2024	**31.80**	**53.91**		
Levelized tariff	**30.70**	**52.73**		
Energy cost Fuel cost – Simple cycle	40.64	71.21	• Indexation with fuel price & CV (for HSD) • Impact of allowed part load and degradation factor (monthly)	• Net HHV RLNG price of PKR 3,300.82 / MMBtu • Net HHV HSD price of PKR 219.94/ liter • Calorific value of HSD of 36,252 btu / liter

Fuel cost – Ind gas - CC	7.07	n/a	• Indexation with fuel price • Impact of allowed part load and degradation factor (monthly)	• Net HHV Ind Gas price of PKR 857 / MMBTU
Fuel cost – Ind gas - OC	10.55	n/a	• Indexation with fuel price • Impact of allowed part load and degradation factor (monthly)	• Net HHV Ind Gas price of PKR 857 / MMBTU

Please refer following tariff tables for year wise tariffs.

K-Electric Limited
Generation Plants Tariff Petition
BQPS II Plant
Tariff table - FY 2024 and onwards

Gas Fuel - RLNG

Gross Capacity	525.6	MW	Exchange rate	286.0	PKR / USD
Net Capacity	494.5	MW	KIBOR	15.2%	%
Units at full capacity	4,332.1	GWh	LIBOR	2.3%	%

		Energy Purchase Price (PKR / kWh)				Capacity Purchase Price PKR / kW / Hour at 88.41% Plant factor											
Year		Fuel cost - ECC - RLNG	Variable O&M - Local	Variable O&M - Foreign	EPP	Fixed O&M - Local	Fixed O&M - Foreign	Insurance	RoRB - Cost of debt - local	RoRB - Cost of debt - foreign	RoRB - Cost of Equity	Depreciation	Working Capital	CPP	Total tariff - PKR / kWh	Total tariff - Cents / kWh	CPP - PKR / kW / Annum
		a	b	c	d = sum(a:c)	e	f	g	h	i	j	k	l	m = sum(e:l)	n = d + m	o = n / 286	p
1	2024	27.25	0.04	0.40	27.68	0.37	0.38	0.20	1.27	-	0.93	0.54	0.43	4.12	31.80	15.44	3,009
2	2025	27.25	0.04	0.40	27.68	0.37	0.38	0.20	1.20	-	0.88	0.54	0.43	4.01	31.69	15.38	2,924
3	2026	27.25	0.04	0.40	27.68	0.37	0.38	0.20	1.13	-	0.83	0.54	0.43	3.89	31.57	15.33	2,839
4	2027	27.25	0.04	0.40	27.68	0.37	0.38	0.20	1.06	-	0.79	0.54	0.43	3.77	31.45	15.27	2,753
5	2028	27.25	0.04	0.40	27.68	0.37	0.38	0.20	1.00	-	0.74	0.54	0.43	3.65	31.34	15.21	2,668
6	2029	27.25	0.04	0.40	27.68	0.37	0.38	0.20	0.93	-	0.69	0.54	0.43	3.54	31.22	15.16	2,583
7	2030	27.25	0.04	0.40	27.68	0.37	0.38	0.20	0.86	-	0.64	0.54	0.43	3.42	31.10	15.10	2,498
8	2031	27.25	0.04	0.40	27.68	0.37	0.38	0.20	0.80	-	0.59	0.54	0.43	3.30	30.99	15.04	2,412
9	2032	27.25	0.04	0.40	27.68	0.37	0.38	0.20	0.73	-	0.54	0.54	0.43	3.19	30.87	14.98	2,327
10	2033	27.25	0.04	0.40	27.68	0.37	0.38	0.20	0.66	-	0.49	0.54	0.43	3.07	30.75	14.93	2,242
11	2034	27.25	0.04	0.40	27.68	0.37	0.38	0.20	0.59	-	0.44	0.54	0.43	2.95	30.64	14.87	2,157
12	2035	27.25	0.04	0.40	27.68	0.37	0.38	0.20	0.53	-	0.39	0.54	0.43	2.84	30.52	14.81	2,071
13	2036	27.25	0.04	0.40	27.68	0.37	0.38	0.20	0.46	-	0.34	0.54	0.43	2.72	30.40	14.76	1,986
14	2037	27.25	0.04	0.40	27.68	0.37	0.38	0.20	0.39	-	0.29	0.54	0.43	2.60	30.29	14.70	1,901
15	2038	27.25	0.04	0.40	27.68	0.37	0.38	0.20	0.33	-	0.24	0.54	0.43	2.49	30.17	14.64	1,816
16	2039	27.25	0.04	0.40	27.68	0.37	0.38	0.20	0.26	-	0.19	0.54	0.43	2.37	30.05	14.59	1,730
17	2040	27.25	0.04	0.40	27.68	0.37	0.38	0.20	0.19	-	0.14	0.54	0.43	2.25	29.93	14.53	1,645
18	2041	27.25	0.04	0.40	27.68	0.37	0.38	0.20	0.12	-	0.09	0.54	0.43	2.14	29.82	14.47	1560
19	2042	27.25	0.04	0.40	27.68	0.37	0.38	0.20	0.06	-	0.04	0.54	0.43	2.02	29.70	14.42	1,475
20	2043	27.25	0.04	0.40	27.68	0.37	0.38	0.20	0.03	-	0.02	0.54	0.43	1.98	29.66	14.40	1,446
Average tariff		27.25	0.04	0.40	27.68	0.37	0.38	0.20	0.63	-	0.46	0.54	0.43	3.02	30.70	14.90	2,202

PKR 30.7 / kWh **US Cents 14.9 / kWh**

Fuel cost component -

RLNG - Simple cycle	40.64
Indigenous Gas - combined cycle	7.07
Indigenous Gas - Simple cycle	10.55

K-Electric Limited — HSD fuel
Generation Plants Tariff Petition
BQPS II Plant
Tariff table - FY 2024 and onwards

Gross Capacity	480.0	MW	Exchange rate	286.0	PKR / USD
Net Capacity	463.5	MW	KIBOR	15.2%	%
Units at full capacity	4,059.9	GWh	LIBOR	2.3%	%

		Energy Purchase Price (PKR / kWh)				Capacity Purchase Price PKR / kW / hour at 88.41% Plant factor											
Year	FY	Fuel cost - FCC HSD	Variable O&M - local	Variable O&M - Foreign	EPP	Fixed O&M - local	Fixed O&M - Foreign	Insurance	RORB - Cost of debt - local	RORB - Cost of debt - foreign	RORB - Cost of Equity	Depreciation	Working capital	CPP	Total tariff - PKR / kWh	Total tariff - Cents / kWh	CPP - PKR / kW / month
		a	b	c	d=sum(a:c)	e	f	g	h	i	j	k	l	m=sum(e:l)	n=d+m	o=n/286	p
1	2024	48.73	0.04	0.75	49.51	0.40	0.40	0.22	1.35	-	1.00	0.58	0.46	4.40	53.91	26.17	3,211
2	2025	48.73	0.04	0.75	49.51	0.40	0.40	0.22	1.28	-	0.94	0.58	0.46	4.27	53.79	26.11	3,120
3	2026	48.73	0.04	0.75	49.51	0.40	0.40	0.22	1.21	-	0.89	0.58	0.46	4.15	53.66	26.05	3,029
4	2027	48.73	0.04	0.75	49.51	0.40	0.40	0.22	1.14	-	0.84	0.58	0.46	4.02	53.54	25.99	2,938
5	2028	48.73	0.04	0.75	49.51	0.40	0.40	0.22	1.06	-	0.78	0.58	0.46	3.90	53.41	25.93	2,847
6	2029	48.73	0.04	0.75	49.51	0.40	0.40	0.22	0.99	-	0.73	0.58	0.46	3.78	53.29	25.87	2,756
7	2030	48.73	0.04	0.75	49.51	0.40	0.40	0.22	0.92	-	0.68	0.58	0.46	3.65	53.16	25.81	2,665
8	2031	48.73	0.04	0.75	49.51	0.40	0.40	0.22	0.85	-	0.63	0.58	0.46	3.53	53.04	25.75	2,574
9	2032	48.73	0.04	0.75	49.51	0.40	0.40	0.22	0.78	-	0.57	0.58	0.46	3.40	52.91	25.69	2,483
10	2033	48.73	0.04	0.75	49.51	0.40	0.40	0.22	0.71	-	0.52	0.58	0.46	3.28	52.79	25.63	2,392
11	2034	48.73	0.04	0.75	49.51	0.40	0.40	0.22	0.63	-	0.47	0.58	0.46	3.15	52.67	25.57	2,301
12	2035	48.73	0.04	0.75	49.51	0.40	0.40	0.22	0.56	-	0.41	0.58	0.46	3.03	52.54	25.51	2,210
13	2036	48.73	0.04	0.75	49.51	0.40	0.40	0.22	0.49	-	0.36	0.58	0.46	2.90	52.42	25.44	2,119
14	2037	48.73	0.04	0.75	49.51	0.40	0.40	0.22	0.42	-	0.31	0.58	0.46	2.78	52.29	25.38	2,028
15	2038	48.73	0.04	0.75	49.51	0.40	0.40	0.22	0.35	-	0.26	0.58	0.46	2.65	52.17	25.32	1,937
16	2039	48.73	0.04	0.75	49.51	0.40	0.40	0.22	0.28	-	0.20	0.58	0.46	2.53	52.04	25.26	1,846
17	2040	48.73	0.04	0.75	49.51	0.40	0.40	0.22	0.20	-	0.15	0.58	0.46	2.40	51.92	25.20	1,755
18	2041	48.73	0.04	0.75	49.51	0.40	0.40	0.22	0.13	-	0.10	0.58	0.46	2.28	51.79	25.14	1,664
18	2041	48.73	0.04	0.75	49.51	0.40	0.40	0.22	0.06	-	0.04	0.58	0.46	2.16	51.67	25.08	1,573
19	2042	48.73	0.04	0.75	49.51	0.40	0.40	0.22	0.04	-	0.03	0.58	0.46	2.11	51.63	25.06	1,543
Average tariff		48.73	0.04	0.75	49.51	0.40	0.40	0.22	0.57	-	0.50	0.58	0.46	3.22	52.73	25.60	2,350

PKR 52.73 / kWh **US Cents 25.6 / kWh**

Fuel cost component -

HSD - Simple cycle	71.21

BQPS II - Annexures

List of Annexures

Annexure	Description
BQPS II – Annexure A (i)	Major Activities Performed for Improving Performance of the Plant
BQPS II – Annexure A (ii)	Safety procedures
BQPS II – Annexure A (iii)	Projects details
BQPS II – Annexure A (iv)	Minimum Loading
BQPS II – Annexure A (v)	Fire protection system
BQPS II – Annexure A (vi)	Plant layout
BQPS II – Annexure A (vii)	Details of Major Equipment
BQPS II – Annexure B	Adjustment of heat rate & aux. consumption based on exclusion of one or two gas compressors
BQPS II – Annexure C (i)	Sample bill for April (Natural Gas / RLNG)
BQPS II – Annexure C (ii)	Sample calculation for Natural Gas / RLNG
BQPS II – Annexure D (i)	Part load Adjustment Factor table - Gas - CC
BQPS II – Annexure D (ii)	Part load Adjustment Factor table - Gas - OC
BQPS II – Annexure E	Sample calculation for weighted average part load factor – Gas
BQPS II – Annexure F (i)	Degradation table -Net Heat rate HHV (Gas) - CC
BQPS II – Annexure F (ii)	Degradation table -Net Output (gas)
BQPS II – Annexure G	O&M Break up (levelized)
BQPS II – Annexure H	Consultant Report (Separate document)
BQPS II – Annexure I	RAB movement
BQPS II – Annexure J (i)	Calculation of Indexed RoE
BQPS II – Annexure J (ii)	RoE Indexation mechanism
BQPS II – Annexure K	Calculation of cost of working capital
BQPS II – Annexure L	Output adjustment due to temperature
BQPS II – Annexure M	Capacity Payment Sample calculation
BQPS II – Annexure N	Outage Schedule and plant factor
BQPS II – Annexure O	O&M Sharing Mechanism
BQPS II – Annexure P	Head of Terms

BQPS II – Annexure A (i)

Major Activities Performed for Improving Performance of the Plant

Unit / Serial No	Maintenance Event Detail		Duration (Days)	Year
GT 1 (890225)	Major Inspection	MI	25	FY-19
	Generator Rotor Replacement	Rotor	37	FY-19
	Combustion Inspection	CI	9	FY-17
	Advance Gas Path	AGP	25	FY-15
	Combustion Inspection	CI	10	FY-14
GT 2 (890226)	Major Inspection + Generator Rotor Replacement	MI + Rotor	28	FY-19
	Combustion Inspection	CI	13	FY-17
	Advance Gas Path	AGP	14	FY-15
	Combustion Inspection	CI	6	FY-14
	Combustion Inspection	CI	9	FY-13
GT 3 (890227)	Hot Gas Path Inspection	HGPI	14	FY-22
	Generator rotor Replacement	Rotor	14	FY-21
	Generator Rotor Replacement	Rotor	17	FY-18
	Major Inspection	MI	23	FY-18
	Combustion Inspection	CI	12	FY-17
	Advance Gas Path	AGP	23	FY-15
	Combustion Inspection	CI	9	FY-14
Steam Turbine	Minor inspection	MI	33	FY-14
	Major overhaul	MO	59	FY 17

BQPS II – Annexure A (ii)

Safety procedures

1	Management Commitment	KE-Gen-BQPS-II-HSEQ-II/001
2	Control of Documents	KE-Gen-BQPS-II-HSEQ-II/002
3	Non-Conformance & Corrective Action	KE-Gen-BQPS-II-HSEQ-II/003
4	Management Review Process	KE-Gen-BQPS-II-HSEQ-II/004
5	QMS Documents and Format Management	KE-Gen-BQPS-II-HSEQ-II/005
6	HSEQ Organization	KE-Gen-BQPS-II-HSEQ-II/006
7	HSEQ Management System	KE-Gen-BQPS-II-HSEQ-II/007
8	Incident / Accident Reporting Management	KE-Gen-BQPS-II-HSEQ-II/008
9	Emergency Response Plan	KE-Gen-BQPS-II-HSEQ-II/009
10	Legal & Other Requirement	KE-Gen-BQPS-II-HSEQ-II/010
11	Business Continuity Plan	KE-Gen-BQPS-II-HSEQ-II/011
12	HSEQ Training, Competence & Awareness	KE-Gen-BQPS-II-HSEQ-II/012
13	Internal Audit	KE-Gen-BQPS-II-HSEQ-II/013
14	Work Permit System Administration	KE-Gen-BQPS-II-HSEQ-II/014
15	Safety Critical System Bypass Procedure	KE-Gen-BQPS-II-HSEQ-II/015
16	Hazard Identification & Risk Assessment	KE-Gen-BQPS-II-HSEQ-II/016
17	Plant Evacuation Drill	KE-Gen-BQPS-II-HSEQ-II/017
18	Work at Height	KE-Gen-BQPS-II-HSEQ-II/018
19	Handling of Hazardous Materials	KE-Gen-BQPS-II-HSEQ-II/019
20	Personnel Protective Equipment	KE-Gen-BQPS-II-HSEQ-II/020
21	First Aid	KE-Gen-BQPS-II-HSEQ-II/021
22	Material Safety Data Sheet	KE-Gen-BQPS-II-HSEQ-II/022
23	Manual Handling Operation	KE-Gen-BQPS-II-HSEQ-II/023
24	Office Safety	KE-Gen-BQPS-II-HSEQ-II/024
25	Housekeeping	KE-Gen-BQPS-II-HSEQ-II/025
26	Fire Water System Control	KE-Gen-BQPS-II-HSEQ-II/026
27	Inspection of Fire Fighting Equipment	KE-Gen-BQPS-II-HSEQ-II/027
28	Safety showers	KE-Gen-BQPS-II-HSEQ-II/028
29	Safety Signs and Tags	KE-Gen-BQPS-II-HSEQ-II/029
30	Safety Guards Barricades & Warning Signs	KE-Gen-BQPS-II-HSEQ-II/030
31	Electrical Safety	KE-Gen-BQPS-II-HSEQ-II/031
32	CoSHH Assessments	KE-Gen-BQPS-II-HSEQ-II/032
33	Accident prevention Plan	KE-Gen-BQPS-II-HSEQ-II/033
34	Contractor Safety Management	KE-Gen-BQPS-II-HSEQ-II/034
35	Monitoring & Measurement	KE-Gen-BQPS-II-HSEQ-II/035
36	HSE Violation Card	KE-Gen-BQPS-II-HSEQ-II/036
37	Confined Space Entry	KE-Gen-BQPS-II-HSEQ-II/037
38	Hot Work Safety	KE-Gen-BQPS-II-HSEQ-II/038
39	Fire System Impairment	KE-Gen-BQPS-II-HSEQ-II/039
40	Management of Overhead Hoist and Crane	KE-Gen-BQPS-II-HSEQ-II/040
41	Work Permit Exceptional Circumstances	KE-Gen-BQPS-II-HSEQ-II/041
42	Control Of Digging	KE-Gen-BQPS-II-HSEQ-II/042
43	Ionization Radiation for NDT	KE-Gen-BQPS-II-HSEQ-II/043

44	Permit System Boundaries and Exempted Areas	KE-Gen-BQPS-II-HSEQ-II/044
45	Diving Safety	KE-Gen-BQPS-II-HSEQ-II/045
46	Management of safety Shower	KE-Gen-BQPS-II-HSEQ-II/046
47	Effluent Control Management	KE-Gen-BQPS-II-HSEQ-II/047
48	Handling and Storage of Hazardous Chemical	KE-Gen-BQPS-II-HSEQ-II/048
49	Resource Conservation Management	KE-Gen-BQPS-II-HSEQ-II/049
50	Asbestoses Management	KE-Gen-BQPS-II-HSEQ-II/050
51	Noise Management	KE-Gen-BQPS-II-HSEQ-II/051
52	Air Emission Control	KE-Gen-BQPS-II-HSEQ-II/052
53	Environmental Aspects Determinates	KE-Gen-BQPS-II-HSEQ-II/053
54	Environmental Related Emergency	KE-Gen-BQPS-II-HSEQ-II/054
55	SF6 Management	KE-Gen-BQPS-II-HSEQ-II/055
56	Waste Management	KE-Gen-BQPS-II-HSEQ-II/056
57	Animal Infestation Management	KE-Gen-BQPS-II-HSEQ-II/057
58	Spill Control Management	KE-Gen-BQPS-II-HSEQ-II/058
59	Resource Conservation Management	KE-Gen-BQPS-II-HSEQ-II/059
60	Indoor Air Quality	KE-Gen-BQPS-II-HSEQ-II/060
61	TBT	KE-Gen-BQPS-II-HSEQ-II/061

BQPS II – Annexure A (iii)

Project Details

Site Details

1. The Plant is located 40 Kms East of Karachi located North-East of Port Mohammad Bin Qasim, Port Qasim Road, in the District of Karachi, Sindh Province
2. Typically, maximum rainfall in 24 hours 110 mm.
3. The design max wind speed of 160 km/h is used in the design of the plant buildings and structures
4. The site is at elevation of 5.5m above mean sea level (MSL)

Plant Reference Condition

Reference Conditions at the Plant Site are:

1. Ambient Air Temperature = Tra = 30 degrees celsius
2. Total Barometric Pressure = p_r = 1013.2 mbar
3. Relative Humidity = 70%
4. Shaft Speed = 3000 rpm
5. Power Factor = 0.80
6. System Frequency = 50 Hz
7. Fuel Supply Temperature = 27 deg C
8. Gas Fuel gas (LHV) = 37,557 Kj/Kg

Plant Configuration

Technology	Combine Cycle Power Plant
Type of fuel	Natural Gas/RLNG HSD planned to be added (as Backup Fuel)
Equipment	Gas turbine + HRSG+ Steam turbine
Units	3 GTs + 3 HRSGs + 1 ST
Output	572.67 MW ISO Installed with a de-rated and net capacity of 525.58MW and 494.53MW at (RSC) respectively
Make	Gas Turbine – GE, Steam Turbine – Harbin China
Model	Gas Turbine model- GE (PG9171E) HRSG type - Q1114/554.3-177.3 (36.5) (8)-8.92(0.79) (0.1)/539(275) Steam Turbine type - single shaft, double pressure, two-casing, two-exhaust, impulse condensing steam turbine. LN190-8.396/0.75/536/273

Plant Characteristics

Gross installed capacity at ISO conditions	572.67 MW
Gross Capacity at RSC	525.58 MW
Auxiliary Consumption	31.048 MW (5.91%)
Net Plant capacity at RSC	494.532 MW
Net Plant efficiency (LHV)	45.805%
Net Plant efficiency (HHV)	41.333%
Generation voltage	15 KV
Grid voltage	220 KV
Frequency	50 HZ
Power factor	Lead 0.85 for GTs and 0.95 for ST / Lag 0.80 for all GTs and ST
Ramp up rate of generators	8 MW/min each GT 1.15 to 2.1 MW/min for ST
Complex Startup & Loading Time	Complex Baseload Hot start 208 min Complex Baseload warm start424 min Complex Baseload cold start 666 min

Frequency Limits

The generators are capable of maintaining constant output for system frequency range of **49.5 ~ 50.5 Continuous operation** Hz in accordance with the requirements.

Voltage Limits

The plant is capable to operate continuously within the voltage range of 215 – 235 kV.

Reactive Power

The plant is designed to operate with reactive capability of 0.85 for GTs (Leading), 0.95 (leading) for ST / 0.80 (Lagging) for all GTs and ST.

Noise

The noise level is 64.3 (avg) dB(A) which fall within the EPA prescribed environmental limits.

Water Resources

In absence of adequate subsoil water and pipeline water, the power plant is designed on a sea water with RO plant.

BQPS II – Annexure A (iv) – Minimum loading details

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NEPRA Query:

- Reasons/justification regarding full load operation of BQPS-II during low system demand and corresponding less drawl by KE from efficient energy sources

KE Response:

As per Gas Turbine OEM's recommendation, the typical firing temperature range for the pre-mix mode of operation is above 1900°F. Therefore, the minimum loading on GT load is 90 MW at which GT can operate without combustion burners mode change over (From Pre-mix mode to Extended Lean-Lean mode) subject to stable grid frequency, however in case of any off rated frequency the Gas Turbine combustion mode changeover can occur from Pre-mix mode to Extended Lean-Lean mode, which will result in higher NOx emissions above the permissible environmental limits and continuous operation on part load increase fatigue/damage to GT combustion hardware.

(Reference Document: DLN I System Operation Page 3, attached)

- IMPACT OF PART LOAD OPERATIONS

- During part load, in the event of off rated frequency operations, the normal output fall-off with speed results in loads less than the defined minimum, for this scenario the turbine MUST compensate, Turbine overfiring is the most obvious compensation option, resulted in mode changeover from Combustion mode (PM) to Extended lean Lean (diffusion) and increased firing temperatures.

- *The higher operating temperatures affect the creep capability of hot gas path components which is the primary life limiting mechanism. The life capability of combustion components can also be affected.*

  Heavy-Duty Gas Turbine Operating and Maintenance Consideration | GER-3620N Page 9.

- *General recommendation for continuous mode operation is in the combustion mode that provides guaranteed emissions, which is the premixed combustion mode (PM). This combustion mode is also the most beneficial operation mode for ensuring expected hardware life. Continuous and extended mode operation in non-PM combustion modes is not recommended due to reduction in combustion hardware life.*

  Heavy-Duty Gas Turbine Operating and Maintenance Consideration | GER-3620N Page 16.

Please also find enclosed letter from GE which recommends base load operations in general conditions. (Letter enclosed).

Syed Mehdi Ali
Plant Head BQPS-II

Zahir Ali Khan
Complex Head BQPSP

KE House, 39-B, Sunset Boulevard, Phase-II, Defence Housing Authority, Karachi
www.ke.com.pk 92-21-3263-7133, 92-21-3570-9132, UAN: 111-537-111

K-ELECTRIC LIMITED

Date: 5th Oct 2021

Subject: Gas turbine operation on part load

Dear Sir,

Many times, during commissioning, maintenance and troubleshooting periods it becomes necessary to operate the frame 9E gas turbine at low output power levels. The GT can be operated without restriction at very low loads such as for maintenance and/or emergency situations. Operation for extended periods at low load may result in the following:

- Premature wear for combustion hardware and its life reduction
- The higher operating temperatures affect the creep capability of hot gas path components which is the primary life limiting mechanism.
- Impact to bleed valves operation due to low load operations in continuous mode
- During part load, in the event of off rated frequency operations, the normal output fall-off with speed results in loads less than the defined minimum, for this scenario the turbine must compensate. Turbine overfiring is the most obvious compensation option, resulted in mode changeover from Combustion mode (PM) to Extended lean Lean (diffusion) and increased firing temperatures.
- Reduced fuel efficiency

Operating the frame 9E at synchronous idle or light load conditions should not be part of the normal operation. Optimal fuel efficiency is achieved when the GT is running at or near maximum output power.

General recommendation for continuous mode operation is in the combustion mode that provides guaranteed emissions, which is the premixed combustion mode (PM). This combustion mode is also the most beneficial operation mode for ensuring expected hardware life. Continuous and extended mode operation in non-PM combustion modes is not recommended due to reduction in combustion hardware life. (Reference document GER-3620N).

Best Regards,
Waqas Ahmad
Senior Contract Performance Manager
GE Power

M +92 300 8478589
M +92 336 6188816
Waqas.ahmad@ge.com

BQPS II – Annexure A (v)

Fire Protection System

1. **Fire area, fire escape and evacuation passage**

Every building of the plant has been provided with a specific and dedicated "Emergency Evacuation Map" at the entrance and other conspicuous locations to warn and update the entrants of the buildings about the route to be taken to assembly point, in case of any emergency.

Also, every building has been provided with the adequate number of emergency evacuations passageways (exit doors) which are always kept healthy and unobstructed to be easily accessible during any emergency.

2. **Evacuation Channels**

Plant has dedicated emergency warning (siren, buddy system, walkie-talkie, hot lines) system, while actions from every employee are clearly documented in the plant Emergency Response Procedure on what to do when they hear the alarm / observe an emergency situation.

Moreover, dedicated Fire Wardens are assigned against individual buildings who will ensure (in case of any emergency) the complete evacuation of the workers in the dedicated building.

Plant has also dedicated assembly points, where every individual has to report after hearing the emergency siren and then a robust headcount management system is followed.

In case of any off-site evacuation need (due to any injury), dedicated emergency vehicle (ambulance) is also available at plant, which will support prompt evacuation of injured individual to the nearest medical facility.

3. **Fire-fighting system and fire extinguisher**

Internationally accepted (i.e. NFPA) and advanced firefighting & fire protection systems are available at plant (including: fire hydrant network, water deluge system, gaseous suppression system, foam suppression system).

Adequate number of fire extinguishers have also been installed across the plant premises (indoor a well as outdoor) and different training sessions are imparted among the team for its operation throughout the year.

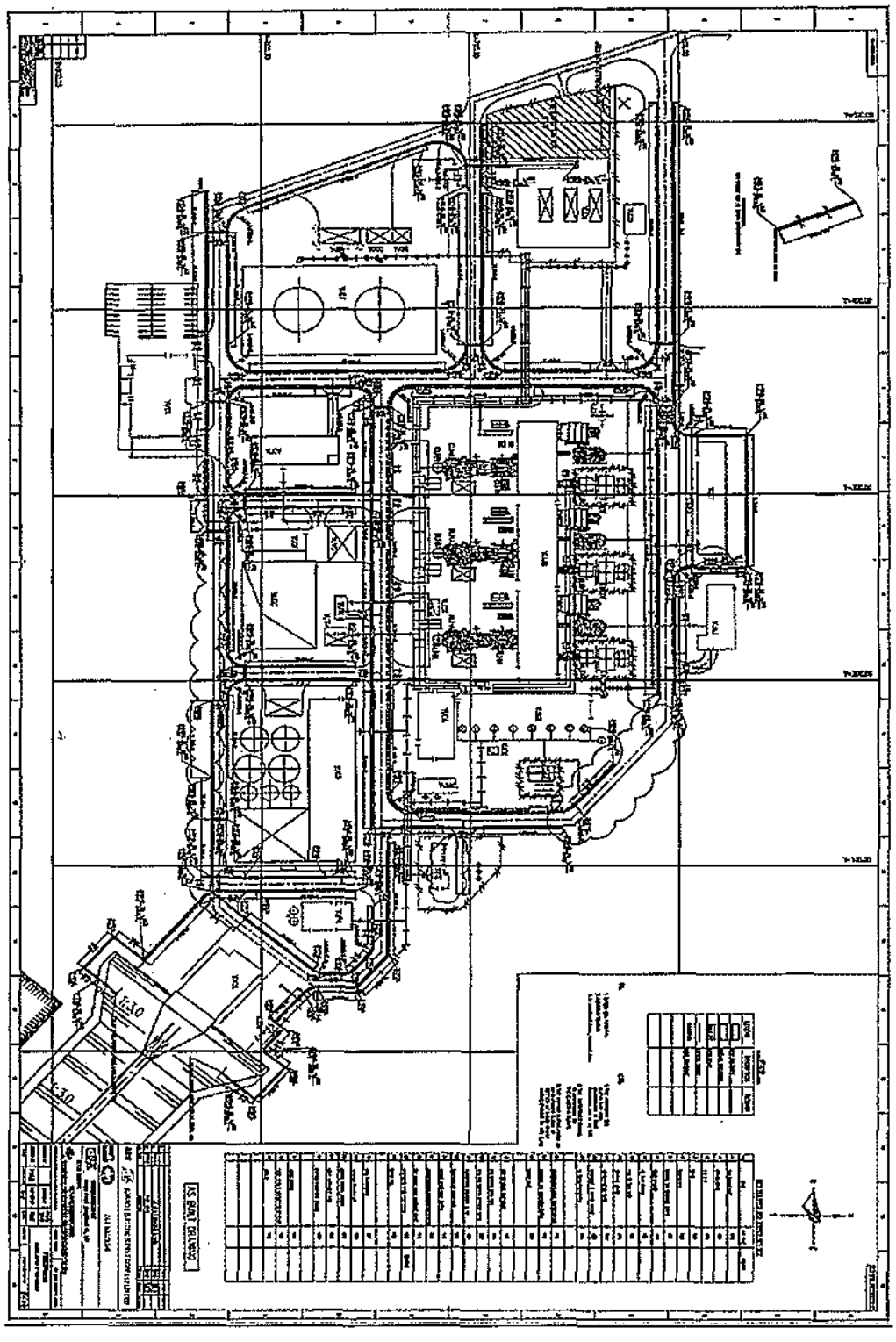
4. **Fire pump and alarm monitoring**

Plant has a dedicated fire water network (covering whole plant premises), along with NFPA compliant fire pumps and water storage facility (supporting ample time of firefighting).

Early detection of the fire is given the paramount importance which ensures that fire is detected at the incipient stage. These (smoke detectors) are widespread across the plant and integrated with plant fire siren system. Multiple manual call points are also installed across the plant for actuation of the fire siren, upon observing any fire emergency.

BQPS II – Annexure A (vi)

Plant Layout



BQPS II – Annexure A (vii)

Details of Major Equipment

Generator

GT-Generator:

Description	Unit	Parameter
Type		Generator: 9A5 TEWAC
Rated capacity	kVA	163,500
Rated voltage	kV	15KV
Rated current	A	6293A
Frequency	Hz	50
Rated speed	Rpm	3000
Power factor	PF	0.8
Number of phases	No.	3
Excitation device		AC Brushless
Stator winding connection		WYE
Number of stator winding terminal leads	No.	6
Insulation class		F
Running duty		S1
Protection class		IP54
Efficiency	%	98.4
Ambient temperature	C	50 degree C
Weight	kg	181,437kg
Dimension (length × width × height)	Mm	8867 X 3886 X 5118.7

ST Generator:

Description	Unit	Parameter
Type		QFSN3-190-2
Rated capacity	kVA	237,500
Rated voltage	kV	15750V
Rated current	A	8706A
Frequency	Hz	50
Rated speed	Rpm	3000
Power factor	PF	0.8
Number of phases	No.	3
Excitation device		Brush Excitation
Stator winding connection		WYE
Number of stator winding terminal leads	No.	6
Insulation class		F
Running duty		S1
Protection class		IP54
Efficiency	%	98.7%
Ambient temperature	C	40-50 degree C
Weight	kg	230.2kg
Dimension (length × width × height)	Mm	10800 X 4700 X 4000

Transformers

Main Transformers

Parameter	GT Unit # 1, 2 & 3	ST
Manufacturer	TBEA Hengyang Transformer Company Ltd.	
Country of Origin	China	
Year	2010	
International Standard of Manufacture	IEC60076-1:2000, IEC60076-2:1993,IEC60076-3:2000, IEC60076-5:2006	
Model/Type	SFPZ-170000/220(TH)	SFPZ-250000/220 TH
Serial Number	1TBEA. 710. 20295, TBA, TBA 100245111, 100245121, 100245131	1TBEA. 710. 20296 100245221
Rating	170000 kVA	250000 kVA
HV/LV	(232 $^{+6}_{-16}$ X 1.25%) / 15kV	(232 $^{+6}_{-16}$ X 1.25%) / 15.75 kV
Tap	23 Taps	23 Taps
Cooling	ODAF	
Dissolved Gas Monitoring	GE Hydran System	GE Hydran System
Fire Separation	Fire Wall available	Actual distance between ST Hall and Transformer is 15.5m which is greater than required distance mentioned in NFPA Standard
Frequency	50 Hz	
Oil Capacity	43500 kg	55120 kg
Specifications of Oil	25# Kalamay	25# Kalamay
Type of		
--Fire Detection	Linear heat detector	Linear heat detector
--Suppression	Deluge Water System	Deluge Water System

Auxiliary Transformer

Parameter	GT1 Auxiliary Transformer	GT2 Auxiliary Transformer	GT3 Auxiliary Transformer
Manufacturer	Fuzhou Tianyu Electric Co. Ltd.	Fuzhou Tianyu Electric Co. Ltd.	Fuzhou Tianyu Electric Co. Ltd.
Year	2010	2010	2010
International Standard	GB1094.1.2.3.5 IEC60076	GB1094.1.2.3.5 IEC60076	GB1094.1.2.3.5 IEC60076
Model/Type	S9-30000/15	S9-30000/15	S9-30000/15
Serial Numbers	K73301	K73302	K73303
Rating(MVA)	30	30	30
Voltage/Frequency	15±2x2.5%/6.9kV / 50Hz	15±2x2.5%/6.9kV / 50Hz	15±2x2.5%/6.9kV / 50Hz
Tap	5	5	5
Cooling	ONAN	ONAN	ONAN
Oil Capacity	7860	7860	7860
Spec/Brand of Oil	25# Kalamay	25# Kalamay	25# Kalamay
Type of			
--Fire Detection	Linear heat detector	Linear heat detector	Linear heat detector
--Suppression	Deluge Water System	Deluge Water System	Deluge Water System.

BQPS II – Annexure B

Adjustment of heat rate & aux. consumption based on exclusion of one or two gas compressors

Extracts from Independent Consultant's (NESPAK) Report

TABLE-31. COMPARISON OF PRIMARY TEST PERFORMANCE PARAMETERS WITH/WITOUT TWO COMPRESSORS' LOAD

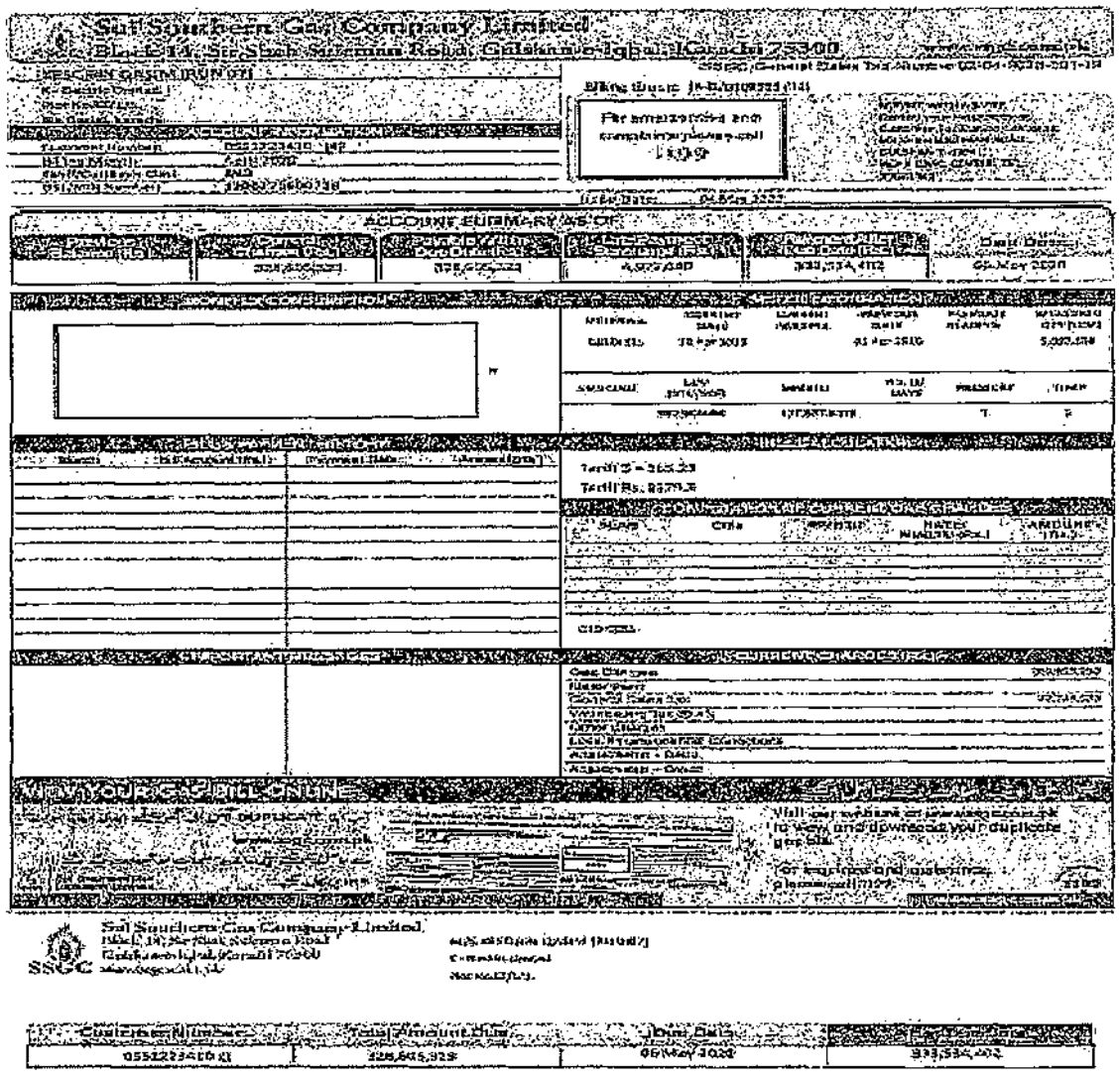
Sr. No.	Parameters	Compressors Load (Two Nos) (MW)	Results by IE (With Gas Compressors)	Results by IE (Without Gas Compressors)	Difference
1	Un-corrected Net Load (MW)	16.571	478.000	494.571	16.571
2	Corrected Net Load (MW)		494.532	511.617	17.085
4	Un-corrected Net Heat Rate (BTU/kWh) (HHV)		8312.641	8034.118	-278.523
6	Corrected Net Heat Rate (BTU/kWh) (HHV)		8255.255	7979.565	-275.69
3	Un-corrected Net Heat Rate (BTU/kWh) (LHV)		7501.098	7249.766	-251.332
5	Corrected Net Heat Rate (BTU/kWh) (LHV)		7449.314	7200.540	-248.774

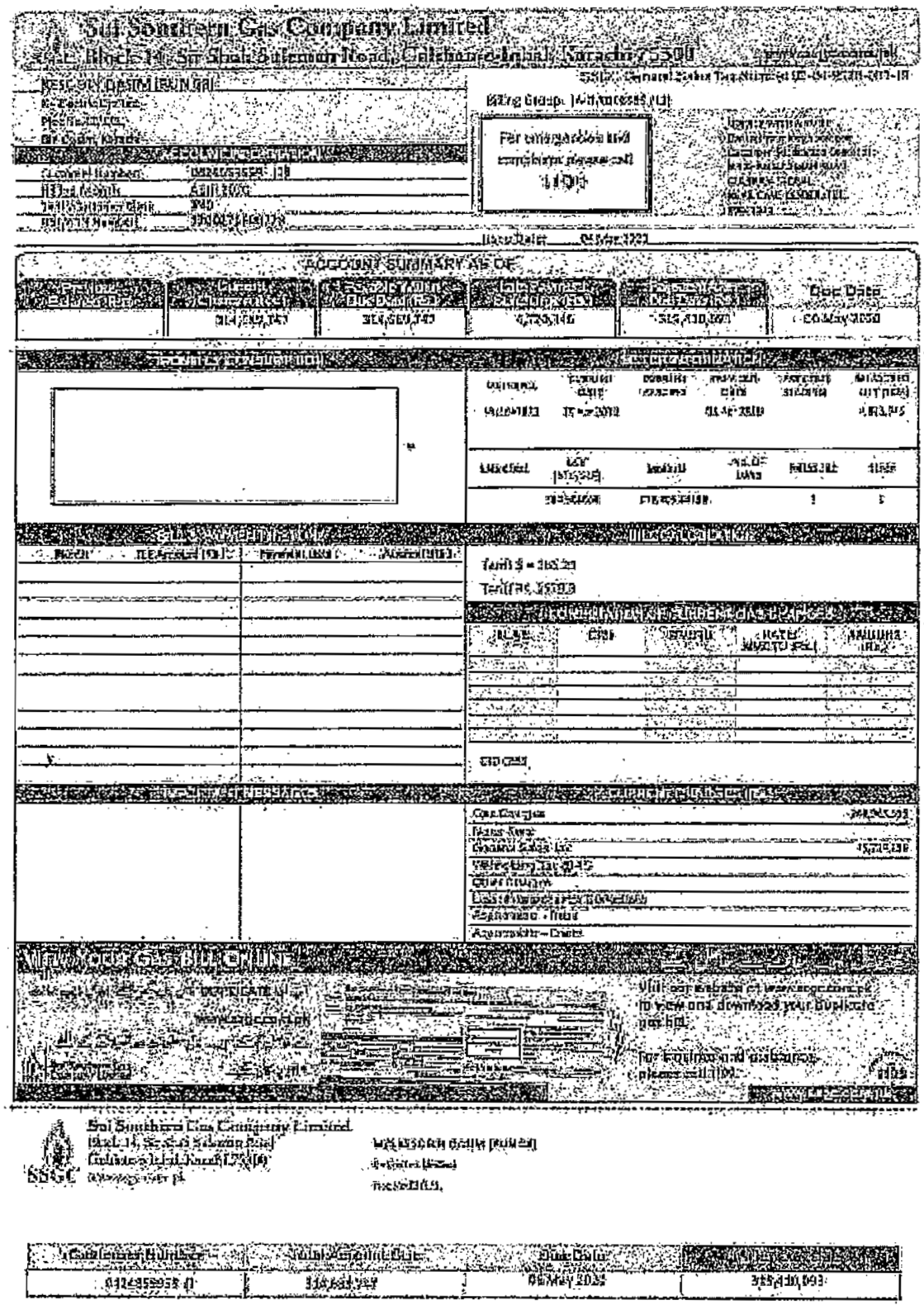
TABLE-32. COMPARISON OF PRIMARY TEST PERFORMANCE PARAMETERS WITH/WITOUT ONE COMPRESSOR'S LOAD

Sr. No.	Parameters	Compressor Load (one no) (MW)	Results by IE (With Gas Compressors)	Results by IE (Without One Gas Compressor)	Difference
1	Un-corrected Net Load (MW)	8.285	478.000	486.285	8.285
2	Corrected Net Load (MW)		494.532	503.075	8.543
4	Un-corrected Net Heat Rate (BTU/kWh) (HHV)		8312.641	8171.007	-141.634
6	Corrected Net Heat Rate (BTU/kWh) (HHV)		8255.255	8115.069	-140.186
3	Un-corrected Net Heat Rate (BTU/kWh) (LHV)		7501.098	7373.291	-127.807
5	Corrected Net Heat Rate (BTU/kWh) (LHV)		7449.314	7322.815	-126.499

BQPS II – Annexure C (i)

RLNG Sample Bills April 2020




Sui Southern Gas Company Limited
Block-14, Sir Shah Suleman Road, Gulshan-e-Iqbal, Karachi-75300
ACCOUNT SUMMARY AS OF
Due Date
Sui Southern Gas Company Limited
Block-14, Sir Shah Suleman Road
Gulshan-e-Iqbal, Karachi-75300

Sui Southern Gas Company Limited

[illegible], Sir Shah Suleman Road, Gulshan-e-Iqbal, Karachi 75300

For emergencies and complaints please call

1199

ACCOUNT SUMMARY AS OF

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Due Date
	[illegible]	[illegible]	[illegible]	[illegible]	05 May 2020

VIEW YOUR GAS BILL ONLINE

Visit our website at www.ssgc.com.pk to view and download your duplicate gas bill.

Sui Southern Gas Company Limited
www.ssgc.com.pk

Consumer Number	Total Amount Due	Due Date	[illegible]
[illegible]	[illegible]	05 May 2020	[illegible]

K-ELECTRIC LIMITED

Sui Southern Gas Company Limited

[illegible] Block 14, Sir Shah Suleman Road, Gulshan-e-Iqbal, Karachi [illegible]

For complaints and queries please call (1199)

Tariff $ = [illegible]

ACCOUNT SUMMARY AS OF

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Due Date
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] May 2020

Gas Charges [illegible]

VIEW YOUR GAS BILL ONLINE

Visit our website at www.ssgc.com.pk to view and download your duplicate gas bill.

For inquiries and grievances please call 1199

Sui Southern Gas Company Limited

SSGC

Customer Number	Total Amount Due	Due Date	[illegible]
[illegible]	[illegible]	[illegible] May 2020	[illegible]

Sui Southern Gas Company Limited

[illegible] Block 14, Sir Shah Suleman Road, Gulshan-e-Iqbal, Karachi 75300 [illegible]

For emergencies and complaints please call

1199

ACCOUNT SUMMARY AS OF

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Due Date
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]		[illegible]

Gas Charges

Carriage Charges [illegible]

Sui Southern Gas Company Limited

[illegible] Gulshan-e-Iqbal, Karachi [illegible]

SSGC [illegible]

Consumer Number	Total Amount Due	Due Date	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Indigenous Gas Sample Bills April 2020

Sui Southern Gas Company Limited

[illegible] Block 14, Sir Shah Suleman Road, Gulshan-e-Iqbal, Karachi 75300

KESC – BIN QASIM [illegible]

For emergency and complaints please call 1199

Issue Date: [illegible] May 2020

ACCOUNT SUMMARY AS OF

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Due Date
[illegible]	[illegible]	[illegible]		[illegible]	[illegible] May 2020

ACTUAL BILL CONSUMPTION

View your gas bill online

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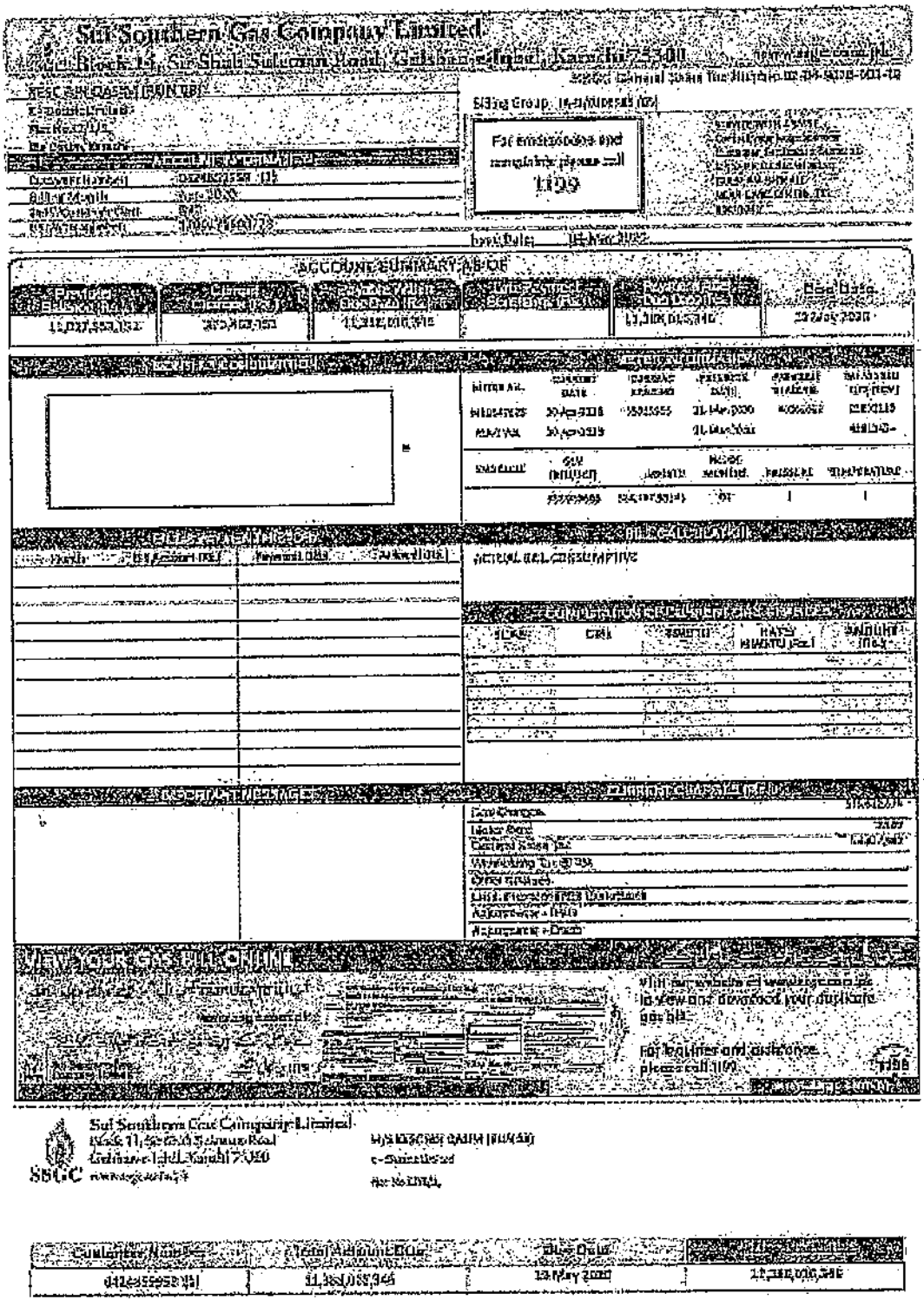
For inquiries and assistance please call 1199

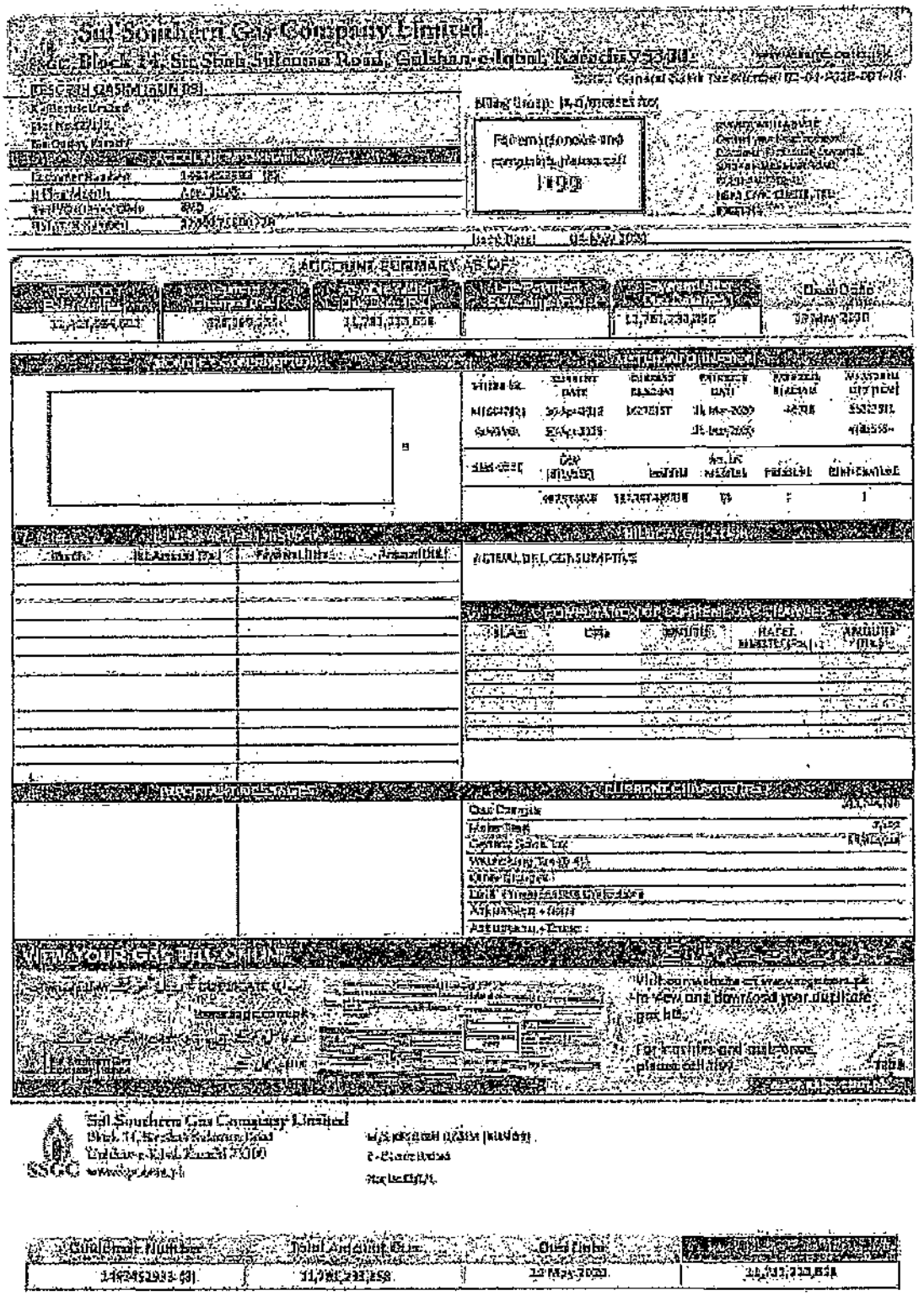
Sui Southern Gas Company Limited

SSGC

Consumer Number	Total Amount Due	Due Date	[illegible]
[illegible]	[illegible]	[illegible] May 2020	[illegible]


Sui Southern Gas Company Limited
1199
ACCOUNT SUMMARY AS OF
SSGC

Section A – 54


Sui Southern Gas Company Limited
Sui Southern Gas Company Limited
SSGC

Sui Southern Gas Company Limited

[illegible] Block 14, Sir Shah Suleman Road, Gulshan-e-Iqbal, Karachi 75300 [illegible]

KESC BIN QASIM [illegible]

Billing Group [illegible]

For complaints and [illegible] please call 1199

Customer Number	[illegible]
Billing Month	[illegible] 2020
[illegible]	[illegible]
[illegible]	[illegible]

Issue Date [illegible]

ACCOUNT SUMMARY AS OF

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Due Date
[illegible]	[illegible]	12,271,[illegible]		12,271,[illegible]	[illegible] May 2020

ACTUAL BILL CONSUMPTION

Gas Charges	[illegible]

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For inquiries and complaints please call 1199

Sui Southern Gas Company Limited
[illegible] Block 14, Sir Shah Suleman Road
Gulshan-e-Iqbal, Karachi 75300
SSGC www.ssgc.com.pk

Customer Number	Total Amount Due	Due Date	[illegible]
[illegible]	12,271,[illegible]	19 May 2020	12,271,[illegible]

K-ELECTRIC LIMITED

Sui Southern Gas Company Limited

[illegible] Block 14, Sir Shah Suleman Road, Gulshan-e-Iqbal, Karachi [illegible] www.ssgc.com.pk

Billing Group: [illegible]

For emergencies and complaints please call : 1199

Due Date: [illegible] May 2020

ACCOUNT SUMMARY AS OF

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]

Actual net consumption

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Sui Southern Gas Company Limited
Block 14, Sir Shah Suleman Road
Gulshan-e-Iqbal, Karachi 75300
SSGC www.ssgc.com.pk

BIN QASIM [illegible]
K-Electric [illegible]
Karachi [illegible]

Customer Number	Total Amount Due	Due Date	[illegible]
[illegible]	[illegible]	[illegible] May 2020	[illegible]

K-ELECTRIC LIMITED

BQPS II – Annexure C (ii)

Description	Unit	Legend	Meter# 16128821 (Run 07)	Meter# M16647823 (Run 08)	Meter# M16647821 (Run 09)	Meter# 20580043 (Run 10)	Meter# 16647822 (Run 11)	Total
Current month reading	SCM	A	58,232,037	55,955,915	16,276,257	114,446,494[5]	80,452,626	325,363,329
Previous month reading	SCM	B	41,624,576	40,060,802	48,926	97,978,392	63,051,028	242,763,724
Total Consumption	SCM	C = A - B	16,607,461	15,895,113	16,227,331	16,468,102	17,401,598	82,599,605
RLNG Consumption	SCM	D	5,097,198	4,881,345	4,983,569	5,056,963	5,344,104	25,363,179
Natural Gas consumption	SCM	E = C - D	11,510,263	11,013,768	11,243,762	11,411,139	12,057,494	57,236,426
Conversion factor (from SCM to SCF)	SCF/SCM	F	35	35	35	35	35	35
NG conversion from SCM to SCF	SCF	G = E x F	408,544,204	390,921,657	399,085,043	405,025,906	427,967,571	2,031,544,381
RLNG conversion from SCM to SCF	SCF	H = D x F	180,919,472	173,258,005	176,886,335	179,491,374	189,683,130	900,238,317
Gross Heating Value (GCV)	BTU/SCF	I	983	983	983	983	983	983
NG MMBTUs	MMBTU	J = G x I / 10^6	401,585	384,263	392,287	398,127	420,678	1,996,941
RLNG MMBTUs	MMBTU	K = H x I / 10^6	177,838	170,307	173,873	176,434	186,452	884,905
Total MMBTUs	MMBTU	L = J + K	579,423	554,570	566,161	574,561	607,130	2,881,846
Generation on Gas	MWH	M	74,260	71,074	72,560	73,636	77,811	369,341
Generation on RLNG	MWH	N = K / L x M	22,792	21,827	22,284	22,612	23,896	113,410
Generation on NG	MWH	O = M - N	51,468	49,248	50,276	51,024	53,915	255,930

[5] Current Reading on the bill 14,446,494 has been corrected to 114,446,494 to make the total Quantity 16,468,102 in bill as meter was reset

BQPS II – Annexure D (i)

Part load Adjustment Factor table – Gas - CC

Annexure 1		
Net Heat Rates Correction Curve for Part Load Operation- Complex		
Percent Load Factor (Net)	Correction factor on Natural gas fuel for combined cycle	Remarks
100%	1.0000	Note 1
95%	1.0037	Note 1
90%	1.0116	Note 1
85%	1.0225	Note 1
80%	1.0356	Note 1
79.3%	1.0374	Note 1
65%	1.0264	Note 2
60%	1.0358	Note 2
55%	1.0542	Note 2
51.2%	1.0719	Note 2
31.0%	1.0768	Note 3

Note:

1) Heat rate values for 100% -79.3% are based on three GTs in operation.
2) Heat rate values for 65% -51.2% are based on two GTs in operation.
3) Based on one GT in base load operation. Due to steam turbine limitation, GT can be only at base
4) Use Linear interpolation when the load variation values fall between the stated values for each
5) Plant will be operated as per Operational Technical limits.

BQPS II – Annexure D (ii)
Part load Adjustment Factor table – Gas - OC

Annexure 2		
Net Heat Rates Correction Curve for Part Load Operation- Complex		
Percent Load Factor (Net)	Correction factor on Natural gas fuel for Simple cycle	Remarks
100%	1.0000	Note 1
95%	1.0104	Note 1
90%	1.0250	Note 1
85%	1.0434	Note 1
80%	1.0653	Note 1
75%	1.0906	Note 1
70%	1.1196	Note 1
67.7%	1.1347	Note 1
64.97%	1.0262	Note 2
60%	1.0433	Note 2
55%	1.0708	Note 2
50%	1.1069	Note 2
44.1%	1.1607	Note 2
32.7%	1.0191	Note 3
30%	1.0374	Note 3
25%	1.1020	Note 3
22.2%	1.1545	Note 3
20.5%	1.1952	Note 3

Note:
1) Heat rate values for 100%-67.7% are based on all three GTs in operation.
2) Heat rate values for 64.97%-44.1% load are based on two GTs in operation.
3) Heat rate values for load at 32.7% and below are based on one GT in operation.
4) Use Linear Interpolation when the load variation values fall between the stated values for each
5) Plant will be operated as per Operational Technical limits.

K-ELECTRIC LIMITED

K-Electric Limited

Generation Plants Tariff Petition

BQPS II Plant

Annexure E - Part Load Adjustment Example

Partial Load Sample Calculation of a DAY

Time	Date	Net Dependable Capacity MW (a)	Forced Outage MW (b)	Planned Outage MW (c)	Forced Derated MW (d)	Planned Derated MW (e)	Available Capacity (post planned and forced outages) MW (f = a-b-c-d-e)	Hourly Net Load MW (from energy meters) MW (g=f)	Amb Temp (h)	Ambient Temp. Correction (i)	Declared Adjusted available Capacity (j = f / i)	Load Factor (k = g / j)	Correction factor (l)	Net Heat Rate (m = (l*Baseload Net HR))	mmbtus (n = m*g/1000)
1:00:00 AM	1-Jul	495	0	0	0	0	495	495	25	0.9718	509	97%	1.0021	8272.51	4,091
2:00:00 AM	1-Jul	495	110	0	0	0	385	385	26	0.9773	393	98%	1.0016	8268.41	3,179
3:00:00 AM	1-Jul	495	0	0	50	0	445	445	27	0.9829	452	98%	1.0012	8265.09	3,674
4:00:00 AM	1-Jul	495	0	0	0	0	495	495	28	0.9886	500	99%	1.0008	8261.67	4,086
5:00:00 AM	1-Jul	495	0	110	0	0	385	385	29	0.9943	387	99%	1.0004	8258.72	3,176
6:00:00 AM	1-Jul	495	0	0	0	50	445	445	30	1.0002	444	100%	1.0116	8351.06	3,712
7:00:00 AM	1-Jul	495	0	0	0	0	495	495	31	1.0061	492	101%	1.0000	8255.26	4,082
8:00:00 AM	1-Jul	495	0	0	0	0	495	495	32	1.0121	489	101%	1.0000	8255.26	4,082
9:00:00 AM	1-Jul	495	0	0	0	0	495	495	33	1.0182	486	102%	1.0170	8395.92	4,152
10:00:00 AM	1-Jul	495	0	0	0	0	495	495	34	1.0244	483	102%	1.0159	8386.37	4,147
11:00:00 AM	1-Jul	495	0	0	0	0	495	495	35	1.0306	480	103%	1.0147	8376.69	4,143
12:00:00 PM	1-Jul	495	110	0	0	0	385	385	36	1.0370	371	104%	1.0332	8529.62	3,280
1:00:00 PM	1-Jul	495	0	0	0	0	495	495	37	1.0434	474	104%	1.0071	8314.08	4,112
2:00:00 PM	1-Jul	495	0	0	0	0	495	495	38	1.0499	471	105%	1.0000	8255.26	4,082
3:00:00 PM	1-Jul	495	0	0	0	0	495	495	27	0.9829	503	98%	1.0035	8283.93	4,097
4:00:00 PM	1-Jul	495	0	0	0	0	495	495	28	0.9886	500	99%	1.0031	8281.05	4,095
5:00:00 PM	1-Jul	495	0	0	0	0	495	495	29	0.9943	497	99%	1.0029	8279.36	4,094
6:00:00 PM	1-Jul	495	0	0	0	0	495	495	30	1.0002	494	100%	1.0027	8277.64	4,094
7:00:00 PM	1-Jul	495	180	0	0	0	315	315	31	1.0061	313	101%	1.0030	8279.92	2,604
8:00:00 PM	1-Jul	495	0	0	0	0	495	495	32	1.0121	489	101%	1.0204	8423.76	4,166
9:00:00 PM	1-Jul	495	0	0	0	0	495	495	33	1.0182	486	102%	1.0193	8414.45	4,161
10:00:00 PM	1-Jul	495	0	0	0	0	495	495	34	1.0244	483	102%	1.0181	8405.01	4,157
11:00:00 PM	1-Jul	495	0	0	0	0	495	495	35	1.0306	480	103%	1.0170	8395.44	4,152
12:00:00 AM	1-Jul	495	0	0	0	0	495	495	33	1.0182	486	102%	1.0193	8414.45	4,161
Total								11259							93,780
Benchmark Heat Rate (Total mmbtus/Total MWs) (o = n x 1000/g)														8329.50	
Adjustment Factor (p = o/Baseload Net HR)														1.0090	

Reference		
Load	Net Eff	Net HR
495	41.33%	8255

K-ELECTRIC LIMITED

BQPS II – Annexure F (i) (Gas)

Degradation table -Net Heat rate HHV

Heat Rate Degradation Factor

FY	Gas Turbine						Complex (100% LF)		
	Permanent	Recoverable	Total	Efficiency		Correctio n Factor	Efficiency		Correction Factor
				Calculated	Revised		Tested	Revised	
18*	1.62%	0.19%	1.81%	27.72%	27.72%	1.0000	41.33%	41.33%	1.0000
19	1.81%	0.21%	2.02%	27.72%	27.66%	1.0022	41.33%	41.25%	1.0021
20	1.70%	0.06%	1.75%	27.72%	27.73%	0.9995	41.33%	41.39%	0.9986
21	1.82%	0.10%	1.92%	27.72%	27.69%	1.0011	41.33%	41.36%	0.9993
22	1.93%	0.12%	2.06%	27.72%	27.65%	1.0025	41.33%	41.32%	1.0003
23	2.04%	0.14%	2.18%	27.72%	27.61%	1.0037	41.33%	41.27%	1.0015
24	2.14%	0.16%	2.30%	27.72%	27.58%	1.0049	41.33%	41.22%	1.0028
25	2.24%	0.18%	2.42%	27.72%	27.55%	1.0061	41.33%	41.17%	1.0039
26	2.33%	0.19%	2.52%	27.72%	27.52%	1.0072	41.33%	41.13%	1.0050
27	2.42%	0.21%	2.63%	27.72%	27.49%	1.0082	41.33%	41.08%	1.0061
28	2.47%	0.10%	2.57%	27.72%	27.51%	1.0076	41.33%	41.16%	1.0041
29	2.47%	0.25%	2.72%	27.72%	27.47%	1.0091	41.33%	41.14%	1.0048
30	2.47%	0.39%	2.86%	27.72%	27.43%	1.0105	41.33%	41.10%	1.0056
31	2.47%	0.51%	2.98%	27.72%	27.40%	1.0117	41.33%	41.05%	1.0069
32	2.47%	0.62%	3.09%	27.72%	27.37%	1.0128	41.33%	41.00%	1.0081
33	2.47%	0.74%	3.21%	27.72%	27.33%	1.0140	41.33%	40.95%	1.0093
34	2.47%	0.83%	3.30%	27.72%	27.31%	1.0150	41.33%	40.91%	1.0103
35	2.47%	0.93%	3.40%	27.72%	27.28%	1.0160	41.33%	40.87%	1.0114
36	2.47%	0.84%	3.31%	27.72%	27.31%	1.0150	41.33%	41.04%	1.0071
37	2.47%	0.99%	3.46%	27.72%	27.26%	1.0166	41.33%	41.01%	1.0079
38	2.47%	1.12%	3.59%	27.72%	27.23%	1.0179	41.33%	40.98%	1.0087
39	2.47%	1.25%	3.72%	27.72%	27.20%	1.0191	41.33%	40.93%	1.0099
40	2.47%	1.35%	3.82%	27.72%	27.17%	1.0201	41.33%	40.88%	1.0111
41	2.47%	1.46%	3.93%	27.72%	27.14%	1.0213	41.33%	40.84%	1.0122
42	2.47%	1.56%	4.03%	27.72%	27.11%	1.0222	41.33%	40.79%	1.0132

* 3rd party Heat Rate Test

FY 18 - 22 : As per actual FFH

FY 23-42 : As per 88.4% Utilization (In line with availability numbers)

Note: Simple cycle output has been computed from combined cycle 3rd party test results, by removing ST

BQPS II – Annexure F (ii) (Gas)
Degradation table – Net Output (Gas)

Output Degradation Factor - CC

FY	Total Degradation Combined Cycle	Tested Combined Cycle Output (MW)	Revised Combined Cycle Output (MW)	Correction Factor
18*	3.35%	494.53	494.53	1.000
19	3.73%	494.53	492.67	1.004
20	3.14%	494.53	495.59	0.998
21	3.41%	494.53	494.24	1.001
22	3.64%	494.53	493.09	1.003
23	3.89%	494.53	491.92	1.005
24	4.10%	494.53	490.85	1.007
25	4.31%	494.53	489.84	1.010
26	4.50%	494.53	488.93	1.011
27	4.68%	494.53	488.07	1.013
28	3.88%	494.53	491.94	1.005
29	4.12%	494.53	490.77	1.008
30	4.32%	494.53	489.81	1.010
31	4.53%	494.53	488.74	1.012
32	4.73%	494.53	487.81	1.014
33	4.91%	494.53	486.92	1.016
34	5.08%	494.53	486.14	1.017
35	5.23%	494.53	485.39	1.019
36	4.12%	494.53	490.77	1.008
37	4.38%	494.53	489.51	1.010
38	4.54%	494.53	488.71	1.012
39	4.74%	494.53	487.74	1.014
40	4.91%	494.53	486.95	1.016
41	5.07%	494.53	486.16	1.017
42	5.23%	494.53	485.42	1.019

Output Degradation Factor - OC

Total Degradation Simple Cycle	Calculated Simple Cycle Output (MW)	Revised Simple Cycle Output (MW)	Correction Factor
3.63%	325.88	325.88	1.000
4.01%	325.88	324.65	1.004
3.51%	325.88	326.29	0.999
3.86%	325.88	325.13	1.002
4.12%	325.88	324.28	1.005
4.36%	325.88	323.51	1.007
4.58%	325.88	322.82	1.009
4.78%	325.88	322.17	1.012
4.97%	325.88	321.58	1.013
5.14%	325.88	321.03	1.015
4.47%	325.88	323.15	1.008
4.80%	325.88	322.12	1.012
5.04%	325.88	321.34	1.014
5.25%	325.88	320.68	1.016
5.44%	325.88	320.10	1.018
5.61%	325.88	319.54	1.020
5.77%	325.88	319.04	1.021
5.92%	325.88	318.59	1.023
5.12%	325.88	321.09	1.015
5.44%	325.88	320.08	1.018
5.66%	325.88	319.40	1.020
5.84%	325.88	318.83	1.022
6.01%	325.88	318.32	1.024
6.16%	325.88	317.84	1.025
6.30%	325.88	317.42	1.027

*3rd Party Heat Rate Test
FY 18 - 22 : As per actual EFH
FY 23-42 : As per 88.4% Utilization (in line with availability numbers)

Note: Simple cycle output has been computed from combined cycle 3rd party test results, by removing ST

BQPS II – Annexure G – O&M break up

Gas

BQPS-II O&M Levelized per year

PKR million

Major Activities	Fixed		Variable		Total
	Foreign	local	Foreign	local	
LTSA	576.37	-	805.04	-	1,381.41
Plant O&M Cost – excluding LTSA	861.58	427.72	714.99	132.37	2,136.66
Overhead Cost	-	991.09	-	2.52	993.61
Total	1,437.95	1,418.81	1,520.03	134.89	4,511.69

HSD

BQPS-II O&M Levelized per year

PKR million

Major Activities	Fixed		Variable		Total
	Foreign	local	Foreign	local	
LTSA	576.37	-	2,009.44	-	2,585.81
Plant O&M Cost – excluding LTSA	861.58	427.72	679.65	133.68	2,102.64
Overhead Cost	-	991.09	-	2.52	993.61
Total	1,437.95	1,418.81	2,689.09	136.21	5,682.06

K-Electric Limited
Generation Plants Tariff Petition
BQPS II Plant
Annexure 1 - RAB Movement

Description	Legend	Unit	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031	FY 2032	FY 2033	FY 2034	FY 2035
RAB movement															
Cost - Without surplus on revaluation															
Opening		PKR Mn		60,997	60,997	60,997	60,997	60,997	60,997	60,997	60,997	60,997	60,997	60,997	60,997
Capitalization		PKR Mn		-	-	-	-	-	-	-	-	-	-	-	-
Disposal		PKR Mn		-	-	-	-	-	-	-	-	-	-	-	-
Closing	a	PKR Mn	60,997	60,997	60,997	60,997	60,997	60,997	60,997	60,997	60,997	60,997	60,997	60,997	60,997
Accumulated Depreciation															
Opening		PKR Mn		20,729	22,811	24,894	26,976	29,059	31,141	33,223	35,306	37,388	39,471	41,553	43,636
Depreciation for the year		PKR Mn		2,082	2,082	2,082	2,082	2,082	2,082	2,082	2,082	2,082	2,082	2,082	2,082
Depreciation - Disposal		PKR Mn		-	-	-	-	-	-	-	-	-	-	-	-
Closing	b	PKR Mn	20,729	22,811	24,894	26,976	29,059	31,141	33,223	35,306	37,388	39,471	41,553	43,636	45,718
Net Book Value - Fixed Assets	c=a+b	PKR Mn	40,268	38,186	36,103	34,021	31,938	29,856	27,773	25,691	23,609	21,526	19,444	17,361	15,279
Capital Work In Progress															
Opening		PKR Mn		-	-	-	-	-	-	-	-	-	-	-	-
Capex		PKR Mn		-	-	-	-	-	-	-	-	-	-	-	-
Transfer to Fixed Assets		PKR Mn		-	-	-	-	-	-	-	-	-	-	-	-
Closing	d	PKR Mn	-	-	-	-	-	-	-	-	-	-	-	-	-
Net RAB	e=c+d	PKR Mn	40,268	38,186	36,103	34,021	31,938	29,856	27,773	25,691	23,609	21,526	19,444	17,361	15,279
Average RAB - PKR	f=average of e	PKR Mn		39,227	37,144	35,062	32,980	30,897	28,815	26,732	24,650	22,567	20,485	18,402	16,320
RoRB break up															
Equity Portion	g	%		30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%
Debt Portion	h	%		70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%
Local Component	i	%		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Foreign Component	j	%		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
KIBOR	k	%		15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%
Spread on KIBOR	l	%		2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%
Cost of Debt - Local borrowing	m=k+l	%		17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%
LIBOR	n	%		2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%
Hedge	o	%		15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%
Spread	p	%		4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Cost of Debt - Foreign borrowing	q=n+o+p	%		22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%
KIBOR	r	%		15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%
LIBOR	s	%		-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%
Hedging spread	t	%		2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%
Hedging cost	u=r+s+t	%		15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%
Indexed Return on Equity - Annexure 1(i)	z	%		30.39%	30.39%	30.39%	30.39%	30.39%	30.39%	30.39%	30.39%	30.39%	30.39%	30.39%	30.39%
RoRB and Depreciation amounts															
Cost of Debt - Local	aa=fxhxixm	PKR Mn		4,849	4,592	4,334	4,077	3,820	3,562	3,305	3,047	2,790	2,532	2,275	2,017
Cost of Debt - Foreign	ab=fxhxjxq	PKR Mn		-	-	-	-	-	-	-	-	-	-	-	-

K-Electric Limited
Generation Plants Tariff Petition
BQPS II Plant
Annexure I - RAB Movement

Description	Reference	Unit	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031	FY 2032	FY 2033	FY 2034	FY 2035
Cost of Equity	ac = f x g x z	PKR Mn		3,577	3,387	3,197	3,007	2,817	2,627	2,437	2,247	2,056	1,868	1,678	1,488
Depreciation	ad = b for the year	PKR Mn		2,082	2,082	2,082	2,082	2,082	2,082	2,082	2,082	2,082	2,082	2,082	2,082
Calculation of Tariff components:															
Gas															
Net Capacity	ae	MW		494.532	494.532	494.532	494.532	494.532	494.532	494.532	494.532	494.532	494.532	494.532	494.532
Plant factor	af	%		88.41%	88.4%	88.4%	88.4%	88.4%	88.4%	88.4%	88.4%	88.4%	88.4%	88.4%	88.4%
Net Capacity units at plant factor	ag = ae x af x 8760 / 1000	GWh		3,830.19	3,830.19	3,830.19	3,830.19	3,830.19	3,830.19	3,830.19	3,830.19	3,830.19	3,830.19	3,830.19	3,830.19
Tariff components on Gas															
Cost of Debt - local	aa / ag	PKR / kWh		1.2661	1.1986	1.1316	1.0644	0.9972	0.9300	0.8628	0.7956	0.7284	0.6612	0.5939	0.5267
Cost of Debt - Foreign	ab / ag	PKR / kWh													
Cost of Equity	ac / ag	PKR / kWh		0.9338	0.8842	0.8346	0.7851	0.7355	0.6859	0.6364	0.5868	0.5372	0.4876	0.4381	0.3885
Depreciation	ad / ag	PKR / kWh		0.5437	0.5437	0.5437	0.5437	0.5437	0.5437	0.5437	0.5437	0.5437	0.5437	0.5437	0.5437
HSD															
Net Capacity	ah	MW		463.46	463.46	463.46	463.46	463.46	463.46	463.46	463.46	463.46	463.46	463.46	463.46
Plant factor	ai	%		88.41%	88.4%	88.4%	88.4%	88.4%	88.4%	88.4%	88.4%	88.4%	88.4%	88.4%	88.4%
Net Capacity units at plant factor	aj = ah x ai x 8760 / 1000	GWh		3,590	3,590	3,590	3,590	3,590	3,590	3,590	3,590	3,590	3,590	3,590	3,590
Tariff components on HSD															
Cost of Debt - local	aa / aj	PKR / kWh		1.1859	1.1232	1.0605	1.0358	1.0641	0.9923	0.9206	0.8469	0.7772	0.7055	0.6338	0.5620
Cost of Debt - Foreign	ab / aj	PKR / kWh													
Cost of Equity	ac / aj	PKR / kWh		0.9964	0.9435	0.8906	0.8377	0.7848	0.7319	0.6790	0.6261	0.5732	0.5203	0.4674	0.4145
Depreciation	ad / aj	PKR / kWh		0.5801	0.5801	0.5801	0.5801	0.5801	0.5801	0.5801	0.5801	0.5801	0.5801	0.5801	0.5801

K-Electric Limited
Generation Plants Tariff Petition
BQPS II Plant
Annexure 1 - RAB Movement

Description	Legend	Unit	FY 2036	FY 2037	FY 2038	FY 2039	FY 2040	FY 2041	FY 2042	FY 2043
RAB movement										
Cost - Without surplus on revaluation										
Opening		PKR Mn	60,997	60,997	60,997	60,997	60,997	60,997	60,997	60,997
Capitalization		PKR Mn	-	-	-	-	-	-	-	-
Disposal		PKR Mn	-	-	-	-	-	-	-	-
Closing	a	PKR Mn	60,997	60,997	60,997	60,997	60,997	60,997	60,997	60,997
Accumulated Depreciation										
Opening		PKR Mn	45,718	47,801	49,883	51,965	54,048	56,130	58,213	60,295
Depreciation for the year		PKR Mn	2,082	2,082	2,082	2,082	2,082	2,082	2,082	702
Depreciation - Disposal		PKR Mn	-	-	-	-	-	-	-	-
Closing	b	PKR Mn	47,801	49,883	51,965	54,048	56,130	58,213	60,295	60,997
Net Book Value - Fixed Assets	c = a + b	PKR Mn	13,196	11,114	9,032	6,949	4,867	2,784	702	-
Capital Work in Progress										
Opening		PKR Mn	-	-	-	-	-	-	-	-
Capex		PKR Mn	-	-	-	-	-	-	-	-
Transfer to Fixed Assets		PKR Mn	-	-	-	-	-	-	-	-
Closing	d	PKR Mn	-	-	-	-	-	-	-	-
Net RAB	e = c + d	PKR Mn	13,196	11,114	9,032	6,949	4,867	2,784	702	-
Average RAB - PKR	f = average of e	PKR Mn	14,238	12,155	10,073	7,990	5,908	3,825	1,743	351
RoRB break up										
Equity Portion	g	%	30%	30%	30%	30%	30%	30%	30%	30%
Debt Portion	h	%	70%	70%	70%	70%	70%	70%	70%	70%
Local Component	i	%	100%	100%	100%	100%	100%	100%	100%	100%
Foreign Component	j	%	0%	0%	0%	0%	0%	0%	0%	0%
KIBOR	k	%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%
Spread on KIBOR	l	%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%
Cost of Debt - Local borrowing	m = k + l	%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%
LIBOR	n	%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%
Hedge	o	%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%
Spread	p	%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Cost of Debt - Foreign borrowing	q = n + o + p	%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%
KIBOR	r	%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%
LIBOR	s	%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%
Hedging spread	t	%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%
Hedging cost	u = r + s + t	%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%
Indexed Return on Equity - Annexure J(i)	z	%	30.39%	30.39%	30.39%	30.39%	30.39%	30.39%	30.39%	30.39%
RoRB and Depreciation amounts										
Cost of Debt - Local	aa = f x h x i x m	PKR Mn	1,760	1,503	1,245	988	730	473	215	43
Cost of Debt - Foreign	ab = f x h x j x q	PKR Mn	-	-	-	-	-	-	-	-

K-ELECTRIC LIMITED

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Annexure I - RAB Movement

Description	Legend	Unit	FY 2036	FY 2037	FY 2038	FY 2039	FY 2040	FY 2041	FY 2042	FY 2043
Cost of Equity	ac = f x g x z	PKR Mn	1,298	1,108	918	729	539	349	159	32
Depreciation	ad = b for the year	PKR Mn	2,082	2,082	2,082	2,082	2,082	2,082	2,092	702
Calculation of Tariff components:										
Gas										
Net Capacity	ae	MW	494.532	494.532	494.532	494.532	494.532	494.532	494.532	494.532
Plant factor	af	%	88.4%	88.4%	88.4%	88.4%	88.4%	88.4%	88.4%	88.4%
Net Capacity units at plant factor	ag = ae x af x 8760 / 1000	GWh	3,830.19	3,830.19	3,830.19	3,830.19	3,830.19	3,830.19	3,830.19	1,290.72
Tariff components on Gas										
Cost of Debt - Local	aa / ag	PKR / kWh	0.4595	0.3923	0.3251	0.2579	0.1907	0.1235	0.0563	0.0436
Cost of Debt - Foreign	ab / ag	PKR / kWh								
Cost of Equity	ac / ag	PKR / kWh	0.3389	0.2894	0.2398	0.1902	0.1406	0.0911	0.0415	0.0248
Depreciation	ad / ag	PKR / kWh	0.5437	0.5437	0.5437	0.5437	0.5437	0.5437	0.5437	0.5437
HSD										
Net Capacity	ah	MW	463.46	463.46	463.46	463.46	463.46	463.46	463.46	463.46
Plant factor	af	%	88.4%	88.4%	88.4%	88.4%	88.4%	88.4%	88.4%	88.4%
Net Capacity units at plant factor	aj = ah x af x 8760 / 1000	GWh	3,590	3,590	3,590	3,590	3,590	3,590	3,590	1,210
Tariff components on HSD										
Cost of Debt - Local	aa / aj	PKR / kWh	0.4803	0.4186	0.3469	0.2752	0.2035	0.1317	0.0600	0.0359
Cost of Debt - Foreign	ab / aj	PKR / kWh								
Cost of Equity	ac / aj	PKR / kWh	0.3616	0.3088	0.2559	0.2030	0.1501	0.0972	0.0443	0.0264
Depreciation	ad / aj	PKR / kWh	0.5801	0.5801	0.5801	0.5801	0.5801	0.5801	0.5801	0.5801

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Annexure I (i) - Calculation of Indexed RoE

Particulars		FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024 - closing
		Actualized							Forecasted	
Average Exchange rates	PKR / USD	104.82	104.81	110.01	136.17	158.38	160.21	178.03	206.00	206.00
RAB amount - Generation	PKR mn	40,894	42,080	43,318	43,326	43,186	42,919	41,240	40,268	40,268
Additions, net of Depreciation & Disposals during the year	PKR mn		1,187	1,238	8	(140)	(267)	(1,679)	(971)	-

Year wise Indexation based on exchange rates (a)

FY 2016	%		-0.01%	4.95%	29.91%	51.10%	52.84%	69.84%	96.53%	96.53%
FY 2017	%			4.96%	29.92%	51.11%	52.86%	69.86%	96.55%	96.55%
FY 2018	%				23.78%	43.97%	45.63%	61.83%	87.26%	87.26%
FY 2019	%					16.31%	17.65%	30.74%	51.28%	51.28%
FY 2020	%						1.16%	12.41%	30.07%	30.07%
FY 2021	%							11.12%	28.58%	28.58%
FY 2022	%								15.71%	15.71%
FY 2023	%									0.00%

Calculated with reference to exchange rate of a relevant year vs exchange rate of base year for example 16.31% in FY 2019 calculated as PKR 158.38 / USD divided by PKR 136.17 / USD

Year wise break up of RAB

FY 2016	PKR mn	40,894	40,894	40,894	40,894	40,894	40,894	40,894	40,894	40,894
FY 2017	PKR mn		1,187	1,187	1,187	1,187	1,187	1,187	1,187	1,187
FY 2018	PKR mn			1,238	1,238	1,238	1,238	1,238	1,238	1,238
FY 2019	PKR mn				8	8	8	8	8	8
FY 2020	PKR mn					(140)	(140)	(140)	(140)	(140)
FY 2021	PKR mn						(267)	(267)	(267)	(267)
FY 2022	PKR mn							(1,679)	(1,679)	(1,679)
FY 2023	PKR mn								(971)	(971)
Total RAB	PKR mn	40,894	42,080	43,318	43,326	43,186	42,919	41,240	40,268	40,268

Weightage of RAB (b)

FY 2016	PKR mn	100%	97%	94%	94%	95%	95%	99%	102%	102%
FY 2017	PKR mn	-	3%	3%	3%	3%	3%	3%	3%	3%
FY 2018	PKR mn	-	-	3%	3%	3%	3%	3%	3%	3%
FY 2019	PKR mn	-	-	-	0%	0%	0%	0%	0%	0%
FY 2020	PKR mn	-	-	-	-	0%	0%	0%	0%	0%
FY 2021	PKR mn	-	-	-	-	-	-1%	-1%	-1%	-1%
FY 2022	PKR mn	-	-	-	-	-	-	-4%	-4%	-4%
FY 2023	PKR mn	-	-	-	-	-	-	-	-2%	-2%
Total	PKR mn	100%	100%	100%	100%	100%	100%	100%	100%	100%

Year wise Indexation - considering RAB weightage [c = (a x b)]

FY 2016	%		0.0%	4.7%	28.2%	48.4%	50.3%	69.3%	98.0%	98.0%
FY 2017	%		-	0.1%	0.8%	1.4%	1.5%	2.0%	2.8%	2.8%
FY 2018	%		-	-	0.7%	1.3%	1.3%	1.9%	2.7%	2.7%
FY 2019	%		-	-	-	0.0%	0.0%	0.0%	0.0%	0.0%
FY 2020	%		-	-	-	-	0.0%	0.0%	-0.1%	-0.1%
FY 2021	%		-	-	-	-	-	-0.1%	-0.2%	-0.2%
FY 2022	%		-	-	-	-	-	-	-0.7%	-0.7%
FY 2023	%		-	-	-	-	-	-	-	-
Total Indexation	%		0.0%	4.8%	29.7%	51.1%	53.1%	73.0%	102.6%	102.6%

RoE - USD based (d)	15.0%
Indexation (e)	102.6%
RoE - Indexed at PKR 206 / USD [f = d x (1 + e)]	30.39%

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Annexure 1 (ii) - Illustration for RoE Indexation

Indexation for the quarter	Q1 - FY 2024
Date of indexation	July 3, 2023

Description	Unit	Legend	Gas	HSD
Reference RoRB Cost of Equity component for FY 2024	PKR / kWh	a	0.9338	0.9964
TT & OD selling rate of USD as notified by National bank of Pakistan at June 30, 2023	PKR / USD	b	250	250
Reference exchange rate	PKR / USD	c	206	206
Indexed RoRB Cost of Equity component for FY 2024	PKR / kWh	d = a x b / c	1.1332	1.2092

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Annexure K - Calculation of Working Capital

	Fuel cost on receivable cycle - RLNG	Unit	Legend	FY 2024
	KIBOR	%	a	15.16%
	Spread	%	b	2.00%
	Total	%	c = a + b	17.16%
1	Fuel cost receivable cycle			
	Receipt - days	days	d	30
	Payment - days	days	e	7
	Net days	days	f = d - e	23
	RLNG bill			
	Net capacity	MW	g	495
	Load factor	%	h	88%
	Units for 365 days	GWh	i = g x h x 24 x 365 / 10^3	3,830
	Allowed Heat Rate for the Quarter	btu / kWh	j	8,255
	Reference price	PKR / MMBtu	k	3,301
	Amount for 365 days	PKR / kWh	l = i x j x k / 10^6	104,369
	Amount for outstanding days	PKR Mn	m = f x l / 365	6,577
	With sales tax	PKR Mn	n = m x (1 + 17%)	7,695
	Cost of working capital	PKR Mn	o = c x n	1,320
2	Cost of SBLC			
	Daily gas	MMBTu	p = g x j x 24 x 1,000 / 10^6	97,980
	60 days	MMBTu	q = p x 60	5,878,782
	Amount of 60 days	PKR Mn	r = k x q / 10^6	19,405
	Actual SBLC given		s	2,118
	Lower of 60 days or Actual		t = Lower of r or s	2,118
	SBLC cost (actual with cap of 0.5%)	%	u	0.50%
	Cost of SBCL	PKR Mn	v = t x u	11
3	Cost of HSD inventory	Not included currently, will be added post HSD commissioning		
4	Cost of other inventory			
	Inventory amount	PKR Mn	w	1,865
	Cost	PKR Mn	x = w x c	320
	Total cost of working capital	PKR Mn	z = o + v + x	1,651
	Net Capacity units at plant factor			
	Gas - CC	GWh	aa	3,830
	HSD - CC	GWh	ab	3,590
	Gas - CC	PKR / kWh	ac = z / aa	0.4310
	HSD - CC	PKR / kWh	ad = z / ab	0.4599

BQPS II – Annexure L

Output adjustment in Temperature

BQPS-2 Ambient Temperature impact on Complex Net Load					
Ambient Temperature	Correction Factor	Complex Net Load	Ambient Temperature	Correction Factor	Complex Net Load
1	0.864	572.44	26	0.977	506.03
2	0.867	570.09	27	0.983	503.15
3	0.871	567.72	28	0.989	500.26
4	0.875	565.31	29	0.994	497.36
5	0.879	562.87	30	1.000	494.45
6	0.882	560.39	31	1.006	491.53
7	0.886	557.89	32	1.012	488.61
8	0.890	555.36	33	1.018	485.69
9	0.895	552.80	34	1.024	482.76
10	0.899	550.21	35	1.031	479.83
11	0.903	547.60	36	1.037	476.89
12	0.907	544.96	37	1.043	473.96
13	0.912	542.30	38	1.050	471.02
14	0.916	539.62	39	1.057	468.08
15	0.921	536.91	40	1.063	465.15
16	0.926	534.19	41	1.070	462.21
17	0.931	531.44	42	1.077	459.28
18	0.935	528.68	43	1.084	456.35
19	0.940	525.90	44	1.091	453.42
20	0.945	523.10	45	1.098	450.50
21	0.950	520.29	46	1.105	447.57
22	0.956	517.46	47	1.112	444.66
23	0.961	514.62	48	1.119	441.75
24	0.966	511.77	49	1.127	438.85
25	0.972	508.91	50	1.134	435.95

K-Electric Limited
Generation Plants Tariff Petition
BQPS II Plant
Annexure M - Capacity Payment Calculation sample

Capacity Payment Sample Calculation for a Day

BQII

Time	Date	Net Dependable Capacity (With degradation adjusted) MW	Forced Outage MW	Planned Outage MW	Forced Derated MW	Planned Derated MW	Available Capacity (post planned and forced outages) MW	Amb Temp	Ambient Temp. Correction	Adjusted available Capacity due to Temp	Impact of Temp Oc	Available Capacity MW	Capacity Tariff Rs/kWh	Capacity Payment PKR - Mn
		a	b	c	d	e	f = a-b-c-d-e	g	h	i = f / h	j = i - f	k = i + j	l	m
1:00:00 AM	1-Jul	495	0	0	0	0	495	25	0.9718	509	-14	495	3.02	1.4918
2:00:00 AM	1-Jul	495	110	0	0	0	385	40	1.0632	362	23	385	3.02	1.1600
3:00:00 AM	1-Jul	495	0	0	50	0	445	27	0.9829	452	-8	445	3.02	1.3410
4:00:00 AM	1-Jul	495	0	0	0	0	495	28	0.9886	500	-6	495	3.02	1.4918
5:00:00 AM	1-Jul	495	0	110	0	0	385	29	0.9943	387	-2	385	3.02	1.1600
6:00:00 AM	1-Jul	495	0	0	0	50	445	30	1.0002	444	0	445	3.02	1.3410
7:00:00 AM	1-Jul	495	0	0	0	0	495	31	1.0061	492	3	495	3.02	1.4918
8:00:00 AM	1-Jul	495	0	0	0	0	495	32	1.0121	489	6	495	3.02	1.4918
9:00:00 AM	1-Jul	495	0	0	0	0	495	33	1.0182	486	9	495	3.02	1.4918
10:00:00 AM	1-Jul	495	0	0	0	0	495	34	1.0244	483	12	495	3.02	1.4918
11:00:00 AM	1-Jul	495	0	0	0	0	495	35	1.0306	480	15	495	3.02	1.4918
12:00:00 PM	1-Jul	495	110	0	0	0	385	36	1.0370	371	14	385	3.02	1.1600
1:00:00 PM	1-Jul	495	0	0	0	0	495	37	1.0434	474	21	495	3.02	1.4918
2:00:00 PM	1-Jul	495	0	0	0	0	495	38	1.0499	471	24	495	3.02	1.4918
3:00:00 PM	1-Jul	495	0	0	0	0	495	27	0.9829	503	-9	495	3.02	1.4918
4:00:00 PM	1-Jul	495	0	0	0	0	495	28	0.9886	500	-6	495	3.02	1.4918
5:00:00 PM	1-Jul	495	0	0	0	0	495	29	0.9943	497	-3	495	3.02	1.4918
6:00:00 PM	1-Jul	495	0	0	0	0	495	30	1.0002	494	0	495	3.02	1.4918
7:00:00 PM	1-Jul	495	180	0	0	0	315	31	1.0061	313	2	315	3.02	0.9488
8:00:00 PM	1-Jul	495	0	0	0	0	495	32	1.0121	489	6	495	3.02	1.4918
9:00:00 PM	1-Jul	495	0	0	0	0	495	33	1.0182	486	9	495	3.02	1.4918
10:00:00 PM	1-Jul	495	0	0	0	0	495	34	1.0244	483	12	495	3.02	1.4918
11:00:00 PM	1-Jul	495	0	0	0	0	495	35	1.0306	480	15	495	3.02	1.4918
12:00:00 AM	1-Jul	495	0	0	0	0	495	33	1.0182	486	9	495	3.02	1.4918
Total										11129		11259	3.02	33.9626

K-ELECTRIC LIMITED

K-Electric Limited
Generation Plants Tariff Petition
BQPS II Plant
Annexure N - Outage schedule and plant factor

Description	Legend	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35	FY36	FY37	FY38	FY39	FY40	FY41	FY42	FY43	Total
Hours	a	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Days	b	366	365	365	365	366	365	365	365	366	365	365	365	366	365	365	365	366	365	365	123	7,069
Hours in a year	c = a x b	8,784	8,760	8,760	8,760	8,784	8,760	8,760	8,760	8,784	8,760	8,760	8,760	8,784	8,760	8,760	8,760	8,784	8,760	8,760	2,952	169,512
1 Annual outages																						
Gross Capacity - MW (Weighted average of HSD cap 10% & Gas Capacity 90%)																						
GT-1	d	114.0	114.0	114.0	114.0	114.0	114.0	114.0	114.0	114.0	114.0	114.0	114.0	114.0	114.0	114.0	114.0	114.0	114.0	114.0	114.0	114.0
GT-2		114.0	114.0	114.0	114.0	114.0	114.0	114.0	114.0	114.0	114.0	114.0	114.0	114.0	114.0	114.0	114.0	114.0	114.0	114.0	114.0	114.0
GT-3		114.4	114.4	114.4	114.4	114.4	114.4	114.4	114.4	114.4	114.4	114.4	114.4	114.4	114.4	114.4	114.4	114.4	114.4	114.4	114.4	114.4
ST		178.7	178.7	178.7	178.7	178.7	178.7	178.7	178.7	178.7	178.7	178.7	178.7	178.7	178.7	178.7	178.7	178.7	178.7	178.7	178.7	178.7
Total		521.0	521.0	521.0	521.0	521.0	521.0	521.0	521.0	521.0	521.0	521.0	521.0	521.0	521.0	521.0	521.0	521.0	521.0	521.0	521.0	521.0
Scheduled outage days																						
GT-1	e	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	10.3	513.8
GT-2		26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	10.3	513.8
GT-3		26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	10.3	513.8
ST		26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	10.3	513.8
Forced outage days																						
GT-1	f	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	4.0	194.0
GT-2		10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	4.0	194.0
GT-3		10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	4.0	194.0
ST		10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	4.0	194.0
Total Annual outage days																						
GT-1	g=e+f	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	14.3	707.8
GT-2		36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	14.3	707.8
GT-3		36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	14.3	707.8
ST		36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	14.3	707.8
Total		146.0	146.0	146.0	146.0	146.0	146.0	146.0	146.0	146.0	146.0	146.0	146.0	146.0	146.0	146.0	146.0	146.0	146.0	146.0	57.0	2,831.0
Total Annual outage %																						
GT-1	h=g/b	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	11.6%	10.0%
GT-2		10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	11.6%	10.0%
GT-3		10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	11.6%	10.0%
ST		10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	11.6%	10.0%
Total	i=w. average g/d	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	11.6%	10.0%
Annual Availability %	j=100%-i	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	88.4%	90.0%
2 Overhauls																						
Cumulative hours																						
GT-1		101,725	109,850	117,086	125,210	133,358	141,482	149,198	157,322	165,470	173,594	181,310	189,434	197,582	205,706	213,422	221,546	229,694	237,818	245,942	248,650	
GT-2		100,616	108,740	115,864	124,136	132,284	140,408	148,532	156,248	164,396	172,520	180,644	187,928	196,076	204,200	212,324	220,088	228,236	236,360	244,484	247,192	
GT-3		100,440	108,564	116,280	124,404	132,552	140,676	148,392	156,516	164,664	172,788	180,060	188,184	196,332	204,456	212,172	220,296	228,444	236,568	244,692	247,400	
ST		96,529	104,653	112,537	120,661	127,885	136,009	144,133	152,017	160,165	167,365	175,489	183,613	191,521	199,645	206,845	214,969	223,117	231,241	239,365	242,073	

K-ELECTRIC LIMITED

X-Electric Limited
Generation Plants Tariff Petition
BQPS II Plant
Annexure N - Outage schedule and plant factor

Description	Unit	FY-24	FY-25	FY-26	FY-27	FY-28	FY-29	FY-30	FY-31	FY-32	FY-33	FY-34	FY-35	FY-36	FY-37	FY-38	FY-39	FY-40	FY-41	FY-42	FY-43	Total
Overhauls																						
GT-1				Major OH				HGPI				Major OH				HGPI						
GT-2					Major OH				HGPI				Major OH					HGPI				
GT-3				Major OH				HGPI				Major OH				HGPI						
ST				Minor OH		Major OH			Minor OH		Major OH			Minor OH		Major OH						

Overhauls are included based on factored fired hours. Accordingly, these events will occur when respective factored fired hours will be achieved

MI = Minor Inspection
HGPI = Hot Gas Path Inspection

Overhaul - days - Note																						
GT-1		-	-	37		-	-	17	-	-	-	17	-	-	-	17	-	-	-	-	-	88
GT-2	k	-	-	-	36	-	-	-	17	-	-	-	35	-	-	-	25	-	-	-	-	103
GT-3		-	-	17		-	-	17	-	-	-	36	-	-	-	17	-	-	-	-	-	87
ST		-	-	10	-	39	-	-	10	-	39	-	-	10	-	39	-	-	-	-	-	146
Total		-	-	64	36	39	-	34	27	-	39	53	35	10	-	73	15	-	-	-	-	423

Note: Required days for ST Major Overhaul are 60 days, ST Minor Overhaul are Thirty (30) days, GT Major Overhaul are Thirty Seven (37) days and GT HGPI are Seventeen (17) days. However, when the Major overhaul co-incides with the Annual Scheduled outage, the additional required days for major overhaul have been shown above.

Overhaul - %																						
GT-1		0.0%	0.0%	10.1%	0.0%	0.0%	0.0%	4.7%	0.0%	0.0%	0.0%	4.7%	0.0%	0.0%	0.0%	4.7%	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%
GT-2	l = k / b	0.0%	0.0%	0.0%	9.7%	0.0%	0.0%	0.0%	4.7%	0.0%	0.0%	0.0%	9.6%	0.0%	0.0%	0.0%	4.1%	0.0%	0.0%	0.0%	0.0%	1.5%
GT-3		0.0%	0.0%	4.7%	0.0%	0.0%	0.0%	4.7%	0.0%	0.0%	0.0%	9.7%	0.0%	0.0%	0.0%	4.7%	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%
ST		0.0%	0.0%	2.7%	0.0%	10.5%	0.0%	0.0%	2.7%	0.0%	10.5%	0.0%	0.0%	2.7%	0.0%	10.5%	0.0%	0.0%	0.0%	0.0%	0.0%	2.1%
Total	m = w. average k / d	0.0%	0.0%	4.2%	2.1%	3.6%	0.0%	2.0%	2.0%	0.0%	3.6%	3.2%	2.1%	0.9%	0.0%	5.7%	0.9%	0.0%	0.0%	0.0%	0.0%	1.6%

3 Annual outages + Overhaul

Outage days - Annual + Overhaul																						
GT-1		37	37	74	37	37	37	54	37	37	37	54	37	37	37	54	37	37	37	37	14	796
GT-2	n = g + k	37	37	37	72	37	37	37	54	37	37	37	72	37	37	37	52	37	37	37	14	810
GT-3		37	37	54	37	37	37	54	37	37	37	72	37	37	37	54	37	37	37	37	14	794
ST		37	37	47	37	75	37	37	47	37	75	37	37	47	37	75	37	37	37	37	14	853
Total		146	146	210	182	185	146	180	173	146	185	199	181	156	146	219	161	146	146	146	57	3,254

Outage % - Annual + Overhaul																						
GT-1		10.0%	10.0%	20.1%	10.0%	10.0%	10.0%	14.7%	10.0%	10.0%	10.0%	14.7%	10.0%	10.0%	10.0%	14.7%	10.0%	10.0%	10.0%	10.0%	11.6%	11.3%
GT-2	o = n / b	10.0%	10.0%	10.0%	19.7%	10.0%	10.0%	10.0%	14.7%	10.0%	10.0%	10.0%	19.6%	10.0%	10.0%	10.0%	14.1%	10.0%	10.0%	10.0%	11.6%	11.5%
GT-3		10.0%	10.0%	14.7%	10.0%	10.0%	10.0%	14.7%	10.0%	10.0%	10.0%	19.7%	10.0%	10.0%	10.0%	14.7%	10.0%	10.0%	10.0%	10.0%	11.6%	11.2%
ST		10.0%	10.0%	12.7%	10.0%	20.5%	10.0%	10.0%	12.7%	10.0%	20.5%	10.0%	10.0%	12.7%	10.0%	20.5%	10.0%	10.0%	10.0%	10.0%	11.6%	12.1%
Total	p = w average n / d	10.0%	10.0%	14.2%	12.1%	13.6%	10.0%	12.0%	12.0%	10.0%	13.6%	13.2%	12.1%	10.9%	10.0%	15.7%	10.9%	10.0%	10.0%	10.0%	11.6%	11.6%
Availability	q = 100% - p	90.03%	90.00%	85.82%	87.87%	86.42%	90.00%	87.96%	88.04%	90.03%	86.38%	86.84%	87.90%	89.09%	90.00%	84.34%	89.20%	90.03%	90.00%	90.00%	88.41%	88.41%

K-ELECTRIC LIMITED

K-Electric Limited
Generation Plants Tariff Petition
BQPS II Plant
Annexure G - O&M Sharing Mechanism

Description	Reference	Unit	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027
Hours	a	no.	24	24	24	24	24
Days	b	no.	365	365	365	365	365
Hours in a year	c = a x b	no.	8,760	8,760	8,760	8,760	8,760

Overhauls

Shall be replaced with Actual occurrence

GT-1			Major OH		
GT-2				Major OH	
GT-3			Major OH		
ST			Minor OH		Major OH

**Overhauls are included based on factored fired hours. Accordingly, these events will occur when respective factored fired hours will be achieved*

MI = Minor Inspection
HGPI = Hot Gas Path Inspection

O&M components - Gas Combined cycle

Tariff components
(Shall be replaced with actual quarterly indexed tariff components)

Variable - local	d	PKR / kWh	0.0352	0.0352	0.0352	0.0352	0.0352
Variable - Foreign	e	PKR / kWh	0.3969	0.3969	0.3969	0.3969	0.3969
Fixed - local	f	PKR / kWh	0.3704	0.3704	0.3704	0.3704	0.3704
Fixed - Foreign	g	PKR / kWh	0.3754	0.3754	0.3754	0.3754	0.3754
Net Capacity	h	MW	494.5	494.5	494.5	494.5	494.5
Availability factor (Shall be replaced with Actual)	i	%	90.0%	90.0%	85.8%	87.9%	86.4%
Available capacity	j = h x i x c / 1000	GWh	3,900.1	3,898.9	3,717.8	3,806.7	3,743.8
Dispatch factor (Shall be replaced with Actual)	j1	%	100%	100%	100%	100%	100%
Units sent out	k = j x j1	GWh	3,900.1	3,898.9	3,717.8	3,806.7	3,743.8
Recovery in tariff							
Variable - local	l = d x k	PKR mn	137	137	131	134	132
Variable - Foreign	m = e x k	PKR mn	1,548	1,547	1,475	1,511	1,486
Fixed - local	n = f x j	PKR mn	1,445	1,444	1,377	1,410	1,387
Fixed - Foreign	o = g x j	PKR mn	1,464	1,464	1,396	1,429	1,406
Total	p	PKR mn	4,594	4,593	4,379	4,484	4,410
Cost (Shall be replaced with actual cost incurred)							
O&M expenses as per Financial statements		PKR mn	2,789	2,749	2,752	2,881	3,219
Addition to CWIP as per Financial statements		PKR mn	1,859	1,883	1,802	1,954	2,146
Total	q	PKR mn	4,648	4,632	4,554	4,834	5,365
Over / (Under) Recovery	r = p - q	PKR mn	(54)	(40)	(175)	(350)	(955)
Over / (Under) Recovery - Movement							
Opening	s	PKR mn	-	(54)	(93)	(268)	(619)
Addition	t = r	PKR mn	(54)	(40)	(175)	(350)	(955)
Closing	u	PKR mn	(54)	(93)	(268)	(619)	(1,573)

Sharing Timeline - based on occurrence on Overhaul of last component in One cycle for 3 GTs and 1 ST, and at the end of life - Note			Sharing on completion of MOH of ST
Over / (Under Recovery)	v = u	PKR mn	(1,573)
In case of (Under recovery) - carry forward	w = if v < 0	PKR mn	(1,573)
In case of Over recovery - sharing	x = if v > 0	PKR mn	-
- Consumer - 60%	y = X x 60%	PKR mn	-
- KE - 40%	z = X x 40%	PKR mn	-

Sharing of consumer to be credited in next invoice.

One Overhaul cycle shall include one:
- One MI for each GT
- One HGPI for each GT
- One Minor overhaul for ST
- One Major overhaul for ST

In case of First overhaul cycle, HGPI for three GTs has already been incurred before FY 2024

K-ELECTRIC LIMITED

BQPS II – Annexure P

Head of Terms

POWER PURCHASE AGREEMENT

TERM SHEET

This Term Sheet dated xxx (the "Date of Signing") is a summary of the principal and indicative terms for inclusion in the Power Purchase Agreement (the "PPA") to be entered into between XX Generating Station (Plant) which is part of KE's generation fleet, and Transmission/Load Dispatch Center (LDC) of KE (individually a "Party" and together the "Parties") in relation to the sale and purchase of electrical energy. The terms and conditions contained in this non-binding term sheet are indicative and non-binding in nature. Any such obligation or agreement will be created only by the execution of a definitive power purchase agreement (the "PPA") by Seller and Buyer (as defined below, and collectively the "Parties"), the provisions of which, if so executed, will supersede this Term Sheet and all other agreements, if any, related to this document and the proposed transaction.

Sr #	Terms	Description
1)	Seller	BQPS 2
2)	Buyer	Load Dispatch Center (LDC)/ Supply Business
3)	Purpose of PPA	The Plant shall sell all electrical energy generated by it to the Buyer based on the dispatch instructions issued by Buyer and the fuel available with Seller to meet such dispatch in line with the agreed availability plan between buyer and seller
4)	Plant	[.] *Description of plant to be added*
5)	Product	The "**Product**" to be delivered and sold by Seller and received and purchased by Buyer consists of: (a) all energy, or Buyer's applicable portion, expressed in MWh, generated by the Plant and delivered to the delivery point/interconnection point ("**Delivered Energy**") b) all other plant output including capacity and ancillary services c) Black start facility, if applicable
6)	Term	The term of the PPA shall be effective on the **Effective Date** (to be defined in the PPA) and shall terminate XX Contract Years or the expiry of the regulatory license of the Plant, whichever is earlier, following the Effective Date ("Term"). "**Contract Year**" means each consecutive 12-month period during the Term that commences on the first day of July following the Effective Date, and every July 1st thereafter. The first Contract Year shall be a partial year, commencing on the Effective Date.
7)	Contract Capacity	The Contract Capacity shall be XX MW (net, at reference condition)
8)	Sale and Purchase of Energy and Capacity	Buyer shall have exclusive right of energy and capacity of the Plant. Subject to terms of PPA, The Seller shall: (i) Make available to the Buyer the Declared Available Capacity up to the Contract Capacity (ii) Deliver and sell to Buyer at the interconnection point, the dispatched net electrical output Subject to the terms of PPA, the Buyer shall, in accordance with NEPRA approved tariff: (i) Pay Declared Available Capacity (Take or Pay mechanism) (ii) Pay for the dispatched and delivered net electrical output

Sr #	Terms	Description
9)	Metering	Buyer's share of the Delivered Energy shall be measured using electric metering devices. The Metering System shall be in place prior to the delivery of net electrical output to the interconnection point. Seller shall maintain and Buyer shall inspect such electric metering devices In accordance with the agreed terms and conditions between buyer and seller and approved by NEPRA.
10)	Billing	The PPA shall contain provisions pursuant to which Seller shall send Buyer monthly invoices in form and method determined by the Parties, showing the amount due to the Seller for the relevant month, specifying MWs supplied, all billing parameters, rates and factors and all other data relevant to the calculation of payments.
11)	Net Heat Rate	The Plant shall perform at a Net Heat Rate (NHR) of XXXX as witnessed and/or approved by NEPRA. Necessary Corrections shall be applicable on part load operations.
12)	Annual Operational Plan	At the beginning of each Year, the Plant shall submit to the Buyer, its Annual Operational Plan, which shall include but not be limited to the following: - Planned Outage Schedule - Maintenance Outage Schedule - Forced Outages Allowance - Annual Availability - Minimum Dispatch requirements as per technical limits - Fuel allocation as available from the Fuel Supplier Upon receipt of the Plants' Annual Operational Plan, the Buyer shall review and provide timely feedback on the operational plan based on the following: - The Year's demand forecast - Economic Merit Order Projection (tentative) to be provided to the seller - System constraints including planned outages in the network if any, to be provided to the Seller. - Annual Dispatch Plan (tentative) - to be provided to the Seller annually. Upon review of the Plant's Annual Operational Plan, both Parties shall mutually agree to the final plan for the upcoming contract year
13)	Plant Availability and Dispatch	Seller shall achieve availability of no less than XX%, The Plant shall be responsible for the availability of the Complex for Dispatch by the Buyer. Upon receipt of a notice of Dispatch from the Buyer, the Seller shall generate and deliver the Net Electrical Output at the Interconnection Point in accordance with the technical limits as per grid code and all applicable standards/prudent practices. The Seller shall give prompt notice to the Buyer regarding any changes to availability of the Complex caused by events such as: (i) Force Majeure Event; (ii) Scheduled Outage; (iii) Forced Outage; (iv) Partial Forced Outage; and (v) Any other event which causes alteration in availability

Sr #	Terms	Description
14)	Operation and Maintenance Costs	Seller will bear all costs and expenses for Operations and Maintenance of the Plant and any other costs up to the delivery /interconnection point for the performance of Seller's obligations under the PPA (collectively, the "Seller Costs"). Any ancillary services costs to be excluded from the Seller Costs shall be discussed in the PPA.
15)	Others	The PPA will also include, among other things, the following covenants, terms, and/or conditions: • Seller will insure operate, maintain, manage, replace, repair, study, test, and otherwise use the Plant up to its battery limits in accordance with (i) Seller's obligations in the PPA, and the OEM Manual(s), (ii) Prudent electrical and utility practices, and (iii) all applicable laws (including environmental laws), consents, and governmental approvals, including all applicable standards and guidelines adopted from time to time by governmental authorities • Seller will schedule and perform required maintenance according to the PPA • Seller will insure against all insurable risks with coverage in an amount not less than full replacement cost and on terms specified in the PPA.
16)	Fuel Supply	The Seller shall make its best efforts for the availability and allocation of Main fuel to the Gen Station to maintain guaranteed availability and to meet dispatch notifications. The Seller shall also make its best efforts to maintain the inventory of Back-up Fuel for xx days and ensure the readiness of Plant to operate on Back-up Fuel to maintain guaranteed availability and meet dispatch notifications. The Seller shall also be responsible to obtain consent from the Buyer, prior to operations based on Back-up Fuel. In no event the Seller shall be required to operate the Plant on HSD for a period exceeding xx hours in any Year, provided that prior consent has been solicited from Buyer for any additional hours.
17)	Start-ups and Minimum Load	The Seller shall make technical references available to the Buyer concerning the required times for Start-Ups and minimum complex/machine loading
18)	Island Mode	The Seller shall be responsible to make the plant fully capable of operating on Island Mode, to the extent consistent with the Technical Limits, for recovery from a local or widespread electrical blackout through its Black Start Facility and voltage reduction to effect load curtailment.
19)	Black Start Facility	The Seller shall be responsible to ensure readiness of Black Start Facility all the time in order to start the Plant in case of widespread electrical blackout to operate the Plant in Island Mode.
20)	Billing	Relevant Payment Terms for Energy shall be 30 days. The Buyer shall pay the Seller the Capacity Payments for the available capacity for each month (70% in advance and 30% immediately after month end) and energy payments for dispatched and delivered net electrical output for the relevant month.
21)	Liquidated Damages	To be discussed between the Parties
22)	Force Majeure	Force Majeure Events and the obligations, duties, compensation, and recourse available to each Party during such events including but not limited to **PPFME** (Pakistan Political Events that occur inside or directly involve Pakistan) and **CLFME** (any Change in Law to the extent of Force Majeure Event) shall be negotiated and finalized in the PPA. The PPA will also include a termination right for extended force majeure that impacts Party's ability to perform under the contract.
23)	Events of Default	The PPA will include standard events of default, as appropriate.

Sr #	Terms	Description
24)	Termination	The PPA will include standard terms for Termination. However, Parties agree that there shall not be any Termination for Convenience in the PPA.
25)	Dispute Resolution	In the event of any disputes between the Parties, the Parties shall seek to resolve the same in the following order: 1. Through mutual discussion involving Steering Committee 2. If the dispute in question is not resolved through mutual discussions, then senior management of KE shall resolve the disputes. Other terms & conditions for settlement of disputes shall be mutually agreed between the Parties
25)	Indemnification	Seller shall indemnify Buyer against any damages (unless resulting from Buyer's gross negligence or willful misconduct). Buyer shall indemnify Seller against any damages (unless resulting from Seller's gross negligence or willful misconduct).
26)	Governing Law	Laws of Pakistan
27)	Confidentiality	Each Party shall be required to keep the terms and provisions, of the PPA and this Term Sheet, confidential and prohibited from disclosing such terms to any third party, subject to certain limited exceptions specified in the PPA.

K-Electric Limited

IC Report on O&M cost evaluation – Bin Qasim Power Station II ("BQPS II") Plant

30 November 2022

Consortium of Independent Consultant

OMS

EY
Building a better working world

Reliance Restricted

Chief Financial Officer
K-Electric Limited
KE House, 39-B
Sunset Boulevard, D.H.A. Phase 2
Karachi, Pakistan

Project Power – IC Report on O&M cost evaluation of BQPS II **30 November 2022**

Dear Sir

In accordance with your instructions, we have performed the work set out in our Purchase Order (No: 7500048189) dated 29 March 2022 (the "Engagement Agreement") in connection with the evaluation of forecast of operations and maintenance cost of owned power generation plants prepared by K-Electric Limited ("KE" or the "Client" or "you"), as part of seeking stand-alone tariff for each power plant under IPP mode from National Electric Power Regulatory Authority ("NEPRA") ("the Project" or "Project Power" or the "Transaction").

Purpose of our report and restrictions on its use

This engagement is of due diligence in nature and accordingly this due diligence report ("Report") on Bin Qasim Power Station II ("BQPS II") has been prepared by consortium comprising OMS (Private) Limited ("OMS" or "Technical cum lead consultant") and EY Ford Rhodes ("EY" or "Financial Consultant") (hereinafter jointly referred as "Independent Consultant" or "IC", "We" or "Our") based on their respective technical and commercial analysis performed in accordance with the scope agreed vide Engagement Agreement. The supplementary analysis performed by IC during the course of this engagement has been compiled and submitted to KE separately.

This Report has been prepared on the specific instructions of KE, solely for the purpose of the Transaction and should not be used or relied upon for any other purpose. This Report (or any portion or summary of it) may not be quoted, referred to or shown to any other parties except as provided in the Engagement Agreement.

We accept no responsibility or liability to any person other than to KE, or to such party to whom we have agreed in writing to accept our responsibility in respect of this Report, and accordingly if such other persons choose to rely upon any of the contents of this Report they do so at their own risk.

Nature and scope of the services and limitations

The nature and scope of the services, including the basis and limitations, are detailed in the Engagement Agreement.

Whilst each part of our Report addresses different aspects of our work, the entire Report together with Appendices should be read for a full understanding of our findings and advice.

"Banner headlines" used in this Report are intended only to act as an introduction to the page concerned and should be read in conjunction with rest of the page. They are not intended to represent any recommendation, conclusion or finding.

Our work was completed on 30 November 2022. Therefore, our Report does not take account of events or circumstances arising after that date and we have no responsibility to update the Report for such events or circumstances.

This Report has been finalized based on the data, explanations and feedback provided by the Client during the course of engagement.

Nature and scope of the services and limitations (cont'd)

IC highlights that our Report do not include any recommendation to you on your future course of action. Any decision to proceed with tariff petition may entail consideration of several factors, some of which IC may not be aware of. The evaluation of these factors or advising you on any business decision does not form part of scope of our work of this Report. You should therefore consider the appropriateness of the Report in light of your own objectives and financial situation.

While EY has performed a review of the Operations and Maintenance ("O&M") cost model, we have not assessed the contents of the model i.e. the financial statements or roll-forward for their appropriateness for financial reporting (as per applicable framework) or taxation authorities. Further, as summarized in section 2 of the Report, our review is based on the data and agreements / quotations of the respective power plants made available to IC during the course of the engagement. Reasonableness of O&M costs has been performed by OMS in detail based on substantial review of relevant supporting documents, wherever available. Additionally, we perform our work in the capacity of IC and have not assessed any agreements for their authenticity / legality from a legal and tax perspective.

IC has reported broadly on matters, which Consortium members have noted and which appear significant to us for the purpose of technical and commercial due diligence. In addition, please note that:

a) Our work in connection with this engagement is of a different nature to that of an audit or a review of information, as those terms are understood in applicable international auditing standards. Consequently, we give no assurance on such information.

b) Our scope of work was limited to the review and analysis of information made available to EY by the management of KE, physical site visit and discussions with key management personnel of KE.

c) We have relied on the information provided during the course of engagement and have assumed the genuineness of all the documents and the signatures thereon as if they were originals and also assumed that the scanned or soft copies conform to the original.

d) Transactions, data and events which were not recorded and which were not disclosed to us may not have been identified during our due diligence.

Detailed findings of technical due diligence performed by OMS have been placed in the appendices to this Report with summary findings and considerations highlighted in different sections of the Report.

The contents of our Report have been reviewed by KE management, who have confirmed to us their factual accuracy. Further, feedback provided on the draft Report has been duly addressed, wherever deemed appropriate.

We appreciate the co-operation extended by the KE team during the course of this engagement. Please do not hesitate to contact us if you have any questions about this engagement or if we may be of any further assistance.

Yours faithfully

For and on behalf of OMS (Private) Limited (Technical cum lead consultant)

Abu Adil (Senior General Manager)

For and on behalf of EY Ford Rhodes (Financial consultant)

Rana Nadeem Idrees (Partner)

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1 Key considerations

Key considerations

Key consideration	Commentary	Findings / Recommendation	Pg. no.
Plant operating profile and availability / utilization factor assumption	▸ Under an integrated MYT regime, KE had a consolidated O&M tariff component based on projected operating profile and load factor of its plants. ▸ Since, KE is planning to seek standalone O&M cost tariff for each plant, including BQPS II, therefore, Management has assumed projected plant availability / utilization factor of 88.41% (i.e. the maximum achievable average availability / utilization factor during remaining plant life). ▸ Aforementioned assumption of projected plant utilization to match projected plant availability has been kept aligned with other IPPs, for the sake of tariff petition. ▸ BQPS II configuration includes 3GTs, 3HRSGs and 1ST. ▸ Since NEPRA determined the performance of complex through 3rd party test i.e., Gross Capacity: 525.584 MW, Net Output: 494.532 MW, Net Efficiency (HHV): 41.33% and auxiliary consumption: 31.05 MW i.e., 5.908% of gross output, therefore, it is implied that the same shall stand accepted as such.	▸ Major cost events and the variable cost annual spend profile during the requested tariff control period has been assessed keeping in view forecast availability/utilization. ▸ Since variable costs, including event based costs, are claimed based on actual utilization of the plant, risk of claiming any extra cost for lower actual utilization is negligible. ▸ The availability/utilization/load factor assumed by KE is reflective of the brownfield nature of the plant and expected maintenance requirements over its remaining useful life.	n.a.
Methodology applied for preparing O&M tariff	▸ KE intends to submit its petition for each of its owned power generation plant under IPP mode. ▸ Previously, NEPRA has considered the Revex component of O&M cost for the immediately preceding year (reference year) and accordingly determined the O&M tariff component. In this particular case, KE is submitting its petition in advance for tariff period commencing from FY24 in the current fiscal year. Therefore, for the purpose of O&M cost estimation, FY22 audited numbers have been used.	▸ KE would need to assess its readiness to address any additional information required during tariff determination process. ▸ The findings of this Report are also expected to provide comfort around O&M cost estimation of KE, during the tariff determination process.	n.a.

Key considerations

Key consideration	Commentary	Findings / Recommendation	Pg. no.

Reclassification of expenses between foreign and local components and other adjustments	▸ The adjustments mainly reflect the impact of:
	  ▸ update of exchange rate assumption by KE from PKR 185 to PKR 206 in case of foreign components of VOM and FOM costs (i.e. with a cumulative increase of PKR 2.9b in VOM foreign and PKR 2.8b in FOM foreign).
	  ▸ reclassification/revisit of costs suggested by IC in local and foreign components of VOM and FOM.
	▸ These adjustments translated into a net cumulative increase of PKR 2.6b in FOM and a net cumulative increase of PKR 2.0b in VOM over the requested tariff control period. Consequently, average per kWh VOM cost increased by PKR 0.0276 and average per kWh FOM cost increased by PKR 0.0356.
		▸ KE has evaluated and concurred with the identified adjustments of IC and accordingly reflected those in its adjusted average tariff computation.
		▸ The adjusted average tariff has been included in the later sections of this Report.
			24

Basis used for estimating O&M costs	▸ Basis of estimations can be summarized in four broad categories:
	  ▸ Linked to latest available POs/quotations;
	  ▸ Management estimate/past experience;
	  ▸ Based on FY22 values and SAP history; and
	  ▸ Linked to CSA
	▸ IC has substantiated the reasonableness of assumptions on sample basis (covering ~89.9% of value) through checking of POs, quotations, SAP history, underlying agreements and / other relevant data / basis considered by the Management.
		▸ Estimation basis used by the management were found reasonable / consistent with the historical benchmarks, underlying agreements and / or historical basis.
		▸ As highlighted above, some re-classification adjustments (between local / foreign and variable / fixed components) and cost reductions were identified by IC. These have been agreed with KE and accordingly have been addressed in the adjusted average tariff computation of KE, shown in later sections of this Report.
			23

Key considerations

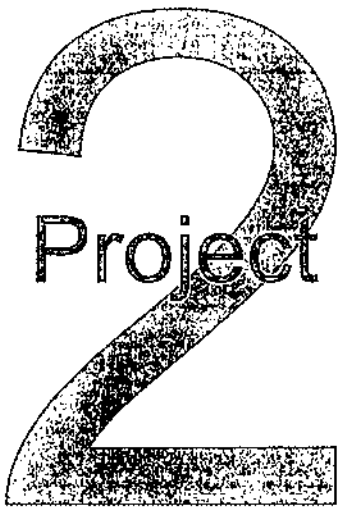
Key consideration	Commentary	Findings / Recommendation	Pg. no.
Benchmarking of O&M costs (Gas operations) PKR/kWh BQPS II:1.1779 UCH-II:1.1775 Nandipur: 1.3180 Average of UCH-II and Nandipur: 1.2478	▸ From technical compatibility perspective (same GTs and fuel etc.), BQPS II average tariff has been benchmarked against estimated indexed tariffs of UCH-II and Nandipur power plants for FY22. ▸ In terms of total reference average O&M component of tariff, as shown in the adjacent column, total BQPS II O&M cost tariff is aligned to UCH-II but at lower side as compared to Nandipur. ▸ Fixed cost ratio in BQPS II (63.3%) is fairly aligned with UCH-II (60.0%) however it is at higher side as compared to Nandipur (36.2%). ▸ Foreign cost component of BQPS II is 65.6% as compared to 75.7% for UCH-II and 88.4% for Nandipur. **Enabling cost benchmarking:** ▸ Due to lack of publicly available data about benchmark projects, enabling costs were analyzed at FOM local level.	▸ On an overall reference average tariff basis, KE's O&M cost tariff is fairly aligned, as compared to the benchmark power plants despite having high comparative FOM cost. ▸ FOM costs are high primarily because of high FOM local costs i.e. FOM local cost of BQPS II constitutes 31.4% of total O&M cost, as compared to 18.4% for UCH-II and 11.6% for Nandipur. This is linked to the following key factors: ▸ Extensive and continuous maintenance needs for open cooling system based on seawater; ▸ Significant annual and routine maintenance cost related to 3 huge gas compressors installed at upstream of GTs; and ▸ High general maintenance costs associated with plant equipment, HVAC system and paint requirement due to sea side location, corrosive environment and usage of sea water for cooling and for RO plant.	28
O&M cost indexations	▸ BQPS II average tariff is expected to be indexed as follows: ▸ Local costs: Pak CPI Quarterly ▸ Foreign costs: US CPI and Exchange rate Quarterly variation	▸ The requested indexations are aligned with benchmark projects and recent determinations by NEPRA for other thermal power projects.	29

Key considerations

Key consideration	Commentary	Findings / Recommendation	Pg. no.

Plant operations on HSD as a back-up fuel	▸ BQPS II is not yet commissioned on HSD, thus, no operational history or tariff is available.
	▸ HSD working is based on following key assumptions:
	  ▸ FFH factor of 2.5 has been considered for CI and 1.5 for HGPI/MI as confirmed by OEM ;
	  ▸ Net capacity of 463.46 MW; and
	  ▸ Net Efficiency (HHV) of 42.5%.
	▸ Current CSA does not cover HSD operations for more than 150FFHs on three (3) GTs. For the purpose of tariff calculation; a factor of 2.5 has been considered subject to actualization as per renegotiated CSA with OEM.
		▸ KE to consider requesting one time adjustment in relation to net capacity and heat rate/efficiency under HSD mode of operations, based on third party testing duly approved by NEPRA.
		▸ In case NEPRA allows HSD commissioning, the CSA would also need to be re-negotiated with OEM accordingly. This should also cover capping of plant operations on HSD mode, while maintaining the approved de-gradation curve under primary fuel. Such capping should also be enshrined in the tariff petition.
		▸ Operational constraints, such as, procurement, handling and storage of liquid fuel, should also be carefully considered while setting the cap for HSD based plant operations at any given point in time.
		▸ As fuel risk is parked with IPP, from power purchaser /regulator perspective, optimum availability is expected to be made available by IPP and hence leaving the fuel mix decision purely at IPP end.
			31,32

Unbundling consideration	▸ BQPS II plant is currently operating under the umbrella of overall KE system. Accordingly, cost structure may change going forward, in case Management decides to unbundle the utility into distinct business segments.	▸ KE is suggested to seek adequate openers (e.g. those related to the recovery of legitimate incremental O&M costs that may arise in future due to potential unbundling of the utility) in its tariff petition.	n.a.
Other commercial considerations	▸ Since KE is using an in-house model for O&M operations, opportunity of embedding certain costs and risks (as part of third-party O&M contractor scope) with performance guarantee mechanism and indirect reflection in fixed or variable O&M charge is not available to KE. Consequently, such costs and risks are being parked with/borne by KE instead of a third party and hence bear a cost recovery challenge. However, KE does not envisage any cost increase due to continuation of an in-house operating model.	▸ KE, in consultation with its legal team, should consider reiterating the legitimate cost recovery principal enshrined within the prevalent tariff regulatory framework while finalizing and framing request for the O&M cost components of the tariff.	n.a.



Project background and scope of work

KE has hired consortium of OMS and EY for the independent evaluation of projected O&M costs for BQPS II

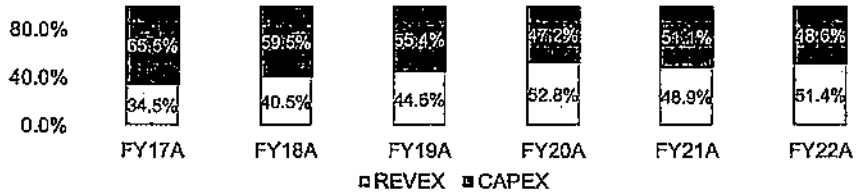
Background

- K-Electric Limited ("KE") is the only vertically integrated power utility of Pakistan.
- KE carries out operations and maintenance of its power generation plants, including major overhauls, under service contracts with OEMs and/or in-house (with or without vendors support), as applicable.
- KE's existing integrated-Multi Year Tariff ("MYT") period is due to expire on 30 June 2023.
- As part of its preparatory work for next MYT petition, KE has internally decided to opt out of MYT for generation component of its business and is in the process of applying separate generation tariff for the following owned power generation plants, covering their remaining useful economic lives as tariff control period:
  - Bin Qasim Power Station – I ("BQPS I")
  - Bin Qasim Power Station – II ("BQPS II")
  - Bin Qasim Power Station – III ("BQPS III")
  - S.I.T.E Gas Engine Power Station ("SGEPS")
  - Korangi Town Gas Engine Power Station ("KTGEPS")
  - Korangi Combined Cycle Power Plant ("KCCPP")
- KE has prepared an O&M cost forecast for each of these power plants for the purpose of tariff petioning. For this purpose, O&M costs have been derived keeping in view historical and forecast revenue expenditure ("REVEX") and capital expenditure ("CAPEX") for each plant.
- KE hired a consortium comprising OMS (Private) Limited ("Technical cum lead consultant") and EY ("Financial Consultant") (hereinafter together referred to as "Independent Consultant" or "IC") for assistance in the evaluation of the aforesaid projected O&M costs.

O&M costs related to generation segment are reflected in audited financial statements as expenses incurred in generation and additions to CWIP – generation segment

Historical generation O&M cost – KE system

Figures in PKRm		FY17A	FY18A	FY19A	FY20A	FY21A	FY22A
REVEX	A	4,751	4,695	5,195	5,054	5,322	4,770
CAPEX	B	9,003	6,877	6,429	4,521	5,656	4,505
Total		13,754	11,572	11,624	9,575	10,978	9,275



Reconciliation with audited financial statements

Figures in PKRm	FY17A	FY18A	FY19A	FY20A	FY21A	FY22A
O&M expenditure	4,751	4,695	5,195	5,054	5,322	4,770
Add: Depreciation & Amortization	7,648	9,061	9,878	11,729	11,436	11,657
O&M expenditure total	12,399	13,756	15,073	16,783	16,758	16,427
O&M expenditure support cost	1,089	920	1,138	986	1,223	1,273
Add: Depreciation & Amortization support dept	43	55	68	82	85	212
O&M expenditure total	1,132	974.56	1,206	1,068	1,308	1,485
Expenses incurred in generation as per AFS	13,531	14,731	16,279	17,851	18,066	17,912

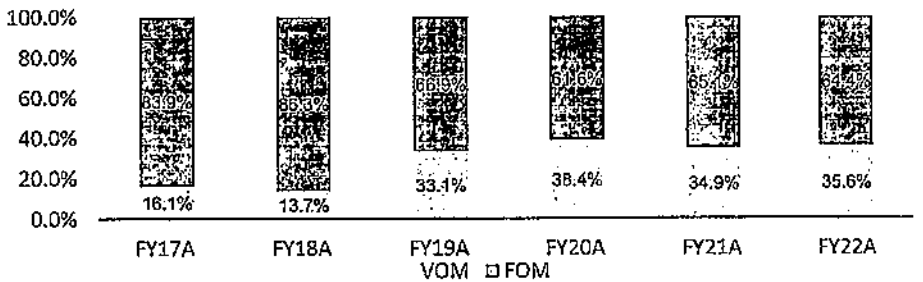
Figures in PKRm	FY17A	FY18A	FY19A	FY20A	FY21A	FY22A
Generation – Plant and machinery additions	7,509	6,385	6,857	4,234	5,059	4,162
Generation – Others	1,494	492	-428	287	597	343
Sub-total	9,003	6,877	6,429	4,521	5,656	4,505
Add: BQPS III Project Cost	0	30	14	16,625	45,372	21,819
CWIP additions as per AFS	9,003	6,907	6,443	21,146	51,028	26,324

Source: Management data and KE Annual Reports

Historical generation O&M cost – BQPS II

Figures in PKRm	FY17A	FY18A	FY19A	FY20A	FY21A	FY22A
REVEX	1,356	855	1,229	1,184	1,371	1,283
CAPEX	5,172	3,266	2,623	1,665	1,727	1,778
Total	6,528	4,121	3,852	2,849	3,098	3,061

Source: Management data



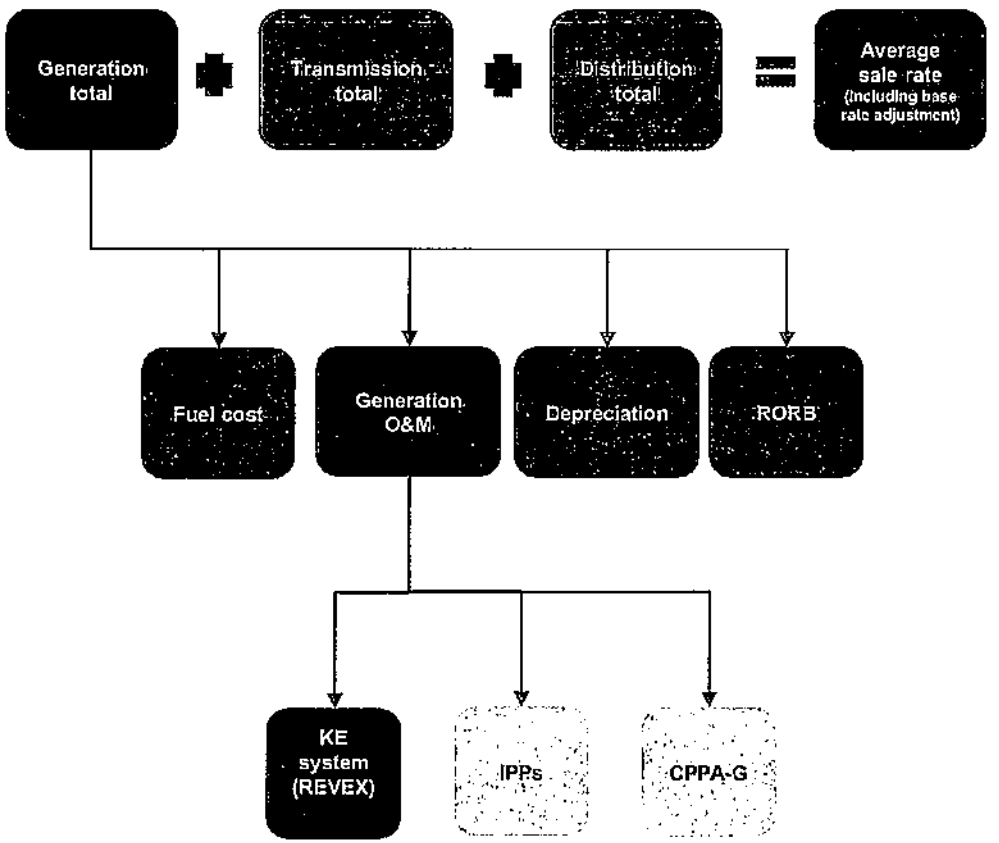
Estimated breakdown of historical BQPS II O&M cost

Figures in PKRm	FY17A	FY18A	FY19A	FY20A	FY21A	FY22A
Variable O&M local	126	138	147	124	117	169
Variable O&M foreign	928	426	1,127	969	963	922
Sub-total variable O&M	1,054	564	1,274	1,093	1,080	1,091
Fixed O&M local	1,098	1,204	346	823	884	938
Fixed O&M foreign	4,376	2,353	2,232	932.62	1,134	1,032
Sub-total fixed O&M	5,474	3,557	2,578	1,756	2,018	1,970
Total	6,528	4,121	3,852	2,849	3,098	3,061

- Per management, since existing MYT does not bifurcate O&M into variable and fixed costs and accordingly, therefore costs are being maintained in the form of REVEX and CAPEX only. According to the Management, for the purposes of comparison with the proposed O&M bifurcation into fixed and variable cost going forward, historical O&M costs have been bifurcated based on assumptions similar to that of projected O&M costs.

Composition and comparability limitations of existing MYT

Current Integrated Multi-Year Tariff structure determined by NEPRA



- KE's current Multi Year Tariff is an Integrated MYT which includes costs and returns for all three segments i.e. Generation (all plants), Transmission and Distribution based on Regulatory Asset Base (RAB).
- While the underlying costs for three segments are defined in the current MYT determination, certain components such as base rate component and working capital component are not bifurcated segment wise.
- Similarly, plant wise tariff bifurcation in case of generation segment is not available within the MYT.
- Current MYT includes below components:
  - Fuel cost based on allowed benchmarks (indexed value for the month of June 2022 was PKR 21.72/kWh*);
  - RoRB and Depreciation components which cover for Returns on Regulatory Asset base (indexed value for the month of June 2022 was PKR 1.13/kWh* for generation); and
  - Operation and maintenance costs for generation, that are covered through:
    - O&M component allowed for Revex expenses (indexed value for the month of June 2022 was PKR 0.59/kWh*); and
    - Capital nature expenses allowed as investments and included in Regulatory Asset Base
- As explained above, base rate and working capital components are given on Company level, which include coverage for Generation segment as well.
- Accordingly, MYT in its current form is not comparable with the O&M cost tariff being requested under IPP mode.

Source: Management data

* Tariff values based on total units sold basis

Scope of work of IC

Scope of work	Responsibility	
	OMS (Lead cum Technical Consultant)	**EY** (Financial Consultant)
Comment on the historical and projected operating profile of plant	✓	
Review and evaluate grouping of O&M activities under fixed and variable components	✓	✓
Review bifurcation of expenses in foreign and local components	✓	✓
Review and evaluate completeness of O&M costs	✓	
Review and evaluate assumptions used for projecting O&M costs	✓	✓
Evaluate enabling / associated cost loading over O&M cost component of isolated plant	✓	✓
Identify gaps in costing and provide estimates to fill those gaps	✓	
Benchmarking of O&M costs against those of comparable projects	✓	✓
Consider inventory in hand and consider its periodic depletion till end of term	✓	

3 Technical specifications of the plant

Key technical specification and plant configuration of BQPS II

- The Power Plant operates in simple cycle as well as combined cycle mode.
- It comprises of 4 Generators, which are:
  - 03 x Gas Turbines (GTs):
    - The Plant has three (3) Gas Turbines that are General Electric (GE- Model PG9171E) France.
  - 01 x Steam Turbine (ST):
    - The Steam Turbine is of Harbin Turbine Company Limited (HTC China)
  - 03 x HRSG:
    - HRSGs are of No. 703 Research Institute of CSIC make (China).
    - HRSG type - Q1114/554.3-177.3 (36.5) (8)-8.92(0.79) (0.1)/539(275).
    - Each HRSG system comprises of a flue gas bypass system. HRSGs are without supplementary combustion, and each HRSG comprises of double drum, integrated deaerator, horizontal type, vertical spiral finned pipes, and natural circulation.
  - 03 x Natural Gas Compressors (NGCs):
    - NGC is 02 stage centrifugal compressor (split casing type)
    - Full Load operation requires 2 functional NGC, with the 3rd NGC on standby.
    - NGC Inlet Pressure is 2 Bars, and Outlet Pressure is 28 Bars. It has 8.5 MW Motors.

Category	Description
Technology	Combined cycle power plant
Configuration	3GT + 3HRSG + 1ST
Type of fuel	Natural Gas – Primary, HSD / RLNG – Backup
Equipment	Gas Turbines & Steam Turbines
Units	3 x 127.8 Gas turbines, 1 x 189.27 MW Steam turbines
Capacity	572.67 MW ISO Installed
Make	Gas Turbine – GE, Steam Turbine – Harbin (HTC)
Model	Gas Turbine – Model PG9171E, Steam Turbine – HTC China

Plant Performance Results

- Plant Performance Test was conducted in 2018 by NESPAK and SGS as per NEPRA approved guidelines / parameters. PTC46-2015 standard (Overall Plant Performance) guidelines were followed for preparation of test procedure, conducting and evaluating the Heat Rate and Capacity (Primary Test). Following the approval of Test Procedure by KE and NEPRA the primary and secondary tests were conducted by NESPAK- SGS JV. All the primary and secondary tests were witnessed by KE and NEPRA's representatives.
- As per Performance Test Parameters, the difference of net and gross output is 31.05 MW (5.908%). This auxiliary consumption of 5.908% is higher than other plants but is reasonable based on the following conditions:
    - Gas received from SSGC is at a very low pressure (6~7 bars) and is required to be boosted to 28 bars. Power consumed to boost the gas pressure is around 17MW (60% of total auxiliary consumption). If SSGC supplies higher pressure gas or RLNG is used, the auxiliary consumption will drop down to 2.7%;
    - Open cycle Seawater is used for the cooling system of the plant which is also one of the major factors contributing to auxiliary consumption.
- The results of the test were shared with NEPRA & subsequent capacities as included in Generation License are as follows

S.No.	Parameters	Complex Output Results
1	Gross Power Output of Complex (Corrected)	525.584 MW
2	Net Power Output of Complex (Corrected)	494.532 MW

S.No.	Parameters	HHV Corrected	LHV Corrected
1.	Gross Heat Rate (BTU/kWh)	7,767.237	7,008.940
2.	Net Heat Rate (BTU/kWh)	8,255.255	7,449.314
3.	Gross Efficiency (%)	43.930	48.683
4.	Net Efficiency (%)	41.333	45.805

Operating profile and maintenance strategy

Historical Availability & Reliability

As per the table given below, it is noted that the average plant availability was more than 94% & reliability remained more than 99% throughout the years.

Performance indicator	FY17	FY18	FY19	FY20	FY21	FY22
Availability [1]	91.10%	95.28%	92.63%	95.40%	94.87%	96.11%
Reliability [2]	99.55%	98.38%	98.90%	99.32%	99.37%	99.94%

Maintenance Strategy

As per the table given below, Maintenance Strategy of Major equipment is reflected as per OEM recommendations and site conditions.

Machine	Outage type	Recommended	Days
GT	GT Compressor OFFWW	Every 2000 Hours	1.5
GT	GT Borescope	Every 6000 Hours	2
GT	Filter Replacement	Every 2000 hrs (SUMMER)	1.5
		Every 1000 hrs (WINTER - COAL IMPACT)	
GT	HGPI	Every 32000 Hours	17
GT	MI	Every 64000 Hours	37
ST	Major Overhaul	Every 5 years	60
ST	Minor Overhaul	Every 3 Years	30
COMPLEX	Complex Annual Outage	Every year	20
GT	CI	Every 12800 Hours on HSD	13

1. Availability % = Available Capacity / Gross Dependable Capacity
2. Reliability % = (Period Hours – Forced Outage Hours) / Period Hours

Operating profile | GT and ST outage history

Unit / Serial No	Maintenance event detail	Year
GT 1 (890225)	Major Inspection, MI	FY-19
	Combustion Inspection, CI	FY-17
	Advance Gas Path, AGP	FY-15
	Combustion Inspection, CI	FY-14
GT 2 (890226)	Major Inspection + Generator Rotor Replacement MI + Rotor	FY-19
	Combustion Inspection, CI	FY-17
	Advance Gas Path, AGP	FY-15
	Combustion Inspection, CI	FY-14
	Combustion Inspection, CI	FY-13
GT 3 (890227)	Hot Gas Path Inspection, HGPI	FY-22
	Major Inspection, MI	FY-18
	Combustion Inspection, CI	FY-17
	Advance Gas Path, AGP	FY-15
	Combustion Inspection, CI	FY-14
Steam Turbine	Minor inspection, MI	FY-14
	Major overhaul, MO	FY 17

Operating profile | GT and ST projected outages

Modification / Upgradation of normal HGPI Parts by replacement with AGP parts has extended the life and outage of gas turbine from 24000 FFH to 32000 FFH. Similarly, CI parts were also replaced with extended life CI parts resulting in extension of life and outage of gas turbine from 12000 FFH to 32000 FFH.

Cumulative operating hours until 30 June 2022:

Duration		Fired Hours/Operational hours				Factored Fired Hours		
Year	Month	GT 1	GT 2	GT 3	ST(Opr. Hrs)	GT 1	GT 2	GT 3
FY-2022	June-22	81871	79967	80515	81820	85638	84591	84344

BQPS-II Major Equipment outages (Gas Fuel) for HGPI and MI projected dates till FY-42 are given below:

	GT-1		GT-2		GT-3	
HGPI	FY-23	86,256	FY-23	87,908	FY-22	81,507
2nd MI	FY-26	114,013	FY-27	121,095	FY-26	112,724
HGPI	FY-30	146,389	FY-31	153,471	FY-30	145,100
3rd MI	FY-34	178,645	FY-35	185,727	FY-34	177,356
HGPI	FY-38	211,021	FY-39	218,103	FY-38	209,732

BQPS-II ST Outage:

ST	Maintenance type	Date as of June 2022
1	Minor	FY-25
2	Major	FY-27
3	Minor	FY-30
4	Major	FY-32
5	Minor	FY-35
6	Major	FY-37

Strategic spares and inventory available in the warehouse

Strategic spares and inventory (excluding fuels) available in the warehouse built up as of 30 June 2022			
S. No.	**Department**	**No. of Items**	**Amount in PKR**
1.	Mechanical	264	572,235,476
2.	Electrical	118	372,788,900
3.	Instrument and maintenance	100	155,630,380
4.	Revex / other consumables	11,789	1,830,895,663
	Total	**12,271**	**2,931,550,419**

Commentary on Inventory Management of Strategic Capital Spares

In BQPS II Project Cost, certain capital spares for GT were provided as well as capital spares for ST and its auxiliaries.

Key findings

Overall spares availability and inventory management was found reasonable to ensure the plant availability / maintenance requirement.

Initial spares

As per CSA, following GT spares were supplied as initial spares for the covered units:

- Two sets of CI Parts and consumables
- Two sets of HGPI Parts and consumables
- MK-VI E
- Turbine Operational Exciter and Generator Spares

Mandatory spares

Mandatory spares for covered units are to be maintained during the tenure of the CSA. As per CSA following mandatory spares are required to be maintained:

- One set of CI
- One set of HGPI
- One set of MK-VI E
- One set of Turbine Operational Exciter and Generator Spares

End of term spares

As per CSA, mandatory spares are required to be supplied around the time of expiration of agreement which have at least useful lives remaining until the next outage.

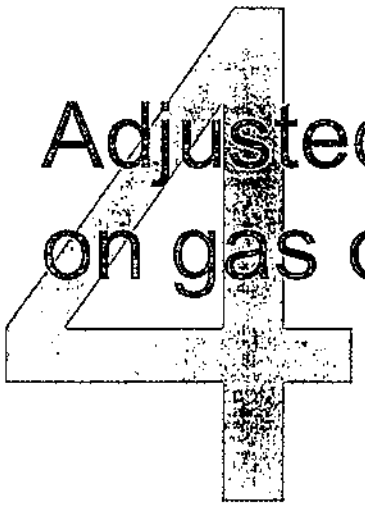
ST parts

Major capital spares of ST was procured before the first MI. 80% of spares are still available in the inventory for the plant.

Other spares

Other auxiliary system spares are maintained according to their requirements. Minimum / maximum quantities of these spares are defined in SAP and reordered accordingly.

Total inventory given in the inventory list is carried at **PKR 2,931,550,419** which requires regular replenishment for smooth O&M of plant during its remaining useful life.



Adjusted O&M cost and average tariff on gas operations

Key assumptions

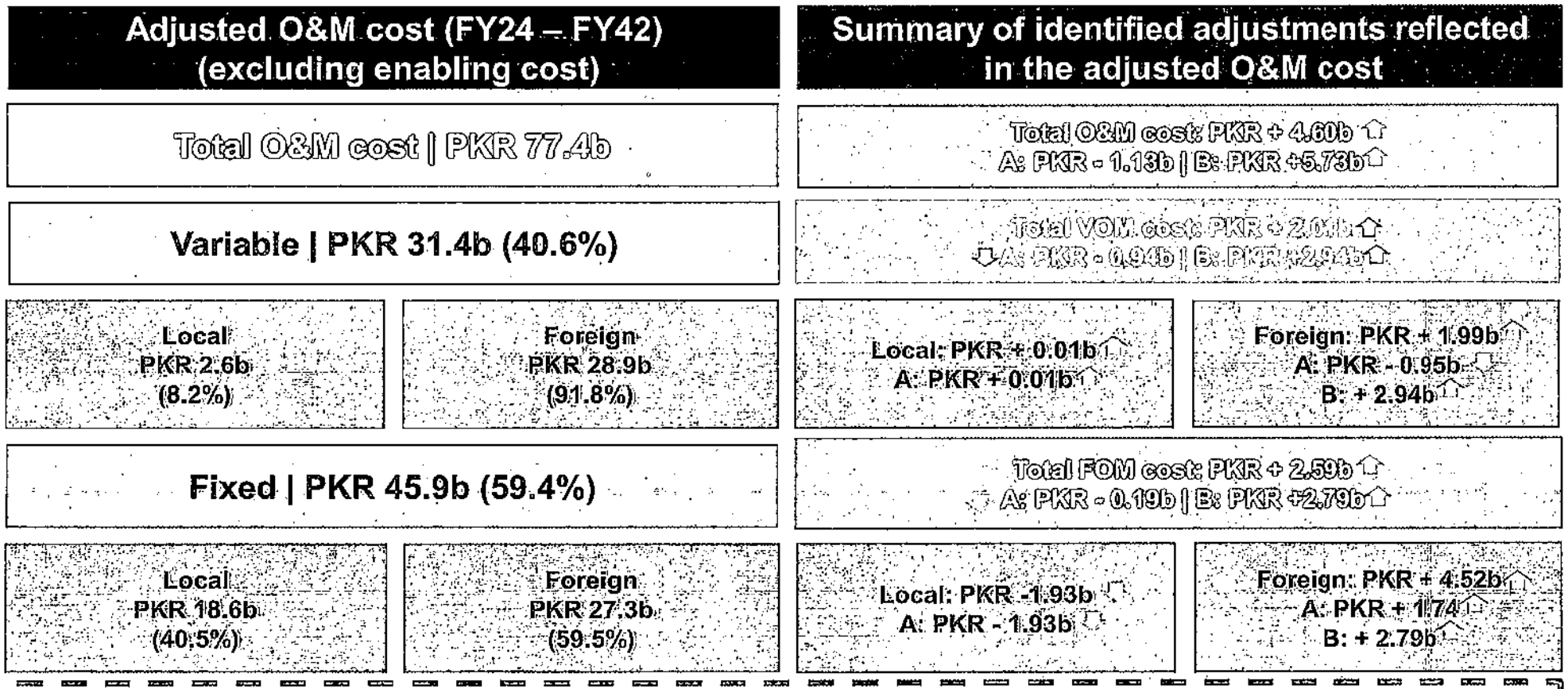
Key assumptions

- As per generation license, precise commercial operations end date for BQPS II is 19 October 2042. However, for the sake of simplicity, KE has projected the O&M costs for period FY24 – FY42 ("BQPS II PP"). The impact of additional period rounded to the nearest month has been illustrated on the following slides for ease of reference and understanding.
- Projected availability / utilization factor varies throughout the years as follows considering 90% Gas and 10% HSD operations:

FY	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
Factor	90.0%	90.0%	85.8%	87.9%	86.4%	90.0%	88.0%	88.0%	90.0%	86.4%	86.8%	87.9%	89.1%	90.0%	84.3%	89.1%	90.0%	90.0%	90.0%

- The average utilization/load factor is reflective of the brownfield nature of the plant and expected maintenance requirements over its remaining useful life.
- Average availability during FY17 – FY22 was 94.23%, whereas, average availability assumed during FY24 – FY42 works out to be 88.41%, keeping in view the anticipated maintenance requirements for the plant.
- Foreign currencies other than USD are first converted to equivalent USD based on their respective exchange rate parity with USD (assumed 1.05, 1.21, 0.15, 0.01, and 1.0 for EUR, GBP, CNY, JPY and USD respectively). Subsequently, USD based values are converted to equivalent PKR using prevailing PKR to USD conversion rate of 206.0, as per 30th June 2022 (as per NBP).
- The projected O&M costs originally estimated by the management of KE was based on PKR to USD exchange rate of 185. Towards the finalization of IC work, this assumption has been updated to PKR 206 for each USD. Accordingly, the adjusted reference tariff is also reflective of exchange rate assumption update.

Adjusted reference cumulative projected O&M cost (un-indexed) during FY24 – FY42 is PKR 77.4b (excluding enabling)



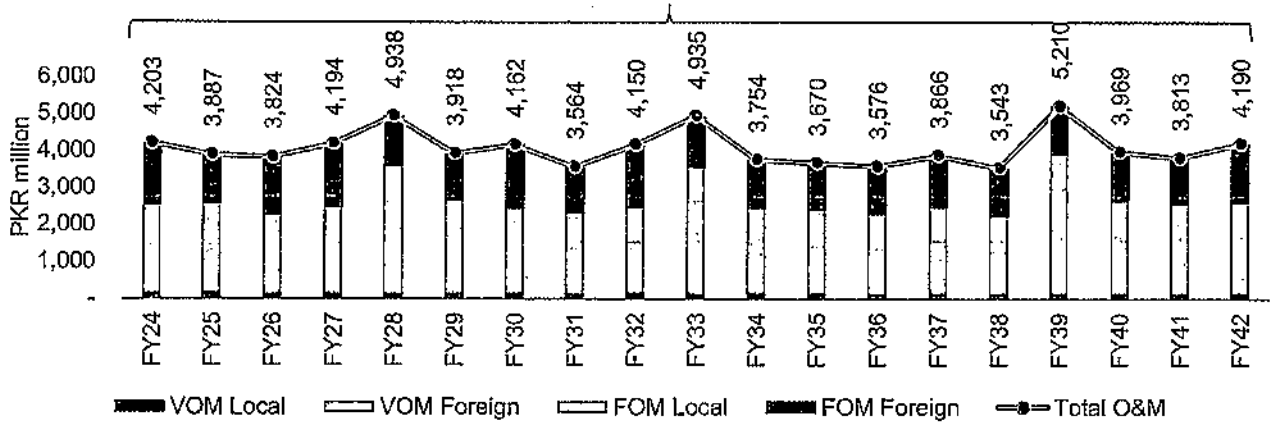
After considering additional period (4 months) until expiry of the generation license, the aggregate increase in the total O&M cost (excluding enabling cost) is PKR 1.4b.

Legend: **Cost reduction** ⇩ **Cost increase** ⇧ **A: Estimated cumulative adjustments identified by IC** **B: Estimated exchange rate update impact**

Source: Management data

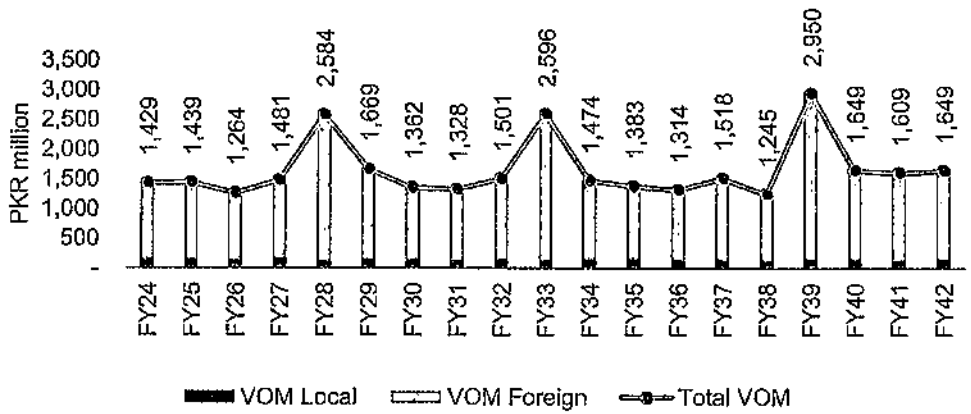
Adjusted total O&M costs mix and trend (excluding enabling cost)

Total adjusted reference O&M cost (un-indexed)
Average availability / utilization: 88.41%

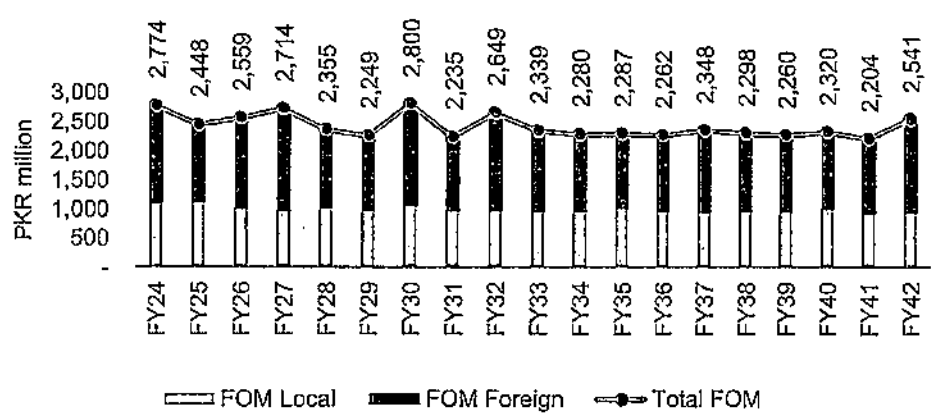


Historical analysis (FY 17 – 22)	
Average availability (%)	94.2
Average utilization (%)	86.7
Average annual total O&M (PKR million)	3,663.3

Total adjusted reference VOM cost (un-indexed)



Total adjusted reference FOM cost (un-indexed)



Computation of tariff based on projected plant availability for both FOM and VOM components

Keeping the expected fuel mix variation in purview, KE has assumed slightly rationalized availability factor over the tariff control period. The same has been considered for tariff computation. Below is the plant availability / load factor used for the tariff computation of both variable and fixed components.

FY	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
Factor	90.0%	90.0%	85.8%	87.9%	86.4%	90.0%	88.0%	88.0%	90.0%	86.4%	86.8%	87.9%	89.1%	90.0%	84.3%	89.1%	90.0%	90.0%	90.0%

Year	Variable O&M			Fixed O&M			Total
	Local	Foreign	Total	Local	Foreign	Total	
FY24	0.0368	0.3295	**0.3663**	0.2809	0.4304	**0.7112**	**1.0776**
FY25	0.0381	0.3310	**0.3691**	0.2842	0.3437	**0.6279**	**0.9970**
FY26	0.0323	0.3077	**0.3401**	0.2666	0.4219	**0.6884**	**1.0285**
FY27	0.0367	0.3523	**0.3890**	0.2534	0.4594	**0.7128**	**1.1018**
FY28	0.0327	0.6574	**0.6901**	0.2668	0.3621	**0.6289**	**1.3190**
FY29	0.0366	0.3915	**0.4281**	0.2473	0.3296	**0.5769**	**1.0049**
FY30	0.0369	0.3206	**0.3574**	0.2752	0.4596	**0.7348**	**1.0923**
FY31	0.0321	0.3162	**0.3483**	0.2512	0.3348	**0.5860**	**0.9343**
FY32	0.0368	0.3481	**0.3849**	0.2450	0.4343	**0.6793**	**1.0642**
FY33	0.0327	0.6610	**0.6936**	0.2543	0.3707	**0.6250**	**1.3186**
FY34	0.0367	0.3552	**0.3919**	0.2523	0.3536	**0.6059**	**0.9978**
FY35	0.0367	0.3265	**0.3633**	0.2628	0.3377	**0.6005**	**0.9638**
FY36	0.0326	0.3078	**0.3404**	0.2449	0.3412	**0.5861**	**0.9265**
FY37	0.0371	0.3523	**0.3894**	0.2387	0.3635	**0.6022**	**0.9915**
FY38	0.0327	0.3081	**0.3408**	0.2607	0.3682	**0.6290**	**0.9697**
FY39	0.0363	0.7279	**0.7642**	0.2466	0.3390	**0.5856**	**1.3497**
FY40	0.0362	0.3865	**0.4227**	0.2538	0.3411	**0.5949**	**1.0176**
FY41	0.0323	0.3803	**0.4127**	0.2355	0.3299	**0.5654**	**0.9781**
FY42	0.0364	0.3865	**0.4230**	0.2378	0.4140	**0.6518**	**1.0748**
Weighted average	0.0352	0.3969	0.4321	0.2556	0.3754	0.6310	1.0631
Add: Enabling charge (for details, please see following pages)				0.1148	-	**0.1148**	**0.1148**
Total tariff	0.0352	0.3969	0.4321	0.3704	0.3754	0.7459	1.1779

Weighted average tariff including additional 123 days:

FY24-43	**0.0352**	**0.3969**	**0.4321**	**0.3704**	**0.3754**	**0.7459**	**1.1779**

Since KE is a vertically integrated power utility and carry a unique position due to brown field nature of its power plants with entity level consumption, it intends to follow a billing regime for capacity payment based on available (net of outage allowances) basis. Accordingly, in order to recover projected fixed costs, Management has computed capacity part at respective availability/ utilization factor across all power plants of KE. In terms of total fixed cost recovery on an annual basis, KE's proposed Fixed cost component is expected to be indifferent from tariff computation being practiced under Take or Pay regime for other IPPs .

Since KE operates as VIU company, it has a central enabling/support function serving all three business segments of the business. Central costs are allocated to each business segment (generation, transmission and distribution)

Allocation of enabling charge to O&M tariff

Average Enabling cost (per annum)

PKR 439.8m

Weighted average tariff component (per kWh)

PKR 0.1148

- Per Management, enabling costs represent costs apportioned to BQPS II by departments, such as Human Resource Management, Information Technology, Marcom, Business Development (including IPP department), Security, Corporate Affairs, CFO Office and CEO Office etc., for provision of shared services to BQPS II.
- The aforementioned costs are directly incurred by the respective departments and subsequently are re-allocated to the generation, transmission and distribution segments, using re-allocation basis provided by the respective departments (generally based on their own assessment of time spent or relevance of cost between generation, transmission and distribution segments).
- Ultimately, projected cost assigned to generation segment is spread between six based on the number of units sent out.
- Such costs are generally covered as part of the administrative costs claim in the fixed O&M local component of the tariff allowed to IPPs.

Key findings

UCH-II and Nandipur were explored as close benchmarks for BQPS II, however, due to data limitations, Nandipur was excluded for the purpose of enabling cost benchmarking. Additionally, in the absence of visibility on UCH-II salaries, wages and other key comparable cost heads, IC is not in a position to benchmark overall enabling cost allocation to BQPS II. Accordingly, these have been analyzed at FOM local level.

Overall O&M tariff of BQPS II is lower than Nandipur and fairly aligned with UCH-II power plant

Tariff components	BQII		(A) UCH-II [1]		(B) Nandipur [1]		Average of A - B	
	PKR/kWh	%share	PKR/kWh	%share	PKR/kWh	%share	PKR/kWh	%share
VOM local	0.0352	3.0%	0.0691	5.9%	0.0000	0.0%	0.0346	2.8%
VOM foreign	0.3969	33.7%	0.4016	34.1%	0.8410	63.8%	0.6213	49.8%
Total VOM	**0.4321**	**36.7%**	**0.4707**	**40.0%**	**0.8410**	**63.8%**	**0.6558**	**52.6%**
FOM local	0.3704	31.4%	0.2166	18.4%	0.1531	11.6%	0.1848	14.8%
FOM foreign	0.3754	31.9%	0.4903	41.6%	0.3239	24.6%	0.4071	32.6%
Total FOM	**0.7459**	**63.3%**	**0.7068**	**60.0%**	**0.4770**	**36.2%**	**0.5919**	**47.4%**
Total O&M tariff	**1.1779**	**100.0%**	**1.1775**	**100.0%**	**1.3180**	**100.0%**	**1.2478**	**100.0%**

Key technical specifications	BQPS II	UCH-II	Nandipur
Net capacity (MW)	494.5	375.2	450.5
Efficiency (net at LHV)	45.8%	49.4%	49.0%
Fuel	Gas	Low BTU Gas	Gas / RLNG / HFO
GTs type	GE 9171-E	GE 9171-E	GE 9171-E
Plant configuration	3GT + 3HRSG + 1ST	2GT + 2HRSG + 1ST	3GT + 3HRSG + 1ST
Generation license period	30 years	25 years	30 years
Average availability / utilization factor for tariff benchmarking	88.41% [2]	88.41% [1]	88.41% [1]

Key findings

From technical compatibility perspective (same GTs and fuel etc.), BQPS II average tariff has been benchmarked against estimated indexed tariffs of UCH-II and Nandipur power plants for FY22.

Overall O&M tariff of BQPS-II is lower than Nandipur and fairly aligned with UCH-II despite having high comparative FOM local cost:

Cost mix alignment:

Fixed cost ratio in BQPS II (63.3%) is fairly aligned with UCH-II (60.0%) however it is at higher side as compared to Nandipur (36.2%). This is due to extensive maintenance needs related to sea water once through cooling system; 3 huge gas compressors and paint requirement due to sea side location, corrosive environment and usage of sea water for cooling / RO plant etc.

Foreign cost component of BQPS II is 65.6% as compared to 75.7% for UCH-II and 88.4% for Nandipur.

Enabling cost benchmarking:

Enabling costs when analyzed at FOM local level appear on a higher side. This may be attributable to different operating model / governance structure being followed at benchmark power plant.

[1] Revised indexed tariff for April to June 2022 quarter adjusted for PKR to USD exchange rate of 206 and latest available CPI of June 2020 (i.e. 269.27 as per NEPRA determinations), adjusted for CPI of 8.9% (FY21) and 9.0% (FY22) respectively. Further, fixed O&M components have been grossed up at 88.41% (representing average projected availability of BQPS II).

[2] Average availability takes into consideration the annual availability of 90% (covering annual scheduled outage & forced outage allowance) along with the impact of periodic major / minor overhauls of GTs / STs in line with outages allowance given to IPPs under applicable Power Policies

Source: Management data and NEPRA website

Indexations being requested by BQPS II are aligned with recent determinations of NEPRA for thermal power plants

Indexation	BQPS II	UCH-II	Nandipur
Variable O&M – Local	• Indexed with Pak CPI (Quarterly)	• Indexed with revised US CPI (all urban consumers), revised Wholesale Price Index (manufacturers) and exchange rate variations as per TT & OD selling rate of USD notified by NBP	• Not applicable
Variable O&M – Foreign	• Indexed with US CPI and USD to PKR exchange rate (Quarterly)		• Indexed with US CPI and USD to PKR exchange rate (Quarterly)
Fixed O&M - Local	• Indexed with Pak CPI (Quarterly)	• Indexed with revised US CPI (all urban consumers), revised Wholesale Price Index (manufacturers) and exchange rate variations as per TT & OD selling rate of USD notified by NBP	• Indexed with Pak CPI (Quarterly)
Fixed O&M - Foreign	• Indexed with US CPI and USD to PKR exchange rate (Quarterly)		• Indexed with US CPI and USD to PKR exchange rate (Quarterly)

Source: Management data and NEPRA website

5 O&M cost and average tariff on HSD operations

Key assumptions for HSD operations

Key assumptions for HSD operations

- HSD has been considered by the Management as a back-up fuel for BQPS II.
- As per generation license, precise commercial operations end date for BQPS II is 19 October 2042. However, for the sake of simplicity, KE has projected the O&M costs for BQPS II PP. The impact of additional period rounded to the nearest month has been illustrated on the following slides for ease of reference and understanding.
- HSD system including storage tanks, filtration & forwarding skid is already installed at BQPS II.
- KE is planning to commission BQPS II plant on HSD fuel to ensure continued operation of the plant in the event of shortage of gas supply. Once commissioned; KE will manage the required HSD supply under current FSA (Fuel Supply Agreement) with PSO or new FSA.
- HSD operation will result in saving of auxiliary consumption due to shut down of Natural Gas Compressor(s).
- Once HSD system is commissioned; Heat rate and capacity shall be conducted by IE and performance parameters shall be adjusted based on test results.
- The Summary of some indicative performance parameters (based on OEM data) are reflected below for reference:

S.No.	Parameters at RSC	Complex
1	Gross Power Output (MW)	480.0
2	Net Power Output (MW)	463.46
3	Auxiliary Consumption (MW)	16.55 (3.45%)
4	Net HHV heat rate – btu / kWh	8,031.4

- HSD system rehabilitation and commissioning cost will be taken up separately as project cost with NEPRA and one time adjustment on HSD tariff will be requested after IE test for capacity and heat rate.
- Current CSA does not cover HSD operations > 150FFHs/year for whole complex and will be renegotiated with OEM after commissioning of HSD system.
- HSD working has been based on the assumptions driven by OEM FFH consideration i.e., each FFH on distillate oil (HSD) operation through DLN burner will reflect as equivalent to 2.5FFH on gas fuel.
- FFH factor of 2.5 has been considered for CI and 1.5 for HGPI/MI as confirmed by OEM ; CSA variable payment/FFH will also increase accordingly throughout the life cycle of project.
- The frequency of associated activities (other than gas turbines) will increase e.g., HRSG external tube cleaning, water treatment plant maintenance due to membrane replacement etc. These are key drivers behind estimation of O&M cost on HSD operations.

Reference cumulative O&M cost (un-indexed) during FY24 – FY42 is PKR 99.6b (excluding enabling)

- For O&M cost estimation on HSD operations, following key assumptions have been taken by the management:
  - PKR to USD exchange rate for conversion of foreign cost has been assumed as 206.0.
  - Availability assumption for HSD operations is considered similar to NG/RLNG operations, however, the frequency of outages has been reflected based on 2.5FFH factor.
  - Annual availability of ~90% will be maintained with the annual outage plan as below
    - 20 Days (480 hours) of schedule outages Per GT & ST,
    - 6.5 Days of Maintenance outages per GT & ST,
    - 10 Days (240 hours) of forced outages Per GT & ST
    - In addition to annual outage plan, additional outage hours during minor (32k) and major (64k) maintenance of Gas Turbine and Steam Turbine minor (after every 3rd years) and major (every 5th year) will be required as per OEM recommended standard activities.
- These assumptions result in the following reference cumulative O&M cost (un-indexed) during FY24 – FY42.

Total O&M cost over tariff control period | PKR 99.6b

Variable | PKR 53.7b (53.9%)

Local	Foreign
PKR 2.6b (4.8%)	PKR 51.1b (95.2%)

Fixed | PKR 45.9b (46.1%)

Local	Foreign
PKR 18.6b (40.5%)	PKR 27.3b (59.5%)

Key findings

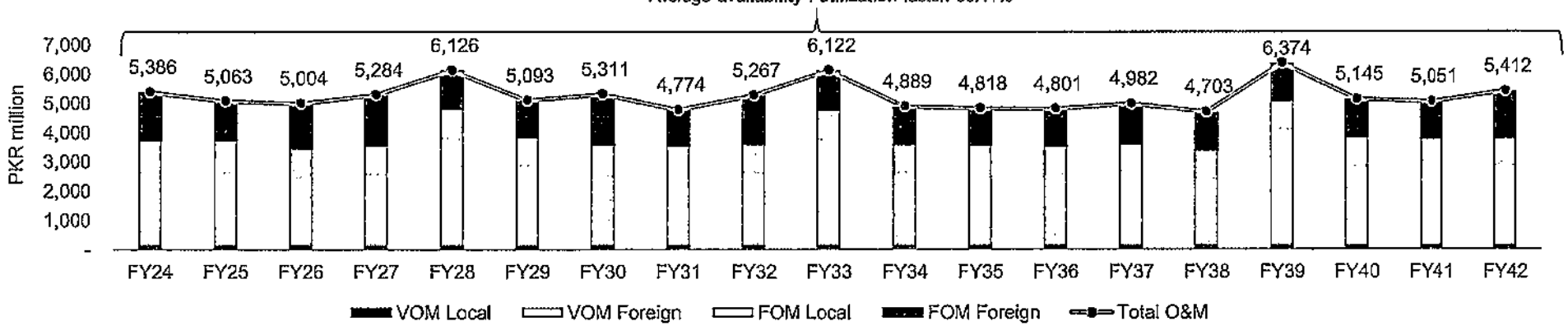
Projected cost has been substantiated as reasonable, subject to identified adjustments addressed during the course of this engagement.

After considering additional period (4 months) until expiry of the generation license, the aggregate increase in the total O&M cost (excluding enabling cost) is PKR 1.8b.

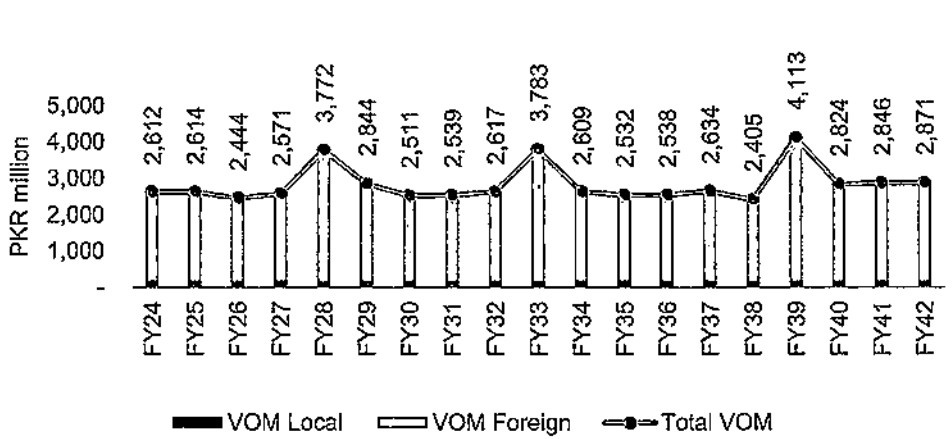
Source: Management data

Adjusted total O&M costs mix and trend (excluding enabling cost)

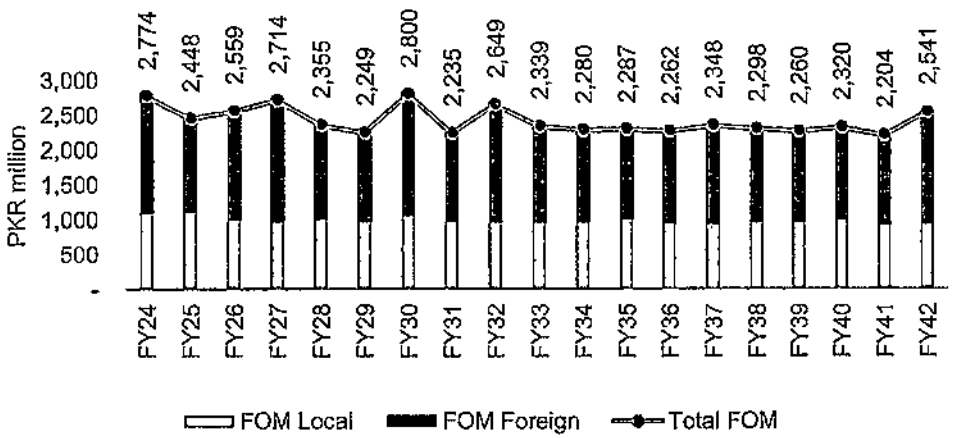
Total adjusted reference O&M cost (un-indexed)



Total adjusted reference VOM cost (un-indexed)



Total adjusted reference FOM cost (un-indexed)



Computation of tariff based on projected plant availability for both FOM and VOM components

Keeping the expected fuel mix variation in purview, KE has assumed slightly rationalized availability factor over the tariff control period. The same has been considered for tariff computation. Below is the pant availability / load factor used for the tariff computation of both variable and fixed components.

FY	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
Factor	90.0%	90.0%	85.8%	87.9%	86.4%	90.0%	88.0%	88.0%	90.0%	86.4%	86.8%	87.9%	89.1%	90.0%	84.3%	89.1%	90.0%	90.0%	90.0%

Year	Variable O&M			Fixed O&M			Total
	Local	Foreign	Total	Local	Foreign	Total	
FY24	0.0382	0.6765	**0.7148**	0.2997	0.4592	**0.7589**	**1.4737**
FY25	0.0394	0.6761	**0.7155**	0.3032	0.3668	**0.6700**	**1.3855**
FY26	0.0376	0.6639	**0.7015**	0.2844	0.4501	**0.7346**	**1.4361**
FY27	0.0380	0.6826	**0.7206**	0.2704	0.4902	**0.7606**	**1.4812**
FY28	0.0380	1.0370	**1.0750**	0.2847	0.3864	**0.6711**	**1.7461**
FY29	0.0378	0.7406	**0.7784**	0.2639	0.3517	**0.6155**	**1.3940**
FY30	0.0382	0.6649	**0.7032**	0.2936	0.4905	**0.7841**	**1.4872**
FY31	0.0373	0.6729	**0.7103**	0.2680	0.3573	**0.6253**	**1.3356**
FY32	0.0380	0.6781	**0.7161**	0.2614	0.4634	**0.7248**	**1.4409**
FY33	0.0379	1.0408	**1.0788**	0.2714	0.3955	**0.6669**	**1.7457**
FY34	0.0380	0.7019	**0.7400**	0.2692	0.3773	**0.6465**	**1.3865**
FY35	0.0380	0.6713	**0.7094**	0.2804	0.3604	**0.6408**	**1.3501**
FY36	0.0379	0.6639	**0.7018**	0.2613	0.3641	**0.6254**	**1.3272**
FY37	0.0383	0.6826	**0.7209**	0.2547	0.3878	**0.6425**	**1.3634**
FY38	0.0380	0.6643	**0.7023**	0.2782	0.3929	**0.6711**	**1.3734**
FY39	0.0375	1.0996	**1.1371**	0.2631	0.3617	**0.6248**	**1.7619**
FY40	0.0373	0.7354	**0.7727**	0.2708	0.3640	**0.6348**	**1.4075**
FY41	0.0376	0.7414	**0.7790**	0.2513	0.3520	**0.6033**	**1.3823**
FY42	0.0376	0.7480	**0.7856**	0.2537	0.4418	**0.6955**	**1.4811**
Weighted average	0.0379	0.7492	0.7871	0.2727	0.4006	0.6733	**1.4604**
Add: Enabling charge				**0.1225**	**0.0000**	**0.1225**	**0.1225**
Total tariff	0.0379	0.7492	0.7871	0.3953	0.4006	0.7959	**1.5830**

Since KE is a vertically integrated power utility and carry a unique position due to brown field nature of its power plants with entity level consumption, it intends to follow a billing regime for capacity payment based on available (net of outage allowances) basis. Accordingly, in order to recover projected fixed costs, Management has computed capacity part at respective availability/ utilization factor across all power plants of KE. In terms of total fixed cost recovery on an annual basis, KE's proposed Fixed cost component is expected to be indifferent from tariff computation being practiced under Take or Pay regime for other IPPs .

Weighted average tariff including additional 123 days:

FY24-43	**0.0379**	**0.7492**	**0.7871**	**0.3953**	**0.4006**	**0.7959**	**1.5830**

Overall VOM tariff of BQPS II is higher than identified benchmark power plant

Tariff components	BQPS II		Engro Powergen Qadirpur Limited (EPQL)[1]	
	PKR / kWh	%share	PKR / kWh	%share
VOM local	0.0379	4.8%	0.1055	14.4%
VOM foreign	0.7492	95.2%	0.6268	85.6%
Total VOM tariff	**0.7871**		**0.7323**	

Key technical specifications	BQPS II	EPQL
Net capacity (MW)	463.46*	210.9
Efficiency on HSD	42.5% (HHV)*	44.4% (LHV)
Fuel	Gas/RLNG HSD (Proposed backup)	Low BTU Gas/ HSD (backup)
GTs type	GE 9171-E	GE 9171-E
Plant configuration	3 GT + 3 HRSG + 1ST	1 GT + 1 HRSG + 1ST
Generation license period	30 years	25 years
Average availability / utilization factor for tariff benchmarking	88.4% [2]	N/A

* Reflected values are calculated from OEM guarantees subject to adjustment as per commissioning results at COD.

[1] Revised indexed tariff for April to June 2022 quarter adjusted for PKR to USD exchange rate of 206 and latest available CPI of June 2020 (i.e. 269.27 as per NEPRA determinations), adjusted for CPI of 8.9% (FY21) and 9.0% (FY22) respectively.

[2] Average availability takes into consideration the annual availability of 90% (covering annual scheduled outage & forced outage allowance) along with the impact of periodic major / minor overhauls of GTs / STs in line with outages allowance given to IPPs under applicable Power Policies

Source: Management data and NEPRA website

Key findings

BQPS II average tariff has been benchmarked against estimated indexed tariff of EPQL for FY22. From technical compatibility perspective, although EPQL has low BTU gas as primary fuel, HSD as backup fuel and secondary firing in HRSG to meet the required performance numbers, but both generation stations have similar technology of GTs, plant configuration in CC mode and fuel etc.

Overall VOM tariff of BQPS II is higher than EPQL which may pertain to assumption for CSA payments on HSD. HSD working has been based on the assumptions driven by OEM EFH consideration i.e., each EFH on distillate oil (HSD) operation through DLN-I burner will reflect as equivalent to 2.5FFH on gas fuel. CSA variable payment/FFH will also increase accordingly throughout the life cycle of project. Said CSA numbers are estimated and will be adjusted as per finalized CSA with OEM after commissioning of HSD system.

Cost mix alignment:

Foreign variable cost component of BQPS II is 95.2% as compared to 85.6% for EPQ, however this different is compensated in VOM local component.

Indexations being requested by BQPS II are aligned with recent determinations of NEPRA for thermal power plants

Indexation	BQPS II	Engro Powergen Qadirpur Limited
Variable O&M – Local	• Indexed with Pak CPI (Quarterly)	• Indexed with WPI (Quarterly)
Variable O&M – Foreign	• Indexed with US CPI and USD to PKR exchange rate (Quarterly)	• Indexed with US CPI and USD to PKR exchange rate (Quarterly)
Fixed O&M - Local	• Indexed with Pak CPI (Quarterly)	• Indexed with WPI (Quarterly)
Fixed O&M - Foreign	• Indexed with US CPI and USD to PKR exchange rate (Quarterly)	• Indexed with US CPI and USD to PKR exchange rate (Quarterly)

Source: Management data and NEPRA website

6 Abbreviations

Abbreviations

Periods

Historical period	FY17 and FY22
Budgeted period	FY23
Forecast period	FY24 – FY42

Abbreviations

AGP	Advanced Gas Path
BQPS I	Bin Qasim Power Station – I
BQPS II	Bin Qasim Power Station – II
BQPS II PP	FY24 – FY42
BQPS III	Bin Qasim Power Station – III
BTU	British Thermal Unit
CAPEX	Capital Expenditure
CEO	Chief Executive Officer
CFO	Chief Financial Officer
CI	Carbon Intensity
COD	Commercial Operations Date
CSA	Comprehensive Services Agreement
CY	Calendar Year
EPQL	Engro Powergen Qadirpur Limited
FFH	Factored Fired Hours
Financial Consultant	EY Ford Rhodes
FOM	Fixed Operations & Maintenance
FYXA	Historical Financial Year X ended 30 June
GE	General Electric
GT	Gas Turbine
HGPI	Hot Gas Path Inspection
HRSG	Heat Recovery Steam Generator
HSD	High Speed Diesel
HSDO	High Speed Diesel Oil
HSE	Health, Safety and Environment
HTC China	Harbin Turbine Company Limited
HVAC	Heating, Ventilating and Air-Conditioning
HV	High Voltage
I&C	Instrumentation and Controls
IC	Independent Consultant
IE	Independent Engineer
IPP	Independent Power Producer
JV	Joint Venture
KE	K-Electric Limited
KGTEPS	Korangi Town Gas Engine Power Station
KPC	Korangi Power Complex
KV	Kilovolt
kWH	Kilowatt Hour
LHV	Lower Heating Value

Abbreviations

LV	Low Voltage
MI	Major Inspection
MW	Megawatt
MYT	Multi-Year Tariff
NEPRA	National Electric Power Regulatory Authority
NESPAK	National Engineering Services Pakistan
NGC	Natural Gas Compressors
O&M	Operations and Maintenance
Pak CPI	Pakistan Consumer Price Index
PKR	Pakistani Rupee
PKRm	PKR millions
POs	Purchase Orders
RAB/WDV	Regulatory Asset Base/Written Down Value
REVEX	Revenue Expenditure
RLNG	Regassified Liquefied Natural Gas
RSC	Rotor Side Converter
SGEPS	S.I.T.E Gas Engine Power Station
ST	Steam Turbine
Technical cum lead consultant	OMS (Private) Limited
US CPI	United States Consumer Price Index
USD	United States Dollar
VOM	Variable Operation & Maintenance
WTP	Water Treatment Plant

K-ELECTRIC
Energy That Moves Life

Section B
Bin Qasim Power Station – III (BQPS-III)

Table of Contents – BQPS III

1. Bin Qasim Power Station – III (BQPS-III)

This section covers details of Bin Qasim Power Station – III (referred as "BQPS-III"), and tariff being requested.

1.1. Introduction to the plant – BQPS-III

BPQS III, upon completion will be one of the key plants in KE's Generation fleet having an installed Gross capacity of 942.32 MW (ISO). Situated at Port Qasim, this plant will serve as a base load plant.

Considering the projected growth in power demand in KE's service area, among other generation additions, KE's planned initiatives included this 900 MW plant RLNG based power plant. This plant has been installed recently and is under its commissioning phase. This plant is the most efficient amongst KE's existing generation fleet and hence, is expected to rank higher in Economic Merit Order (EMO).

Principal Features

1. The Power Plant is situated about 38 km from the city on Port Qasim road in the South (e.g. northwest) of Steel Mill Township, in District Malir, Karachi.
2. The plant comprises of 2 Units of 471.16 MW each, having 1 GT and 1 ST (Gross ISO Installed Capacity) making a total installed capacity of **942.32 MW**
3. The project construction was started in December 2019. Despite delays faced due to COVID-19, security issues for foreign personnel, both units have been completed and have entered their commissioning phase, to be followed by declaration of CoD.
4. In December 2020, NEPRA issued Modification IX to the Generation License no. GL/04/2002 to the Company in accordance with the prevailing regulatory regime, adding BQPS III in the fleet.
5. This plant will have a life of 30 years form CoD.

Operation Summary

900MW BQPS-III combined cycle power plant consists of two trains of combined cycle units (2 x 450 MW) installed in single shaft arrangement (Gas Turbine, Generator and Steam Turbine will be operated on a single shaft). Each unit comprises of Siemens Gas Turbine SGT5-4000F, Siemens Steam Turbine SST5-3000 and Siemens Generator SGen5-3000W. Primary fuel of the power plant will be RLNG with HSD serving as secondary fuel for Gas Turbines.

Health & Safety

The facility observes good O&M practices and has a skilled plant operations team. The plant premises has a well-equipped first aid facility backed by a 24/7 ambulance.

Safety Procedures

Please refer **BQPS-III – Annexure A (i)** for Safety procedures.

Project Details

For project details including plant reference conditions & plant machinery details, please refer **BQPS-III – Annexure A (ii).**

Fuel Source

Plant is designed to be operated on RLNG as well as HSD. KE has a Gas Supply agreement with Pakistan LNG Limited (PLL) for RLNG fuel supply to BQPS-III power plant till December 31, 2025 with take or pay arrangement, with minimum annual order of 75% (of the maximum annual quantity of 54,750 MMSCF), through dedicated RLNG metering and supply pipeline. For arrangement of supply of RLNG beyond 2025, KE is considering sourcing from other RLNG suppliers / terminal operators as well.

Under agreement with PLL, KE is required to submit an SBLC to PLL, equal to forty (40) Days of gas supply, subject to revision every ninety (90) Days in a year if there is a ten percent (10%) or more change in the required SBLC value, as requested by PLL.

Further, KE will enter into FSA for HSD once HSD is commissioned.

Fuel Storage and Transportation

HSD Fuel supply to plant will be made through tankers.

There are 2 HSD storage tanks each with capacity of 5000 m³ located within BQPS-II premises whereas HSD Day tank with capacity of 3200 m³ is constructed at BQPS-III. In addition to this, KE is planning to refurbish one more tank with capacity of 10,000 m³ located at BQ-I. So, in total 4 tanks with aggregate quantity of 23,200 m³ will be available that can support BQ-III operations for 7 days.

However, all tanks, other than day tank 3,200 m³ at BQ-III, (2 tanks at BQ-II, 5,000x2 m³ and 1 tank at BQ-I 10,000 m³) are common facilities which means these tanks will also be used for BQ-II and BQ-III. In that scenario, if both plants run simultaneously then BQ-III and BQ-II can operate, at HSDO, for 3.5 to 4 days.

Primary Fuel	RLNG	
Alternate Fuel	HSD	
Fuel Source	Imported	
Fuel Supplier	RLNG	PLL
	HSD	Agreement proceedings are in process with fuel suppliers
Supply Arrangement	RLNG	Pipeline
	HSD	Tankers
No of storage tanks for Fuel	RLNG	Not applicable
	HSD	1 day tank 2 storage tanks at BQPS-II
Fuel Storage Tank capacity	RLNG	Not applicable
	HSD	1 day tank = 3200 m3 2 tanks at BQPS-II = 2 * 5000 m3

Emissions

Description	RLNG	HSD
SO2	Nil	Based on Fuel
NOx	≤ 50 ppmv	≤ 74 ppmv
CO	≤ 80 ppmv	≤ 80 ppmv

Minimum Loading

Minimum loading of each unit is 298 MW (Gross) which will be tested and if necessary, shall be revised / optimized considering the machine technical safe limits.

Fire Protection System

The plant has a state-of-the-art Fire Protection System, details of which are given in refer **BQPS-III – Annexure A (iii)**

Spares & Inventories

In order to ensure reliable operations of the power plant, inventory of worth **PKR 39 million**, as of June 2022 is maintained by the Company, which is being planned to be build up to **PKR 8,399 million** by FY 2028.

Plant Layout

Please refer **BQPS-III – Annexure A (iv)**

Details of Major Equipment

Please refer **BQPS-III - Annexure A (v).**

Plant Capacity and Heat Rate

Below parameters are of heat rate and capacity are based on guaranteed values / calculated from guaranteed values.

Further, tests will be performed at commissioning of the plant in presence of NEPRA professionals and KE would request to provide a one time adjustment for Heat rate and capacity based on test results.

Description	BQPS-III Unit 1 (RLNG Combined Cycle)	BQPS-III Unit 2 (RLNG Combined Cycle)
Gross Capacity – MW (RSC)	459.2	459.2
Auxiliary – MW	9.4	9.4
Net Capacity – MW (RSC)	**449.8***	**449.8***
Auxiliary	**2.05%**	**2.05%**
Net Heat Rate LHV Basis – btu / kWh	5760.8**	5760.8**
Net Efficiency LHV Basis	59.23%	59.23%
Gross Heat rate LHV Basis – btu / kWh	5643.0	5643.0
Gross Efficiency LHV Basis	60.47%	60.47%
Net Heat Rate HHV Basis – btu / kWh	6336.9***	6336.9***
Net Efficiency HHV Basis	53.85%	53.85%
Gross Heat rate HHV Basis – btu / kWh	6207.3	6207.3
Gross Efficiency HHV Basis	54.97%	54.97%

*Guaranteed Net Output
**Guaranteed Net LHV : 6078 Kj/kWh (Conversion Factor from KJ to BTU: 1.05506 Kj/ btu)
***Using LHV-HHV conversion factor of 1.1

Category	Unit 1		Unit 2	
	Gas Combined cycle	HSD Combined cycle	Gas Combined cycle	HSD Combined cycle
Gross De rated capacity – MW	459.2	368.0	459.2	368.0
Auxiliary consumption – MW	9.4	10.5	9.4	10.5
Net Capacity – MW*	449.8	357.5	449.8	357.5
Auxiliary consumption %	2.05%	2.85%	2.05%	2.85%
Net HHV heat rate – btu** / kWh	6336.9	6756.4	6336.9	6756.4

*Guaranteed values
**Guaranteed Net LHV: 6078 Kj/kWh (RLNG) & 6,662 Kj/kWh (HSD). (Conversion Factor from KJ to BTU: 1.05506 Kj/ btu)
**Using LHV-HHV conversion factor of 1.1 (RLNG) & 1.07 (HSD)

1.2. Tariff Mechanism

This section explains in detail the tariff mechanism of BQPS-III to ensure cost reflective tariffs including component wise indexation so that all prudent costs of the plant are adequately recovered.

KE is requesting a two-part tariff structure, in line with IPPs i.e. Energy payments and Capacity payments on a Take-or-pay mechanism where Capacity payment shall be paid for the Available Capacity and Energy payments for the Net Electrical Output.

Available capacity has been calculated considering annual availability of 90% and additional outage allowance in the year in which Overhaul is occurring. Accordingly, based on expected incurrence of Overhauls, levelized availability of **88.57%** has been calculated and has been used as Plant factor for Capacity components, so that Capacity components cover the impact of outages. Details of Outages and billing mechanism have been further discussed in detail in Section *Billing Mechanism*.

For indexation purposes, following Indexation factors are proposed to be used sources of which given in the table below:

Indexation Factors	Sources
Local Inflation (CPI)	Pakistan Bureau of Statistics (PBS)
Foreign Inflation (US CPI)	US Bureau of Labor Statistics
Exchange rates (USD)	National Bank of Pakistan
KIBOR	State Bank of Pakistan
LIBOR / SOFR	Intercontinental Exchange /Federal Reserve Bank of New York

1.2.1. Fuel Cost

This component represents the cost of fuel for the Net Electrical Output produced by the plant at the allowed efficiency levels and shall be indexed for any fuel price variations.

Net Electrical Output: The net electrical energy expressed in kWh that is generated by the Complex (or any Unit) and delivered to the Interconnection Point as measured by the Metering system.

Fuel price

BQPS-III is currently operating on RLNG (main fuel) and having HSD as a backup fuel.

NEO is currently recorded through meters at 220 KV bus bar for units generated based on RLNG. Similarly, units generated on HSD will be recorded through the same meters at bus bar. However, For segregated generation on different fuel, sent out meter reading will be

recorded at start and end of HSD generation. (Sample calculation is enclosed as **BQPS-III– Annexure B (i)**)

RLNG – Mechanism of billing, pricing, and bifurcation

Price for RLNG shall be calculated based on OGRA's notification. For KE exclusively or any provisional rates, as agreed with fuel supplier under GSA. Prices of RLNG are notified by OGRA in USD / mmbtu which are then translated into PKR / mmbtu by Pakistan LNG Limited (PLL) using the daily average exchange rates issued by National bank for the invoicing date. Accordingly, PLL mentions the rate in PKR / mmbtu on the bills.

Considering prices of RLNG are notified in per mmbtu, calorific value is not required for price conversion, unlike HSD which are notified in PKR / mton and liters respectively.

PLL supplies RLNG to KE based on notified RLNG quantity through dedicated RLNG metering system and supply pipeline based on billing done as mentioned above. Currently signed GSA with PLL under take or pay basis is expiring in December 2025, subsequent renewal/ fresh agreement is also expected to be signed on similar terms for which KE will be required to ensure regular payments for Fuel Charges as per the Gas Supply Agreements regardless of plant operations. Accordingly, KE requests the Authority to allow these costs as pass through in the proposed tariff. Alternatively, the Authority may allow KE to consider the plant as a must run under the Economic Merit Order (EMO) to the extent of Take or Pay Gas arrangements.

(Sample bill for the month of June 2022 are enclosed as **BQPS-III - Annexure B (ii)**).

RLNG from any Dedicated Line / Alternate Supplier

In future, if RLNG is procured from any dedicated line / alternate supplier, the same will be measured through separate meters and energy will be bifurcated in supply from any dedicated line / alternate supplier based on actual MMBTUs, accordingly, to apply separate prices as per respective pricing mechanism.

HSD

HSD price is quoted in PKR / liter on price as per mutual agreement based on Fuel Supply Agreement. Accordingly, Gross Calorific value and conversion factors are required to convert the price in PKR / mmbtu. Sample calculation is provided in the table below:

Description	Unit	Calculation	Amount	Source
HSD price	PKR / liter	a	219.94	Weighted average price of fuel consumed for the month
Gross Calorific value	btu / lb	b	19,731	Actual GCV for the month as per test reports
Conversion factor	lb / kg	c	2.2046	Standard conversion factor
Gross Calorific value	btu / kg	d = b x c	43,499	Calculated
Density	kg / liter	e	0.833	Actual Density for the month as per test reports
Gross Calorific value	btu / liter	f = d x e	36,252	Calculated
HSD price	PKR / mmbtu	g = (a / f) x 10^6	6,066.91	Calculated

Mechanism of Part load adjustment factor

For BQPS-III, Net HHV Heat rate will be determined post heat rate test to be conducted by IE. Considering separate tariff requests for each plant, central economic dispatch plan going

forward as explained in **section 5** and the part load adjustment mechanism followed for IPPs, KE is proposing monthly part load adjustment based on actual operations for a month and part load adjustment factor given in the table as per the part load curve. Part load table for combined cycle of both units is enclosed as **BQPS-III – Annexure C** for RLNG. Part load table for HSD combined cycle will be submitted post commissioning of the plant on HSD fuel. This mechanism of adjustment based on actual part load factor will also be consistent with other IPPs.

Part load adjustment will be based on hourly data for energy generated on plant and available capacity on RLNG and HSD fuel separately, based on which part loading % for each hour will be determined for RLNG and HSD fuels. Part load factor for each hour will be calculated based on part load % and part load factors given in Part load table for RLNG (given in as **BQPS-III - Annexure C**) and same for HSD will be submitted post commissioning on HSD. Accordingly, a weighted average part load factor for the month will be calculated for RLNG and HSD which shall be denominated as PL_{RLNG} and PL_{HSD} (Sample calculation for a day enclosed as **BQPS-III - Annexure D)** for RLNG. Calculation for HSD will be submitted post commissioning of the plant on HSD fuel.

Degradation factor

Reference values of heat rate and capacity (RLNG – combined cycle) shall be based on degradation tables provided by EPC which are enclosed as **BQPS-III – Annexure E(i) to E(ii) for RLNG.** These will be updated post heat rate tests on CoD.

Further, for the purpose HSD, KE will submit the degradation table at the time of commissioning, based on degradation curve for heat rate and output post commissioning of the plant on HSD and would request NEPRA to adjust the heat rate and output for each year based on degradation table.

Simple cycle operations

Simple cycle operation is not applicable as the plant's power train configuration is 1+1+1 on single shaft (450 MW) without bypass damper for exhaust gases, resulting to maximum safe design continuous operation in combined cycle mode. Open cycle operation is limited to startups however, OEM is reviewing the option of allowing the limited operation in simple cycle for 2 to 3 hours by dumping HRSG steam in condenser and maintaining the operational heat balance of water cycle / steam cycle.

Summary of assumptions used for reference tariff

Description	RLNG	HSD
	Combined cycle	Combined cycle
Net HHV heat rate btu /kwh	6,336	6,757
Fuel price PKR / mmbtu	2,929.79	6,067
Fuel Component PKR / kWh	18.56	40.99
RLNG price		
Fuel Price PKR / mmbtu	2,929.79	
HSD price		
HSD price per liter		219.94
GCV (btu / liter) – please refer section HSD		36,252

Indexation formula

The fuel cost component of tariff shall be adjusted on account of fuel price variation as per the following mechanism:

RLNG

$FCCRLNG_{(Rev)}$	=	$FCCRLNG_{(Ref)} \times PRLNG_{(Rev)} / PRLNG_{(Ref)}$
Where:		
$FCCRLNG_{(Rev)}$	=	The revised fuel cost component on RLNG in PKR / kWh
$FCCRLNG_{(Ref)}$	=	The reference fuel cost component of **PKR 18.56 / kWh** on RLNG for combined cycle
$PRLNG_{(Rev)}$	=	The revised net HHV RLNG price notified by the OGRA in USD / MMBTU multiplied by exchange rate appearing on PLL bills
$PRLNG_{(Ref)}$	=	The reference net HHV RLNG price of **PKR 2,929.8 / MMBtu**

HSD (Monthly adjustment based on weighted average price for the month)

$FCCHSD_{(Rev)}$	=	$FCCHSD_{(Ref)} \times PHSD_{(Rev)} / PHSD_{(Ref)} \times CalHSD_{(Ref)} / CalHSD_{(Rev)}$
Where:		
$FCCHSD_{(Rev)}$	=	The revised fuel cost component on HSD in PKR / kWh
$FCCHSD_{(Ref)}$	=	The reference fuel cost component or **PKR 40.99 / kWh** on HSD for combined cycle
$PHSD_{(Rev)}$	=	The revised net HHV HSD price of HSD in PKR / liter based on weighted average formula as given below
$PHSD_{(Ref)}$	=	The reference net HHV HSD price of **PKR 219.94 / liter**
$CalHSD_{(Ref)}$	=	The revised Calorific value of HSD for the month in btu / liter as per lab tests done by reputable labs based on frequency mechanism defined in **BQPS-III – Annexure F**
$CalHSD_{(Rev)}$	=	The reference Calorific value of HSD of **36,252 btu / liter**

Calculation of Weighted average HSD price for a month (sample basis)

HSD	Legend	Stock in Litres	Amount PKR	Weighted average price
		I	ii	iii = ii / i x 10^6
Opening	a	4,824,108	1,061	
Purchases	b	-	-	
Available for consumption	c = a + b	4,824,108	1,061	219.94
Less: Consumption	d	(440,080)	(97)	
Closing	d = c - d	4,384,027	964	

The calculated $FCCRLNG_{(Rev)}$ and $FCCHSD_{(Rev)}$ shall be adjusted with weighted average part load factor for the month based on calculation as explained in *Mechanism of Part load Adjustment Factor* and degradation factor under section *Degradation Factor*.

Fuel cost components

$FCCRLNG_{(Rev)\,(adj)}$	=	$FCCRLNG_{(Rev)} \times PL_{RLNG} \times D_y$
$FCCHSD_{(Rev)\,(adj)}$	=	$FCCHSD_{(Rev)} \times PL_{HSD} \times D_y$
Where;		
SC	=	Simple cycle
PL_{RLNG}	=	Weighted average Part load factor for the month for RLNG operations as calculated on mechanism explained under section *"Mechanism of Part load Adjustment factor"* for combined cycle operations
PL_{HSD}	=	Weighted average Part load factor for the month for HSD operations as calculated on mechanism explained under section *"Mechanism of Part load Adjustment factor"* for combined cycle operations
D_y	=	Degradation factor for the year based on degradation table (to be submitted after heat rate test is conducted)

1.2.2. O&M Expenses

Under the current MYT structure, capital expenditure for maintenance of plant is allowed as investment plan and becomes part of Regulatory Asset base, whereas revenue expenses are allowed as part of O&M expenses.

However, as explained above, KE is proposing a tariff for remaining life of generation plant with structure in line with IPPs where both capex and revex nature of expenditures are allowed through Fixed and Variable O&M. This will help to have better visibility and align the tariff structure with CTBCM requirement and industry practice.

Accordingly, proposed O&M expenses are bifurcated in Variable and Fixed, and then further bifurcated in Foreign and local, based on nature of expenses for applying relevant indexations.

Bifurcation of O&M is as follows:

Variable O&M local

The Variable O&M Local represents plant maintenance costs consisting of both parts and services which are procured in local currency by the Company. Being variable in nature, these costs are linked to plants' operating hours and incurred on some specific machine operating hours intervals.

For tariff calculation purposes, KE has calculated levelized Variable O&M Local keeping in view costs of FY 2022 and based on projected Variable O&M local for the remaining useful life of the plant, including maintenance expenses being incurred at regular intervals of hours recommended by OEM, which shall be indexed with Pak CPI at the start of each quarter.

Accordingly, levelized variable O&M cost for each **Unit 1** comes out to **PKR 132 million per year** (RLNG based) translating into **PKR 0.04 / kWh** at reference CPI of **158.48 average as of FY2022** which shall be indexed with Pak CPI at the start of each quarter.

Unit wise Variable O&M local (levelized)

Unit	Category	Amount – PKR million	Units at plant factor – GWh	O&M Per unit – PKR / kWh
Unit 1	RLNG	134	3,489.87	0.0384
Unit 1	HSD	165	2,773.53	0.0595
Unit 2	RLNG	134	3,490.04	0.0383
Unit 2	HSD	165	2,773.66	0.0594

Indexation formula:

$Var.\ Local.\ O\&M_{(Rev)}$	=	$Var.\ Local\ O\&M_{(Ref)} \times CPI_{(Rev)} / CPI_{(Ref)}$
Where;		
$Var.\ Local.\ O\&M_{(Rev)}$	=	Revised Variable O&M local Component of Tariff
$Var.\ Local\ O\&M_{(Ref)}$	=	Reference Variable O&M local Component of Tariff
$CPI_{(Rev)}$	=	Revised CPI – notified by Pakistan Bureau of Statistics latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
$CPI_{(Ref)}$	=	Reference CPI of **158.48** average for FY 2022

Variable O&M Foreign

The Variable O&M Foreign is for imported Gas Turbine capital spare parts, electrical spares and technical services required. Further, KE is under tendering process for CSA / LTSA arrangements for planned / unplanned parts and repair services.

For tariff calculation purposes, KE has calculated levelized Variable O&M Foreign keeping in view costs of FY 2022 and based on projected Variable O&M Foreign for the remaining useful life of the plant, including maintenance expenses being incurred at regular intervals of hours recommended by OEM which shall be indexed with US CPI and exchange rates at the start of each quarter.

Accordingly, levelized variable O&M Foreign component cost per year for **Unit 1** is estimated at **PKR 810 million** (RLNG based) per year translating into **PKR 0.23 / kWh** at reference USD CPI of **282.03** and exchange rate of **PKR 206 / USD as of FY2022,** based on projected expenses which shall be indexed based on US CPI and exchange rates at the start of each quarter.

Unit wise Variable O&M Foreign (levelized)

Unit	Category	Amount – PKR million	Units at plant factor – GWh	O&M Per unit – PKR/kWh
Unit 1	RLNG	819	3,489.87	0.2346
Unit 1	HSD	990	2,773.53	0.3570
Unit 2	RLNG	818	3,490.04	0.2343
Unit 2	HSD	988	2,773.66	0.3562

Indexation formula:

Var. Foreign. O&M$_{(Rev)}$	=	Var. Foreign O&M$_{(Ref)}$ x USCPI$_{(Rev)}$ / USCPI$_{(Ref)}$ x ER$_{(Rev)}$ / ER$_{(Ref)}$
Where;		
Var. Foreign. O&M$_{(Rev)}$	=	Revised Variable O&M Foreign Component of Tariff
Var. Foreign O&M$_{(Ref)}$	=	Reference Variable O&M Foreign Component of Tariff
USCPI$_{(Rev)}$	=	The revised US CPI (All Urban Consumers) notified by US Bureau of Labor Statistics latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
USCPI$_{(Ref)}$	=	The reference US CPI of **282.03** average for FY 2022
ER$_{(Rev)}$	=	The Revised TT & OD selling rate of USD as notified by National bank latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
ER$_{(Ref)}$	=	The reference exchange rate of **PKR 206 / USD** as of FY2022

Fixed O&M local

Fixed costs are incurred to ensure plant's availability irrespective of its operations. This component includes both plant maintenance expenses and necessary allied costs of salaries and wages, third party services, transport costs etc.

For tariff calculation purposes, KE has calculated levelized Fixed O&M Local considering FY 22 costs and based on the projected Fixed O&M local for the remaining useful life of the plant which shall be indexed with Pak CPI at the start of each quarter.

Accordingly, levelized Fixed O&M local component cost per year for **Unit 1** is estimated at **PKR 947 million** (RLNG based) per year translating into **PKR 0.27 / kW/h** (based on units **at plant factor)** at reference Pak CPI of **158.48** (Average FY 22) based on projected expenses which shall be indeed based on Pak CPI at the start of each quarter.

Unit wise Fixed O&M local (levelized)

Unit	Category	Amount – PKR million	Units at plant factor – GWh	O&M Per unit – PKR / kWh
Unit 1	RLNG	958	3,489.87	0.2745
Unit 1	HSD	958	2,773.53	0.3454
Unit 2	RLNG	957	3,490.04	0.2743
Unit 2	HSD	957	2,773.66	0.3452

Indexation formula:

Fix. Local. O&M$_{(Rev)}$	=	Fix. Local O&M$_{(Ref)}$ x CPI$_{(Rev)}$ / CPI$_{(Ref)}$
Where;		
Fix. Local. O&M$_{(Rev)}$	=	Revised Fixed O&M local Component of Tariff
Fix. Local O&M$_{(Ref)}$	=	Reference Fixed O&M local Component of Tariff
CPI$_{(Rev)}$	=	Revised CPI notified by Pakistan Bureau of Statistics latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
CPI$_{(Ref)}$	=	Reference CPI of **158.48 average FY 2022**

Fixed O&M Foreign

Fixed costs are incurred to ensure plant's availability irrespective of its operations. These costs are critical to ensure availability and continued operations of the plant.

KE is under tendering process for CSA / LTSA arrangements for planned / unplanned parts and repair services.

For tariff calculation purpose, KE has calculated Fixed cost foreign based on FY 2022 costs and projected Fixed cost foreign which shall be indexed to US CPI and exchange rates at the start of each quarter.

Accordingly, levelized Fixed O&M foreign component cost per year for **Unit 1** is estimated at **PKR 283 million** (RLNG based) per year translating into **PKR 0.08 / kW/h** at reference US CPI of **282.03** average as of FY 2022 based on projected expenses which shall be indexed based on USD CPI and exchange rate at the start of each quarter.

Unit wise Fixed O&M Foreign (levelized)

Unit	Category	Amount – PKR million	Units at plant factor – GWh	O&M Per unit – PKR /kWh
Unit 1	RLNG	286	3,489.87	0.0820
Unit 1	HSD	286	2,773.53	0.1032
Unit 2	RLNG	285	3,490.04	0.0816
Unit 2	HSD	285	2,773.66	0.1026

Indexation formula:

$Fix.\ Foreign.\ O\&M_{(Rev)}$	=	$Fix.\ Foreign\ O\&M_{(Ref)} \times USCPI_{(Rev)} / USCPI_{(Ref)} \times ER_{(Rev)} / ER_{(Ref)}$
Where;		
$Fix.\ Foreign.\ O\&M_{(Rev)}$	=	Revised Fixed O&M Foreign Component of Tariff
$Fix.\ Foreign\ O\&M_{(Ref)}$	=	Reference Fixed O&M Foreign Component of Tariff
$USCPI_{(Rev)}$	=	The revised US CPI (All Urban Consumers) notified by US Bureau of Labor Statistics latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
$USCPI_{(Ref)}$	=	The reference US CPI of **282.03 average** FY 2022
$ER_{(Rev)}$	=	The Revised TT & OD selling rate of USD as notified by National bank latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
$ER_{(Ref)}$	=	The reference exchange rate of **PKR 206 / USD** as of FY2022

For break up of O&M (levelized), please refer **BQPS-III - Annexure G**

O&M costs both Variable & Fixed (local / foreign) are validated and benchmarked by Independent Consultant, report of which is enclosed as **BQPS-III – Annexure H**

1.2.3. Insurance

KE requests an insurance premium up to 1% of EPC cost consistent with the insurance cost allowed to IPPs that shall be adjusted annually as per actual subject to maximum limit of 1% of EPC.

Insurance cost based on EPC cost:

Description	Unit 1	Unit 2
EPC Cost	USD 221 Mn	USD 221 Mn
1% of EPC cost	USD 2.21 Mn	USD 2.21 Mn
Reference exchange rate	PKR 206 / USD	PKR 206 / USD
1% of EPC Cost	PKR 455.26 Mn	PKR 455.26 Mn
$Ins_{(Ref)}$ RLNG at 88.57% plant factor	PKR 0.1304 / kWh	PKR 0.1304 / kWh
$Ins_{(Ref)}$ HSD at 88.57% plant factor	PKR 0.1641 / kWh	PKR 0.1641 / kWh

Insurance component shall be adjusted for each unit with actual cost at start of the year

$Ins_{(Ref)(adj)}$	=	$Ins_{(Ref)} \times P_{(Act)} / P_{(Ref.)}$
Where;		
$Ins_{(Ref)(adj)}$	=	Adjusted Reference Insurance Component of Tariff
$Ins_{(Ref)}$	=	Reference Insurance Component of Tariff
$P_{(Ref)}$	=	Reference Premium USD 221 million
$P_{(Act.)}$	=	Actual Premium in USD or USD 2.21 million (1% of EPC cost) whichever is lower

Further, insurance component shall be adjusted quarterly based on below formula

$Ins_{(Rev)}$	=	$Ins_{(Ref)(adj)} \times ER_{(Rev)} / ER_{(Ref)}$
Where;		
$Ins_{(Ref)(adj)}$	=	Adjusted reference Insurance component of Tariff
$ER_{(Rev)}$	=	The Revised TT & OD selling rate of USD as notified by National bank latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
$ER_{(Ref)}$	=	The reference exchange rate of **PKR 206 / USD** as of FY2022

1.2.4. Return on Regulatory Asset Base and Depreciation

Regulatory Asset base

Regulatory Asset Base shall comprise of written down value of plant excluding surplus on revaluation and including Intangibles (mainly software used for regulated business) and CWIP at start of control period, which will be depreciated each year based on remaining useful life of the plant. Under the current MYT, Capex expenditure is allowed as part of RAB.

Regulatory asset base based on current structure at the end of FY 2023 will be locked and used as a basis for proposed MYT and further additions to RAB shall only be based on any project based addition / modification to the plant subject to NEPRA's approval for which a onetime request will be submitted for adjustment in tariff components.

With regard to RAB, KE has projected RAB as of FY 2023 at **PKR 46,457 million for Unit 1** and **PKR 48,697 million for Unit 2**. Accordingly, KE requests NEPRA to actualize the same at the start of the next term i.e. July 2023 based on audited financial statements.

Unit wise RAB movement is enclosed as **BQPS-III - Annexure I (i) to I (ii)**. Once RAB at end of FY 2023 will be finalized post audit of financial statements, KE will file **BQPS-III - Annexure I (i) – I (ii)** with updated opening RAB and accordingly related tariff components, including RoRB and Depreciation will be updated.

KE would also like to highlight that the RAB related to allied transmission assets has been included in Transmission segment in accordance with the nature of assets.

Return

Return shall be calculated based on Return on Equity, cost of debt and Debt to Equity ratio

Debt Equity ratio

Debt to equity ratio is proposed to be 70:30 as allowed in current MYT, subject to discussion in Main section.

Cost of Debt

Like current MYT, cost of debt for local component will be calculated based on 3 month KIBOR plus a spread of 2.5% and cost of debt for foreign component is calculated based on 3 month LIBOR, spread 4.0% and hedging cost based on difference of 3 month KIBOR and 3 month LIBOR plus a hedging cost spread of 2.5%, including 1% for principal and 1.5% for spread.

Accordingly, cost of debt has been calculated using reference 3 month KIBOR of **15.16% as of FY2022**, reference 3 month LIBOR of **2.29%** as of FY 2022 and local to foreign debt ratio of 25:75 based on current debt profile of Generation segment.

KIBOR / LIBOR is proposed to be indexed each quarter going forward based on actual.

Implementation of Secured Overnight Financing Rate (SOFR)

The above mentioned spreads are based on LIBOR and accordingly LIBOR has been used as a reference for the tariff petition for calculating foreign cost of borrowing. However, considering Secured Overnight Financing Rate (SOFR) will supersede LIBOR as a new interest rate benchmark post June 2023 i.e., start of the next term, LIBOR will be replaced by SOFR and accordingly, change in spreads on shifting to SOFR from LIBOR will be requested as a one-time adjustment based on changes in the current loan agreements with the Lenders. Consequently, allowed spreads on foreign loans along with associated impact on reference tariff shall be updated and then SOFR will be used as reference for indexation for subsequent periods.

Local to Foreign debt ratio

KE has drawn ECA backed foreign loans as well as local loans for this project in the ratio of around 25:75 (local : foreign). Accordingly, cost of debt is being requested on the same.

Further, ECA backed loans include payment of premium and tax on premium / interest payments. As the premium was paid in during current MYT, KE has claimed cost of premium in Current MYT. However, in case if the same allowed by Authority as levelized cost over the term of loan, KE would request to allow the revision of Cost of debt component determined for pursuant to the instant tariff petition. Further, KE would request to allow tax on foreign loan payments as pass through, as allowed to other Power sector entities.

Accordingly, Unit wise Return on Regulatory Asset base based on units at plant factor for FY 2024 is given below. For year wise tariff components for Gas and HSD, please refer Tariff table.

Unit wise Cost of Debt FY 2024

Unit	PKR / kWh		
	CoD - Local	CoD - Foreign	Total
Unit 1	0.40	1.52	1.92
Unit 2	0.42	1.60	2.02

RoRB – Foreign component of Cost of debt

$RoRBCoD\ Foreign_{(Rev)}$	=	$RoRBCoD\ Foreign_{(Ref)}$ for relevant year x $CoD\ Foreign_{(Rev)}$ / $CoD\ Foreign_{(Ref)}$ x $ER_{(Rev)}$ / $ER_{(Ref)}$
Where;		
$RoRBCoD\ Foreign_{(Rev)}$	=	Revised Foreign RoRB of cost of debt component of tariff
$RoRBCoD\ Foreign_{(Ref)}$	=	Reference Foreign RoRB of cost of debt component of tariff
$CoD\ Foreign_{(Rev)}$	=	$LIBOR_{(Rev)}$ + 4.5% + $Hedging\ Cost_{(Rev)}$
$Hedging\ Cost_{(Rev)}$	=	$KIBOR_{(Rev)}$ - $LIBOR_{(Rev)}$ + 2.5 % Hedging spread
$CoD\ Foreign_{(Ref)}$	=	$LIBOR_{(Ref)}$ + 4.5% + $Hedging\ Cost_{(Ref)}$
$Hedging\ Cost_{(Ref)}$	=	$KIBOR_{(Ref)}$ - $LIBOR_{(Ref)}$ + 2.5% Hedging spread
$KIBOR_{(Ref)}$	=	The reference 3 month KIBOR of **15.16% as of FY 2022**
$KIBOR_{(Rev)}$	=	The revised 3 month KIBOR as published by State Bank of Pakistan latest available at the start of each quarter i.e. July 1st, October 1st, January 1st, and April 1st
$LIBOR_{(Ref)}$	=	The reference 3 month LIBOR of **2.29% as of FY 2022**
$LIBOR_{(Rev)}$	=	The revised 3 month LIBOR as published by Intercontinental Exchange (ICE) latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April
$ER_{(Rev)}$	=	The Revised TT & OD selling rate of USD as notified by National bank latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
$ER_{(Ref)}$	=	The Reference exchange rate of **PKR 206 / USD**

RoRB – Local component of Cost of debt

$RoRBCoD\ Local_{(Rev)}$	=	$RoRBCoD\ Local_{(Ref)}$ for relevant year x $CoD\ Local_{(Rev)}$ / $CoD\ Local_{(Ref)}$
Where;		
$RoRBCoD\ Local_{(Rev)}$	=	Revised Local RoRB cost of debt component of tariff
$RoRBCoD_{(Ref)}$	=	Reference Foreign RoRB cost of debt component of tariff
$CoD\ Local_{(Rev)}$	=	$KIBOR_{(Rev)}$ + 2.5%
$CoD\ Local_{(Ref)}$	=	$KIBOR_{(Ref)}$ + 2.5%
$KIBOR_{(Rev)}$	=	The revised 3 month KIBOR as published by State Bank of Pakistan latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
$KIBOR_{(Ref)}$	=	The reference 3 month KIBOR of 15.16% as of FY22

Cost of Equity

Keeping in view currently allowed returns, return on equity of USD based 15% is proposed that shall be indexed based on changes in USD to PKR exchange rate at the start of each quarter.

For the purpose of Exchange rate indexation, indexation has been calculated considering weightage of RAB each year till FY 2023 in line with mechanism used by NEPRA in the current MYT. Accordingly, reference indexed cost of equity has been calculated using reference current exchange rate of **PKR 206 / USD.** Accordingly, KE requests the Authority to consider the actual average exchange rate of FY23 at the time of actualization of RAB at FY23 as

mentioned in **"Regulatory Asset Base"** section above. Please refer calculation in **BQPS III - Annexure J (i) – J(ii).**

Accordingly, Return on Regulatory Base – Cost of Equity (RoRBCoE) for Unit 1 and Unit 2 comes out to **PKR 0.71/ kWh** and **PKR 0.73/ kWh** respectively for FY 2024 considering USD RoE of **15%** and indexed RoE for Unit 1 and Unit 2 of **18.11% and 17.81% respectively** at exchange rate of **PKR 206 / USD**. For year wise tariff components for Gas and HSD, please refer Tariff table.

Indexation formula is given below. Further, an illustration for RoE indexation is given in **BQPS III - Annexure K (i) to K (ii).**

RoRB – Component of Cost of Equity

$RoRBCoE_{(Rev)}$	=	**$RoRBCoE_{(Ref)}$ for relevant year x $ER_{(Rev)}$ / $ER_{(Ref)}$**
Where;		
$RoRBCoE_{(Rev)}$	=	Revised RoRB cost of equity component of tariff
$RoRBCoE_{(Ref)}$	=	Reference RoRB cost of equity component of tariff
$ER_{(Rev)}$	=	The Revised TT & OD selling rate of USD as notified by National bank of Pakistan latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
$ER_{(Ref)}$	=	The Reference exchange rate of **PKR 206 / USD**

Depreciation

Depreciation shall be calculated as straight line based on written down value of RAB at the end of FY 2023 (Current control period) and remaining useful life at the end of Control period.

Accordingly, Depreciation component for **Unit 1 and Unit 2** comes out to **PKR 0.45 / kW/h and PKR 0.47 / kW/h respectively** for FY 2024. For year wise tariff components for Gas and HSD, please refer Tariff table.

1.2.5. Cost of Working Capital

KE requests NEPRA for working capital mechanism based on below formula, consistent with IPPs.

Legend	Working Capital Components
A	Cost of Stores & spares inventory
B	Cost of Fuel Inventory (currently not included, will be requested post commissioning of plant on HSD fuel)
C	Cost of Fuel in Receivable cycle based on 30 days receipt period and 7 days payment period on RLNG fuel with 17% sales tax – based on units at plant factor, to be actualized every quarter.
D	Cost of SBLC

Working capital component has been calculated for the control period based on current movement of balances year on year and reference KIBOR of **15.16%** plus a short term spread **2%.**

Cost of working capital shall be indexed with actual KIBOR and change in fuel prices, on a ***quarterly basis.*** *Further, reference component shall be updated in future through a request* in case of any change in circumstances for example introduction of HSD inventory.

Based on above, working capital component for comes out to **PKR 0.35/ kW/h** for FY 2024 for **Unit 1 and Unit 2**. For year wise tariff components for Gas and HSD, please refer Tariff table.

Working Capital requirement shall be indexed through updating the template enclosed in **BQPS III - Annexure L (i) – L (ii)** at each quarter, including addition of HSD inventory and update in SBLC cost pursuant to any changes / addition in the arrangement(s).

1.2.6. Pass through items

Similar to the current MYT and as allowed to IPPs, KE proposes the following items to be allowed as pass-through costs in the new MYT.

Corporate tax and WWPF / WWF

Currently, KE is an integrated entity therefore Corporate tax and WPPF / WWF on overall company level is a pass through item within MYT.

Considering that legal structure will remain same, KE is proposing that Corporate tax and WPPF / WWF shall be passed through to consumers in Supply Tariff.

However, going forward, in case of any change in legal structure whereby a Corporate tax and WWF / WPPF is separately levied on Generation plant, same shall be passed through as done in case of IPPs.

Further, as explained in section *'Local to Foreign Debt Ratio'* above, KE requests to allow tax on foreign loan payments as pass through.

Unrecovered cost of Current MYT

Any unrecovered cost of Current MYT shall be pass through in tariff.

Startup Charges

Startup : Any startup of a Gas / HSD Unit that is necessary for a station to comply with the Dispatch requirements / Instructions and that results in the synchronization with the grid system.

Consistent with industry practice, KE requests the Authority to allow start up charges, as defined below.

In any month, if a startup occurs in a financial year KE shall be allowed to claim "Start-Up charges" based on Reference start up charges indexed with relevant indices, including fuel prices and electricity tariff as requested below.

"Start-Up Charge" shall consist of two components and is calculated as follows:

Start-Up Charge = MDI Charge+ Reference Unit Start-Up Charges.

a) **MDI Charge:** The MDI charge shall be based on maximum demand recorded during the relevant month at startup and shall be calculated based on the then applicable MDI rate in Rs/kW, from time to time,

b) **Reference Unit Start-Up Charge:** This cost will cover the consumables, fuel and equivalent operating hours consumed for the start-ups.

The Start-Up Charges for each Start-Up shall be calculated as follows:

SC_M	=	$MDIR_X \times N_1 + ((SCPI_{Ref} \times SCFadjust_{PI}) + ((SCFC_{Ref} \times SCFadjust_{FC})) \times N_2$
Where:		
SC_M	=	The Start Up Charges during the Month M
$MDIR_x$	=	Total fixed charges for the month due to Distributing segment during the relevant month (based on MDI for the month and MDI charge) divided by the total number of Start Ups performed during the month.
N1	=	The number of Start ups to be claimed, unless any shutdowns claimed during the relevant month in which case this will be considered as zero.
N2	=	The number of Start ups to be claimed
$SC_{(Ref)}$	=	The Reference Start-Up Charge as given below. Consists of the following two components:
$SCPI_{Ref}$	=	The Reference Start-Up Charge for the Power Import from Transmission System during GT Startup till Synchronization.
$SCFadjust_{PI}$	=	The Startup Charges Adjustment Factor for the hour h for the Import of Power from Transmission Network as per following formula: **$SCFadjust_{PI}$ = $WAVCT\text{-}B5_{(Rev)}$ / $WAVCT\text{-}B5_{(Ref)}$** where: **$WACT\text{-}B5_{(Rev)}$** = Weighted Average of the latest notified variable consumer tariff for the Industrial Consumer Category (B-5) based on a weightage of 4:20 for Peak & Off-Peak Rates respectively. **$WACT\text{-}B5_{(Ref)}$** = Weighted Average of the reference notified variable consumer tariff for the Industrial Consumer Category (B-5) based on a weightage of 4:20 for Peak & Off-Peak Rates (i.e. Rs. 30.33 per kWh & Rs. 23.55 per kWh) respectively (i.e. **Rs. 24.68 per kWh**)
$SCFC_{Ref}$	=	The Reference Start-Up Charge for the Fuel Consumed during GT Startup till Synchronization including ST Synchronization, if applicable.
$SCFadjust_{FC}$	=	The Startup Charges Adjustment Factor for the hour h for the consumption of fuel as per the following formula:

		For Gas[1] – $SCFadjust_{FC} = FCCG_{Rev} / FCCG_{Ref}$ For HSD – $SCFadjust_{FC} = FCCHSD_{Rev} / FCCHSD_{Ref}$

TYPE OF START (RLNG)	Reference Single Unit Start Up Charges
	PKR million
Hot Start (2 to 8 hours): Total Cost	5.41
Recovery based on Simple Cycle	(2.05)
Net Claim	3.36
Warm-I Start (8 to 48 hours): Total Cost	10.68
Recovery based on Simple Cycle	(3.61)
Net Claim	7.07
Warm-II Start (48 to 150 hours): Total Cost	14.86
Recovery based on Simple Cycle	(5.09)
Net Claim	9.77
Cold Start (> 150 hours): Total Cost	23.80
Recovery based on Simple Cycle	(8.27)
Net Claim	15.53

Part Load Adjustment Factor: 1.56 for hot, 1.84 for warm and cold startup

Note: Costs relating to HSD will be provided post commissioning

Black Start Cost

Black Start : Any startup of a Gas / HSD Unit having black startup facility, that is necessary for the Company to comply with a Dispatch Instruction or a Revised Dispatch Instruction, that results in restoring power supply to the respective power plant, and to a part of an electric grid without relying on the external electric power transmission network to recover from a total or partial shutdown of the transmission network. KE requests the Authority to allow black start charges, as defined below.

In any month, KE shall be allowed to claim "Black-start charges" based on Reference Black-start charges indexed with relevant indices, including fuel prices as requested below.

"Black-start Charges" shall consist of consumables, fuel and equivalent operating hours consumed for the black-start.

[1] Furthermore, in case Gas is made available through Dedicated Line/ Alternate Supplier as discussed in Section 1.2.1 above, then separate costs will be calculated and submitted to the Authority for approval.

		For Gas[1] – $SCFadjust_{FC} = FCCG_{Rev} / FCCG_{Ref}$ For HSD – $SCFadjust_{FC} = FCCHSD_{Rev} / FCCHSD_{Ref}$

TYPE OF START (RLNG)	Reference Single Unit Start Up Charges
	PKR million
Hot Start (2 to 8 hours): Total Cost	5.41
Recovery based on Simple Cycle	(2.05)
Net Claim	3.36
Warm-I Start (8 to 48 hours): Total Cost	10.68
Recovery based on Simple Cycle	(3.61)
Net Claim	7.07
Warm-II Start (48 to 150 hours): Total Cost	14.86
Recovery based on Simple Cycle	(5.09)
Net Claim	9.77
Cold Start (> 150 hours): Total Cost	23.80
Recovery based on Simple Cycle	(8.27)
Net Claim	15.53

Part Load Adjustment Factor: 1.56 for hot, 1.84 for warm and cold startup

Note: Costs relating to HSD will be provided post commissioning

Black Start Cost

Black Start : *Any startup of a Gas / HSD Unit having black startup facility, that is necessary* for the Company to comply with a Dispatch Instruction or a Revised Dispatch Instruction, that results in restoring power supply to the respective power plant, and to a part of an electric grid without relying on the external electric power transmission network to recover from a total or partial shutdown of the transmission network. KE requests the Authority to allow black start charges, as defined below.

In any month, KE shall be allowed to claim "Black-start charges" based on Reference Black-start charges indexed with relevant indices, including fuel prices as requested below.

"Black-start Charges" shall consist of consumables, fuel and equivalent operating hours consumed for the black-start.

[1] Furthermore, in case Gas is made available through Dedicated Line/ Alternate Supplier as discussed in Section 1.2.1 above, then separate costs will be calculated and submitted to the Authority for approval.

The Black-start Charges for each Start-up shall be calculated as follows:

BSC_M	=	$(BSC_{Ref} \times BSCFadjust_h) \times N)$
Where:		
BSC_M	=	the Black-start Charges during the Month M;
BSC_{Ref}	=	the Reference Black-Startup Charge as given in the table below.
N	=	The number of black startups to be claimed
$BSC_{(Ref)}$	=	The Reference Black-Startup Charge as given below.
$BSCFadjust_h$	=	The Black-start Charges Adjustment Factor for the hour h; where, For HSD – $SHCFadjust_h = FCCHSD_{Rev} / FCCHSD_{Ref}$ For RLNG – $SHCFadjust_h = FCCRLNG_{Rev} / FCCRLNG_{Ref}$

Type of Start	1 Unit Cost – PKR million
Black Start (RLNG)	2.37

Note: Costs relating to HSD will be provided post commissioning

Shutdown Cost

Shutdown : Any shutdown of a Gas / HSD Unit that is necessary for a station to comply with the Dispatch requirements / Instructions which results in the de synchronization with the grid system.

KE requests the Authority to allow shutdown charges, as defined below.

In any month, KE shall be allowed to claim "Shutdown charges" based on Reference Shutdown charges indexed with relevant indices, including electricity tariff as requested below.

"Shutdown Charge" shall consist of two components and is calculated as follows:

Shutdown Charge = MDI Charge+ Reference Unit Shutdown Charges.

a) **MDI Charge:** The MDI charge shall be based on maximum demand recorded during the relevant month at shutdown and shall be calculated based on the then applicable MDI rate in Rs/kW, from time to time,

b) **Reference Unit Shutdown Charge:** This cost will cover the consumables, fuel and equivalent operating hours consumed for the shutdown.

The Shutdown Charges payable by the Power Purchaser for each Shutdown shall be calculated as follows:

SHC_M	=	$MDIR_x \times N1 + ((SHCPI_{Ref} \times SHCFadjust_{PI}) + ((SHCFC_{Ref} \times SHCFadjust_{FC})) \times N2$
Where:		
SHC_M	=	The Shutdown Charges during the Month M
$MDIR_x$	=	Total fixed charges for the month due to Distributing segment during the relevant month (based on MDI for the month and MDI charge) divided by the total number of Shutdowns performed during the month.
N1	=	The number of Shutdowns to be claimed, unless any startups claimed during the relevant month in which case this will be considered as zero.
N2	=	The number of Shutdowns to be claimed
$SHC_{(Ref)}$	=	The Reference Shutdown Charge as given below. Consists of the following two components:
$SHCPI_{Ref}$	=	The Reference Shutdown Charge for the Power Import from Transmission System till GT & ST are in Standby mode.
$SHCFadjust_{PI}$	=	The Shutdown Charges Adjustment Factor for the hour h for the Import of Power from Transmission Network as per following formula: **$SHCFadjust_{PI}$ = $WAVCT\text{-}B5_{(Rev)}$ / $WAVCT\text{-}B5_{(Ref)}$** where: **$WACT\text{-}B5_{(Rev)}$** = Weighted Average of the latest notified variable consumer tariff for the Industrial Consumer Category (B-5) based on a weightage of 4:20 for Peak & Off-Peak Rates respectively. **$WACT\text{-}B5_{(Ref)}$** = Weighted Average of the reference notified variable consumer tariff for the Industrial Consumer Category (B-5) based on a weightage of 4:20 for Peak & Off-Peak Rates (i.e. Rs. 30.33 per kWh & Rs. 23.55 per kWh) respectively **(i.e. Rs. 24.68 per kWh)**
$SHCFC_{Ref}$	=	The Reference Shutdown Charge for the Fuel Consumed during GT & ST (if applicable) De-Synchronization till Flame-Off.
$SHCFadjust_{FC}$	=	The Shutdown Charges Adjustment Factor for the hour h for the consumption of fuel as per the following formula: For Gas[a] – $SHCFadjust_{FC}$ = $FCCG_{Rev}$ / $FCCG_{Ref}$ For HSD – $SHCFadjust_{FC}$ = $FCCHSD_{Rev}$ / $FCCHSD_{Ref}$

Type of Shutdown	Unit Shutdown Charges PKR million
RLNG	0.28

Note: Costs relating to HSD will be provided post commissioning

Costs pursuant to Import of Power during Non-Operational Hours

Costs of Import of Power for the period when plant is stand-by but not in operation, in accordance with EMO is requested to be passed through in Tariff.

The Power Import Charges for each month shall be based on actual amount billed by the Supply business based on Import readings recorded, including monthly MDI / Fixed Charges paid to Supply Business for fixed capacity dedicated for plant startup operations. Amount

[a] Furthermore, in case Gas is made available through Dedicated Line/ Alternate Supplier as discussed in Section 1.2.1 above, then separate costs will be calculated and submitted to the Authority for approval.

billed shall be reduced by any MDI Charges recovered under Startup & Shutdown Costs as per mechanism explained in this petition.

1.3. Billing Mechanism

Billing shall be based on a Take-or-pay mechanism where Capacity payment shall be paid for the Available Capacity and Energy payments for the Net Electrical Output.

Available capacity for a month shall be based on hourly Annual Dependable Capacity after considering outages in each year.

Annual Dependable Capacity shall be based on ADC Test to be carried out at start of each year, to be carried out by Plant team and results of which shall be submitted to NEPRA.

NEO will be based on energy recorded through meters as explained in above sections.

1.3.1. Capacity payments

Capacity cost includes Fixed O&M local, Fixed O&M foreign, Insurance, Working capital, RoRB – cost of debt, RoRB – cost of equity and Depreciation which are detailed in above sections. Capacity payment shall be made on a monthly basis as per formula detailed below:

Monthly Capacity Payment

CapacityPayment	=	**$CapacityPrice \times AvailCap_m \times DO_y$**
Where:		
CapacityPayment	=	the Capacity Payment, in Rupee, paid for a Month;
$AvailCap_m$	=	Aggregate Available capacity, in kWh, for the month based on Hourly Available capacity
CapacityPrice	=	(Fixed O&M local + Fixed O&M foreign, working capital + RoRB – cost of debt + RoRB – cost of equity + insurance) for the relevant month after indexations as explained above.
DO_y	=	the output degradation factor, to be submitted post tests for RLNG and HSD, for the relevant year.

Capacity payment shall be separately calculated for RLNG and HSD based on Available capacity, in kWh on HSD / RLNG and their respective Capacity components. For the purpose of calculation of Available capacity on HSD, capacity shall be considered based on actual operations on HSD, and remaining capacity shall be considered to be available on RLNG.

Further, available capacity shall also be adjusted with ambient temperature as per the table given in **BQPS-III – Annexure M.** Moreover, example for calculation of hourly available capacity payment of Gas is also given in **BQPS III – Annexure N.** Ambient temperature table example of HSD will be submitted once commissioned.

Outages

Plant will maintain Annual Availability of 90% considering annual outages of 10% for below outages:

- **17 Days (408 hours)** of schedule outages Per unit,
- **6 Days of** Maintenance outages per unit
- **13.5 Days (324 hours)** of forced outages Per GT & ST

Maintenance Outage will be required as follows:

- 1.5 Days / Unit offline water washing (Every 2000 Hours in summers).

- 2 Days / Unit OFFWW + Pre Filters-Replacement (Once every year)
- 2.5 Days / Unit OFFWW + Fine Filters Replacement (As per Filter DP)

Further, Additional outages will be required for Overhauls as below:

- Hot Gas Path Inspection is required, at EBH interval of 25K hours, in which case the Company shall be entitled to an additional **Nine (9) days** of Scheduled Outage periods per Unit

- Extended Hot Gas Path Inspection is required at EBH interval of 66K hours, in which case the Company shall be entitled to an additional **Fourteen (14)** days of Scheduled Outage periods per Unit"

- Major Overhaul is required at EBH interval of 107K hours, in which case the Company shall be entitled to an additional **Fifty Five (55)** days of Scheduled Outage periods per Unit" .

- The unit will complete the above Maintenance cycle i.e. HGPI followed by EHGPI followed by MOH, subsequent to which the maintenance cycle will start again in the same sequence.

EBH = Equivalent Baseload Hours

These overhauls will be required when plant will reach the required Factored Fired hours. Based on annual availability of 90% and expected occurrence of Overhauls, Levelized Plant factor has been calculated as **88.57%. Please refer BQPS-III - Annexure O.**

For the purpose of calculation of Availability, 10% annual operation on HSD has been assumed with remaining capacity on Gas, and outage schedule has been made accordingly. In case if HSD operations exceed 10% in a year impacting average availability over the life, KE will file a one time adjustment to adjust the availability % used in the tariff

1.3.2. Energy Payments

Energy cost includes:

- Fuel cost (including RLNG & HSD),
- Variable O&M local & Variable O&M foreign which are detailed in above sections multiplied by degradation factor of relevant year.

The Energy Price shall be calculated using the Reference Fuel Cost Component during the year.

Fuel	NEO for the month	Fuel	Variable O&M local	Variable O&M Foreign	Total Variable O&M	Output Degradation factor	Variable O&M after Degradation factor	EPP per unit	Energy payment
	A	b	c	d	e = c + d	f	g = e x f	h = b + g	l = a x h
	kWh	PKR / kWh	PKR / kWh	PKR / kWh	PKR / kWh	Factor	PKR / kWh	PKR / kWh	PKR
RLNG – Combined cycle	Units	$FCCRLNG_{(Rev)(adj)}$	$Var.\ Local.\ O\&M_{(Rev)}$	$Var.\ Foreign.\ O\&M_{(Rev)}$	Calculated	Relevant factor	Calculated	Calculated	Calculated
HSD – Combined cycle	Units	$FCCHSD_{(Rev)(adj)}$	$Var.\ Local.\ O\&M_{(Rev)}$	$Var.\ Foreign.\ O\&M_{(Rev)}$	Calculated	Relevant factor	Calculated	Calculated	Calculated
Total	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated

1.4. O&M Sharing mechanism

KE is proposing to share the savings in O&M, if any, in proportion of 60:40 for Consumers: KE, which shall be calculated at completion of Overhaul cycle.

Overhaul cycle shall include

- One HGPI for each unit.
- One eHGPI for each unit
- One Major overhaul for each unit

Overhaul cycle shall be completed when Major inspections of all GTs and STs are completed at every 107,000 Equivalent Base Hours. At completion of Overhaul cycle, any savings in O&M shall be shared in 60:40 for Consumers: KE, where is in case of Loss, it shall be carried forward to future years to set off with expenses of future years.

For the purpose of calculation of sharing of O&M savings/ (loss) at the completion of each major overhaul cycle, O&M expenses (O&M Expenses as per Profit & Loss Account & Addition to CWIP) as per the audited financial statements shall be used.

An illustration of sharing mechanism for one cycle is given in **BQPS-III - Annexure P.** Same shall be applicable for next overhaul cycles till the end of respective unit life.

1.5. Other items

Items generally covered under PPA

Unlike current MYT, KE has proposed Tariff structure in line with IPPs. In case of IPPs, certain modalities / charges are governed under the Power Purchase Agreement, which have been included in the petition. However, detailed modalities and other remaining terms will be agreed in a "Service Level Agreement" for which KE has prepared and Annexed a Head of Terms, (please refer, **BQPS-III – Annexure Q**. Full scope SLA will be prepared and submitted for NEPRA's approval based on Tariff determination.

Costs pursuant to Unbundling in future

KE is an integrated utility and therefore there are certain synergies in common costs. In future, if there is any legal unbundling, KE will file for a onetime adjustment for additional costs pursuant to that.

Alternate Supplier of RLNG

In case of any additional requirements on account of arranging RLNG through an Alternative Supplier as detailed in **Section 1.2.1 - Plant Capacity and Heat Rate** above, KE will submit details of the proposal separately to NEPRA for approval. Post approval of the Authority, KE will file a one-time adjustment for reference tariff components, based on allowed investment, Net capacity and heat rate impacts.

Costs pursuant to Force Majeure Events

Costs related to a Force Majeure Events are allowed to IPPs and accordingly KE also request those to be passed through in Tariff. Details and modalities of force majeure events will be included under the SLA, pursuant to the Terms of Agreements as explained in **BQPS III – Annexure Q**, in line with agreements of other IPPs.

1.6. Summary of Base Tariff FY 2024 & Indexation Mechanism

In view of the foregoing and considering the significant changes in tariff structure, following component wise indexation mechanism for **Unit 1 and Unit 2** is being requested to ensure recovery of prudent costs critical to ensure quality of service.

Unit 1

Tariff Components	RLNG PKR / kWh	HSD PKR / kWh	Indexation Mechanism	Reference Rates
Energy cost Fuel cost	18.56	40.99	• Indexation with fuel price & CV (for HSD) • Impact of allowed part load and degradation factor (monthly)	• Net HHV RLNG price of PKR 2,929.79 / MMBtu • Net HHV HSD price of PKR 219.94/ liter • Calorific value of HSD of 36,252 btu / liter
Variable O&M – local	0.04	0.06	• Indexed with Pak CPI (Quarterly)	• Average CPI of 158.48 for FY 2022
Variable O&M - Foreign	0.23	0.36	• Indexed with US CPI and USD to PKR exchange rate (Quarterly)	• Average US CPI of 282.03 for FY 22 • Exchange rate of PKR 206 / USD as of FY 22
Energy cost subtotal	**18.84**	**41.41**		
Capacity cost Fixed O&M - local	0.27	0.35	• Indexed with Pak CPI (Quarterly)	• Average CPI of 158.48 for FY 2022
Fixed O&M - Foreign	0.08	0.10	• Indexed with US CPI and USD to PKR exchange rate (Quarterly)	• Average US CPI of 282.03 for FY 22 • Exchange rate of PKR 206 / USD as of FY2022
Insurance	0.13	0.16	• Indexed with USD to PKR exchange rate – quarterly • Annual actualization based on capping of 1% of EPC cost (in USD terms)	• Exchange rate of PKR 206 / USD as of FY23
Working Capital	0.35	0.44	• Indexed with KIBOR (Quarterly) and change in fuel prices.	• KIBOR of 15.16% as of FY22
RoRB - Cost of Debt Local	0.40	0.51	• Indexed with KIBOR (Quarterly) • Recalculated based on RAB changes due to addition of specific project approved by NEPRA	• KIBOR of 15.16% as of FY22
RoRB - Cost of Debt Foreign	1.52	1.92	• Indexed with LIBOR (Quarterly) • Hedging cost for foreign portion updated with KIBOR / LIBOR (Quarterly) • Recalculated based on RAB changes due to addition of specific project approved by NEPRA	• LIBOR of 2.29% as of FY22 • Exchange rate of PKR 206 / USD as of FY2022
RoRB - Cost of Equity	0.71	0.89	• Indexed with USD to PKR exchange rate • Recalculated based on RAB changes due to addition of specific project approved by NEPRA	• Exchange rate of PKR 206 / USD as of FY2022
Depreciation	0.45	0.56	• Recalculated based on RAB changes due to addition of specific project approved by NEPRA	
Capacity cost subtotal	**3.93**	**4.94**		
Total Base Tariff – FY 2024	**22.76**	**46.35**		
Levelized tariff	**21.54**	**44.81**		

Unit 2

Tariff Components	RLNG PKR / kWh	HSD PKR / kWh	Indexation Mechanism	Refererice Rates
Energy cost Fuel cost	18.56	40.99	• Indexation with fuel price & CV (for HSD) • Impact of allowed part load and degradation factor (monthly)	• Net HHV RLNG price of PKR 2,929.79 / MMBtu • Net HHV HSD price of PKR 219.94/ liter • Calorific value of HSD of 36,252 btu / liter
Variable O&M – local	0.04	0.06	• Indexed with Pak CPI (Quarterly)	• Average CPI of 158.48 for FY 2022
Variable O&M - Foreign	0.23	0.36	• Indexed with US CPI and USD to PKR exchange rate (Quarterly)	• Average US CPI of 282.03 for FY 22 • Exchange rate of PKR 206 / USD as of FY 22
Energy cost subtotal	**18.84**	**41.41**		
Capacity cost Fixed O&M - local	0.27	0.35	• Indexed with Pak CPI (Quarterly)	• Average CPI of 158.48 for FY 2022
Fixed O&M - Foreign	0.08	0.10	• Indexed with US CPI and USD to PKR exchange rate (Quarterly)	• Average US CPI of 282.03 for FY 22 • Exchange rate of PKR 206 / USD as of FY2022
Insurance	0.13	0.16	• Indexed with USD to PKR exchange rate – quarterly • Annual actualization based on capping of 1% of EPC cost (in USD terms)	• Exchange rate of PKR 206 / USD as of FY23
Working Capital	0.35	0.44	• Indexed with KIBOR (Quarterly) and change in fuel prices.	• KIBOR of 15.16% as of FY22
RoRB - Cost of Debt Local	0.42	0.53	• Indexed with KIBOR (Quarterly) • Recalculated based on RAB changes due to addition of specific project approved by NEPRA	• KIBOR of 15.16% as of FY22
RoRB - Cost of Debt Foreign	1.60	2.01	• Indexed with LIBOR (Quarterly) • Hedging cost for foreign portion updated with KIBOR / LIBOR (Quarterly) • Recalculated based on RAB changes due to addition of specific project approved by NEPRA	• LIBOR of 2.29% as of FY22 • Exchange rate of PKR 206 / USD as of FY2022
RoRB - Cost of Equity	0.73	0.92	• Indexed with USD to PKR exchange rate • Recalculated based on RAB changes due to addition of specific project approved by NEPRA	• Exchange rate of PKR 206 / USD as of FY2022
Depreciation	0.47	0.59	• Recalculated based on RAB changes due to addition of specific project approved by NEPRA	
Capacity cost subtotal	**4.06**	**5.11**		
Total Base Tariff – FY 2024	**22.90**	**46.52**		
Levelized tariff	**21.63**	**44.92**		

Please refer following tariff tables for year wise tariffs.

K-Electric Limited
Generation Plants Tariff Petition
BQPS III Plant - Unit 1
Tariff table - FY 2024 and onwards

Gas Fuel - RLNG

Gross Capacity	459.2	MW	Exchange rate	206	PKR / USD
Net Capacity	449.8	MW	KIBOR	15.16%	%
Units at full capacity	3,940.3	GWh	LIBOR	2.29%	%

		Energy Purchase Price (PKR / kWh)				Capacity Purchase Price PKR / kW / hour at 88.57% Plant factor												
Year	Tariff Year FY	Fuel cost / CC RLNG	Variable O&M local	Variable O&M foreign	Total EPP	Fixed O&M local	Fixed O&M foreign	Insurance	RoRB - Cost of debt local	RoRB - Cost of debt foreign	RoRB - Cost of Equity	Depreciation	Working Capital	CPP	Total Tariff PKR / kWh	Total Tariff Cents / kWh		CPP PKR / kW / month
		a	b	c	d=a+b+c	e	f	g	h	i	j	k	l	m=sum e to l	n=d+m	o=n/206		p
1	2024	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.40	1.52	0.71	0.45	0.35	3.93	22.76	11.05		2,866
2	2025	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.39	1.47	0.69	0.45	0.38	3.87	22.70	11.02		2,823
3	2026	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.38	1.42	0.66	0.45	0.41	3.81	22.64	10.99		2,778
4	2027	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.36	1.37	0.64	0.45	0.43	3.73	22.57	10.96		2,725
5	2028	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.35	1.31	0.61	0.45	0.45	3.66	22.50	10.92		2,671
6	2029	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.34	1.26	0.59	0.45	0.45	3.57	22.41	10.88		2,605
7	2030	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.32	1.21	0.56	0.45	0.45	3.48	22.32	10.83		2,539
8	2031	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.31	1.16	0.54	0.45	0.45	3.39	22.22	10.79		2,473
9	2032	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.29	1.10	0.52	0.45	0.45	3.30	22.13	10.74		2,407
10	2033	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.28	1.05	0.49	0.45	0.45	3.21	22.04	10.70		2,341
11	2034	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.27	1.00	0.47	0.45	0.45	3.12	21.95	10.66		2,275
12	2035	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.25	0.95	0.44	0.45	0.45	3.03	21.86	10.61		2,209
13	2036	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.24	0.90	0.42	0.45	0.45	2.94	21.77	10.57		2,143
14	2037	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.22	0.84	0.39	0.45	0.45	2.84	21.68	10.53		2,077
15	2038	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.21	0.79	0.37	0.45	0.45	2.75	21.59	10.48		2,011
16	2039	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.20	0.74	0.35	0.45	0.45	2.66	21.50	10.44		1,945
17	2040	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.18	0.69	0.32	0.45	0.45	2.57	21.41	10.39		1,879
18	2041	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.17	0.64	0.30	0.45	0.45	2.48	21.32	10.35		1,813
19	2042	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.15	0.58	0.27	0.45	0.45	2.39	21.23	10.31		1,747
20	2043	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.14	0.53	0.25	0.45	0.45	2.30	21.14	10.26		1,681
21	2044	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.13	0.48	0.22	0.45	0.45	2.21	21.05	10.22		1,615
22	2045	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.11	0.43	0.20	0.45	0.45	2.12	20.96	10.17		1,549
23	2046	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.10	0.37	0.17	0.45	0.45	2.03	20.87	10.13		1,483
24	2047	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.09	0.32	0.15	0.45	0.45	1.94	20.78	10.09		1,417
25	2048	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.07	0.27	0.13	0.45	0.45	1.85	20.69	10.04		1,350
26	2049	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.06	0.22	0.10	0.45	0.45	1.76	20.60	10.00		1,284
27	2050	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.04	0.17	0.08	0.45	0.45	1.67	20.51	9.95		1,218
28	2051	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.03	0.11	0.05	0.45	0.45	1.58	20.42	9.91		1,152
28	2052	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.02	0.09	0.04	0.45	0.45	1.53	20.37	9.89		1,119
29	2053	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.02	0.06	0.03	0.45	0.45	1.49	20.33	9.87		1,087
Average tariff		18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.20	0.77	0.36	0.45	0.44	2.71	21.54	10.46		2,333

PKR 21.54 / kWh US Cents 10.46 / kWh

K-Electric Limited
Generation Plants Tariff Petition
BQPS III Plant - Unit 2
Tariff table - FY 2024 and onwards

Gas Fuel - RLNG

Gross Capacity	457.2	MW	*Exchange rate*	206	PKR / USD
Net Capacity	449.8	MW	KIBOR	15.16%	%
Units at full capacity	3,940.3	GWh	LIBOR	2.29%	%

Year	[illegible]	Energy Purchase Price (PKR / kWh): Fuel cost RLNG	Variable O&M local	Variable O&M Foreign	EPP	Capacity Purchase Price PKR / kW / hour at 88.57% Plant factor: Fixed O&M local	Fixed O&M Foreign	Insurance	RoRB-Cost of debt (local)	RoRB-Cost of debt foreign	RoRB-Cost of Equity	Depreciation	Working Capital	CPP	Total tariff PKR / kWh	Total tariff Cents / kWh	Cap ... PKR/kW/month
		a	b	c	d=a+b+c	e	f	g	h	i	j	k	l	m=sum e to l	n=d+m	o=n/206	p
1	2024	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.42	1.60	0.73	0.47	0.35	4.06	22.90	11.12	2,964.40
2	2025	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.41	1.54	0.71	0.47	0.38	4.00	22.84	11.09	2,919
3	2026	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.39	1.49	0.68	0.47	0.41	3.93	22.77	11.05	2,871
4	2027	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.38	1.43	0.66	0.47	0.43	3.86	22.69	11.02	2,815
5	2028	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.37	1.38	0.63	0.47	0.45	3.78	22.62	10.98	2,759
6	2029	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.35	1.32	0.61	0.47	0.45	3.68	22.52	10.93	2,690
7	2030	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.34	1.27	0.58	0.47	0.45	3.59	22.43	10.89	2,621
8	2031	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.32	1.21	0.56	0.47	0.45	3.50	22.33	10.84	2,553
9	2032	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.31	1.16	0.53	0.47	0.45	3.40	22.24	10.80	2,484
10	2033	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.29	1.10	0.51	0.47	0.45	3.31	22.15	10.75	2,415
11	2034	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.28	1.05	0.48	0.47	0.45	3.21	22.05	10.70	2,346
12	2035	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.26	1.00	0.46	0.47	0.45	3.12	21.96	10.66	2,278
13	2036	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.25	0.94	0.43	0.47	0.45	3.03	21.86	10.61	2,209
14	2037	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.24	0.89	0.41	0.47	0.45	2.93	21.77	10.57	2,140
15	2038	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.22	0.83	0.38	0.47	0.45	2.84	21.67	10.52	2,072
16	2039	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.21	0.78	0.36	0.47	0.45	2.74	21.58	10.48	2,003
17	2040	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.19	0.72	0.33	0.47	0.45	2.65	21.49	10.43	1,934
18	2041	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.18	0.67	0.31	0.47	0.45	2.56	21.39	10.38	1,865
19	2042	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.16	0.61	0.28	0.47	0.45	2.46	21.30	10.34	1,797
20	2043	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.15	0.56	0.26	0.47	0.45	2.37	21.20	10.29	1,728
21	2044	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.13	0.50	0.23	0.47	0.45	2.27	21.11	10.25	1,659
22	2045	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.12	0.45	0.21	0.47	0.45	2.18	21.02	10.20	1,591
23	2046	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.11	0.40	0.18	0.47	0.45	2.08	20.92	10.16	1,522
24	2047	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.09	0.34	0.16	0.47	0.45	1.99	20.83	10.11	1,453
25	2048	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.08	0.29	0.13	0.47	0.45	1.90	20.73	10.06	1,385
26	2049	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.06	0.23	0.11	0.47	0.45	1.80	20.64	10.02	1,316
27	2050	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.05	0.18	0.08	0.47	0.45	1.71	20.55	9.97	1,247
28	2051	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.03	0.12	0.06	0.47	0.45	1.61	20.45	9.93	1,178
29	2052	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.03	0.10	0.04	0.47	0.45	1.57	20.40	9.90	1,144
30	2053	18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.02	0.06	0.03	0.47	0.45	1.51	20.34	9.88	1,100
Average tariff		18.56	0.04	0.23	18.84	0.27	0.08	0.13	0.21	0.81	0.37	0.47	0.44	2.79	21.63	10.50	2,035

PKR 21.63 / kWh

US Cents 10.5 / kWh

K-Electric Limited
Generation Plants Tariff Petition
BQPS III Plant - Unit 1
Tariff table - FY 2024 and onwards

HSD fuel

Gross Capacity	362	MW	Exchange rate	206	PKR / USD
Net Capacity	357.5	MW	KIBOR	15.16%	%
Units at full capacity	3,131.5	GWh	LIBOR	2.29%	%

		Energy Purchase Price (PKR / kWh)				Capacity Purchase Price PKR / kW / hour at 88.57% Plant factor											
Year	FY	Fuel cost - FCC HSD	Variable O&M Local	Variable O&M Foreign	EPP	Fixed O&M Local	Fixed O&M Foreign	Insurance	RoRB - Cost of debt - Local	RoRB - Cost of debt - Foreign	RoRB - Cost of Equity	Depreciation	Working capital	CPP	Total tariff (PKR / kWh)	Total tariff US Cents / kWh	CPP PKR / kW / month
		a	b	c	d=a+b+c	e	f	g	h	i	j	k	l	m=sum e to l	n=d+m	o=n/206	p
1	2024	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.51	3.92	0.89	0.56	0.44	4.94	46.35	22.50	3,606
2	2025	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.49	1.85	0.86	0.56	0.48	4.87	46.28	22.46	3,552
3	2026	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.47	1.78	0.83	0.56	0.52	4.79	46.20	22.43	3,496
4	2027	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.46	1.72	0.80	0.56	0.54	4.70	46.11	22.38	3,429
5	2028	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.44	1.65	0.77	0.56	0.56	4.60	46.01	22.34	3,361
6	2029	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.42	1.59	0.74	0.56	0.56	4.49	45.90	22.28	3,278
7	2030	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.40	1.52	0.71	0.56	0.56	4.38	45.79	22.23	3,195
8	2031	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.39	1.46	0.68	0.56	0.56	4.26	45.67	22.17	3,112
9	2032	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.37	1.39	0.65	0.56	0.56	4.15	45.56	22.12	3,029
10	2033	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.35	1.32	0.62	0.56	0.56	4.03	45.44	22.06	2,945
11	2034	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.33	1.26	0.59	0.56	0.56	3.92	45.33	22.00	2,862
12	2035	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.32	1.19	0.56	0.56	0.56	3.81	45.22	21.95	2,779
13	2036	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.30	1.13	0.53	0.56	0.56	3.69	45.10	21.89	2,696
14	2037	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.28	1.06	0.50	0.56	0.56	3.58	44.99	21.84	2,613
15	2038	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.26	1.00	0.47	0.56	0.56	3.47	44.87	21.78	2,530
16	2039	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.25	0.93	0.43	0.56	0.56	3.35	44.76	21.73	2,447
17	2040	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.23	0.86	0.40	0.56	0.56	3.24	44.65	21.67	2,364
18	2041	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.21	0.80	0.37	0.56	0.56	3.12	44.53	21.62	2,281
19	2042	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.19	0.73	0.34	0.56	0.56	3.01	44.42	21.56	2,198
20	2043	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.18	0.67	0.31	0.56	0.56	2.90	44.31	21.51	2,115
21	2044	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.16	0.60	0.28	0.56	0.56	2.78	44.19	21.45	2,032
22	2045	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.14	0.54	0.25	0.56	0.56	2.67	44.08	21.40	1,949
23	2046	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.13	0.47	0.22	0.56	0.56	2.56	43.96	21.34	1,865
24	2047	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.11	0.41	0.19	0.56	0.56	2.44	43.85	21.29	1,782
25	2048	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.09	0.34	0.16	0.56	0.56	2.33	43.74	21.23	1,699
26	2049	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.07	0.27	0.13	0.56	0.56	2.21	43.62	21.18	1,616
27	2050	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.06	0.21	0.10	0.56	0.56	2.10	43.51	21.12	1,533
28	2051	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.04	0.14	0.07	0.56	0.56	1.99	43.40	21.07	1,450
28	2051	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.03	0.11	0.05	0.56	0.56	1.93	43.34	21.04	1,409
29	2052	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.02	0.08	0.04	0.56	0.56	1.87	43.28	21.01	1,367
Average tariff		40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.26	0.97	0.45	0.56	0.55	3.41	44.81	21.75	2,486

PKR 44.81 / kWh

US Cents 21.75 / kWh

K-ELECTRIC LIMITED

K-Electric Limited
Generation Plants Tariff Petition
BQPS III Plant - Unit 2
Tariff table - FY 2024 and onwards

HSD fuel

Gross Capacity	369	MW	Exchange rate	286	PKR / USD
Net Capacity	357.5	MW	KIBOR	15.16%	%
Units at full capacity	3,131.5	GWh	LIBOR	2.29%	%

		Energy Purchase Price (PKR / kWh)				Capacity Purchase Price (PKR / kW / Hour) at 88.5% Plant Factor											
Year	Year	Fuel Cost - FCC (HSD)	Variable O&M - Local	Variable O&M - Foreign	Sub-total	Fixed O&M - Local	Fixed O&M - Foreign	Insurance	RoRD Cost of debt - local	RoRD Cost of debt - foreign	RoRD Cost of Equity	Depreciation	Investment in Capital	RoRD	Total Tariff - PKR / kWh	Total Tariff - US Cents / kWh	Capacity Price - PKR / kW / Hour
		a	b	c	d=a+b+c	e	f	g	h	i	j	k	l	m=g+e+l	n=d+m	o=n/286	p
1	2024	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.53	2.01	0.92	0.59	0.44	5.11	46.52	22.58	3,730
2	2025	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.52	1.94	0.89	0.59	0.48	5.03	46.44	22.54	3,673
3	2026	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.50	1.87	0.86	0.59	0.52	4.95	46.36	22.50	3,613
4	2027	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.48	1.80	0.83	0.59	0.54	4.85	46.26	22.46	3,542
5	2028	40.99	0.06	0.36	41.42	0.35	0.10	0.16	0.46	1.73	0.80	0.59	0.56	4.76	46.18	22.41	3,472
6	2029	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.44	1.66	0.76	0.59	0.56	4.64	46.04	22.35	3,385
7	2030	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.42	1.60	0.73	0.59	0.56	4.52	45.93	22.20	3,298
8	2031	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.41	1.53	0.70	0.59	0.56	4.40	45.81	22.24	3,212
9	2032	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.39	1.46	0.67	0.59	0.56	4.28	45.69	22.18	3,125
10	2033	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.37	1.39	0.64	0.59	0.56	4.16	45.57	22.12	3,039
11	2034	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.35	1.32	0.61	0.59	0.56	4.04	45.45	22.06	2,952
12	2035	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.33	1.25	0.58	0.59	0.56	3.93	45.33	22.01	2,866
13	2036	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.31	1.18	0.54	0.59	0.56	3.81	45.22	21.95	2,780
14	2037	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.30	1.12	0.51	0.59	0.56	3.69	45.10	21.89	2,693
15	2038	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.28	1.05	0.48	0.59	0.56	3.57	44.98	21.83	2,607
16	2039	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.26	0.98	0.45	0.59	0.56	3.45	44.86	21.78	2,520
17	2040	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.24	0.91	0.42	0.59	0.56	3.33	44.74	21.72	2,434
18	2041	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.22	0.84	0.39	0.59	0.56	3.22	44.62	21.66	2,347
19	2042	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.21	0.77	0.35	0.59	0.56	3.10	44.51	21.60	2,261
20	2043	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.19	0.70	0.32	0.59	0.56	2.98	44.39	21.55	2,174
21	2044	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.17	0.64	0.29	0.59	0.56	2.86	44.27	21.49	2,088
22	2045	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.15	0.57	0.26	0.59	0.56	2.74	44.15	21.43	2,001
23	2046	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.13	0.50	0.23	0.59	0.56	2.62	44.03	21.37	1,915
24	2047	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.11	0.43	0.20	0.59	0.56	2.50	43.91	21.32	1,829
25	2048	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.10	0.36	0.17	0.59	0.56	2.39	43.79	21.26	1,742
26	2049	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.08	0.29	0.13	0.59	0.56	2.27	43.68	21.20	1,656
27	2050	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.06	0.22	0.10	0.59	0.56	2.15	43.56	21.14	1,569
28	2051	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.04	0.15	0.07	0.59	0.56	2.03	43.44	21.09	1,483
29	2052	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.03	0.12	0.06	0.59	0.56	1.97	43.38	21.06	1,439
30	2053	40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.02	0.08	0.04	0.59	0.56	1.90	43.30	21.02	1,384
Average tariff		40.99	0.06	0.36	41.41	0.35	0.10	0.16	0.27	1.02	0.47	0.59	0.55	3.51	44.92	21.80	2,561

PKR 44.92 / kWh

US Cents 21.8 / kWh

BQPS-III - Annexures

List of Annexures

Annexure	Description
BQPS-III – Annexure A (i)	Safety procedures
BQPS-III – Annexure A (ii)	Projects details
BQPS-III – Annexure A (iii)	Fire protection system
BQPS-III – Annexure A (iv)	Plant layout
BQPS-III – Annexure A (v)	Details of Major Equipment
BQPS-III – Annexure B (i)	Bifurcation of units generated on HSD & RLNG
BQPS-III – Annexure B (ii)	Sample bill for June 2022 (RLNG)
BQPS-III - Annexure C	Part load Adjustment Factor table - RLNG - CC
BQPS-III – Annexure D	Sample calculation for weighted average part load factor – RLNG
BQPS-III – Annexure E (i)	Degradation table – Net heat Rate HHV - CC
BQPS-III – Annexure E (ii)	Degradation table – Net Output - CC
BQPS-III – Annexure F	HSD Calorific value frequency mechanism
BQPS-III – Annexure G	O&M Break up (levelized)
BQPS-III – Annexure H	Consultant Report (Separate document)
BQPS-III – Annexure I (i)	RAB movement - Unit 1
BQPS-III – Annexure I (ii)	RAB movement - Unit 2
BQPS-III – Annexure J (i)	Calculation of indexed ROE – Unit 1
BQPS-III – Annexure J (ii)	Calculation of indexed ROE – Unit 2
BQPS-III – Annexure K (i)	RoE indexation illustration - Unit 1
BQPS-III – Annexure K (ii)	RoE indexation illustration - Unit 2
BQPS-III – Annexure L (i)	Cost of Working Capital – Unit 1
BQPS-III – Annexure L (ii)	Cost of Working Capital – Unit 2
BQPS-III – Annexure M	Output adjustment due to Ambient temperature
BQPS-III – Annexure N	Capacity sample calculation
BQPS-III – Annexure O	Outage Schedule and plant factor
BQPS-III – Annexure P	O&M Sharing Mechanism
BQPS-III – Annexure Q	Head of Terms

BQPS-III – Annexure A (i)

Safety Procedures

INDEX	NO	TITLE
1	BQIII-HSE-SP-001	BQPS-III HSEQ MANUAL
2	BQIII-HSE-SP-002	HSEQ COMMITTEE AND THEIR FUNCTIONS
3	BQIII-HSE-SP-003	HSE HAZARD ASPECT IDENTIFICATION & RISK ASSESSMENT
4	BQIII-HSE-SP-003A	ENVIRONMENTAL ASPECTS & THEIR IMPACTS
5	BQIII-HSE-SP-004	SETTING HSE OBJECTIVES AND TARGETS
6	BQIII-HSE-SP-005	*HSEQ LAWS & REGULATIONS*
7	BQIII-HSE-SP-006	HSE RESPONSIBILITIES & ACCOUNTABILITIES
8	BQIII-HSE-SP-007	TRAINING , AWARENESS AND COMPETENCE
9	BQIII-HSE-SP-008	COMMUNICATION AND CONSULTATION
10	BQIII-HSE-SP-009	CALIBRATION OF MEASURING AND MONITORING DEVICES
11	BQIII-HSE-SP-010	EMERGENCY RESPONSE PLAN
12	BQIII-HSE-SP-011	MEASUREMENT & MONITORING OF HSEQ MANAGEMENT SYSTEM
13	BQIII-HSE-SP-012	INTERNAL AUDIT
14	BQIII-HSE-SP-013	MANAGEMENT REVIEW

BQPS-III – Annexure A (ii)

Project Details

Plant Refcrence Condition

Reference Conditions at the Plant Site are:

1. Ambient Air Temperature = 30 deg. C
2. Total Barometric Pressure (Design) = 1013.2 mbar
3. Relative Humidity = 70 %

Plant Configuration

Plant installed Gross capacity at ISO condition	942.32 MW	
Type of Technology	Combined Cycle Power Plant	
Number of units and capacity (at ISO condition)	Unit-1 Gas Turbine & Steam Turbine	471.16 MW
	Unit-2 Gas Turbine & Steam Turbine	471.16 MW
Unit Make & Model	Gas Turbine	Siemens SGT5-4000F
	Steam Turbine	Siemens SST5-3000
Expected useful Life of Each Unit from COD	Unit-1	30 Years
	Unit-2	30 Years

Plant Characteristics

Generation Voltage	18.5 KV ± 5%	
Frequency	50 Hz	
Power Factor	0.80 Lagging / 0.95 Lagging	
Automatic Generation control	Yes	
Ramping Rate	0.9 – 3.8 MW per minute	
Time required to synchronize with Grid	Gas Turbine	89 minutes approx..
	Steam Turbine	164 minutes approx. (hot start)

BQPS-III – Annexure A (iii)

Fire Protection System

Fire Protection System has following main measures:

1. **Fire area, fire escape and evacuation passage**

   Every building of the plant has been provided with a specific and dedicated "Emergency Evacuation Map" at the entrance and other conspicuous locations to warn and update the entrants of the buildings about the route to be taken to assembly point, in case of any emergency.

   All the buildings are also equipped with "illuminated Exit signs" directing Emergency escape door

2. **Evacuation Channels**

   Plant has dedicated emergency warning (siren, buddy system, walkie-talkie, hot lines) system, while actions from every employee are clearly documented in the plant Emergency Response Procedure on what to do when they hear the alarm / observe an emergency situation.

   Moreover, dedicated Fire Wardens are assigned against individual buildings who will ensure (in case of any emergency) the complete evacuation of the workers in the dedicated building.

   Plant has also dedicated assembly points, where every individual has to report after hearing the emergency siren and then a robust headcount management system is followed.

   In case of any off-site evacuation need (due to any injury), dedicated emergency vehicle (ambulance) is also available at plant, which will support prompt evacuation of injured individual to the nearest medical facility.

   Evacuation alarms are tested on weekly basis as per define procedure, all the occupants are familiarize with Evacuation procedure at the time of safety induction.

3. **Fire-fighting system and fire extinguisher**

   Advanced firefighting & fire protection systems are available at plant (including fire hydrant network, water deluge system, and Clean agent Fire suppression system like FM 200)

   Adequate number of fire extinguishers including Foam firefighting mobile trollies have also been installed across the plant premises (indoor as well as outdoor) and different training sessions are imparted among the team for its operation throughout the year.

   Plant have one dedicated Fire truck equipped with accessories e.g. Fire gears, SCBA, Nozzles, Hose pipes

4. **Fire pump and alarm monitoring**

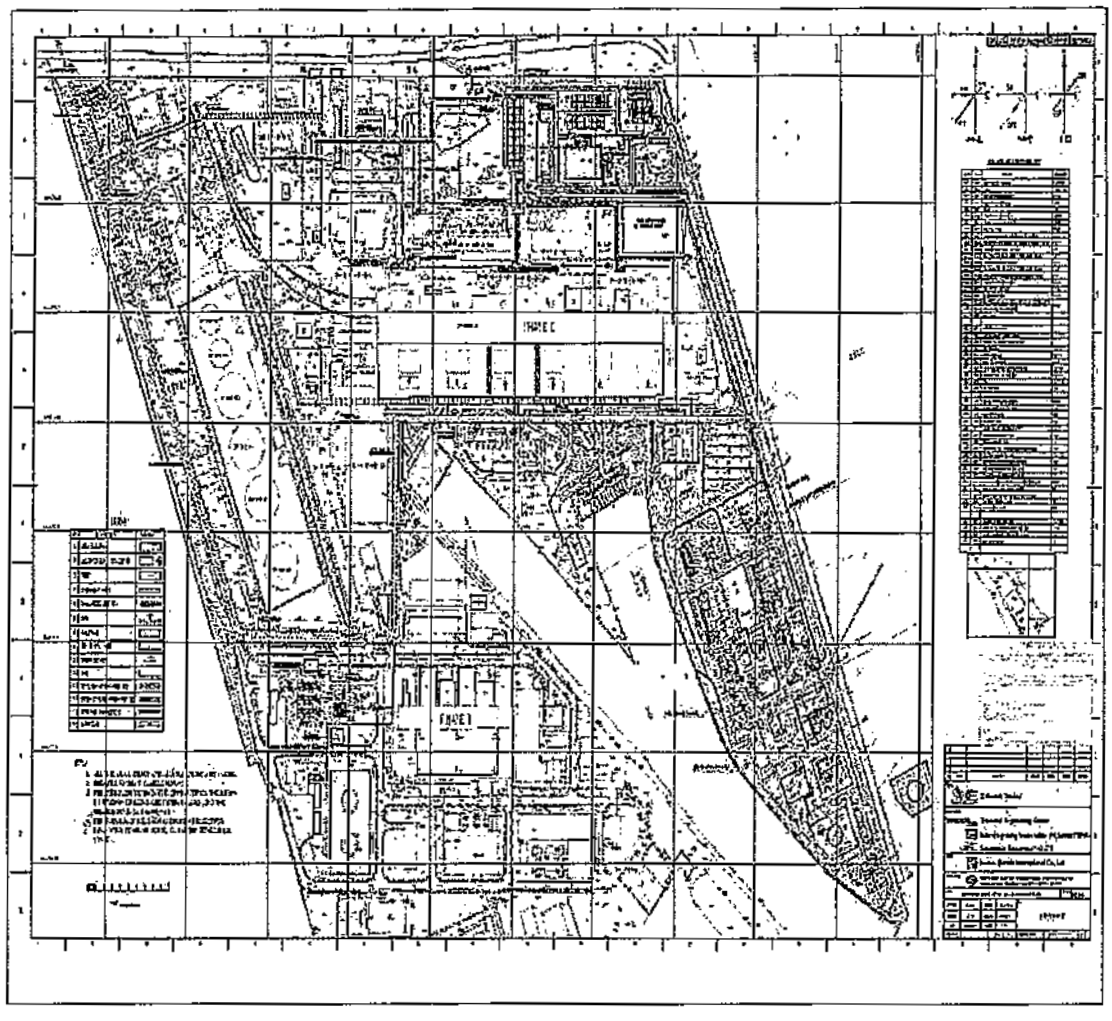
   Plant has a dedicated firefighting water network (covering whole plant premises). BQPS-III Fire pump set consists of a main electric pump(driven by electric motor), standby diesel pump(driven by diesel engine), and a multistage jockey pump.

   Early detection of the fire is given the paramount importance which ensures that fire is detected at the incipient stage. These (smoke detectors) are widespread across the plant and integrated with plant fire siren system. Plant facilitated with Fire Detection system

comprising on Smoke/ Heat/ Thermal / Beam Detectors, Multiple manual call points are also installed across the plant for actuation of the fire Alarm, upon observing any fire emergency."

BQPS-III – Annexure A (iv)

Plant Layout



BQPS-III – Annexure A (v)

Details of Major Equipment

Gas Turbine

Model	SGT5-4000F
Manufacturer	SIEMENS
Rated Capacity	300 MW
Quantity	2
Rated Speed	3000 RPM
Compressor	15 Stages
Pressure ratio	19
Combustion Chamber	1
No of Combustors	24
Liquid fuel NOX Control	No
Turbine	04 Stages

Steam Turbine

Model	SST5-3000
Manufacturer	SIEMENS
Rated Capacity	160 MW
Quantity	2
Rated Speed	3000 RPM
Type	H-IL condensing

Generator

Description	Unit	Parameter
Type		SGen5-3000W
Rated capacity	kVA	584000 (43 °C cold gas)
Rated voltage	kV	18.5
Rated current	A	18226
Frequency	Hz	50
Rated speed	Rpm	3000
Power factor	PF	0.8
Number of phases	No.	03

HRSG

Type	MHDB-SGT5-4000F-Q1
Manufacturer	Dong Feng
Quantity	2
HP Pressure and flow rate	15.72MPa.a & 313.08t/h
IP Pressure and flow rate	3.78MPa.a & 50.56t/h
LP Pressure and flow rate	0.45MPa.a & 39.18t/h

Transformers

Generator Step up Transformer

Description	Unit	Parameters
Type		SFPZ-600000/220TH
Quantity		02
Rated capacity	MVA	600
Rated voltage	KV	232 /18.5
Cooling		ODAF
Rated frequency	Hz	50
Connection symbol		YN d1

Auxiliary Transformer

Description	Unit	Parameters
Type		S-25000/20
Quantity		02
Rated capacity	MVA	25
Rated voltage	KV	18.5 / 6.9
Cooling		ONAN
Rated frequency	Hz	50
Connection symbol		Dyn11

Stand By Transformer

Description	Unit	Parameters
Type		SZ-25000/220
Quantity		01
Rated capacity	MVA	25
Rated voltage	KV	220 / 6.9
Cooling		ONAN
Rated frequency	Hz	50
Connection symbol		YNynO+d

BQPS-III – Annexure B (i)

HSD & RLNG sample calculation

Gross Energy Distribution BQ3	Unit	Legend	Unit - 1	Unit - 2
Gross Energy meter reading at start of Day	MWHR	a	1,000	1,000
Gross Energy meter reading at End of Day	MWHR	b	1,500	1,500
Total Gross energy for the day	MWHR	c = b – a	500	500
Gross Energy meter reading at start of HSD operation	MWHR	d	1,200	1,200
Gross Energy meter reading at End of HSD operation	MWHR	e	1,300	1,300
Total Gross Energy on HSD	MWHR	f = e - f	100	100
Total Gross Energy on RLNG	MWHR	g = c – f	400	400
Complex Gross Energy on HSD (Both Unit sum of HSD Generation)	MWHR	h = sum f	200	
Complex Gross on RLNG (Both Unit sum of RLNG Generation)	MWHR	I = sum g	800	

Sent out Energy Distribution BQ3	Unit	Legend	Unit - 1	Unit – 2
Export-Sent out Energy meter reading at start of Day	MWHR	a	1,000	1,000
Export-Sentout Energy meter reading at End of Day	MWHR	b	1,500	1,500
Total Export-sent out energy for the day (2-1)	MWHR	c = b – a	500	500
Import-Sent out Energy meter reading at start of day	MWHR	d	100	100
Import-Sentout Energy meter reading at End of day	MWHR	e	100	100
Total Import-sent out energy for the day (5-4)	MWHR	f = e - d	-	-
Total Net sent out for the day (3-6)	MWHR	g = c – f	500	500
Export-Sent out Energy meter reading at start of HSD operation	MWHR	h	1,200	1,200
Export-Sentout Energy meter reading at End of HSD operation	MWHR	i	1,300	1,300
Total Export-sent out energy for HSD Operation (9-8)	MWHR	j = i - h	100	100
Import-Sent out Energy meter reading at start of HSD operation	MWHR	k	100	100
Import-Sentout Energy meter reading at End of HSD operation	MWHR	l	100	100
Total Import-sent out energy for HSD Operation (12-11)	MWHR	m = l – k	-	-
Total Net sent out on HSD (10-13)	MWHR	n = j - m	100	100
Total Net sent out on RLNG (7-14)	MWHR	o = g - n	400	400
Complex Net sent out on HSD (Both Unit sum of HSD Net Sentout)	MWHR	p = sum n	200	
Complex Net sent out on RLNG (Both Unit sum of RLNG Net Sentout)	MWHR	q = sum o	800	

Note: these are sample calculations based on sample data

BQPS-III – Annexure B (ii)

RLNG Sample Bills June 2022

(4)

PAKISTAN LNG Ltd.

ORIGINAL SEEN
DMC-AP
DP # ______
K-ELECTRIC

Invoice No.	KE-0?/2022	
Billing Cycle	From	To
	1-Jun-22	10-Jun-22
Invoice Date	Monday, June 13, 2022	
Issue Date	Monday, June 13, 2022	
Due Date	Saturday, June 18, 2022	

Managing Director,
KE House, 39B Sunset
Boulevard, DHA Phase-II,
Karachi

Buyer's NTN 1543137-1

INVOICE UNDER THE GAS SALES AGREEMENT

Dear Sir,

In accordance with the terms agreed, K-Electric is requested to arrange payment of PKR 3,236,390,088.86 being the payment against Gas supplied during the above-mentioned period. Details in this respect are given below:

(1)	Gas Supplied	MMBTU	546,805.454000	
(2)	Gas Price	USD / MMBTU	24.91851	Annex-II
(3)	USD exchange rate	PKR / USD	202.85	Annex-III
(4)	Gas Charges	PKR	2,766,145,375.09	(1) x (2) x (3)
(5)	PKR 50 PKR / MMBTU	PKR	-	See notes below
(6)	Sub-Total	PKR	2,766,145,375.09	(4) + (5)
(7)	Adjustments (If any)	PKR	-	Annex-IV
(8)	Total	PKR	2,766,145,375.09	(6) + (7)
(9)	GST @ 17%	PKR	470,244,713.77	(8) x 17%
(10)	Take or Pay / other charges (if any)	PKR	-	N/A
	Total Amount Due	PKR	3,236,390,088.86	(8) + (9) + (10)

Amount In Words:
Three Billion Two Hundred Thirty Six Million Three Hundred Ninety Thousand Eighty Eight Rupees and Eighty Six Paisas

Payment may be made in any of PLL's following bank accounts:

1	Bank	United Bank Limited (UBL)
	Branch	Corporate Centre, UBL Building, Blue Area Islamabad (0219)
	Account No.	243961539
	Account Title	Pakistan LNG Limited
2	Bank	National Bank of Pakistan (NBP)
	Branch	Corporate Branch, G-5, Islamabad (2221)
	Account No.	3146100890
	Account Title	Pakistan LNG Limited
3	Bank	Habib Metropolitan Bank
	Branch	F-7 Markaz Branch Islamabad
	Account No.	0037217140131770
	Account Title	Pakistan LNG Limited

Other Details:
NTN 7203423-3
STRN 3277876123000

Kind Regards,

Chief Financial Officer
for Pakistan LNG Limited

9th Floor, Petroleum House, Ataturk Avenue, G-5/2, Islamabad, Pakistan. Ph: +92 51 921 6903 Fax: +92 51 921 6904
www.pakistanlng.com | info@paklng.com

BQPS-III – Annexure C

Part load Adjustment Factor table – RLNG – CC

Applicable for both units.

UNIT Net Heat Rate Correction Factor for Combined Cycle Part Load Operation	
Percent Load Factor	Correction Factor on Natural Gas fuel for Unit Combined Cycle operation
100%	1.0000
95%	1.0123
90%	1.0224
85%	1.0327
80%	1.0428
75%	1.0528
70%	1.0635
65%	1.0764

Table for HSD will be submitted post commissioning

K-Electric Limited
Generation Plants Tariff Petition
BQPS III Plant - Unit 1
Annexure O - Part Load Adjustment Example

Partial Load Sample Calculation of a DAY

Time	Date	Net Dependable Capacity MW (A)	Forced Outage MW (B)	Planned Outage MW (C)	Forced Derated MW (D)	Planned Derated MW (E)	Available Capacity (post planned and forced outages) MW F=A-B-C-D-E	Hourly Net Load MW (from energy meters) MW (G)	Amb Temp (°C)	Ambient Temp Correction	Adjusted Available Capacity J=F/I	Load Factor K=G/J	L=0.00000001 ...	M=0.00001453 ...	N=0.003856 ...	O=0.1047704597 ...	P=3.3100	Correction factor Q=L+M+N+O+P	Net Heat Rate R=Q*Declared Net HR	mmbtu S=R*G/1000
1:00:00 AM	1-Jul	449.8	0	0	0	0	450	292	30	1.00	450	65%	0.7845	-4.0618	7.8222	-6.8011	3.3100	1.0766	6201.38	1,813
2:00:00 AM	1-Jul	449.8	0	0	0	0	450	345	31	1.01	447	80%	2.4466	-9.4984	13.7790	-9.0748	3.3100	1.0303	5935.53	2,285
3:00:00 AM	1-Jul	449.8	0	0	0	0	450	444	32	1.01	444	100%	4.4400	-14.8513	18.5620	-10.4771	3.3100	1.0000	5760.83	2,558
4:00:00 AM	1-Jul	449.8	0	0	0	0	450	444	33	1.02	441	100%	4.4400	-14.8513	18.5620	-10.4771	3.3100	1.0000	5760.83	2,558
5:00:00 AM	1-Jul	449.8	0	0	0	0	450	449	33	1.02	441	100%	4.4400	-14.8513	18.5620	-10.4771	3.3100	1.0000	5760.83	2,587
6:00:00 AM	1-Jul	449.8	0	0	0	0	450	400	33	1.02	441	91%	3.0073	-11.0882	15.2764	-9.5047	3.3100	1.0209	5881.09	2,352
7:00:00 AM	1-Jul	449.8	0	0	0	0	450	440	31	1.01	447	98%	4.1738	-14.1784	17.9970	-10.3164	3.3100	1.0060	5795.64	2,550
8:00:00 AM	1-Jul	449.8	0	0	0	0	450	440	31	1.01	444	99%	4.2851	-14.4611	18.2354	-10.3845	3.3100	1.0050	5789.60	2,547
9:00:00 AM	1-Jul	449.8	0	0	0	0	450	425	33	1.02	441	96%	3.8126	-13.2099	17.2457	-10.0987	3.3100	1.0097	5816.54	2,472
10:00:00 AM	1-Jul	449.8	0	0	0	0	450	425	34	1.03	438	97%	3.9471	-13.5414	17.4882	-10.1695	3.3100	1.0084	5809.53	2,464
11:00:00 AM	1-Jul	449.8	0	0	0	0	450	425	35	1.03	435	93%	4.0559	-13.8759	17.7409	-10.2427	3.3100	1.0072	5802.45	2,466
12:00:00 PM	1-Jul	449.8	0	0	0	0	450	300	36	1.04	431	70%	2.0171	-4.9898	8.9710	-7.2016	3.3100	1.0646	6133.07	1,840
1:00:00 PM	1-Jul	449.8	0	0	0	0	450	440	37	1.05	428	100%	4.4400	-14.8513	18.5620	-10.4771	3.3100	1.0000	5760.83	2,535
2:00:00 PM	1-Jul	449.8	0	0	0	0	450	445	38	1.06	425	100%	4.4400	-14.8513	18.5620	-10.4771	3.3100	1.0000	5760.83	2,564
3:00:00 PM	1-Jul	449.8	0	0	0	0	450	445	33	1.02	441	100%	4.4400	-14.8513	18.5620	-10.4771	3.3100	1.0000	5760.83	2,564
4:00:00 PM	1-Jul	449.8	0	0	0	0	450	445	33	1.02	441	100%	4.4400	-14.8513	18.5620	-10.4771	3.3100	1.0000	5760.83	2,564
5:00:00 PM	1-Jul	449.8	0	0	0	0	450	440	33	1.02	441	100%	4.4030	-14.7584	18.4845	-10.4552	3.3100	1.0040	5783.03	2,545
6:00:00 PM	1-Jul	449.8	0	0	0	0	450	435	33	1.02	441	99%	4.2062	-14.2609	18.0668	-10.3364	3.3100	1.0057	5793.84	2,520
7:00:00 PM	1-Jul	449.8	0	0	0	0	450	100	31	1.01	447	22%	0.0111	-0.1664	0.9296	-2.3446	3.3100	1.7597	10137.21	1,016
8:00:00 PM	1-Jul	449.8	0	0	0	0	450	435	31	1.01	444	98%	4.0917	-13.9737	17.8233	-10.2665	3.3100	1.0068	5800.23	2,511
9:00:00 PM	1-Jul	449.8	0	0	0	0	450	444	33	1.02	441	100%	4.4400	-14.8513	18.5620	-10.4771	3.3100	1.0000	5760.83	2,535
10:00:00 PM	1-Jul	449.8	0	0	0	0	450	430	34	1.03	438	98%	4.1299	-14.0684	17.9021	-10.2891	3.3100	1.0065	5798.13	2,491
11:00:00 PM	1-Jul	449.8	0	0	0	0	450	430	35	1.03	435	99%	4.2502	-14.3725	18.1606	-10.3632	3.3100	1.0053	5791.46	2,490
12:00:00 AM	1-Jul	449.8	0	0	0	0	450	435	33	1.02	441	99%	4.2062	-14.2609	18.0668	-10.3364	3.3100	1.0057	5793.84	2,520
Total								9793			10561									57,385
Benchmark Efficiency (Total mmbtu/Total MWh)																			58.23%	
Adjustment Factor (Benchmark Efficiency / Reference Efficiency)																			1.017	

*The calculation is based on provisional Part Load Curve
Final submission of Part Load Curve from EPC is still awaited

	Reference	
450	59.23%	5761

K-ELECTRIC LIMITED *

K-Electric Limited
Generation Plants Tariff Petition
BQPS III Plant - Unit 2
Annexure D - Part Load Adjustment Example

Partial Load Sample Calculation of a DAY

Time	Date	Net Dependable Capacity MW A	Forced Outage MW B	Planned Outage MW C	Forced Derated MW D	Planned Derated MW E	Available Capacity (post planned and forced outages) MW F=A-B-C-D-E	Hourly Net Load MW (from energy meters) MW G	Amb Temp (°C) H	Ambient Temp Correction I	Adjusted Available Capacity J=F/I	Load Factor X=G/J	L=0.0000000444*X^4	M=-0.0000143513*X^3	N=0.0018561989*X^2	O=-0.104770659*X	P=3.3100234130	Correction factor Q=L+M+N+O+P	Net Heat Rate R=Q*Baseload Net HR	mmbtu S=R*G/1000
1:00:00 AM	1-Jul	449.8	0	0	0	0	450	292	30	1.00	450	65%	0.7885	-4.0628	7.8722	-6.8013	3.3300	1.0766	6202.38	1,811
2:00:00 AM	1-Jul	449.8	0	0	0	0	450	385	31	1.01	447	86%	2.4466	-9.4984	11.7790	-9.0268	3.3300	1.0303	5915.53	2,277
3:00:00 AM	1-Jul	449.8	0	0	0	0	450	444	32	1.01	444	100%	4.4400	-14.8513	18.5620	-10.4771	3.3300	1.0000	5760.83	2,558
4:00:00 AM	1-Jul	449.8	0	0	0	0	450	444	33	1.02	441	100%	4.4400	-14.8513	18.5620	-10.4771	3.3300	1.0000	5760.83	2,558
5:00:00 AM	1-Jul	449.8	0	0	0	0	450	449	33	1.02	441	100%	4.4400	-14.8513	18.5620	-10.4771	3.3300	1.0000	5760.83	2,587
6:00:00 AM	1-Jul	449.8	0	0	0	0	450	400	33	1.02	441	91%	3.0073	-11.0382	15.2764	-9.5047	3.3300	1.0209	5881.07	2,352
7:00:00 AM	1-Jul	449.8	0	0	0	0	450	440	31	1.01	447	98%	4.1738	-14.1784	17.9370	-10.3164	3.3300	1.0060	5795.64	2,550
8:00:00 AM	1-Jul	449.8	0	0	0	0	450	440	32	1.01	444	99%	4.2851	-14.4611	18.2354	-10.3845	3.3300	1.0050	5789.60	2,547
9:00:00 AM	1-Jul	449.8	0	0	0	0	450	425	33	1.02	441	96%	3.8326	-13.2998	17.2457	-10.0937	3.3300	1.0097	5816.54	2,472
10:00:00 AM	1-Jul	449.8	0	0	0	0	450	425	34	1.03	438	97%	3.9411	-13.5614	17.4482	-10.1695	3.3300	1.0084	5809.52	2,469
11:00:00 AM	1-Jul	449.8	0	0	0	0	450	425	35	1.03	435	98%	4.0559	-13.8769	17.7409	-10.2427	3.3300	1.0072	5802.46	2,466
12:00:00 PM	1-Jul	449.8	0	0	0	0	450	300	36	1.04	432	70%	1.0371	-4.9898	8.9730	-7.2836	3.3300	1.0646	6133.07	1,840
1:00:00 PM	1-Jul	449.8	0	0	0	0	450	440	37	1.05	428	100%	4.4400	-14.8513	18.5620	-10.4771	3.3300	1.0000	5760.83	2,535
2:00:00 PM	1-Jul	449.8	0	0	0	0	450	445	38	1.06	425	100%	4.4400	-14.8513	18.5620	-10.4771	3.3300	1.0000	5760.83	2,564
3:00:00 PM	1-Jul	449.8	0	0	0	0	450	445	33	1.02	441	100%	4.4400	-14.8513	18.5620	-10.4771	3.3300	1.0000	5760.83	2,564
4:00:00 PM	1-Jul	449.8	0	0	0	0	450	445	33	1.02	441	100%	4.4400	-14.8513	18.5620	-10.4771	3.3300	1.0000	5760.83	2,564
5:00:00 PM	1-Jul	449.8	0	0	0	0	450	440	33	1.02	441	100%	4.4000	-14.7584	18.4645	-10.4552	3.3300	1.0040	5783.62	2,545
6:00:00 PM	1-Jul	449.8	0	0	0	0	450	435	33	1.02	441	99%	4.2062	-14.2609	18.0668	-10.3364	3.3300	1.0057	5791.84	2,520
7:00:00 PM	1-Jul	449.8	0	0	0	0	450	100	31	1.01	447	22%	0.0131	-0.1664	0.9296	-2.3445	3.3300	1.7597	10137.21	1,014
8:00:00 PM	1-Jul	449.8	0	0	0	0	450	435	32	1.01	444	98%	4.0937	-13.9737	17.8231	-10.2665	3.3300	1.0068	5800.23	2,523
9:00:00 PM	1-Jul	449.8	0	0	0	0	450	444	33	1.02	441	100%	4.4400	-14.8513	18.5620	-10.4771	3.3300	1.0000	5760.83	2,558
10:00:00 PM	1-Jul	449.8	0	0	0	0	450	430	34	1.03	438	98%	4.1290	-14.0664	17.9027	-10.2891	3.3300	1.0065	5793.13	2,493
11:00:00 PM	1-Jul	449.8	0	0	0	0	450	430	35	1.03	435	99%	4.2502	-14.3725	18.1608	-10.3637	3.3300	1.0053	5791.46	2,490
12:00:00 AM	1-Jul	449.8	0	0	0	0	450	435	33	1.02	441	99%	4.2062	-14.2609	18.0668	-10.3364	3.3300	1.0057	5791.84	2,520
Total								9793			10561									57,385
Benchmark Efficiency (Total mmbtu/Total MWh)																			58.23%	
Adjustment Factor (Benchmark Efficiency/ Reference Efficiency)																			1.017	

*The calculation is based on provisional Part Load Curve
Final submission of Part Load Curve from EPC is still awaited

Reference		
Load	Net Eff	Net HR
450	59.23%	5761

BQPS-III – Annexure E (i)

Degradation table -Net Heat rate HHV (Gas)-

Heat Rate Degradation Factor – CC

FY	Net Efficiency (%)*	Revised Net Efficiency (%)	Correction
22	53.85%	53.85%	1.0000
23	53.85%	53.48%	1.0068
24	53.85%	53.26%	1.0110
25	53.85%	53.07%	1.0147
26	53.85%	53.00%	1.0160
27	53.85%	52.87%	1.0184
28	53.85%	52.75%	1.0207
29	53.85%	52.64%	1.0230
30	53.85%	52.52%	1.0252
31	53.85%	52.79%	1.0200
32	53.85%	52.68%	1.0221
33	53.85%	52.57%	1.0242
34	53.85%	52.47%	1.0263
35	53.85%	52.36%	1.0283
36	53.85%	52.26%	1.0302
37	53.85%	52.39%	1.0279
38	53.85%	52.28%	1.0299
39	53.85%	52.18%	1.0320
40	53.85%	52.07%	1.0341
41	53.85%	51.97%	1.0361
42	53.85%	52.25%	1.0306
43	53.85%	52.15%	1.0326
44	53.85%	52.04%	1.0346
45	53.85%	51.94%	1.0367
46	53.85%	51.84%	1.0387
47	53.85%	51.95%	1.0364
48	53.85%	52.02%	1.0352
49	53.85%	51.91%	1.0372
50	53.85%	51.81%	1.0392

*As per Performance Guarantees & LHV-HHV factor of 1.1

FY 23 : Considering 50% utilization

FY 24-42 : As per 88.5% Utilization (In line with availability numbers)

HSD will be submitted post commissioning

BQPS-III – Annexure E (ii)

Degradation table -Output Degradation (Gas)

Output Degradation Factor – CC

FY	Combined Cycle Output (MW)	Revised Combined Cycle Output (MW)	Correction Factor
22	449.80	449.80	1.000
23	449.80	447.81	1.004
24	449.80	446.30	1.008
25	449.80	445.41	1.010
26	449.80	445.30	1.010
27	449.80	444.75	1.011
28	449.80	444.04	1.013
29	449.80	443.64	1.014
30	449.80	442.96	1.015
31	449.80	444.36	1.012
32	449.80	443.93	1.013
33	449.80	443.35	1.015
34	449.80	442.70	1.016
35	449.80	442.06	1.018
36	449.80	441.64	1.018
37	449.80	442.73	1.016
38	449.80	442.22	1.017
39	449.80	441.72	1.018
40	449.80	441.22	1.019
41	449.80	440.72	1.021
42	449.80	442.05	1.018
43	449.80	441.56	1.019
44	449.80	441.06	1.020
45	449.80	440.57	1.021
46	449.80	440.08	1.022
47	449.80	440.63	1.021
48	449.80	440.93	1.020
49	449.80	440.44	1.021
50	449.80	439.95	1.022

*As per Generation License
FY 23 : Considering 50% utilization
FY 24-42 : As per 88.5% Utilization (In line with availability numbers)

HSD will be submitted post commissioning

BQPS-III – Annexure F

HSD Calorific value mechanism

a. BQPS-III has two main storage tanks of 5000 m³ each at BQPS-II and one day tank of 3200 m³ at own plant (BQPS-III) for holding inventory of HSD.

b. Per day consumption of one unit is approximately 1600 m³ at base load.

c. The oil is transferred from main storage tanks to day tank after going through a purifier system which removes moisture content from the oil.

d. Diesel samples will be collected from HSD forwarding pump discharge (installed after the day tank) in 500ml sample bottle daily when any of the GT is in operation on HSD.

e. A 5 liter Sample bottle will be placed in the lab control and be marked as Diesel composite sample for 10 days with specific date range mentioned

f. This diesel from the 500ml bottle collected as mentioned in para d above, will be poured into five liter sample bottle placed in the laboratory with its cap tightly closed.

g. This 5 liter composite sample bottle will be kept in a locker with lock and key.

h. 500ml sample will be collected on daily basis as long as any of the GT is in service on diesel fuel and sample will be poured in the same 5liter sample bottle to maintain a 10 days composite sample

i. If no GT runs on the diesel fuel for whole day [24hrs] then no sample will be collected on that day.

j. On every tenth day composite sample will be sent to third party lab for HEATING VALUE testing.

k. The month CV will be the weighted average of 1 to 3 samples (Depending on running of GT).

BQPS-III – Annexure G

O&M break up

Unit 1

RLNG – combined cycle

BQPS-III O&M Levelized per year

PKR million

Major Activities	Fixed		Variable		Total
	Foreign	local	Foreign	Local	
CSA / LTSA	38.82	-	554.53	-	593.35
Plant O&M Cost - excluding LTSA	244.16	251.38	255.19	132.43	883.16
Overhead Cost	-	695.95	-	-	695.95
Total	**282.99**	**947.33**	**809.71**	**132.43**	**2,172.46**

HSD – Combined cycle

BQPS-III O&M Levelized per year

PKR million

Major Activities	Fixed		Variable		Total
	Foreign	local	Foreign	Local	
CSA / LTSA	38.82	-	758.27	-	797.09
Plant O&M Cost - excluding LTSA	244.16	251.38	220.92	162.91	879.37
Overhead Cost	-	695.95	-	0.18	696.13
Total	**282.99**	**947.33**	**979.18**	**163.09**	**2,372.59**

Unit 2

RLNG – Combined Cycle

BQPS-III O&M Levelized per year

PKR million

Major Activities	Fixed		Variable		Total
	Foreign	local	Foreign	Local	
CSA / LTSA	38.83	-	554.67	-	593.51
Plant O&M Cost - excluding LTSA	243.45	256.70	256.23	132.72	889.10
Overhead Cost	-	692.78	-	-	692.78
Total	**282.29**	**949.475**	**810.904**	**132.723**	**2,175.39**

HSD – Combined cycle

BQPS-III O&M Levelized per year

PKR million

Major Activities	Fixed		Variable		Total
	Foreign	local	Foreign	Local	
CSA / LTSA	38.83	-	758.47	-	797.30
Plant O&M Cost - excluding LTSA	243.45	256.70	221.34	163.12	884.61
Overhead Cost	-	692.78	-	0.18	692.96
Total	**282.29**	**949.47**	**979.80**	**163.30**	**2,374.87**

K-Electric Limited
Generation Plants Tariff Petition
BQPS III Plant - Unit 1
Annexure I (i) - RAB Movement

Description		Unit	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031	FY 2032	FY 2033	FY 2034	FY 2035	FY 2036	FY 2037	FY 2038	FY 2039	FY 2040	FY 2041	FY 2042	FY 2043	FY 2044	FY 2045	FY 2046
RAB movement																										
Cost - Without surplus on revaluation																										
Opening		PKR Mn		46,979	46,979	46,979	46,979	46,979	46,979	46,979	46,979	46,979	46,979	46,979	46,979	46,979	46,979	46,979	46,979	46,979	46,979	46,979	46,979	46,979	46,979	46,979
Capitalization		PKR Mn		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Disposal		PKR Mn		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Closing	a	PKR Mn	46,979	46,979	46,979	46,979	46,979	46,979	46,979	46,979	46,979	46,979	46,979	46,979	46,979	46,979	46,979	46,979	46,979	46,979	46,979	46,979	46,979	46,979	46,979	46,979
Accumulated Depreciation																										
Opening		PKR Mn		522	2,088	3,654	5,220	6,786	8,352	9,918	11,484	13,050	14,616	16,182	17,748	19,314	20,880	22,446	24,012	25,578	27,144	28,710	30,276	31,842	33,408	34,974
Depreciation for the year		PKR Mn		1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566
Depreciation - Disposal		PKR Mn		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Closing	b	PKR Mn	522	2,088	3,654	5,220	6,786	8,352	9,918	11,484	13,050	14,616	16,182	17,748	19,314	20,880	22,446	24,012	25,578	27,144	28,710	30,276	31,842	33,408	34,974	36,540
Net Book Value - Fixed Assets	c=a+b	PKR Mn	46,457	44,891	43,325	41,759	40,193	38,627	37,061	35,495	33,929	32,363	30,797	29,231	27,665	26,099	24,533	22,967	21,401	19,835	18,269	16,703	15,137	13,571	12,005	10,439
Capital Work in Progress																										
Opening		PKR Mn		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Capex		PKR Mn		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Transfer to Fixed Assets		PKR Mn		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Closing	d	PKR Mn	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Net RAB	e=c+d	PKR Mn	46,457	44,891	43,325	41,759	40,193	38,627	37,061	35,495	33,929	32,363	30,797	29,231	27,665	26,099	24,533	22,967	21,401	19,835	18,269	16,703	15,137	13,571	12,005	10,439
Average RAB - PKR	f=average of e	PKR Mn		45,674	44,108	42,542	40,976	39,410	37,844	36,278	34,712	33,146	31,580	30,014	28,448	26,882	25,316	23,750	22,184	20,618	19,052	17,486	15,920	14,354	12,788	11,222
RoRB break up																										
Equity Portion	g	%		30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%
Debt Portion	h	%		70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%
Local Component	i	%		25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%
Foreign Component	j	%		75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%
KIBOR	k	%		15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%
Spread on KIBOR	l	%		2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%
Cost of Debt - Local borrowing	m=k+l	%		17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%
LIBOR	n	%		2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%
Hedge	o	%		15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%
Spread	p	%		4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Cost of Debt - Foreign borrowing	q=n+o+p	%		22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%
KIBOR	r	%		15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%
LIBOR	s	%		-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%
Hedging spread	t	%		2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%
Hedging cost	u=r+s+t	%		15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%
Indexed Return on Equity	v	%		18.11%	18.11%	18.11%	18.11%	18.11%	18.11%	18.11%	18.11%	18.11%	18.11%	18.11%	18.11%	18.11%	18.11%	18.11%	18.11%	18.11%	18.11%	18.11%	18.11%	18.11%	18.11%	18.11%

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Annexure I (i) - RAB Movement

Particulars	Code	Description	Unit	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031	FY 2032	FY 2033	FY 2034	FY 2035	FY 2036	FY 2037	FY 2038	FY 2039	FY 2040	FY 2041	FY 2042	FY 2043	FY 2044	FY 2045	FY 2046
RoRD and Depreciation amounts																											
Cost of Debt - Local	w = f x h x i x m		PKR Mn	1,412	1,363	1,315	1,266	1,218	1,170	1,121	1,073	1,024	976	928	879	831	782	734	686	637	589	540	492	444	395	347
Cost of Debt - Foreign	x = f x h x j x q		PKR Mn	5,314	5,131	4,949	4,767	4,585	4,403	4,221	4,038	3,856	3,674	3,492	3,310	3,127	2,945	2,763	2,581	2,399	2,216	2,034	1,852	1,670	1,488	1,306
Cost of Equity	y = f x g x v		PKR Mn	2,481	2,396	2,311	2,226	2,141	2,056	1,970	1,885	1,800	1,715	1,630	1,545	1,460	1,375	1,290	1,205	1,120	1,035	950	865	780	695	610
Depreciation	z = b for the year		PKR Mn	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566
Calculation of Tariff components																											
Gas																											
Net Capacity	aa		MW	449.808	449.808	449.808	449.808	449.808	449.808	449.808	449.808	449.808	449.808	449.808	449.808	449.808	449.808	449.808	449.808	449.808	449.808	449.808	449.808	449.808	449.808	449.808	449.808
Plant factor	ab		%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%
Net Capacity units at Plant factor	ac = aa x ab x 8760 / 1000		GWh	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490
Tariff components on Gas																											
Cost of Debt - Local	ad = w / ac		PKR / kWh	0.4045	0.3906	0.3767	0.3629	0.3490	0.3351	0.3213	0.3074	0.2935	0.2797	0.2658	0.2519	0.2381	0.2242	0.2103	0.1964	0.1826	0.1687	0.1548	0.1410	0.1271	0.1132	0.0994
Cost of Debt - Foreign	ae = x / ac		PKR / kWh	1.5226	1.4704	1.4182	1.3660	1.3138	1.2616	1.2094	1.1572	1.1050	1.0527	1.0005	0.9483	0.8961	0.8439	0.7917	0.7395	0.6873	0.6351	0.5829	0.5307	0.4785	0.4263	0.3741
Cost of Equity	af = y / ac		PKR / kWh	0.7109	0.6865	0.6621	0.6378	0.6134	0.5890	0.5646	0.5403	0.5159	0.4915	0.4671	0.4428	0.4184	0.3940	0.3696	0.3453	0.3209	0.2965	0.2722	0.2478	0.2234	0.1990	0.1747
Depreciation	ag = z / ac		PKR / kWh	0.4487	0.4487	0.4487	0.4487	0.4487	0.4487	0.4487	0.4487	0.4487	0.4487	0.4487	0.4487	0.4487	0.4487	0.4487	0.4487	0.4487	0.4487	0.4487	0.4487	0.4487	0.4487	0.4487
HSD																											
Net Capacity	ah		MW	357.479	357.479	357.479	357.479	357.479	357.479	357.479	357.479	357.479	357.479	357.479	357.479	357.479	357.479	357.479	357.479	357.479	357.479	357.479	357.479	357.479	357.479	357.479	357.479
Plant factor	ai		%	88.57%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%
Net Capacity units at Plant factor	aj = ah x ai x 8760 / 1000		GWh	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774
Tariff components on HSD																											
Cost of Debt - Local	ak = w / aj		PKR / kWh	0.5089	0.4915	0.4740	0.4566	0.4391	0.4217	0.4042	0.3868	0.3693	0.3519	0.3344	0.3170	0.2995	0.2821	0.2646	0.2472	0.2297	0.2123	0.1948	0.1774	0.1599	0.1425	0.1250
Cost of Debt - Foreign	al = x / aj		PKR / kWh	1.9158	1.8502	1.7845	1.7188	1.6531	1.5874	1.5217	1.4560	1.3903	1.3247	1.2590	1.1933	1.1276	1.0619	0.9962	0.9305	0.8648	0.7991	0.7335	0.6678	0.6021	0.5364	0.4707
Cost of Equity	am = y / aj		PKR / kWh	0.8945	0.8638	0.8331	0.8025	0.7718	0.7411	0.7105	0.6798	0.6491	0.6185	0.5878	0.5571	0.5265	0.4958	0.4651	0.4344	0.4038	0.3731	0.3424	0.3118	0.2811	0.2504	0.2198
Depreciation	an = z / al		PKR / kWh	0.5646	0.5646	0.5646	0.5646	0.5646	0.5646	0.5646	0.5646	0.5646	0.5646	0.5646	0.5646	0.5646	0.5646	0.5646	0.5646	0.5646	0.5646	0.5646	0.5646	0.5646	0.5646	0.5646

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Annexure I (i) - RAB Movement

Description	Workings	Units	FY2047	FY2048	FY2049	FY2050	FY2051	FY2052	FY2053
RAB movement									
Cost - Without surplus on revaluation									
Opening		PKR Mn	46,979	46,979	46,979	46,979	46,979	46,979	46,979
Capitalisation		PKR Mn	-	-	-	-	-	-	-
Disposal		PKR Mn	-	-	-	-	-	-	-
Closing	a	PKR Mn	46,979	46,979	46,979	46,979	46,979	46,979	46,979
Accumulated Depreciation									
Opening		PKR Mn	36,540	38,106	39,672	41,238	42,804	44,370	45,936
Depreciation for the year		PKR Mn	1,566	1,566	1,566	1,566	1,566	1,566	1,043
Depreciation - Disposal		PKR Mn	-	-	-	-	-	-	-
Closing	b	PKR Mn	38,106	39,672	41,238	42,804	44,370	45,936	46,979
Net Book Value - Fixed Assets	c = a + b	PKR Mn	8,873	7,307	5,741	4,175	2,609	1,043	-
Capital Work in Progress									
Opening		PKR Mn	-	-	-	-	-	-	-
Capex		PKR Mn	-	-	-	-	-	-	
Transfer to Fixed Assets		PKR Mn	-	-	-	-	-	-	-
Closing	d	PKR Mn	-	-	-	-	-	-	-
Net RAB	e = c + d	PKR Mn	8,873	7,307	5,741	4,175	2,609	1,043	-
Average RAB - PKR	f = average of e	PKR Mn	9,656	8,090	6,524	4,958	3,392	2,609	1,217
RoRB break up									
Equity Portion	g	%	30%	30%	30%	30%	30%	30%	30%
Debt Portion	h	%	70%	70%	70%	70%	70%	70%	70%
Local Component	i	%	25%	25%	25%	25%	25%	25%	25%
Foreign Component	j	%	75%	75%	75%	75%	75%	75%	75%
KIBOR	k	%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%
Spread on KIBOR	l	%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%
Cost of Debt - Local borrowing	m = k + l	%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%
LIBOR	n	%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%
Hedge	o	%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%
Spread	p	%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Cost of Debt - Foreign borrowing	q = n + o + p	%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%
KIBOR	r	%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%
LIBOR	s	%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%
Hedging spread	t	%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%
Hedging cost	u = r + s + t	%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%
Indexed Return on Equity	v	%	18.11%	18.11%	18.11%	18.11%	18.11%	18.11%	18.11%

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Annexure I (i) - RAB Movement

Description	Reference	Unit	FY2047	FY2048	FY2049	FY2050	FY2051	FY2052	FY2053
RoRD and Depreciation amounts									
Cost of Debt - Local	w = f x h x i x m	PKR Mn	298	250	202	153	105	81	33
Cost of Debt - Foreign	x = f x h x j x q	PKR Mn	1,123	941	759	577	395	304	142
Cost of Equity	y = f x g x v	PKR Mn	524	439	354	269	184	142	66
Depreciation	z = b for the year	PKR Mn	1,566	1,566	1,566	1,566	1,566	1,566	1,043
Calculation of Tariff components									
Gas									
Net Capacity	aa	MW	449.808	449.808	449.808	449.808	449.808	449.808	449.808
Plant factor	ab	%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%
Net Capacity units at Plant factor	ac = aa x ab x 8760 / 1000	GWh	3,490	3,490	3,490	3,490	3,490	3,490	3,323
Tariff components on Gas									
Cost of Debt - Local	ad = w / ac	PKR / kWh	0.0855	0.0716	0.0578	0.0439	0.0300	0.0231	0.0102
Cost of Debt - Foreign	ae = x / ac	PKR / kWh	0.3219	0.2697	0.2175	0.1653	0.1131	0.0870	0.0610
Cost of Equity	af = y / ac	PKR / kWh	0.1503	0.1259	0.1015	0.0772	0.0528	0.0406	0.0285
Depreciation	ag = z / ac	PKR / kWh	0.4487	0.4487	0.4487	0.4487	0.4487	0.4487	0.4489
HSD									
Net Capacity	ah	MW	357.479	357.479	357.479	357.479	357.479	357.479	357.479
Plant factor	ai	%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%
Net Capacity units at Plant factor	aj = ah x ai x 8760 / 1000	GWh	2,774	2,774	2,774	2,774	2,774	2,774	1,846
Tariff components on HSD									
Cost of Debt - Local	ak = w / aj	PKR / kWh	0.1076	0.0901	0.0727	0.0552	0.0378	0.0291	0.0204
Cost of Debt - Foreign	al = x / aj	PKR / kWh	0.4050	0.3393	0.2737	0.2080	0.1423	0.1094	0.0767
Cost of Equity	am = y / aj	PKR / kWh	0.1891	0.1584	0.1278	0.0971	0.0664	0.0511	0.0358
Depreciation	an = z / aj	PKR / kWh	0.5646	0.5646	0.5646	0.5646	0.5646	0.5646	0.5649

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BQPS III Plant - Unit 2
Annexure I (ii) - RAB Movement

Description				FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
RAB movement																			
Cost - Without surplus on revaluation																			
Opening		PKR Mn			49,106	49,106	49,106	49,106	49,106	49,106	49,106	49,106	49,106	49,106	49,106	49,106	49,106	49,106	49,106
Capitalization		PKR Mn			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Disposal		PKR Mn			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Closing	a	PKR Mn		49,106	49,106	49,106	49,106	49,106	49,106	49,106	49,106	49,106	49,106	49,106	49,106	49,106	49,106	49,106	49,106
Accumulated Depreciation																			
Opening		PKR Mn			409	2,046	3,683	5,320	6,957	8,593	10,230	11,867	13,504	15,141	16,778	18,414	20,051	21,688	23,325
Depreciation for the year		PKR Mn			1,637	1,637	1,637	1,637	1,637	1,637	1,637	1,637	1,637	1,637	1,637	1,637	1,637	1,637	1,637
Depreciation - Disposal		PKR Mn			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Closing	b	PKR Mn		409	2,046	3,683	5,320	6,957	8,593	10,230	11,867	13,504	15,141	16,778	18,414	20,051	21,688	23,325	24,962
Net Book Value - Fixed Assets	c=a+b	PKR Mn		48,697	47,060	45,423	43,787	42,150	40,513	38,876	37,239	35,602	33,966	32,329	30,692	29,055	27,418	25,781	24,145
Capital Work in Progress																			
Opening		PKR Mn			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Capex		PKR Mn			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Transfer to Fixed Assets		PKR Mn			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Closing	d	PKR Mn	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Net RAB	e=c+d	PKR Mn		48,697	47,060	45,423	43,787	42,150	40,513	38,876	37,239	35,602	33,966	32,329	30,692	29,055	27,418	25,781	24,145
Average RAB - PKR	f=average of e	PKR Mn			47,879	46,242	44,605	42,968	41,331	39,695	38,058	36,421	34,784	33,147	31,510	29,873	28,237	26,600	24,963
RoRB break up																			
Equity Portion	g	%			30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%
Debt Portion	h	%			70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%
Local Component	i	%			25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%
Foreign Component	j	%			75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%
KIBOR	k	%			15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%
Spread on KIBOR	l	%			2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%
Cost of Debt - Local borrowing	m=k+l	%			17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%
LIBOR	n	%			2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%
Hedge	o	%			15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%
Spread	p	%			4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Cost of Debt - Foreign borrowing	q=n+o+p	%			22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%
KIBOR	r	%			15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%
LIBOR	s	%			-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%
Hedging spread	t	%			2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%
Hedging cost	u=r+s+t	%			15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%
Indexed Return on Equity	v=vxy	%			17.81%	17.81%	17.81%	17.81%	17.81%	17.81%	17.81%	17.81%	17.81%	17.81%	17.81%	17.81%	17.81%	17.81%	17.81%

K-ELECTRIC LIMITED

K-Electric Limited
Generation Plants Tariff Petition
BQPS III Plant - Unit 2
Annexure I (iii) - RAB Movement

Description	Reference	Unit	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029
RoAB and Depreciation amounts																		
Cost of Debt - Local	ay = f x h x i x m	PKR Mn	1,420	1,420	1,370	1,328	1,277	1,227	1,176	1,126	1,075	1,024	974	923	873	822	771	721
Cost of Debt - Foreign	ab = f x h x j x q	PKR Mn	5,570	5,380	5,189	4,999	4,808	4,618	4,428	4,237	4,047	3,856	3,666	3,475	3,285	3,095	2,904	2,714
Cost of Equity	ac = f x g x k	PKR Mn	2,559	2,471	2,384	2,296	2,209	2,121	2,034	1,946	1,859	1,771	1,684	1,597	1,509	1,422	1,334	1,247
Depreciation	ad = b for the year	PKR Mn	1,637	1,637	1,637	1,637	1,637	1,637	1,637	1,637	1,637	1,637	1,637	1,637	1,637	1,637	1,637	1,637
Calculation of Tariff components																		
Gas																		
Net Capacity	ae	MW	449.808	449.808	449.808	449.808	449.808	449.808	449.808	449.808	449.808	449.808	449.808	449.808	449.808	449.808	449.808	449.808
Plant factor	af	%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%
Net Capacity units at plant factor	ag = ae x af x 8760 / 1000	GWh	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490
Tariff components on Gas																		
Cost of Debt - Local	aa / ag	PKR / kWh	0.4240	0.4095	0.3950	0.3805	0.3660	0.3515	0.3370	0.3225	0.3080	0.2935	0.2790	0.2645	0.2500	0.2355	0.2211	0.2066
Cost of Debt - Foreign	ab / ag	PKR / kWh	1.5960	1.5415	1.4869	1.4323	1.3778	1.3233	1.2686	1.2141	1.1595	1.1050	1.0504	0.9958	0.9412	0.8867	0.8321	0.7776
Cost of Equity	ac / ag	PKR / kWh	0.7332	0.7081	0.6830	0.6580	0.6329	0.6078	0.5828	0.5577	0.5327	0.5076	0.4825	0.4575	0.4324	0.4073	0.3823	0.3572
Depreciation	ad / ag	PKR / kWh	0.4690	0.4690	0.4690	0.4690	0.4690	0.4690	0.4690	0.4690	0.4690	0.4690	0.4690	0.4690	0.4690	0.4690	0.4690	0.4690
HSD																		
Net Capacity	ah	MW	357.479	357.479	357.479	357.479	357.479	357.479	357.479	357.479	357.479	357.479	357.479	357.479	357.479	357.479	357.479	357.479
Plant factor	ai	%	88.57%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%
Net Capacity units at plant factor	aj = ah x ai x 8760 / 1000	GWh	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774
Tariff components on HSD																		
Cost of Debt - Local	aa / aj	PKR / kWh	0.5335	0.5152	0.4970	0.4788	0.4605	0.4423	0.4241	0.4058	0.3876	0.3693	0.3511	0.3329	0.3146	0.2964	0.2781	0.2599
Cost of Debt - Foreign	ab / aj	PKR / kWh	2.0083	1.9396	1.8709	1.8023	1.7336	1.6650	1.5963	1.5277	1.4590	1.3903	1.3217	1.2530	1.1844	1.1157	1.0471	0.9784
Cost of Equity	ac / aj	PKR / kWh	0.9225	0.8910	0.8595	0.8279	0.7964	0.7648	0.7333	0.7018	0.6702	0.6387	0.6071	0.5756	0.5441	0.5125	0.4810	0.4495
Depreciation	ad / aj	PKR / kWh	0.5901	0.5901	0.5901	0.5901	0.5901	0.5901	0.5901	0.5901	0.5901	0.5901	0.5901	0.5901	0.5901	0.5901	0.5901	0.5901

K-Electric Limited
Generation Plants Tariff Petition
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Annexure I (iii) - RAB Movement

RAB movement

Cost - Without surplus on revaluation															
Opening		PKR Mn	49,106	49,106	49,106	49,106	49,106	49,106	49,106	49,106	49,106	49,106	49,106	49,106	49,106
Capitalization		PKR Mn	-	-	-	-	-	-	-	-	-	-	-	-	-
Disposal		PKR Mn	-	-	-	-	-	-	-	-	-	-	-	-	-
Closing	a	PKR Mn	49,106	49,106	49,106	49,106	49,106	49,106	49,106	49,106	49,106	49,106	49,106	49,106	49,106
Accumulated Depreciation															
Opening		PKR Mn	26,500	28,235	29,872	31,509	33,146	34,783	36,420	38,057	39,693	41,330	42,967	44,604	46,241
Depreciation for the year		PKR Mn	1,637	1,637	1,637	1,637	1,637	1,637	1,637	1,637	1,637	1,637	1,637	1,637	1,229
Depreciation - Disposal		PKR Mn	-	-	-	-	-	-	-	-	-	-	-	-	-
Closing	b	PKR Mn	28,235	29,872	31,509	33,146	34,783	36,420	38,057	39,693	41,330	42,967	44,604	46,241	47,878
Net Book Value - Fixed Assets	c = a + b	PKR Mn	20,871	19,234	17,597	15,960	14,323	12,687	11,050	9,413	7,776	6,139	4,502	2,866	1,229
Capital Work in Progress															
Opening		PKR Mn	-	-	-	-	-	-	-	-	-	-	-	-	-
Capex		PKR Mn	-	-	-	-	-	-	-	-	-	-	-	-	-
Transfer to Fixed Assets		PKR Mn	-	-	-	-	-	-	-	-	-	-	-	-	-
Closing	d	PKR Mn	-	-	-	-	-	-	-	-	-	-	-	-	-
Net RAB	e = c + d	PKR Mn	20,871	19,234	17,597	15,960	14,323	12,687	11,050	9,413	7,776	6,139	4,502	2,866	1,229
Average RAB - PKR	f = average of e	PKR Mn	21,689	20,052	18,416	16,779	15,142	13,505	11,868	10,231	8,595	6,958	5,321	3,684	2,866
RoRB break up															
Equity Portion	g	%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%
Debt Portion	h	%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%
Local Component	i	%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%
Foreign Component	j	%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%
KIBOR	k	%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%
Spread on KIBOR	l	%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%
Cost of Debt - Local borrowing	m = k + l	%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%
LIBOR	n	%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%
Hedge	o	%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%
Spread	p	%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Cost of Debt - Foreign borrowing	q = n + o + p	%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%
KIBOR	r	%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%
LIBOR	s	%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%	-2.29%
Hedging spread	t	%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%
Hedging cost	u = r + s + t	%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%
Indexed Return on Equity	z = v x y	%	17.81%	17.81%	17.81%	17.81%	17.81%	17.81%	17.81%	17.81%	17.81%	17.81%	17.81%	17.81%	17.81%

K-Electric Limited
Generation Plants Tariff Petition
BQPS III Plant - Unit 2
Annexure I(II) - RAB Movement

Description	Legend	Unit	FY 2040	FY 2041	FY 2042	FY 2043	FY 2044	FY 2045	FY 2046	FY 2047	FY 2048	FY 2049	FY 2050	FY 2051	FY 2052	FY 2052-3
RoRB and Depreciation amounts																
Cost of Debt - Local	aa = f x h x l x m	PKR Mn	670	620	569	519	468	417	367	316	266	215	164	114	89	42
Cost of Debt - Foreign	ab = f x h x j x q	PKR Mn	2,523	2,333	2,142	1,952	1,762	1,571	1,381	1,190	1,000	809	619	429	333	159
Cost of Equity	ac = f x g x z	PKR Mn	1,159	1,072	984	897	809	722	634	547	459	372	284	197	153	73
Depreciation	ad = b for the year	PKR Mn	1,637	1,637	1,637	1,637	1,637	1,637	1,637	1,637	1,637	1,637	1,637	1,637	1,637	1,229
Calculation of Tariff components																
Gas																
Net Capacity	ae	MW	449.808	449.808	449.808	449.808	449.808	449.808	449.808	449.808	449.808	449.808	449.808	449.808	449.808	449.808
Plant factor	af	%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%	88.57%
Net Capacity units at plant factor	ag = ae x af x 8760 / 1000	GWh	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490	2,620
Tariff components on Gas																
Cost of Debt - Local	aa / ag	PKR / kWh	0.1921	0.1776	0.1631	0.1486	0.1341	0.1196	0.1051	0.0906	0.0761	0.0616	0.0471	0.0326	0.0254	0.0161
Cost of Debt - Foreign	ab / ag	PKR / kWh	0.7230	0.6684	0.6139	0.5593	0.5048	0.4502	0.3956	0.3411	0.2865	0.2319	0.1774	0.1228	0.0955	0.0606
Cost of Equity	ac / ag	PKR / kWh	0.3321	0.3071	0.2820	0.2569	0.2319	0.2068	0.1817	0.1567	0.1316	0.1065	0.0815	0.0564	0.0439	0.0278
Depreciation	ad / ag	PKR / kWh	0.4690	0.4690	0.4690	0.4690	0.4690	0.4690	0.4690	0.4690	0.4690	0.4690	0.4690	0.4690	0.4690	0.4690
HSD																
Net Capacity	ah	MW	357.479	357.479	357.479	357.479	357.479	357.479	357.479	357.479	357.479	357.479	357.479	357.479	357.479	357.479
Plant factor	ai	%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%
Net Capacity units at plant factor	aj = ah x ai x 8760 / 1000	GWh	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,082
Tariff components on HSD																
Cost of Debt - Local	aa / aj	PKR / kWh	0.2417	0.2234	0.2052	0.1870	0.1687	0.1505	0.1322	0.1140	0.0958	0.0775	0.0593	0.0410	0.0319	0.0203
Cost of Debt - Foreign	ab / aj	PKR / kWh	0.9097	0.8411	0.7724	0.7038	0.6351	0.5665	0.4978	0.4292	0.3605	0.2918	0.2232	0.1545	0.1202	0.0763
Cost of Equity	ac / aj	PKR / kWh	0.4179	0.3864	0.3548	0.3233	0.2918	0.2602	0.2287	0.1971	0.1656	0.1341	0.1025	0.0710	0.0552	0.0350
Depreciation	ad / aj	PKR / kWh	0.5901	0.5901	0.5901	0.5901	0.5901	0.5901	0.5901	0.5901	0.5901	0.5901	0.5901	0.5901	0.5901	0.5901

K-ELECTRIC LIMITED

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Generation Plants Tariff Petition
BQPS III Plant - Unit 1
Annexure J (i) - Calculation of Indexed RoE

		FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
		Actualized							Forecasted	
Average Exchange rates	PKR / USD	104.82	104.81	110.01	136.27	158.38	160.21	178.03	206.00	206.00
RAB amount - Generation	PKR mn	-	4	108	114	7,343	26,981	38,022	46,457	46,457
Additions, net of Depreciation & Disposals during the year	PKR mn		4	104	6	7,229	19,638	11,042	8,434	-

Year wise Indexation based on exchange rates (A)

FY 2016	%		-0.01%	4.95%	29.91%	51.10%	52.84%	69.84%	96.53%	96.53%
FY 2017	%			4.96%	29.92%	51.11%	52.86%	69.86%	96.55%	96.55%
FY 2018	%				23.78%	43.97%	45.63%	61.83%	87.26%	87.26%
FY 2019	%					16.31%	17.65%	30.74%	51.28%	51.28%
FY 2020	%						1.16%	12.41%	30.07%	30.07%
FY 2021	%							11.12%	28.58%	28.58%
FY 2022	%								15.71%	15.71%
FY 2023	%									0.00%

Calculated with reference to exchange rate of a relevant year vs exchange rate of base year for example 16.31% in FY 2019 calculated as PKR 158.38 / USD divided by PKR 136.17 / USD

Year wise break up of RAB

FY 2016	PKR mn	-	-	-	-	-	-	-	-	-
FY 2017	PKR mn		4	4	4	4	4	4	4	4
FY 2018	PKR mn			104	104	104	104	104	104	104
FY 2019	PKR mn				6	6	6	6	6	6
FY 2020	PKR mn					7,229	7,229	7,229	7,229	7,229
FY 2021	PKR mn						19,638	19,638	19,638	19,638
FY 2022	PKR mn							11,042	11,042	11,042
FY 2023	PKR mn								8,434	8,434
Total RAB	PKR mn	-	4	108	114	7,343	26,981	38,022	46,457	46,457

Weightage of RAB (B)

FY 2016	PKR mn	-	-	-	-	-	-	-	-	-
FY 2017	PKR mn	-	-	4%	3%	0%	0%	0%	0%	0%
FY 2018	PKR mn	-	-	96%	91%	1%	0%	0%	0%	0%
FY 2019	PKR mn	-	-	-	5%	0%	0%	0%	0%	0%
FY 2020	PKR mn	-	-	-	-	98%	27%	19%	16%	16%
FY 2021	PKR mn	-	-	-	-	-	73%	52%	42%	42%
FY 2022	PKR mn	-	-	-	-	-	-	29%	24%	24%
FY 2023	PKR mn	-	-	-	-	-	-	-	18%	18%
Total	PKR mn	-	-	100%	100%	100%	100%	100%	100%	100%

Year wise Indexation - considering RAB weightage (A x B)

FY 2016	%		-	-	-	-	-	-	-	-
FY 2017	%		-	0.2%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%
FY 2018	%		-	-	21.7%	0.6%	0.2%	0.2%	0.2%	0.2%
FY 2019	%		-	-	-	0.0%	0.0%	0.0%	0.0%	0.0%
FY 2020	%		-	-	-	-	0.3%	2.4%	4.7%	4.7%
FY 2021	%		-	-	-	-	-	5.7%	12.1%	12.1%
FY 2022	%		-	-	-	-	-	-	3.7%	3.7%
FY 2023	%		-	-	-	-	-	-	-	-
Total Indexation	%		-	0.00	22.7%	0.7%	0.5%	8.3%	20.7%	20.7%

RoE - USD based	15.0%
Indexation	20.7%
RoE - Indexed at PKR 206 / USD	18.11%

K-ELECTRIC LIMITED

K-Electric Limited
Generation Plants Tariff Petition
BQPS III Plant - Unit 2
Annexure J (II) - Calculation of Indexed RoE

		FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
		Actualized							Forecasted	
Average Exchange rates	PKR / USD	104.82	104.81	110.01	136.17	158.38	160.21	178.03	206.00	206.00
RAB amount - BQPS III Unit (II)	PKR mn	-	-	13	19	7,251	26,997	35,301	48,697	48,697
Additions, net of Depreciation & Disposals during the year	PKR mn		-	13	6	7,232	19,746	8,304	13,396	-

Year wise indexation based on exchange rates (A)

FY 2016	%		-0.01%	4.95%	29.91%	51.10%	52.84%	69.84%	96.53%	96.53%
FY 2017	%			4.96%	29.92%	51.11%	52.86%	69.86%	96.55%	96.55%
FY 2018	%				23.78%	43.97%	45.63%	61.83%	87.26%	87.26%
FY 2019	%					16.31%	17.65%	30.74%	51.28%	51.28%
FY 2020	%						1.16%	12.41%	30.07%	30.07%
FY 2021	%							11.12%	28.58%	28.58%
FY 2022	%								15.71%	15.71%
FY 2023	%									0.00%

Calculated with reference to exchange rate of a relevant year vs exchange rate of base year for example 16.31% in FY 2019 calculated as PKR 158.38 / USD divided by PKR 136.17 / USD

Year wise break up of RAB

FY 2015	PKR mn	-	-	-	-	-	-	-	-	-
FY 2017	PKR mn		-	-	-	-	-	-	-	-
FY 2018	PKR mn			13	13	13	13	13	13	13
FY 2019	PKR mn				6	6	6	6	6	6
FY 2020	PKR mn					7,232	7,232	7,232	7,232	7,232
FY 2021	PKR mn						19,746	19,746	19,746	19,746
FY 2022	PKR mn							8,304	8,304	8,304
FY 2023	PKR mn								13,396	13,396
Total RAB	PKR mn	-	-	13	19	7,251	26,997	35,301	48,697	48,697

Weightage of RAB (B)

FY 2016	PKR mn			-	-	-	-	-	-	-
FY 2017	PKR mn			-	-	-	-	-	-	-
FY 2018	PKR mn			100%	68%	0%	0%	0%	0%	0%
FY 2019	PKR mn			-	32%	0%	0%	0%	0%	0%
FY 2020	PKR mn			-	-	100%	27%	20%	15%	15%
FY 2021	PKR mn			-	-	-	73%	56%	41%	41%
FY 2022	PKR mn			-	-	-	-	24%	17%	17%
FY 2023	PKR mn			-	-	-	-	-	28%	28%
Total	PKR mn	0%	0%	100%	100%	100%	100%	100%	100%	100%

Year wise indexation - considering RAB weightage (A x B)

FY 2016	%		-	-	-	-	-	-	-	-
FY 2017	%		-	-	-	-	-	-	-	-
FY 2018	%		-	-	16.3%	0.1%	0.0%	0.0%	0.0%	0.0%
FY 2019	%		-	-	-	0.0%	0.0%	0.0%	0.0%	0.0%
FY 2020	%		-	-	-	-	0.3%	2.5%	4.5%	4.5%
FY 2021	%		-	-	-	-	-	6.2%	11.6%	11.6%
FY 2022	%		-	-	-	-	-	-	2.7%	2.7%
FY 2023	%		-	-	-	-	-	-	-	-
Total Indexation	%		0.0%	0.0%	16.3%	0.1%	0.3%	8.8%	18.8%	18.8%

RoE - USD based	15.0%
Indexation	18.8%
RoE - Indexed at 206 PKR/ USD	17.81%

K-Electric Limited
Generation Plants Tariff Petition
BQPS III Plant - Unit 1
Annexure K (i) - Illustration for RoE Indexation

Indexation for the quarter	Q1 - FY 2024
Date of indexation	July 3, 2023

Description	Units	Legend	Gas	HSD
Reference RoRB Cost of Equity component for FY 2024	PKR / kWh	a	0.7109	0.8945
TT & OD selling rate of USD as notified by National bank of Pakistan at June 30, 2022	PKR / USD	b	250	250
Reference exchange rate	PKR / USD	c	206.00	206.00
Indexed RoRB Cost of Equity component for FY 2024	PKR / kWh	d = a x b / c	0.8627	1.0855

K-Electric Limited
Generation Plants Tariff Petition
BQPS III Plant - Unit 2
Annexure K(ii) - illustration for RoE indexation

Indexation for the quarter	Q1 - FY 2024
Date of indexation	July 3, 2023

Description	Unit	Legend	Gas	HSD
Reference RoRB Cost of Equity component for FY 2024	PKR / kWh	a	0.7332	0.9225
TT & OD selling rate of USD as notified by National bank of Pakistan at June 30, 2023	PKR / USD	b	250	250
Reference exchange rate	PKR / USD	c	206.00	206.00
Indexed RoRB Cost of Equity component for FY 2024	PKR / kWh	d = a x b / c	0.8898	1.1196

K-Electric Limited
Generation Plants Tariff Petition
BQPS III Plant - Unit 1
Annexure L (I) - Calculation of Working Capital

Fuel cost on receivable cycle - RLNG	Unit	Legend	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
KIBOR	%	A	15.16%	15.16%	15.16%	15.16%	15.16%
Spread	%	B	2.00%	2.00%	2.00%	2.00%	2.00%
Total	%	C=A+B	17.16%	17.16%	17.16%	17.16%	17.16%
1 Fuel cost receivable cycle							
Receipt - days	days	D	30	30	30	30	30
Payment - days	days	E	7	7	7	7	7
Net days	days	F=D-E	23	23	23	23	23
RLNG bill							
Net capacity	MW	G	450	450	450	450	450
Load factor	%	H	89%	89%	89%	89%	89%
Units for 365 days	GWh	I=G x 24 x 365 / 10^3 x H	3,490	3,490	3,490	3,490	3,490
Allowed Heat Rate for the Quarter	btu / kWh	J	6,336	6,336	6,336	6,336	6,336
Reference price	PKR / MMBtu	K	2,930	2,930	2,930	2,930	2,930
Amount for 365 days	PKR / kWh	L=I x J x K / 10^6	64,787	64,787	64,787	64,787	64,787
Amount for outstanding days	PKR Mn	M=F x L / 365	4,082	4,082	4,082	4,082	4,082
With sales tax	PKR Mn	N=M x (1+17%)	4,776	4,776	4,776	4,776	4,776
Cost of working capital	PKR Mn	O=C x N	820	820	820	820	820
2 Cost of SBLC							
Daily gas	MMBTu	P=G x J x 1,000 / 10^6	68,404	68,404	68,404	68,404	68,404
60 days	MMBTu	Q=P x 60	4,104,222	4,104,222	4,104,222	4,104,222	4,104,222
Amount of 60 days	PKR Mn	R=K x Q / 10^6	12,025	12,025	12,025	12,025	12,025
Actual SBLC given		S	3,311	3,311	3,311	3,311	3,311
Lower of 60 days or Actual		T=Lower of R or S	3,311	3,311	3,311	3,311	3,311
SBLC cost (actual with cap of 0.6%)	%	U	0.60%	0.60%	0.60%	0.60%	0.60%
Cost of SBCL	PKR Mn	V=T x U	20	20	20	20	20
3 Cost of HSD Inventory		Following formula to be used for HSD cost calculation					
HSD Price	PKR / litre	W					
GST	%	X					
HSD Price including GST	PKR / litre	Z=(1+X)					
Net Capacity	MW	AA					
Calorific value	btu / litre	AB					
HSD Price	PKR / MMBTu	AC=W / AB x 10^6					
Allowed Heat Rate for the Quarter	btu / kWh	AD					
7 Per day liter	litres	AE=AA x 1000 x 24 x 7 x AB / AD					
Amount	PKR Mn	AF=Z x AE / 10^6					
Cost of HSD	PKR Mn	AG=AF x C					
4 Cost of other inventory							
Inventory amount	PKR Mn	AH	2,273	2,922	3,513	3,859	4,199
Cost	PKR Mn	AI=AH x C	390	501	603	662	721
Total cost of working capital	PKR Mn	AJ=O+V+AG+AI	1,230	1,341	1,442	1,502	1,560
Net Capacity units at Plant factor							
Gas	GWh	AK	3,490	3,490	3,490	3,490	3,490
HSD	GWh	AL	2,774	2,774	2,774	2,774	2,774
Gas	PKR / kWh	AM=AJ / AK	0.3523	0.3842	0.4133	0.4303	0.4470
HSD	PKR / kWh	AC=AJ / AL	0.4433	0.4834	0.5200	0.5415	0.5625

K-Electric Limited
Generation Plants Tariff Petition
BQPS III Plant - Unit 2
Annexure L (ii) – Calculation of working capital

Fuel cost on receivable cycle - RLNG	Unit	Legend	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
KIBOR	%	A	15.16%	15.16%	15.16%	15.16%	15.16%
Spread	%	B	2.00%	2.00%	2.00%	2.00%	2.00%
Total	%	C=A+B	17.16%	17.16%	17.16%	17.16%	17.16%
1 Fuel cost receivable cycle							
Receipt - days	days	D	30	30	30	30	30
Payment - days	days	E	7	7	7	7	7
Net days	days	F=D-E	23	23	23	23	23
RLNG bill							
Net capacity	MW	G	450	450	450	450	450
Load factor	%	H	88.57%	88.57%	88.57%	88.57%	88.57%
Units for 365 days	GWh	I=G x 24 x 365 / 10^3 x H	3,490	3,490	3,490	3,490	3,490
Allowed Heat Rate for the Quarter	btu / kWh	J	6,336	6,336	6,336	6,336	6,336
Reference price	PKR / MMBtu	K	2,930	2,930	2,930	2,930	2,930
Amount for 365 days	PKR / kWh	L=I x J x K / 10^6	64,790	64,790	64,790	64,790	64,790
Amount for outstanding days	PKR Mn	M=F x L / 365	4,083	4,083	4,083	4,083	4,083
With sales tax	PKR Mn	N=M x (1+17%)	4,777	4,777	4,777	4,777	4,777
Cost of working capital	PKR Mn	O=C x N	820	820	820	820	820
2 Cost of SBLC							
Daily gas	MMBTu	P=G x J x 1,000 / 10^6	68,404	68,404	68,404	68,404	68,404
60 days	MMBTu	Q=P x 60	4,104,222	4,104,222	4,104,222	4,104,222	4,104,222
Amount of 60 days	PKR Mn	R=K x Q / 10^6	12,025	12,025	12,025	12,025	12,025
Actual SBLC given		S	3,311	3,311	3,311	3,311	3,311
Lower of 60 days or Actual		T=Lower of R or S	3,311	3,311	3,311	3,311	3,311
SBLC cost (actual with cap of 0.6%)	%	U	0.60%	0.60%	0.60%	0.60%	0.60%
Cost of SBLC	PKR Mn	V=T x U	20	20	20	20	20
3 Cost of HSD Inventory	Not Applicable until plant is commissioned on HSD						
HSD Price	PKR / litre	W					
GST	%	X					
HSD Price including GST	PKR / litre	Z=(1+X)					
Net Capacity	MW	AA					
Calorific value	btu / litre	AB					
HSD Price	PKR / MMBTu	AC=W / AB x 10^6					
Heat rate - CC	btu / kWh	AD					
7 Per day liter	litres	AE=AA x 1000 x 24 x 7 x AB / AD					
Amount	PKR Mn	AF=Z x AE / 10^6					
Cost of HSD	PKR Mn	AG=AF x C					
4 Cost of other inventory							
Inventory amount	PKR Mn	AH	2,273	2,922	3,513	3,859	4,199
Cost	PKR Mn	AI=AH x C	390	501	603	662	721
Total cost of working capital	PKR Mn	AJ=O+V+AG+AI	1,230	1,341	1,442	1,502	1,560
Net Capacity units at plant factor							
Gas - CC	GWh	AK	3,490	3,490	3,490	3,490	3,490
HSD - CC	GWh	AL	2,774	2,774	2,774	2,774	2,774
Gas - CC	PKR / kWh	AM=AJ / AK	0.3523	0.3842	0.4133	0.4303	0.4470
HSD - CC	PKR / kWh	AC=AJ / AL	0.4433	0.4834	0.5200	0.5415	0.5625

BQPS-III – Annexure M

Output adjustment due to Ambient temperature (for both units)

UNIT Net Capacity with Temperature[3]					
Ambient Temp (°C)	Correction Factor	Unit Net Output (MW)	Ambient Temp (°C)	Correction Factor	Unit Net Output (MW)
1	0.95623	470.397	26	0.98351	457.347
2	0.95714	469.950	27	0.98669	455.874
3	0.95793	469.564	28	0.99043	454.155
4	0.95863	469.221	29	0.99482	452.148
5	0.95928	468.902	30	0.99999	449.810
6	0.95990	468.597	31	1.00661	446.853
7	0.96052	468.296	32	1.01326	443.922
8	0.96115	467.989	33	1.02015	440.921
9	0.96180	467.674	34	1.02730	437.854
10	0.96247	467.346	35	1.03470	434.723
11	0.96318	467.002	36	1.04235	431.533
12	0.96393	466.640	37	1.05025	428.287
13	0.96471	466.261	38	1.05840	424.989
14	0.96554	465.861	39	1.06680	421.642
15	0.96641	465.440	40	1.07545	418.250
16	0.96734	464.996	41	1.08436	414.815
17	0.96832	464.523	42	1.09351	411.343
18	0.96938	464.018	43	1.10292	407.835
19	0.97052	463.472	44	1.11257	404.295
20	0.97177	462.877	45	1.12248	400.727
21	0.97315	462.220	46	1.13264	397.133
22	0.97470	461.485	47	1.14305	393.517
23	0.97645	460.654	48	1.15371	389.881
24	0.97847	459.706	49	1.16462	386.229
25	0.98080	458.614	50	1.17578	382.562

[3] The temperature adjusted capacity has been calculated using the EPC Guaranteed Net Output of 449.8 MW and the Combined Cycle Baseload Correction Curves. Degradation factor is not included.

K-Electric Limited
Generation Plants Tariff Petition
BQPS III Plant - Unit 1
Annexure N - Capacity Payment Calculation sample

Capacity Payment Sample Calculation of a DAY

Time	Date	Net Dependable Capacity MW A	Forced Outage MW B	Planned Outage MW C	Forced Derated MW D	Planned Derated MW E	Available Capacity (post planned and forced outages) MW F=A-B-C-D-E	Amb Temp (°C) H	Ambient Temp. Correction Factor I	Adjusted available Capacity due to Temp J = F / I	Impact of Temp. on Ce (Ke) K	Available Capacity MW L = J x K	Capacity Tariff Rs/kWh M	Capacity Payment PKR - Mn N = L x M x 1000/10^6
1:00:00 AM	1-Jul	449.8	0	0	0	0	450	30	1.00	450	0	450	2.71	1.2168
2:00:00 AM	1-Jul	449.8	0	0	0	0	450	31	1.01	447	3	450	2.71	1.2168
3:00:00 AM	1-Jul	449.8	0	0	0	0	450	32	1.01	444	6	450	2.71	1.2168
4:00:00 AM	1-Jul	449.8	450	0	0	0	0	33	1.02	0	0	0	2.71	0.0000
5:00:00 AM	1-Jul	449.8	0	0	0	0	450	33	1.02	441	9	450	2.71	1.2168
6:00:00 AM	1-Jul	449.8	0	0	0	0	450	33	1.02	441	9	450	2.71	1.2168
7:00:00 AM	1-Jul	449.8	0	0	0	0	450	31	1.01	447	3	450	2.71	1.2168
8:00:00 AM	1-Jul	449.8	0	0	0	0	450	32	1.01	444	6	450	2.71	1.2168
9:00:00 AM	1-Jul	449.8	0	450	0	0	0	33	1.02	0	0	0	2.71	0.0000
10:00:00 AM	1-Jul	449.8	0	0	0	0	450	34	1.03	438	12	450	2.71	1.2168
11:00:00 AM	1-Jul	449.8	0	0	50	0	400	35	1.03	386	13	400	2.71	1.0815
12:00:00 PM	1-Jul	449.8	0	0	0	0	450	36	1.04	432	18	450	2.71	1.2168
1:00:00 PM	1-Jul	449.8	0	0	0	0	450	37	1.05	428	22	450	2.71	1.2168
2:00:00 PM	1-Jul	449.8	0	0	0	0	450	38	1.06	425	25	450	2.71	1.2168
3:00:00 PM	1-Jul	449.8	0	0	0	0	450	33	1.02	441	9	450	2.71	1.2168
4:00:00 PM	1-Jul	449.8	0	0	0	0	450	33	1.02	441	9	450	2.71	1.2168
5:00:00 PM	1-Jul	449.8	0	0	0	0	450	33	1.02	441	9	450	2.71	1.2168
6:00:00 PM	1-Jul	449.8	0	0	0	0	450	33	1.02	441	9	450	2.71	1.2168
7:00:00 PM	1-Jul	449.8	0	0	0	0	450	31	1.01	447	3	450	2.71	1.2168
8:00:00 PM	1-Jul	449.8	0	0	0	0	450	32	1.01	444	6	450	2.71	1.2168
9:00:00 PM	1-Jul	449.8	0	0	0	0	450	33	1.02	441	9	450	2.71	1.2168
10:00:00 PM	1-Jul	449.8	0	0	0	0	450	34	1.03	438	12	450	2.71	1.2168
11:00:00 PM	1-Jul	449.8	0	0	0	0	450	35	1.03	436	15	450	2.71	1.2168
12:00:00 AM	1-Jul	449.8	0	0	0	0	450	33	1.02	441	9	450	2.71	1.2168
Total										9691		9846	2.71	26.6340

K-Electric Limited
Generation Plants Tariff Petition
BQPS III Plant - Unit 2
Annexure N - Capacity Payment Calculation sample

Capacity Payment Sample Calculation of a DAY

Time	Date	Net Dependable Capacity MW	Forced Outage MW	Planned Outage MW	Forced Derated MW	Planned Derated MW	Available Capacity (post planned and forced outages) MW	Amb Temp (°C)	Ambient Temp Correction	Adjusted available Capacity due to Temp	Impact of Temp Oc	Available Capacity MW	Capacity Tariff Rs/kWh	Capacity Payment PKR - Mn
		A	B	C	D	E	F = A-B-C-D-E	H		I = F / J	K = F-I	L = J x K	M	N = L x M x 1000/10^6
1:00:00 AM	1-Jul	449.8	0	0	0	0	450	30	1.00	450	0	450	2.79	1.2531
2:00:00 AM	1-Jul	449.8	0	0	0	0	450	31	1.01	447	3	450	2.79	1.2531
3:00:00 AM	1-Jul	449.8	0	0	0	0	450	32	1.01	444	6	450	2.79	1.2531
4:00:00 AM	1-Jul	449.8	450	0	0	0	0	33	1.02	0	0	0	2.79	0.0000
5:00:00 AM	1-Jul	449.8	0	0	0	0	450	33	1.02	441	9	450	2.79	1.2531
6:00:00 AM	1-Jul	449.8	0	0	0	0	450	33	1.02	441	9	450	2.79	1.2531
7:00:00 AM	1-Jul	449.8	0	0	0	0	450	31	1.01	447	3	450	2.79	1.2531
8:00:00 AM	1-Jul	449.8	0	0	0	0	450	32	1.01	444	6	450	2.79	1.2531
9:00:00 AM	1-Jul	449.8	0	450	0	0	0	33	1.02	0	0	0	2.79	0.0000
10:00:00 AM	1-Jul	449.8	0	0	0	0	450	34	1.03	438	12	450	2.79	1.2531
11:00:00 AM	1-Jul	449.8	0	0	50	0	400	35	1.03	386	13	400	2.79	1.1138
12:00:00 PM	1-Jul	449.8	0	0	0	0	450	36	1.04	432	18	450	2.79	1.2531
1:00:00 PM	1-Jul	449.8	0	0	0	0	450	37	1.05	428	22	450	2.79	1.2531
2:00:00 PM	1-Jul	449.8	0	0	0	0	450	38	1.06	425	25	450	2.79	1.2531
3:00:00 PM	1-Jul	449.8	0	0	0	0	450	33	1.02	441	9	450	2.79	1.2531
4:00:00 PM	1-Jul	449.8	0	0	0	0	450	33	1.02	441	9	450	2.79	1.2531
5:00:00 PM	1-Jul	449.8	0	0	0	0	450	33	1.02	441	9	450	2.79	1.2531
6:00:00 PM	1-Jul	449.8	0	0	0	0	450	33	1.02	441	9	450	2.79	1.2531
7:00:00 PM	1-Jul	449.8	0	0	0	0	450	31	1.01	447	3	450	2.79	1.2531
8:00:00 PM	1-Jul	449.8	0	0	0	0	450	32	1.01	444	6	450	2.79	1.2531
9:00:00 PM	1-Jul	449.8	0	0	0	0	450	33	1.02	441	9	450	2.79	1.2531
10:00:00 PM	1-Jul	449.8	0	0	0	0	450	34	1.03	438	12	450	2.79	1.2531
11:00:00 PM	1-Jul	449.8	0	0	0	0	450	35	1.03	435	15	450	2.79	1.2531
12:00:00 AM	1-Jul	449.8	0	0	0	0	450	33	1.02	442	9	450	2.79	1.2531
Total										9931		9846	2.79	27.4280

K-Electric Limited
Generation Plants Tariff Petition
BQPS III Plant - Unit 1
Annexure O - Outage schedule and Plant factor

Description	Legend	FY-24	FY-25	FY-26	FY-27	FY-28	FY-29	FY-30	FY-31	FY-32	FY-33	FY-34	FY-35	FY-36	FY-37	FY-38	FY-39	FY-40	FY-41	FY-42	FY-43	FY-44
Hours	a	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Days	b	366	365	365	365	366	365	365	365	366	365	365	365	366	365	365	365	366	365	365	365	366
Hours in a year	c = a x b	8,784	8,760	8,760	8,760	8,784	8,760	8,760	8,760	8,784	8,760	8,760	8,760	8,784	8,760	8,760	8,760	8,784	8,760	8,760	8,760	8,784
1 Annual outages																						
Gross Capacity - MW																						
U-1	d	450.1	450.1	450.1	450.1	450.1	450.1	450.1	450.1	450.1	450.1	450.1	450.1	450.1	450.1	450.1	450.1	450.1	450.1	450.1	450.1	450.1
Scheduled outage days																						
U-1	e	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
Forced outage days																						
U-1	f	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5
Total Annual outage days																						
U-1	g = e + f	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5
Total Annual outage %																						
U-1	h = g / b	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Annual Availability %	j = 100% - h	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
2 Overhauls																						
Cumulative hours																						
U-1		13,954	22,232	30,510	38,789	47,090	55,368	63,646	71,924	80,225	88,503	96,781	105,060	113,361	121,639	129,917	138,195	146,496	154,774	163,052	171,331	179,631
Overhauls																						
U-1		-	-	HGPI	-	-	-		eHGPI	-	-	-	-	MI	-		HGPI	-	-	-		eHGPI

*Overhauls are included based on factored fired hours. Accordingly, these events will occur when respective factored fired hours will be achieved

HGPI = Hot Gas Path Inspection
eHGPI = Extended Hot Gas Path Inspection
MI= Major Inspection

Overhaul - days																						
U-1	k	-	-	9	-	-	-	-	14	-	-	-	-	55	-		9	-	-	-		14
Overhaul - %																						
U-1	l = k / b	-	-	2.5%	-	-	-	-	3.8%	-	-	-	-	15.0%	-	-	2.5%	-	-	-	-	0.04
3 Annual outages + Overhaul																						
Outage days - Annual + Overhaul																						
U-1	n = g + k	37	37	46	37	37	37	37	51	37	37	37	37	92	37	37	46	37	37	37	37	51
Outage % - Annual + Overhaul																						
U-1	o = n / b	10.0%	10.0%	12.5%	10.0%	10.0%	10.0%	10.0%	13.8%	10.0%	10.0%	10.0%	10.0%	25.0%	10.0%	10.0%	12.5%	10.0%	10.0%	10.0%	10.0%	13.8%
Availability																						
U-1	q = 100% - p	90.0%	90.0%	87.5%	90.0%	90.0%	90.0%	90.0%	86.2%	90.0%	90.0%	90.0%	90.0%	75.0%	90.0%	90.0%	87.5%	90.0%	90.0%	90.0%	90.0%	86.2%

K-Electric Limited
Generation Plants Tariff Petition
BQPS III Plant - Unit 1
Annexure O - Outage schedule and Plant factor

Description	Legend	FY-45	FY-46	FY-47	FY-48	FY-49	FY-50	FY-51	FY-52	FY-53	Total
Hours	a	24	24	24	24	24	24	24	24	24	720
Days	b	365	365	365	366	365	365	365	366	243	10,836
Hours in a year	c = a x b	8,760	8,760	8,760	8,784	8,760	8,760	8,760	8,784	5,832	260,064
Annual outages											
Gross Capacity - MW-											
U-1	d	450.1	450.1	450.1	450.1	450.1	450.1	450.1	450.1	450.1	450.1
Scheduled outage days											
U-1	e	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	15.3	682.3
Forced outage days											
U-1	f	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	9.0	400.5
Total Annual outage days											
U-1	g = e + f	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	24.2	1,082.7
Total Annual outage %											
U-1	h = g / b	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Annual Availability %	J = 100% - h	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Overhauls											
Cumulative hours											
U-1		187,910	196,188	204,466	212,767	221,045	229,323	237,602	245,902	251,414	
Overhauls*											
U-1		-	-	-		MI	-	-	-	-	

**Overhauls are included based on factored fired hou.*

HGPI = Hot Gas Path Inspection
eHGPI = Extended Hot Gas Path Inspection
MI= Major Inspection

Overhaul - days											
U-1	k	-	-	-		55	-	-	-	-	156
Overhaul - %											
U-1	l = k / b	-	-	-	-	0.15	-	-	-	-	1.4%
Annual outages + Overhauls											
Outage days - Annual + Overhaul											
U-1	n = g + k	37	37	37	37	92	37	37	37	24	1,239
Outage % - Annual + Overhaul											
U-1	o = n / b	10.0%	10.0%	10.0%	10.0%	25.1%	10.0%	10.0%	10.0%	10.0%	11.4%
Availability											
U-1	q = 100% - p	90.0%	90.0%	90.0%	90.0%	74.9%	90.0%	90.0%	90.0%	90.0%	88.57%

K-Electric Limited
Generation Plants Tariff Petition
BQPS III Plant - Unit 2
Annexure O - Outage schedule and plant factor

Hours	a	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Days	b	366	365	365	365	366	365	365	365	366	365	365	365	366	365	365	365	366	365	365	365	365
Hours in a year	c = a x b	8,784	8,760	8,760	8,760	8,784	8,760	8,760	8,760	8,784	8,760	8,760	8,760	8,784	8,760	8,760	8,760	8,784	8,760	8,760	8,760	8,784
1 Annual outages																						
Gross Capacity - MW																						
U-2	d	450.1	450.1	450.1	450.1	450.1	450.1	450.1	450.1	450.1	450.1	450.1	450.1	450.1	450.1	450.1	450.1	450.1	450.1	450.1	450.1	450.1
Scheduled outage days - Overhaul																						
U-2	e	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
Forced outage days																						
U-2	f	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5
Total Annual outage days																						
U-2	g = e + f	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5
Total Annual outage %																						
U-2	h = g / b	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Annual Availability %	i = 100% - h	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
2 Overhauls																						
Cumulative hours																						
U-2		13,532	21,011	30,089	38,367	46,668	54,946	63,224	71,502	79,803	88,082	96,360	104,638	113,939	121,217	129,495	137,773	146,074	154,353	162,631	170,909	179,210
Overhauls																						
U-2		-	-	HGPI	-	-	-	-	eHGPI	-	-	-	-	MI	-		HGPI	-	-	-		eHGPI

Overhauls are included based on factored fired hours. Accordingly, these events will occur when respective factored fired hours will be achieved

HGPI = Hot Gas Path Inspection
eHGPI = Extended Hot Gas Path Inspection
MIs Major Inspection

Overhaul - days																						
U-2	j	-	-	9	-	-	-	-	14	-	-	-	-	55	-		9	-	-	-		14
Overhaul - %																						
U-2	k = j / b	-	-	2.5%	-	-	-	-	3.8%	-	-	-	-	15.0%	-	-	2.5%	-	-	-	-	0.01
3 Annual outages + Overhaul																						
Outage days - Annual + Overhaul																						
U-2	l = g + k	37	37	46	37	37	37	37	51	37	37	37	37	92	37	37	46	37	37	37	37	51
Outage % - Annual + Overhaul																						
U-2	m = l / b	10.0%	10.0%	12.5%	10.0%	10.0%	10.0%	10.0%	13.8%	10.0%	10.0%	10.0%	10.0%	25.0%	10.0%	10.0%	12.5%	10.0%	10.0%	10.0%	10.0%	13.8%
Availability																						
U-2	n = 100% - m	90.0%	90.0%	87.5%	90.0%	90.0%	90.0%	90.0%	86.2%	90.0%	90.0%	90.0%	90.0%	75.0%	90.0%	90.0%	87.5%	90.0%	90.0%	90.0%	90.0%	86.2%

K-Electric Limited
Generation Plants Tariff Petition
BQPS III Plant - Unit 2
Annexure O - Outage schedule and plant factor

Description		Overhaul	CY-47	CY-48	CY-49	CY-50	CY-51	CY-52	CY-53	CY-54	Total
Hours	a	24	24	24	24	24	24	24	24	24	720
Days	b	365	365	365	366	365	365	365	366	274	10,867
Hours in a year	c = a x b	8,760	8,760	8,760	8,784	8,760	8,760	8,760	8,784	6,576	260,808
Annual outages											
Gross Capacity - MW U-2	d	450.1	450.1	450.1	450.1	450.1	450.1	450.1	450.1	450.1	450.1
Scheduled outage days U-2	e	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	17.2	684.2
Forced outage days U-2	f	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	10.1	401.6
Total Annual outage days U-2	g = e + f	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	27.3	1,085.8
Total Annual outage % U-2	h = g / b	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Annual Availability %	i = 100% - h	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Overhauls											
Cumulative hours U-2		187,488	195,766	204,044	212,345	220,623	228,902	237,180	245,481	251,695	
Overhauls U-2	j	-	-	-	-	55	-	-	-	-	

*Overhauls are included based on factored fired hou

HGPI = Hot Gas Path Inspection
eHGPI = Extended Hot Gas Path Inspection
MIr Major Inspection

Overhaul - days U-2	j	-	-	-		55	-	-	-	-	155
Overhaul - % U-2	k = j / b	-	-	-	-	0.15	-	-	-	-	1.4%
Annual outages + Overhaul											
Outage days - Annual + Overhaul U-2	l = g + k	37	37	37	37	92	37	37	37	27	1,242
Outage % - Annual + Overhaul U-2	m = l / b	10.0%	10.0%	10.0%	10.0%	25.1%	10.0%	10.0%	10.0%	10.0%	11.4%
Availability U-2	n = 100% - m	90.0%	90.0%	90.0%	90.0%	74.9%	90.0%	90.0%	90.0%	90.0%	88.57%

K-ELECTRIC LIMITED

K-Electric Limited
Generation Plants Tariff Petition
BQPS III Plant - Unit 1
Annexure P - O&M Sharing Mechanism

Description															
Hours	a	no.	24	24	24	24	24	24	24	24	24	24	24	24	24
Days	b	no.	366	365	365	365	366	365	365	365	366	365	365	365	366
Hours in a year	c = a x b	no.	8,784	8,760	8,760	8,760	8,784	8,760	8,760	8,760	8,784	8,760	8,760	8,760	8,784

Overhauls

Shall be replaced with Actual occurrence

U-1	-	-	HGPI	-	-	-		eHGPI	-	-	-	-		MI

**Overhauls are included based on factored fired hours. Accordingly, these events will occur when respective factored fired hours will be achieved*

HGPI = Hot Gas Path Inspection
eHGPI = Extended Hot Gas Path Inspection
MI = Major Inspection

O&M components - Gas Combined cycle

Tariff components [Shall be replaced with actual quarterly indexed tariff components]														
Variable - local	d	PKR / kWh	0.0384	0.0384	0.0384	0.0384	0.0384	0.0384	0.0384	0.0384	0.0384	0.0384	0.0384	0.0384
Variable - Foreign	e	PKR / kWh	0.2346	0.2346	0.2346	0.2346	0.2346	0.2346	0.2346	0.2346	0.2346	0.2346	0.2346	0.2346
Fixed - local	f	PKR / kWh	0.2745	0.2745	0.2745	0.2745	0.2745	0.2745	0.2745	0.2745	0.2745	0.2745	0.2745	0.2745
Fixed - Foreign	g	PKR / kWh	0.0820	0.0820	0.0820	0.0820	0.0820	0.0820	0.0820	0.0820	0.0820	0.0820	0.0820	0.0820
Net Capacity	h	MW	449.8	449.8	449.8	449.8	449.8	449.8	449.8	449.8	449.8	449.8	449.8	449.8
Availability factor [Shall be replaced with Actual]	i	%	90.0%	90.0%	87.5%	90.0%	90.0%	90.0%	90.0%	86.2%	90.0%	90.0%	90.0%	75.0%
Available capacity	j = h x i x c / 1000	GWh	3,557	3,546	3,449	3,546	3,557	3,546	3,546	3,395	3,557	3,546	3,546	2,963
Dispatch factor [Shall be replaced with Actual]	k	%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Units sent out	l = j x k	GWh	3,557	3,546	3,449	3,546	3,557	3,546	3,546	3,395	3,557	3,546	3,546	2,963
Recovery in tariff														
Variable - local	m = d x l	PKR mn	136.50	136.08	132.36	136.08	136.50	136.08	136.08	130.28	136.50	136.08	136.08	113.71
Variable - Foreign	n = e x l	PKR mn	834.60	832.07	809.28	832.07	834.60	832.07	832.07	796.61	834.60	832.07	832.07	695.29
Fixed - local	o = f x j	PKR mn	976.45	973.49	946.82	973.49	976.45	973.49	973.49	932.00	976.45	973.49	973.49	813.46
Fixed - Foreign	p = g x j	PKR mn	291.69	290.80	282.84	290.80	291.69	290.80	290.80	278.41	291.69	290.80	290.80	243.00
Total	q = sum (m:p)	PKR mn	2,239.25	2,232.45	2,171.29	2,232.45	2,239.25	2,232.45	2,232.45	2,137.31	2,239.25	2,232.45	2,232.45	1,865.47
Cost [Shall be replaced with actual cost incurred]														
O&M expenses as per Financial statements		PKR mn	1,702.13	1,799.69	1,868.51	1,897.50	1,973.10	1,864.95	1,834.15	1,826.42	1,849.86	2,377.72	1,902.22	2,004.89	1,541.15
Addition to CWIP as per Financial statements		PKR mn	1,458.97	1,285.49	934.25	948.75	986.55	932.47	917.08	913.21	924.93	1,088.86	951.11	1,002.44	770.57
Total	r	PKR mn	3,161.10	3,085.19	2,802.76	2,846.25	2,959.64	2,797.42	2,751.23	2,739.63	2,774.79	3,266.57	2,853.32	3,007.33	2,311.72
Over / (Under) Recovery	s = q - r	PKR mn	(922)	(853)	(631)	(614)	(720)	(565)	(519)	(602)	(536)	(1,034)	(621)	(775)	(446)
Over / (Under) Recovery - Movement															
Opening	t	PKR mn	-	(922)	(1,775)	(2,406)	(3,020)	(3,740)	(4,305)	(4,824)	(5,426)	(5,962)	(6,996)	(7,617)	(8,392)
Addition	u = s	PKR mn	(922)	(853)	(631)	(614)	(720)	(565)	(519)	(602)	(536)	(1,034)	(621)	(775)	(446)
Closing	v = t + u	PKR mn	(922)	(1,775)	(2,406)	(3,020)	(3,740)	(4,305)	(4,824)	(5,426)	(5,962)	(6,996)	(7,617)	(8,392)	(8,838)

Sharing Timeline - based on occurrence on Overhaul of last component in One cycle and at the end of life - Note			*Sharing on completion of MOH of ST*
Over / (Under Recovery)	w = v	PKR mn	(8,838)
In case of (Under recovery) - carry forward	x = if w < 0	PKR mn	(8,838)
In case of Over recovery - sharing	y = if w > 0	PKR mn	-
- Consumer - 60%	z = y x 60%	PKR mn	-
- KE - 40%	aa = z x 40%	PKR mn	-

Sharing of consumer to be credited in next invoice.

One Overhaul cycle shall include once
- One HGPI after 25k operation hours
- One eHGPI after 66k operation hours
- One Major inspection after 107k operation hours

K-ELECTRIC LIMITED

K-Electric Limited
Generation Plants Tariff Petition
BQPS III Plant - Unit 2
Annexure P - O&M Sharing mechanism

Description	Legend	Unit	FY-24	FY-25	FY-26	FY-27	FY-28	FY-29	FY-30	FY-31	FY-32	FY-33	FY-34	FY-35	FY-36
Hours	a	no.	24	24	24	24	24	24	24	24	24	24	24	24	24
Days	b	no.	365	365	365	365	365	365	365	365	365	365	365	365	365
Hours in a year	c = a x b	no.	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760
Overhauls															
Shall be replaced with Actual occurrence															
U-2			-	-	HGPI	-	-	-	-	eHGPI	-	-	-	-	MI

Overhauls are included based on factored fired hours. Accordingly, these events will occur when respective factored fired hours will be achieved

HGPI = Hot Gas Path Inspection
eHGPI = Extended Hot Gas Path Inspection
MI = Major Inspection

Description	Legend	Unit	FY-24	FY-25	FY-26	FY-27	FY-28	FY-29	FY-30	FY-31	FY-32	FY-33	FY-34	FY-35	FY-36
O&M components - Gas															
Tariff components [Shall be replaced with actual quarterly indexed tariff components]															
Variable - local	d	PKR / kWh	0.0422	0.0365	0.0398	0.0362	0.0367	0.0348	0.0356	0.0350	0.0457	0.0385	0.0436	0.0375	0.0375
Variable - Foreign	e	PKR / kWh	0.2540	0.2661	0.3039	0.2942	0.2903	0.2695	0.2931	0.2901	0.2913	0.2894	0.2905	0.2877	0.2877
Fixed - local	f	PKR / kWh	0.2998	0.3434	0.2549	0.2713	0.2616	0.2626	0.2713	0.2770	0.2609	0.2730	0.2756	0.2893	0.2893
Fixed - Foreign	g	PKR / kWh	0.0581	0.0603	0.0828	0.0753	0.2172	0.0784	0.0559	0.0586	0.0620	0.1780	0.0637	0.0942	0.0942
Net Capacity	h	MW	449.8	449.8	449.8	449.8	449.8	449.8	449.8	449.8	449.8	449.8	449.8	449.8	449.8
Availability factor [Shall be replaced with Actual]	i	%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Available capacity	j = h x i x c	GWh	3,547.4	3,546.3	3,546.3	3,546.3	3,547.4	3,546.3	3,546.3	3,546.3	3,547.4	3,546.3	3,546.3	3,546.3	3,547.4
Dispatch factor [Shall be replaced with Actual]	j1	%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Units sent out	k = (j x j1)	GWh	3,547	3,546	3,546	3,546	3,547	3,546	3,546	3,546	3,547	3,546	3,546	3,546	3,547
Recovery in tariff															
Variable - local	l = d x k	PKR mn	150	130	141	128	130	123	126	124	162	137	155	133	133
Variable - Foreign	m = e x k	PKR mn	1,043	1,015	1,078	1,043	1,030	1,027	1,040	1,029	1,033	1,026	1,030	1,020	1,021
Fixed - local	n = (x)	PKR mn	1,064	1,218	904	962	928	931	962	982	926	968	978	1,026	1,026
Fixed - Foreign	o = g x j	PKR mn	206	214	294	267	416	278	158	208	220	631	226	334	334
Total	p	PKR mn	2,462	2,576	2,416	2,401	2,503	2,359	2,326	2,343	2,341	2,762	2,388	2,513	2,514
Cost [Shall be replaced with actual cost incurred]															
O&M expenses as per Financial statements		PKR mn	1,931	1,887	1,847	1,932	1,928	1,514	1,584	1,374	1,645	1,840	1,461	1,413	2,379
Addition to CWIP as per Financial statements		PKR mn	1,021	1,041	931	1,054	1,286	1,009	1,056	916	1,097	1,227	974	942	1,586
Total	q	PKR mn	2,952	2,928	2,778	2,986	3,214	2,524	2,640	2,290	2,742	3,067	2,434	2,355	3,965
Over / (Under) Recovery	r = p - q	PKR mn	(490)	(352)	(362)	(586)	(711)	(164)	(314)	53	(401)	(304)	(46)	158	(1,451)
Over / (Under) Recovery - Movement															
Opening	s	PKR mn	-	(490)	(842)	(1,204)	(1,789)	(2,500)	(2,664)	(2,978)	(2,925)	(3,326)	(3,631)	(3,677)	(3,519)
Addition	t = r	PKR mn	(490)	(352)	(362)	(586)	(711)	(164)	(314)	53	(401)	(304)	(46)	158	(1,451)
Closing	u	PKR mn	(490)	(842)	(1,204)	(1,789)	(2,500)	(2,664)	(2,978)	(2,925)	(3,326)	(3,631)	(3,677)	(3,519)	(4,970)

Sharing Timeline - based on occurrence on Overhaul of last components in One cycle for Unit 2, and at the end of life - Note	Legend	Unit	Sharing on completion of MI of Unit 2
Over / (Under Recovery)	v = u	PKR mn	(4,970)
In case of (Under recovery) - carry forward	w = if v < 0	PKR mn	(4,970)
In case of Over recovery - sharing	x = if v > 0	PKR mn	-
- Consumer - 60%	y = x x 60%	PKR mn	-
- KE - 40%	z = x x 40%	PKR mn	-

Sharing of consumer to be credited in next invoice.

One Overhaul cycle shall include one:
- One HGPI after 25k operation hours
- One eHGPI after 66k operation hours
- One Major Inspection after 107k operation hours

BQPS III – Annexure Q

Head of Terms

POWER PURCHASE AGREEMENT

TERM SHEET

This Term Sheet dated xxx (the "Date of Signing") is a summary of the principal and indicative terms for inclusion in the Power Purchase Agreement (the "PPA") to be entered into between XX Generating Station (Plant) which is part of KE's generation fleet, and Transmission/Load Dispatch Center (LDC) of KE (individually a "Party" and together the "Parties") in relation to the sale and purchase of electrical energy. The terms and conditions contained in this non-binding term sheet are indicative and non-binding in nature. Any such obligation or agreement will be created only by the execution of a definitive power purchase agreement (the "PPA") by Seller and Buyer (as defined below, and collectively the "Parties"), the provisions of which, if so executed, will supersede this Term Sheet and all other agreements, if any, related to this document and the proposed transaction.

Sr #	Terms	Description
1)	Seller	BQPS 3
2)	Buyer	Load Dispatch Center (LDC) / Supply
3)	Purpose of PPA	The Plant shall sell all electrical energy generated by it to the Buyer based on the dispatch instructions issued by Buyer and the fuel available with Seller to meet such dispatch in line with the agreed availability plan between buyer and seller
4)	Plant	[.] *Description of plant to be added*
5)	Product	The "**Product**" to be delivered and sold by Seller and received and purchased by Buyer consists of: (a) all energy, or Buyer's applicable portion, expressed in MWh, generated by the Plant and delivered to the delivery point/interconnection point ("**Delivered Energy**") b) all other plant output including capacity and ancillary services c) Black start facility, if applicable
6)	Term	The term of the PPA shall be effective on the **Effective Date** (to be defined in the PPA) and shall terminate XX Contract Years or the expiry of the regulatory license of the Plant, whichever is earlier, following the Effective Date ("**Term**"). "**Contract Year**" means each consecutive 12-month period during the Term that commences on the first day of July following the Effective Date, and every July 1st thereafter. The first Contract Year shall be a partial year, commencing on the Effective Date.
7)	Contract Capacity	The Contract Capacity shall be XX MW (net, at reference condition)
8)	Sale and Purchase of Energy and Capacity	Buyer shall have exclusive right of energy and capacity of the Plant. Subject to terms of PPA, The Seller shall: (i) Make available to the Buyer the Declared Available Capacity up to the Contract Capacity (ii) Deliver and sell to Buyer at the interconnection point, the dispatched net electrical output Subject to the terms of PPA, the Buyer shall, in accordance with NEPRA approved tariff: (i) Pay Declared Available Capacity (Take or Pay mechanism) (ii) Pay for the dispatched and delivered net electrical output

Sr.#	Terms	Description
9)	Metering	Buyer's share of the Delivered Energy shall be measured using electric metering devices. The Metering System shall be in place prior to the delivery of net electrical output to the interconnection point. Seller shall maintain and Buyer shall inspect such electric metering devices In accordance with the agreed terms and conditions between buyer and seller and approved by NEPRA.
10)	Billing	The PPA shall contain provisions pursuant to which Seller shall send Buyer monthly invoices in form and method determined by the Parties, showing the amount due to the Seller for the relevant month, specifying MWs supplied, all billing parameters, rates and factors and all other data relevant to the calculation of payments.
11)	Net Heat Rate	The Plant shall perform at a Net Heat Rate (NHR) of XXXX as witnessed and/or approved by NEPRA. Necessary Corrections shall be applicable on part load operations.
12)	Annual Operational Plan	At the beginning of each Year, the Plant shall submit to the Buyer, its Annual Operational Plan, which shall include but not be limited to the following: - Planned Outage Schedule - Maintenance Outage Schedule - Forced Outages Allowance - Annual Availability - Minimum Dispatch requirements as per technical limits - Fuel allocation as available from the Fuel Supplier Upon receipt of the Plants' Annual Operational Plan, the Buyer shall review and provide timely feedback on the operational plan based on the following: - The Year's demand forecast - Economic Merit Order Projection (tentative) to be provided to the seller - System constraints including planned outages in the network if any, to be provided to the Seller. - Annual Dispatch Plan (tentative) - to be provided to the Seller annually. Upon review of the Plant's Annual Operational Plan, both Parties shall mutually agree to the final plan for the upcoming contract year
13)	Plant Availability and Dispatch	*Seller shall achieve availability of no less than XX%, The Plant shall be* responsible for the availability of the Complex for Dispatch by the Buyer. Upon receipt of a notice of Dispatch from the Buyer, the Seller shall generate and deliver the Net Electrical Output at the Interconnection Point in accordance with the technical limits as per grid code and all applicable standards/prudent practices. The Seller shall give prompt notice to the Buyer regarding any changes to availability of the Complex caused by events such as: (i) Force Majeure Event; (ii) Scheduled Outage; (iii) Forced Outage; (iv) Partial Forced Outage; and (v) Any other event which causes alteration in availability

Sr.#	Terms	Description
14)	Operation and Maintenance Costs	Seller will bear all costs and expenses for Operations and Maintenance of the Plant and any other costs up to the delivery /interconnection point for the performance of Seller's obligations under the PPA (collectively, the "Seller Costs"). Any ancillary services costs to be excluded from the Seller Costs shall be discussed in the PPA.
15)	Others	The PPA will also include, among other things, the following covenants, terms, and/or conditions: • Seller will insure operate, maintain, manage, replace, repair, study, test, and otherwise use the Plant up to its battery limits in accordance with (i) Seller's obligations in the PPA, and the OEM Manual(s), (ii) Prudent electrical and utility practices, and (iii) all applicable laws (including environmental laws), consents, and governmental approvals, including all applicable standards and guidelines adopted from time to time by governmental authorities • Seller will schedule and perform required maintenance according to the PPA • Seller will insure against all insurable risks with coverage in an amount not less than full replacement cost and on terms specified in the PPA.
16)	Fuel Supply	The Seller shall make its best efforts for the availability and allocation of Main fuel to the Gen Station to maintain guaranteed availability and to meet dispatch notifications. The Seller shall also make its best efforts to maintain the inventory of Back-up Fuel for xx days and ensure the readiness of Plant to operate on Back-up Fuel to maintain guaranteed availability and meet dispatch notifications. The Seller shall also be responsible to obtain consent from the Buyer, prior to operations based on Back-up Fuel. In no event the Seller shall be required to operate the Plant on HSD for a period exceeding xx hours in any Year, provided that prior consent has been solicited from Buyer for any additional hours.
17)	Start-ups and Minimum Load	The Seller shall make technical references available to the Buyer concerning the required times for Start-Ups and minimum complex/machine loading
18)	Island Mode	The Seller shall be responsible to make the plant fully capable of operating on Island Mode, to the extent consistent with the Technical Limits, for recovery from a local or widespread electrical blackout through its Black Start Facility and voltage reduction to effect load curtailment.
19)	Black Start Facility	The Seller shall be responsible to ensure readiness of Black Start Facility all the time in order to start the Plant in case of widespread electrical blackout to operate the Plant in Island Mode.
20)	Billing	Relevant Payment Terms for Energy shall be 30 days. The Buyer shall pay the Seller the Capacity Payments for the available capacity for each month (70% in advance and 30% immediately after month end) and energy payments for dispatched and delivered net electrical output for the relevant month.
21)	Liquidated Damages	To be discussed between the Parties
22)	Force Majeure	Force Majeure Events and the obligations, duties, compensation, and recourse available to each Party during such events including but not limited to **PPFME** (Pakistan Political Events that occur inside or directly involve Pakistan) and **CLFME** (any Change in Law to the extent of Force Majeure Event) shall be negotiated and finalized in the PPA. The PPA will also include a termination right for extended force majeure that impacts Party's ability to perform under the contract.
23)	Events of Default	The PPA will include standard events of default, as appropriate.

Sr #	Terms	Description
24)	Termination	The PPA will include standard terms for Termination. However, Parties agree that there shall not be any Termination for Convenience in the PPA.
25)	Dispute Resolution	In the event of any disputes between the Parties, the Parties shall seek to resolve the same in the following order: 1. Through mutual discussion involving Steering Committee 2. If the dispute in question is not resolved through mutual discussions, then senior management of KE shall resolve the disputes. Other terms & conditions for settlement of disputes shall be mutually agreed between the Parties
25)	Indemnification	Seller shall indemnify Buyer against any damages (unless resulting from Buyer's gross negligence or willful misconduct). Buyer shall indemnify Seller against any damages (unless resulting from Seller's gross negligence or willful misconduct).
26)	Governing Law	Laws of Pakistan
27)	Confidentiality	Each Party shall be required to keep the terms and provisions, of the PPA and this Term Sheet, confidential and prohibited from disclosing such terms to any third party, subject to certain limited exceptions specified in the PPA.

K-Electric Limited

IC Report on O&M cost evaluation – Bin Qasim Power Station – III ("BQPS III") Plant

30 November 2022

Consortium of Independent Consultant

OMS

EY

Building a better working world

Reliance Restricted

Chief Financial Officer
K-Electric Limited
KE House, 39-B
Sunset Boulevard, D.H.A. Phase 2
Karachi, Pakistan

Project Power– IC Report on O&M cost evaluation of BQPS III **30 November 2022**

Dear Sir

In accordance with your instructions, we have performed the work set out in our Purchase Order (No: 7500048189) dated 29 March 2022 (the "Engagement Agreement") in connection with the evaluation of forecast of operations and maintenance cost of owned power generation plants prepared by K-Electric Limited ("KE" or the "Client" or "you"), as part of seeking stand-alone tariff for each power plant under IPP mode from National Electric Power Regulatory Authority ("NEPRA") ("the Project" or "Project Power" or the "Transaction").

Purpose of our report and restrictions on its use

This engagement is of due diligence in nature and accordingly this due diligence report ("Report") on Bin Qasim Power Station – III ("BQPS III") has been prepared by consortium comprising OMS (Private) Limited ("OMS" or "Technical cum lead consultant") and EY Ford Rhodes ("EY" or "Financial Consultant") (hereinafter jointly referred as "Independent Consultant" or "IC", "We" or "Our") based on their respective technical and commercial analysis performed in accordance with the scope agreed vide Engagement Agreement. The supplementary analysis performed by IC during the course of this engagement has been compiled and submitted to KE separately.

This Report has been prepared on the specific instructions of KE, solely for the purpose of the Transaction and should not be used or relied upon for any other purpose. This Report (or any portion or summary of it) may not be quoted, referred to or shown to any other parties except as provided in the Engagement Agreement.

We accept no responsibility or liability to any person other than to KE, or to such party to whom we have agreed in writing to accept our responsibility in respect of this Report, and accordingly if such other persons choose to rely upon any of the contents of this Report they do so at their own risk.

Nature and scope of the services and limitations

The nature and scope of the services, including the basis and limitations, are detailed in the Engagement Agreement.

Whilst each part of our Report addresses different aspects of our work, the entire Report together with Appendices should be read for a full understanding of our findings and advice.

"Banner headlines" used in this Report are intended only to act as an introduction to the page concerned and should be read in conjunction with rest of the page. They are not intended to represent any recommendation, conclusion or finding.

Our work was completed on 30 November 2022. Therefore, our Report does not take account of events or circumstances arising after that date and we have no responsibility to update the Report for such events or circumstances.

This Report has been finalized based on the data, explanations and feedback provided by the Client during the course of engagement.

Nature and scope of the services and limitations (cont'd)

IC highlights that our Report do not include any recommendation to you on your future course of action. Any decision to proceed with tariff petition may entail consideration of several factors, some of which IC may not be aware of. The evaluation of these factors or advising you on any business decision does not form part of scope of our work of this Report. You should therefore consider the appropriateness of the Report in light of your own objectives and financial situation.

While EY has performed a review of the Operations and Maintenance ("O&M") cost model, we have not assessed the contents of the model i.e. the financial statements or roll-forward for their appropriateness for financial reporting (as per applicable framework) or taxation authorities. Further, as summarized in section 2 of the Report, our review is based on the data and agreements / quotations of the respective power plants made available to IC during the course of the engagement. Reasonableness of O&M costs has been performed by OMS in detail based on substantial review of relevant supporting documents, wherever available. Additionally, we perform our work in the capacity of IC and have not assessed any agreements for their authenticity / legality from a legal and tax perspective.

IC has reported broadly on matters, which Consortium members have noted and which appear significant to us for the purpose of technical and commercial due diligence. In addition, please note that:

a) Our work in connection with this engagement is of a different nature to that of an audit or a review of information, as those terms are understood in applicable international auditing standards. Consequently, we give no assurance on such information.

b) Our scope of work was limited to the review and analysis of information made available to EY by the management of KE, physical site visit and discussions with key management personnel of KE.

c) We have relied on the information provided during the course of engagement and have assumed the genuineness of all the documents and the signatures thereon as if they were originals and also assumed that the scanned or soft copies conform to the original.

d) Transactions, data and events which were not recorded and which were not disclosed to us may not have been identified during our due diligence.

Detailed findings of technical due diligence performed by OMS have been placed in the appendices to this Report with summary findings and considerations highlighted in different sections of the Report.

The contents of our Report have been reviewed by KE management, who have confirmed to us their factual accuracy. Further, feedback provided on the draft Report has been duly addressed, wherever deemed appropriate.

We appreciate the co-operation extended by the KE team during the course of this engagement. Please do not hesitate to contact us if you have any questions about this engagement or if we may be of any further assistance.

Yours faithfully

For and on behalf of OMS (Private) Limited (Technical cum lead consultant)

Abu Adil (Senior General Manager)

For and on behalf of EY Ford Rhodes (Financial consultant)

Rana Nadeem Idrees (Partner)

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1 Key Considerations

Key considerations

Key consideration	Commentary	Findings / Recommendation	Pg. no.
Plant operating profile and availability / utilization factor assumption	▸ Under an integrated MYT regime, KE had a consolidated O&M tariff component based on projected operating profile and load factor of its plants. ▸ Since, KE is planning to seek standalone O&M cost tariff for each plant, including BQPS III, therefore, Management has assumed projected plant availability / utilization factor of 88.57%, i.e. the maximum achievable average availability / utilization factor during remaining plant life). ▸ Aforementioned assumption of projected plant utilization to match projected plant availability has been kept aligned with other IPPs, for the sake of tariff petition. ▸ BQPS III configuration includes 02 single shaft units. Each unit contains 01 × GT, 01 × HRSG and 01 × ST. ▸ Since BQPS III is still under testing & commissioning, NEPRA heat rate test through 3rd party is therefore not yet performed. However, EPC performance guarantees of each unit are, Net Output: 449.808 MW (for both Unit 1 and Unit 2), Net Efficiency (LHV): 59.23%. Estimated Auxiliary Consumption (as per EPC documents): 9.432 MW i.e., 2.05% of Gross Output i.e., 459.24MW	▸ Major cost events and the variable cost annual spend profile during the requested tariff control period has been assessed keeping in view forecast availability/utilization. ▸ Since variable costs, including event based costs, are claimed based on actual utilization of the plant, risk of claiming any extra cost for lower actual utilization is negligible. ▸ The availability/utilization/load factor assumed by KE is reflective of the greenfield nature of the plant and expected maintenance requirements over its remaining useful life.	n.a.
Methodology applied for preparing O&M tariff	▸ KE intends to submit its petition for each of its owned power generation plant under IPP mode. ▸ Previously, NEPRA has considered the Revex component of O&M cost for the immediately preceding year (reference year) and accordingly determined the O&M tariff component. In this particular case, KE is submitting its petition in advance for tariff period commencing from FY24 in the current fiscal year. Therefore, wherever relevant, for the purpose of O&M cost estimation, FY22 audited numbers of BQII have been used. Additionally, CSA costs have been estimated based on Management's past experience and assumption for its future re-negotiation.	▸ KE would need to assess its readiness to address any additional information required during tariff determination process. ▸ The findings of this Report are also expected to provide comfort around O&M cost estimation of KE, during the tariff determination process	n.a.

Key considerations

Key consideration	Commentary	Findings / Recommendation	Pg. no.

Reclassification of expenses between foreign and local components and other adjustments	▸ The adjustments mainly reflect the impact of:
	  ▸ update of exchange rate assumption by KE from PKR 185 to PKR 206 in case of foreign components of VOM and FOM costs (i.e. with a cumulative increase of PKR 5.0b in VOM foreign and PKR 1.7b in FOM foreign).
	  ▸ reclassification/revisit of costs suggested by IC in local and foreign components of VOM and FOM.
	▸ These adjustments translated into a net cumulative increase of PKR 6.1b in FOM and a net cumulative increase of PKR 2.3b in VOM over the requested tariff control period. Consequently, average per kWh VOM cost increased by PKR 0.0111 and average per kWh FOM cost increased by PKR 0.0297.
		▸ KE has evaluated and concurred with the identified adjustments of IC and accordingly reflected those in its adjusted average tariff computation.
		▸ The adjusted average tariff has been included in the later sections of this Report.
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Basis used for estimating O&M costs	▸ Basis of estimations can be summarized in four broad categories:
	  ▸ Linked to latest available POs/quotations;
	  ▸ Management estimate/past experience;
	  ▸ Based on FY22 values and SAP history; and
	  ▸ Linked to management assumptions for CSA and its future re-negotiation
	▸ IC has substantiated the reasonableness of assumptions on sample basis (covering ~91.8% of value) through checking of POs, quotations, SAP history, underlying agreements and / other relevant data / basis considered by the Management.
		▸ Estimation basis used by the management were found reasonable / consistent with the historical benchmarks, underlying agreements and / or historical basis.
		▸ As highlighted above, some re-classification adjustments (between local / foreign and variable / fixed components) and cost reductions were identified by IC. These have been agreed with KE and accordingly have been addressed in the adjusted average tariff computation of KE, shown in later sections of this Report.
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Key considerations

Key consideration	Commentary	Findings / Recommendation	Pg. no.
Benchmarking of O&M costs PKR/kWh BQPS III (Unit 1): 0.6295 BQPS III (Unit 2): 0.6285 HBS: 0.6000 Balloki: 0.6438 Average of HBS and Balloki: 0.6219	▸ From technical compatibility perspective, BQPS III average tariff has been benchmarked against estimated indexed tariffs of HBS and Balloki power plants of NPPMCL for FY22. ▸ In terms of total reference average O&M component of tariff, as shown in the adjacent column, total BQPS III O&M cost tariff is slightly higher than HBS and lower than Balloki. ▸ Fixed cost ratio of both units of BQPS III (~56.6%) is fairly aligned with HBS (i.e. 55.7%) and Balloki (i.e. 54.0%). ▸ Foreign cost component for both units in BQPS III is ~50.3%, as compared to 93.2% for HBS and 93.6% for Balloki. **Enabling cost benchmarking:** ▸ Due to lack of publicly available data about benchmark projects, enabling costs were analyzed at FOM local level.	▸ On an overall reference average tariff basis, KE's O&M cost tariff is marginally more than the average tariff for identified benchmark power plants. ▸ Higher enabling costs of BQPS III may be attributable to different operating model / governance structure being followed at benchmark power plant. KE would need to firm up its enabling cost allocation basis to BQPS III to support its case.	34

O&M cost indexations	▸ BQPS III average tariff is expected to be indexed as follows:
	  ▸ Local costs: Pak CPI Quarterly
	  ▸ Foreign costs: US CPI and Exchange rate Quarterly variation
		▸ The requested indexations are aligned with benchmark projects and recent determinations by NEPRA for other thermal power projects.	35

Key considerations

Key consideration	Commentary	Findings / Recommendation	Pg. no.

Plant operations on HSD as a back-up fuel	▸ BQPS III is not yet commissioned on HSD, thus, no operational history or tariff is available.
	▸ HSD working is based on following key assumptions:
	  ▸ Severity factor of 1.5 has been considered for HSD operations as confirmed by OEM;
	  ▸ Outage plan w.r.t. 90% RLNG and 10% HSD operations;
	  ▸ Net capacity of 714.95 MW; and
	  ▸ Net efficiency of 54.04%.
		▸ Provision of HSD storage tank is not considered under EPC contract, however, interconnection from storage facility of BQPS II is provided with day tank of BQPS III (capacity ~3,200M³) through forwarding skid.
		▸ KE has considered to convert 01 storage tank (capacity ~10,000M³) of HFO at BQPS I to HSD storage tank. Conversion of HFO tank to HSD includes complete rehabilitation of tank, decanting station for tank lorries, HSD forwarding skid for transfer of HSD to BQPS III and provision of fire water deluge system for HSD system.
		▸ As fuel risk is parked with IPP, from power purchaser /regulator perspective, optimum availability is expected to be made available by IPP and hence leaving the fuel mix decision purely at IPP end.
			37, 38

Unbundling consideration	▸ BQPS III plant is currently operating under the umbrella of overall KE system. Accordingly, cost structure may change going forward, in case Management decides to unbundle the utility into distinct business segments.	▸ KE is suggested to seek adequate openers (e.g. those related to the recovery of legitimate incremental O&M costs that may arise in future due to potential unbundling of the utility) in its tariff petition.	n.a.
Other commercial considerations	▸ Since KE is using an in-house model for O&M operations, opportunity of embedding certain costs and risks (as part of third-party O&M contractor scope) with performance guarantee mechanism and indirect reflection in fixed or variable O&M charge is not available to KE. Consequently, such costs and risks are being parked with/borne by KE instead of a third party and hence bear a cost recovery challenge. However, KE does not envisage any cost increase due to continuation of an in-house operating model.	▸ KE, in consultation with its legal team, should consider reiterating the legitimate cost recovery principal enshrined within the prevalent tariff regulatory framework while finalizing and framing request for the O&M cost components of the tariff.	n.a.

Project background and scope of work

KE has hired consortium of OMS and EY for the independent evaluation of projected O&M costs for BQPS III

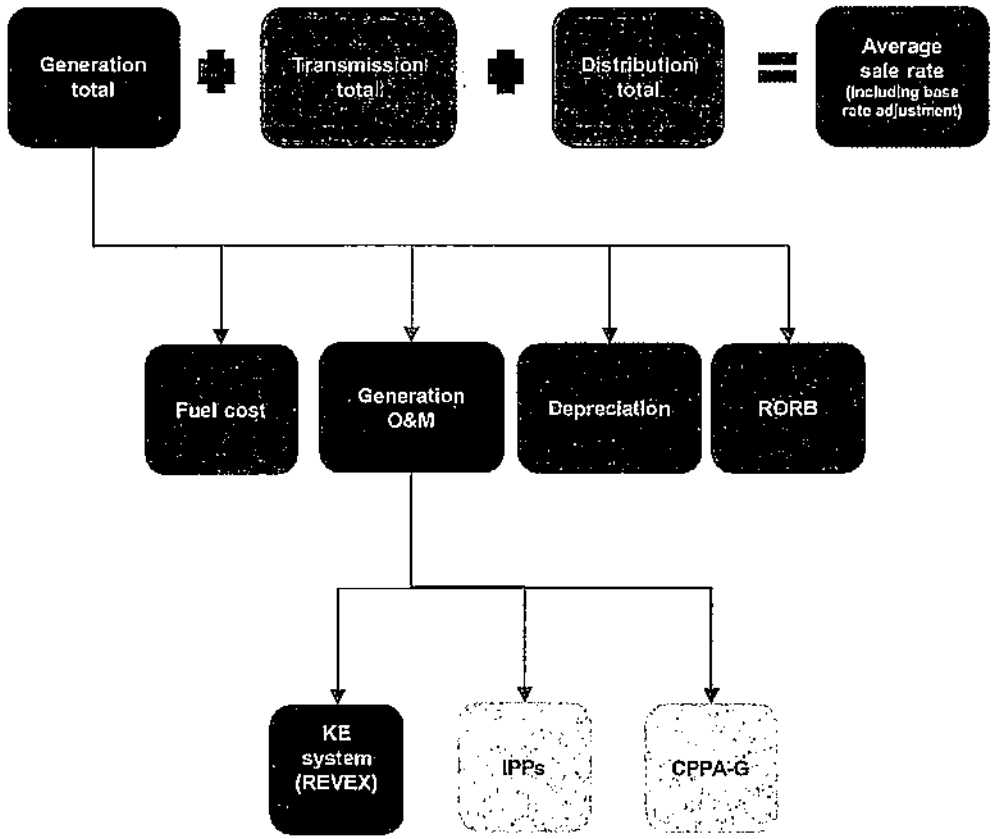
Background

- K-Electric Limited ("KE") is the only vertically integrated power utility of Pakistan.
- KE carries out operations and maintenance of its power generation plants, including major overhauls, under service contracts with OEMs and/or in-house (with or without vendors support), as applicable.
- KE's existing integrated-Multi Year Tariff ("MYT") period is due to expire on 30 June 2023.
- As part of its preparatory work for next MYT petition, KE has internally decided to opt out of MYT for generation component of its business and is in the process of applying separate generation tariff for the following owned power generation plants, covering their remaining useful economic lives as tariff control period:
  - Bin Qasim Power Station – I ("BQPS I")
  - Bin Qasim Power Station – II ("BQPS II")
  - Bin Qasim Power Station – III ("BQPS III")
  - S.I.T.E Gas Engine Power Station ("SGEPS")
  - Korangi Town Gas Engine Power Station ("KTGEPS")
  - Korangi Combined Cycle Power Plant ("KCCPP")
- KE has prepared an O&M cost forecast for each of these power plants for the purpose of tariff petioning. For this purpose, O&M costs have been derived keeping in view historical and forecast revenue expenditure ("REVEX") and capital expenditure ("CAPEX") for each plant.
- KE hired a consortium comprising OMS (Private) Limited ("Technical cum lead consultant") and EY ("Financial Consultant") (hereinafter together referred to as "Independent Consultant" or "IC") for assistance in the evaluation of the aforesaid projected O&M costs.

Source: Management data

Composition and comparability limitations of existing MYT

Current Integrated Multi-Year Tariff structure determined by NEPRA



- KE's current Multi Year Tariff is an Integrated MYT which includes costs and returns for all three segments i.e. Generation (all plants), Transmission and Distribution based on Regulatory Asset Base (RAB).
- While the underlying costs for three segments are defined in the current MYT determination, certain components such as base rate component and working capital component are not bifurcated segment wise.
- Similarly, plant wise tariff bifurcation in case of generation segment is not available within the MYT.
- Current MYT includes below components:
  - Fuel cost based on allowed benchmarks (indexed value for the month of June 2022 was PKR 21.72/kWh*);
  - RoRB and Depreciation components which cover for Returns on Regulatory Asset base (indexed value for the month of June 2022 was PKR 1.13/kWh* for generation); and
  - Operation and maintenance costs for generation, that are covered through:
    - O&M component allowed for Revex expenses (indexed value for the month of June 2022 was PKR 0.59/kWh*); and
    - Capital nature expenses allowed as investments and included in Regulatory Asset Base
- As explained above, base rate and working capital components are given on Company level, which include coverage for Generation segment as well.
- Accordingly, MYT in its current form is not comparable with the O&M cost tariff being requested under IPP mode.

Source: Management data

* Tariff values based on total units sold basis

Scope of work of IC

Scope of work	Responsibility	
	OMS (Lead cum Technical Consultant)	EY (Financial Consultant)
Comment on the historical and projected operating profile of plant	✓	
Review and evaluate grouping of O&M activities under fixed and variable components	✓	✓
Review bifurcation of expenses in foreign and local components	✓	✓
Review and evaluate completeness of O&M costs	✓	
Review and evaluate assumptions used for projecting O&M costs	✓	✓
Evaluate enabling / associated cost loading over O&M cost component of isolated plant	✓	✓
Identify gaps in costing and provide estimates to fill those gaps	✓	
Benchmarking of O&M costs against those of comparable projects	✓	✓
Consider inventory in hand and consider its periodic depletion till end of term	✓	

3 Technical specifications of the plant

Key technical specification and plant configuration of BQPS III

- 900MW BQPS -III combined cycle power plant consists of two trains of combined cycle units installed in single shaft arrangement (Gas Turbine, Generator and Steam Turbine will be operated on a single shaft).
- Each unit comprises of Siemens Gas Turbine SGT5-4000F, Siemens Steam Turbine SST5-3000 and Siemens Generator SGen5-3000W.
- Primary fuel of the power plant will be RLNG with HSD serving as secondary fuel for Gas Turbines.
- **Gas Turbine:**
  - The plant has two Gas Turbines installed that are Siemens SGT5-4000F
- **Steam Turbine:**
  - The plant has two Steam Turbines installed that are Siemens SST5-3000.
- **Generator:**
  - The plant has two Generators installed that are Siemens SGen5-3000W
- **HRSG:**
  - Plant has two HRSGs installed.
  - HRSG Type : MHDB-SGT5-4000F-Q1
  - Manufacturer : Dong Feng
  - HRSG is without supplementary firing and each HRSG is of triple pressure reheat type.

Category	Description
Technology	Single Shaft Combined cycle power plant
Configuration	2 x (1GT + 1HRSG + 1ST)
Type of fuel	RLNG – Primary, HSD-- Backup
Equipment	Gas Turbines & Steam Turbines
Units	2 x 471.16 Gas/Steam turbines,
Capacity	942.32 MW ISO Installed
Make	Gas Turbine – SIEMENS, Steam Turbine – SIEMENS
Model	Gas Turbine – SGT5-4000F, Steam Turbine – SST5-3000

EPC guaranteed conditions

S. No.	Description	Unit	RLNG	HSD
1	***Base reference conditions***			
	Ambient Air Temperature	C	30	30
	Relative Humidity	%	70	70
	Barometric Pressure	Mbar	1,013.2	1,013.2
	Sea Water Temperature	C	30	30
	Evaporative Cooler Operating Condition		OFF	OFF
	Inlet Air System		Static Filter System	Static Filter System
	Grid Frequency (nominal condition)	Hz	50	50
	Power Factor, Turbine Train Generator (lagging)		0.85(at generator terminals)	0.85(at generator terminals)
	Lower Heating Value	KJ/KG BTU/SCF	44112 / 936.9 **	42660
	RLNG Pressure for guaranteed condition	MPa	8.5 **	
2	***Plant configuration***		2 × (1GT + 1HRSG + 1ST)	
	Gas Turbine		2	2
	HRSG		2	2
	Steam Turbine		2	2

EPC guaranteed conditions

S. No.	Description	Unit	RLNG	HSD
3	***Performance data***			
	*Unit Net Output	KW	449,808	357.479
	*Unit Net Heat Rate	KJ/KW-H	6,078	6,662
4	***Auxiliary consumption***			
		KW	9,432	10,491

* The performance guarantees by EPC

** For information only.

Projected maintenance strategy

Maintenance strategy

As per the table given below, maintenance strategy of major equipment is reflected as per OEM recommendations and site conditions.

Recommended Scheduled Intervals for BQ3			
Machine	Outage type	Recommended	Days
GT	GT Compressor OFFWW	Every 2000 Hours	1.5
GT	GT Compressor OFFWW + Pre Filters Replacement	Once Every Year	2
GT	GT Compressor OFFWW + Fine Filters Replacement	As Per Filter DP	2.5
GT	Minor	At intervals on EBH 8k,16k,36k,47k,58k,77k,88k,99k for 1st interval through Major	9
GT+ST	HGPI + ST Medium	At intervals on EBH 25k for 1st interval through Major	26
GT+ST	eHGPI + ST Module 1	At intervals on EBH 66k for 1st interval through Major	31
GT+ST	MI + ST Module 2	At intervals on EBH 107k for 1st interval through Major	72

Projected outage plan on RLNG fuel

	Cumulative EBH		Outage type	
Financial Year	Unit 1	Unit 2	Unit 1	Unit 2
FY-23	5,653	5,232		
FY-24	13,954	13,532	Minor	Minor
FY-25	22,232	21,811	Minor	Minor
FY-26	30,510	30,089	HGPI	HGPI
FY-27	38,789	38,367	Minor	Minor
FY-28	47,090	46,668	Minor	
FY-29	55,368	54,946		Minor
FY-30	63,646	63,224	Minor	Minor
FY-31	71,924	71,502	eHGPI	eHGPI
FY-32	80,225	79,803	Minor	Minor
FY-33	88,503	88,082	Minor	Minor
FY-34	96,781	96,360		
FY-35	105,060	104,638	Minor	Minor
FY-36	113,361	112,939	Major Overhaul	Major Overhaul
FY-37	121,639	121,217	Minor	Minor
FY-38	129,917	129,495	Minor	Minor
FY-39	138,195	137,773	HGPI	HGPI
FY-40	146,496	146,074	Minor	Minor
FY-41	154,774	154,353	Minor	Minor
FY-42	163,052	162,631		
FY-43	171,331	170,909	Minor	Minor
FY-44	179,631	179,210	eHGPI	eHGPI
FY-45	187,910	187,488	Minor	Minor
FY-46	196,188	195,766	Minor	Minor
FY-47	204,466	204,044		
FY-48	212,767	212,345	Minor	Minor
FY-49	221,045	220,623	Major Overhaul	Major Overhaul
FY-50	229,323	228,902	Minor	Minor
FY-51	237,602	237,180	Minor	Minor
FY-52	245,902	245,481	Minor	Minor
FY-53	251,414	251,695		

Mandatory spare parts to be maintained (reference purpose)

S. No.	Item	Description
1	Gas Turbine & Steam Turbine	03 years Operational Spares as per Siemens standard
2	HRSG	HP, IP, LP drum manhole gasket Blowdown, Flush tank manhole gasket
		Inner liner board
		Insulation material
		Heating surface pipes (Φ38.1, Φ44.5, Φ44.5, Φ50.8, Φ50.8)
		Thermal resistance, Primary valve and drain valve, Lamps, Water level gauge bulb
3	Feed Water Pump	Mechanical Seal, Shaft Sleeve, Filter Cartridge IP & HP outlet Flange Gasket
4	Condensate Recirculating Pump	Filter Cartridge
5	CW Pump, OCW Pump, & CCW Pump	O ring
		Gland Packing
		Shaft Protecting Sleeve
6	HSD Pump & Demin Water Pump	Mechanical Seal
		Bearing
7	Gas Pressure Regulating Station	Filter Cartridge, Pressure Gauge Metal graphite winding gasket (10"-300#) (8"-300#) (6"-300#) (1"-300#)

Mandatory spare parts to be maintained (reference purpose)

S. No.	Item	Description
8	Plate Heat Exchanger, Condensate Pump. Air Compressor, Overhead Crane for Turbine Hall	Sealing belt, Inlet filter, O ring, Mechanical Seal, Wear ring, PT100, Filter, Oil & Air filter element, Coolant(100L), Contactor, Air & Limit Switch
9	GIS, Main Step-up Transformer, Unit Auxiliary Transformer, GCB	CB contractor & opening coil, SF6 gas, O-ring, Auxiliary switch, density relay, gas valve, oil level gauge, gas relay, pressure relief valve, winding temp and oil temp indicator, kit with 3 coils, motor kit CMK, switch kit
10	MV & LV Switchgear	changeover switch, indicator light, protective fuse, aux contact group, each level move contactor, each level fixed contactor, closing & tripping coil, amperemeter, voltage meter, various spring charging motor, limit switch, voltage transformer
11	Back start Diesel Generator, Diesel Generator, DCS, Plant Instruments	Filter, Oil, Element, air cleaner, normal duty, Separator, Fuel, Filter, Water, Digital Input/Output Modules, Analog Input/Output Modules, RTD, SOE, & TC Modules, Thermocouple, RTD, Pressure & Level Transmitter, Gauge, Temp meter
12	BOP Control System (PLC), Fire Fighting System, HVAC	Power Supply Module, DI/DO & AI/AO Modules, Spray and Sprinkler Nozzle, Drain, End test and Air test valves, Heater and Smoker Detector, Filter Bag, Fan Belt

Initial spare parts for reference purpose

S. No.	Item category	Description
1	CT Components	Core Engine & Combustion Chamber
2	CT Auxiliary Parts	Fuel Gas Strainer Pack
3		Drainage Skid
4		Gas Analyzer
5		Turning Device GT
6		Hydraulic Oil Skid
7		Instrument Air Skid
8		Hydraulic Clearance Optimization Skid
9		Interconnecting Piping
10		Cabling Combustors
11		Fuel Oil Skid
12		Ignition Gas Skid
13		Purge Water Skid
14		Air Intake System
15		Evaporative Cooler
16		Air Intake System – Filter
17		Dehumidifier
18		GT Acoustic Enclosure
19		Fire Alarm & Gas Detection System

Initial spare parts for reference purpose

S. No.	Item category	Description
20	CT Auxiliary Parts	SFC Change over Isolation Cubicle
21		GENERATOR NEUTRAL POINT CUBICLE
22		Low Voltage Switchgear GT
23		DC-DC Convertor
24		Static Invertor
25		Battery Charger (Rectifier)
26		SFC-SEE Compact Unit
27		Geno Protection / Sync / Measuring+Metering
28		Power Control Center
29		I&C System / Equipment Gas Turbine
30		Automation System Turbo Set Stream Turbine
31	ST Components	3000S_41K-OPERATIONAL Parts
32	GN-CT Components	3000W_OPERATIONAL PACKAGE

Expected initial strategic spares and inventory amount to PKR 8.4b

Initial spare parts							
	FY23	FY24	FY25	FY26	FY27	FY28	Total
Amount in PKR million							
Total	3,085	1,421	1,298	1,182	694	680	8,360

4 Adjusted O&M cost and average tariff on gas operations

Key assumptions

Key assumptions

- O&M costs have been projected for period FY24 – FY53 ("BQPS III PP").
- Projected availability / utilization factor varies throughout the years as follows, considering 90% Gas and 10% HSD operations:

Unit 1	FY	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
	Factor	90.0%	90.0%	87.5%	90.0%	90.0%	90.0%	90.0%	86.2%	90.0%	90.0%	90.0%	90.0%	75.0%	90.0%	90.0%
	FY	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53
	Factor	87.5%	90.0%	90.0%	90.0%	90.0%	86.2%	90.0%	90.0%	90.0%	90.0%	74.9%	90.0%	90.0%	90.0%	90.0%

Unit 2	FY	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
	Factor	90.0%	90.0%	87.5%	90.0%	90.0%	90.0%	90.0%	86.2%	90.0%	90.0%	90.0%	90.0%	75.0%	90.0%	90.0%
	FY	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53
	Factor	87.5%	90.0%	90.0%	90.0%	90.0%	86.2%	90.0%	90.0%	90.0%	90.0%	74.9%	90.0%	90.0%	90.0%	90.0%

- Average availability during FY24 – FY53 is 88.57% for Unit 1 and 88.57% for Unit 2.
- Foreign currencies other than USD are first converted to equivalent USD based on their respective exchange rate parity with USD (assumed 1.05, 1.21, 0.15, 0.01, and 1.0 for EUR, GBP, CNY, JPY and USD respectively). Subsequently, USD based values are converted to equivalent PKR using prevailing PKR to USD conversion rate of 206.0, as per 30th June 2022 (as per NBP).
- The projected O&M costs originally estimated by the management of KE was based on PKR to USD exchange rate of 185. Towards the finalization of IC work, this assumption has been updated to PKR 206 for each USD. Accordingly, the adjusted reference tariff is also reflective of exchange rate assumption update.

Adjusted reference cumulative O&M cost (un-indexed) during FY24 – FY53 is PKR 106.9b (excluding enabling cost)

Adjusted O&M cost (FY24 – FY53) (excluding enabling cost)	Summary of identified adjustments reflected in the adjusted O&M cost
Total O&M cost | PKR 106.9b	Total O&M cost: PKR + 8.4b ⇧ ⇧ A: PKR + 1.7b | B: PKR + 6.7b ⇧
Variable | PKR 56.6b (52.9%)	Total VOM cost: PKR + 2.3b ⇧ ⇩ A: PKR - 2.7b | B: PKR + 5.0b ⇧
Local **PKR 8.0b** **(14.1%)**	**Local: PKR - 1.0b ⇩** **A: PKR - 1.0b ⇩**
Foreign **PKR 48.6b** **(85.9%)**	**Foreign: PKR + 3.3b ⇧** **A: PKR - 1.7b ⇩** **B: + 5.0b ⇧**
Fixed | PKR 50.3b (47.1%)	Total FOM cost: PKR + 6.1b ⇧ ⇧ A: PKR + 4.4b | B: PKR + 1.7b ⇧
Local **PKR 33.4b** **(66.3%)**	**Local: PKR + 3.4b ⇧** **A: PKR + 3.4b ⇧**
Foreign **PKR 17.0b** **(33.7%)**	**Foreign: PKR + 2.7b ⇧** **A: PKR + 1.0b ⇧** **B: + 1.7b ⇧**

Legend: **Cost reduction ⇩** **Cost increase ⇧** **A: Estimated cumulative adjustments identified by IC** **B: Estimated exchange rate update impact**

Source: Management data

Adjusted reference cumulative O&M cost (un-indexed) during FY24 – FY53 unit wise (excluding enabling cost)

Unit 1
Adjusted O&M cost (FY24 – FY53) (excluding enabling cost)

Total O&M cost | PKR 53.4b

Variable | PKR 28.3b (52.9%)

Local	Foreign
PKR 4.0b (14.1%)	PKR 24.3b (85.9%)

Fixed | PKR 25.2b (47.1%)

Local	Foreign
PKR 16.7b (66.2%)	PKR 8.5b (33.8%)

Unit 2
Adjusted O&M cost (FY24 – FY53) (excluding enabling cost)

Total O&M cost | PKR 53.5b

Variable | PKR 28.3b (52.9%)

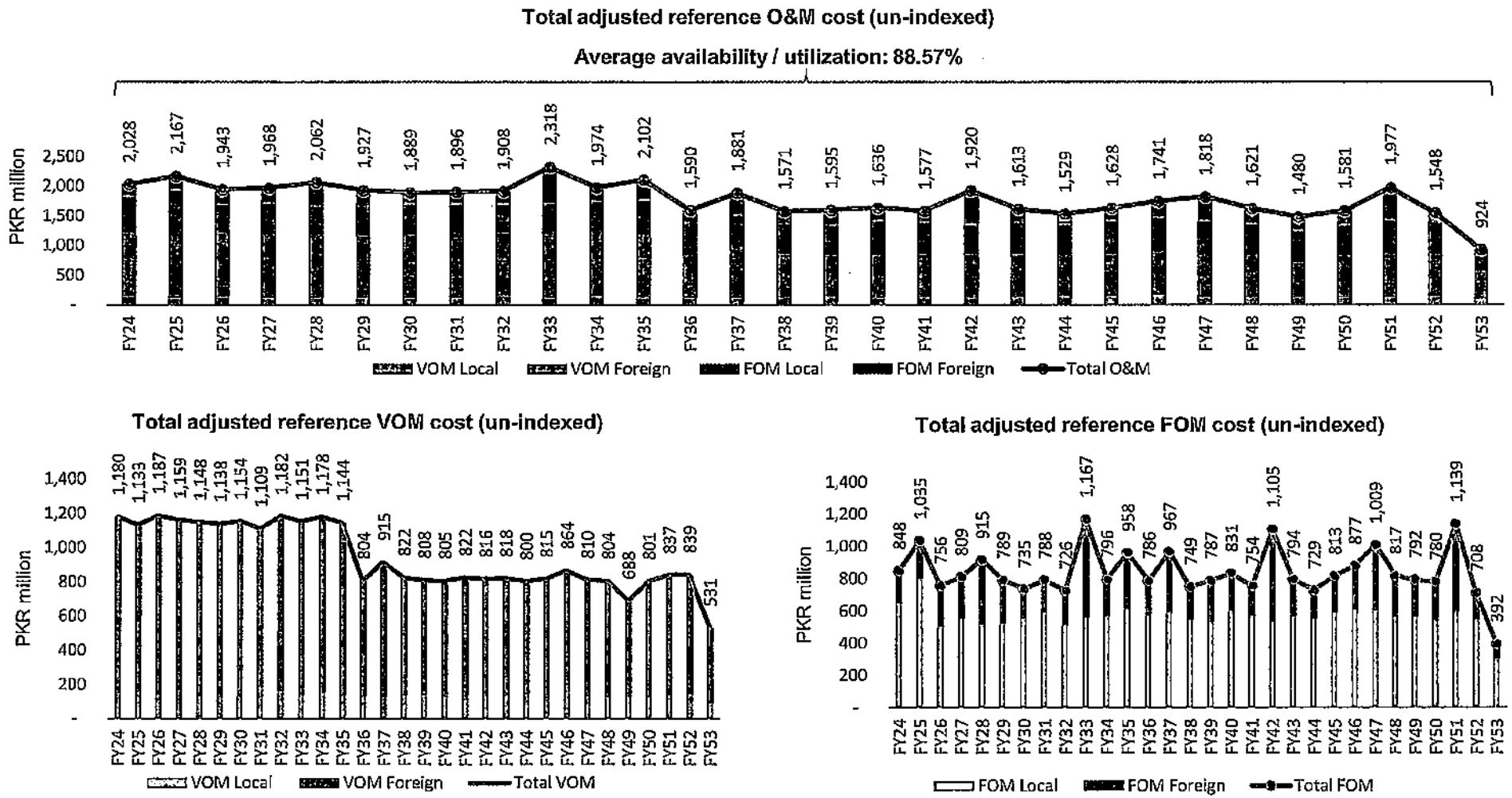
Local	Foreign
PKR 4.0b (14.1%)	PKR 24.3b (85.9%)

Fixed | PKR 25.2b (47.1%)

Local	Foreign
PKR 16.7b (66.3%)	PKR 8.5b (33.7%)

Source: Management data

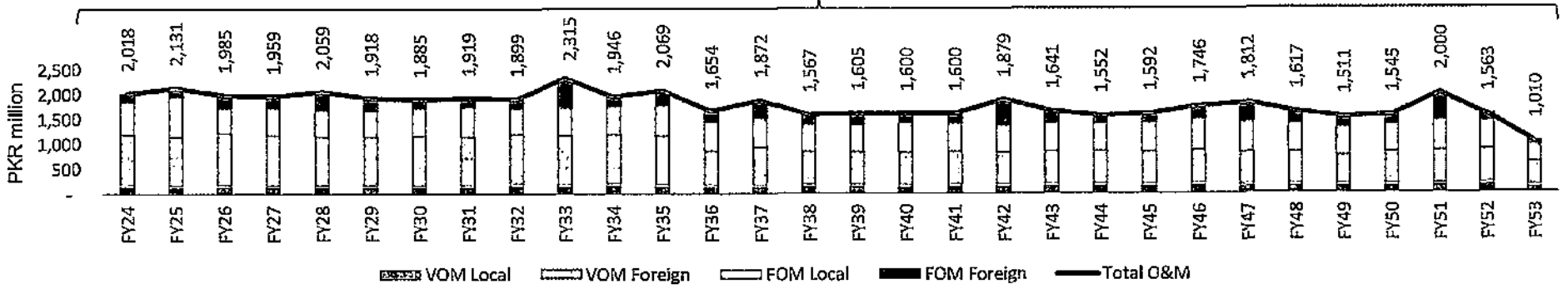
Adjusted total O&M costs mix and trend (Unit 1) (excluding enabling cost)



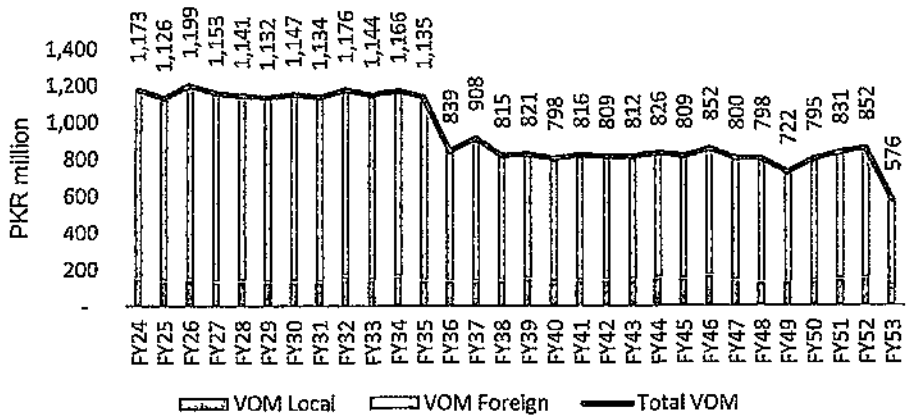
Adjusted total O&M costs mix and trend (Unit 2) (excluding enabling cost)

Total adjusted reference O&M cost (un-indexed)

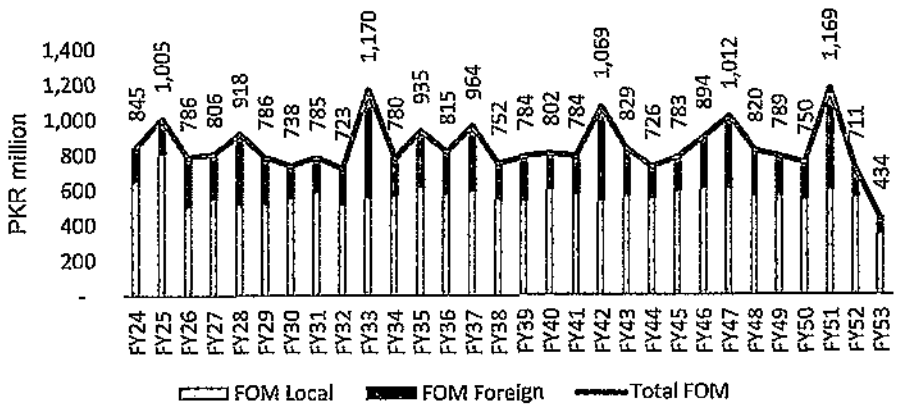
Average availability / utilization: 88.57%



Total adjusted reference VOM cost (un-indexed)



Total adjusted reference FOM cost (un-indexed)



Computation of tariff based on projected plant availability for both FOM and VOM components – (Unit 1)

Keeping the expected fuel mix variation in purview, KE has assumed a slightly rationalized availability factor over the tariff control period. The same has been considered for the tariff computation.

Plant availability / Load factor used for both variable and fixed components:

Unit 1	FY	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
	Factor	90.0%	90.0%	87.5%	90.0%	90.0%	90.0%	90.0%	86.2%	90.0%	90.0%	90.0%	90.0%	75.0%	90.0%	90.0%
	FY	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53
	Factor	87.5%	90.0%	90.0%	90.0%	90.0%	86.2%	90.0%	90.0%	90.0%	90.0%	74.9%	90.0%	90.0%	90.0%	90.0%

Year	Variable O&M			Fixed O&M			Total
	Local	Foreign	Total	Local	Foreign	Total	
FY24	0.0415	0.2910	0.3325	0.1811	0.0580	0.2391	0.5716
FY25	0.0360	0.2833	0.3193	0.2241	0.0676	0.2917	0.6110
FY26	0.0403	0.2953	0.3356	0.1440	0.0752	0.2193	0.5549
FY27	0.0356	0.2912	0.3268	0.1531	0.0749	0.2281	0.5549
FY28	0.0361	0.2874	0.3235	0.1434	0.1144	0.2579	0.5814
FY29	0.0343	0.2866	0.3209	0.1445	0.0780	0.2225	0.5434
FY30	0.0350	0.2902	0.3252	0.1531	0.0542	0.2073	0.5325
FY31	0.0360	0.2781	0.3141	0.1709	0.0611	0.2320	0.5461
FY32	0.0450	0.2884	0.3333	0.1428	0.0618	0.2046	0.5380
FY33	0.0379	0.2865	0.3244	0.1548	0.1744	0.3292	0.6536
FY34	0.0424	0.2898	0.3321	0.1574	0.0670	0.2244	0.5565
FY35	0.0374	0.2851	0.3226	0.1709	0.0993	0.2702	0.5927
FY36	0.0432	0.1908	0.2339	0.1916	0.0743	0.2658	0.4998
FY37	0.0358	0.2220	0.2578	0.1647	0.1079	0.2726	0.5304
FY38	0.0376	0.1941	0.2317	0.1515	0.0597	0.2112	0.4429
FY39	0.0405	0.1884	0.2289	0.1529	0.0752	0.2281	0.4570
FY40	0.0348	0.1921	0.2269	0.1675	0.0668	0.2343	0.4612
FY41	0.0367	0.1951	0.2318	0.1586	0.0542	0.2127	0.4445
FY42	0.0372	0.1928	0.2300	0.1489	0.1626	0.3115	0.5415
FY43	0.0380	0.1927	0.2307	0.1572	0.0667	0.2239	0.4546
FY44	0.0429	0.1845	0.2274	0.1591	0.0556	0.2147	0.4421
FY45	0.0393	0.1906	0.2299	0.1637	0.0655	0.2291	0.4590
FY46	0.0441	0.1995	0.2436	0.1682	0.0792	0.2474	0.4910
FY47	0.0366	0.1917	0.2283	0.1671	0.1173	0.2844	0.5127
FY48	0.0349	0.1917	0.2266	0.1556	0.0748	0.2303	0.4570
FY49	0.0419	0.1590	0.2009	0.1872	0.0810	0.2682	0.4692
FY50	0.0354	0.1905	0.2259	0.1499	0.0700	0.2199	0.4458
FY51	0.0384	0.1977	0.2360	0.1644	0.1568	0.3213	0.5573
FY52	0.0405	0.1961	0.2366	0.1521	0.0476	0.1997	0.4363
FY53	0.0373	0.1249	0.1622	0.1245	0.0416	0.1661	0.3283
Weighted average	0.0384	0.2346	0.2730	0.1609	0.0820	0.2429	0.5159
Add: Enabling charge (for details, please see pages that follow)				0.1136	0.0000	0.1136	0.1136
Total Tariff	0.0384	0.2346	0.2730	0.2745	0.0820	0.3565	0.6295

Since KE is a vertically integrated power utility and carry a unique position due to brown field nature of its power plants with entity level consumption, it intends to follow a billing regime for capacity payment based on available (net of outage allowances) basis. Accordingly, in order to recover projected fixed costs, Management has computed capacity part at respective availability/ utilization factor across all power plants of KE. In terms of total fixed cost recovery on an annual basis, KE's proposed Fixed cost component is expected to be indifferent from tariff computation being practiced under Take or Pay regime for other IPPs.

Computation of tariff based on projected plant availability for both FOM and VOM components – (Unit 2)

Keeping the expected fuel mix variation in purview, KE has assumed a slightly rationalized availability factor over the tariff control period. The same has been considered for the tariff computation.

Plant availability / Load factor used for both variable and fixed components:

Unit 2	FY	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
	Factor	90.0%	90.0%	87.5%	90.0%	90.0%	90.0%	90.0%	86.2%	90.0%	90.0%	90.0%	90.0%	75.0%	90.0%	90.0%
	FY	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53
	Factor	87.5%	90.0%	90.0%	90.0%	90.0%	86.2%	90.0%	90.0%	90.0%	90.0%	74.9%	90.0%	90.0%	90.0%	90.0%

Year	Variable O&M			Fixed O&M			Total
	Local	Foreign	Total	Local	Foreign	Total	
FY24	0.0415	0.2892	0.3307	0.1811	0.0572	0.2382	0.5690
FY25	0.0360	0.2816	0.3176	0.2241	0.0593	0.2834	0.6010
FY26	0.0403	0.3075	0.3478	0.1440	0.0838	0.2278	0.5755
FY27	0.0356	0.2895	0.3251	0.1531	0.0741	0.2272	0.5523
FY28	0.0361	0.2856	0.3217	0.1434	0.1153	0.2587	0.5804
FY29	0.0343	0.2849	0.3192	0.1445	0.0771	0.2217	0.5409
FY30	0.0350	0.2885	0.3235	0.1531	0.0550	0.2081	0.5316
FY31	0.0360	0.2982	0.3341	0.1709	0.0603	0.2311	0.5653
FY32	0.0450	0.2866	0.3315	0.1428	0.0610	0.2038	0.5353
FY33	0.0379	0.2848	0.3227	0.1548	0.1752	0.3300	0.6527
FY34	0.0429	0.2859	0.3288	0.1574	0.0627	0.2201	0.5489
FY35	0.0369	0.2832	0.3200	0.1709	0.0927	0.2635	0.5836
FY36	0.0432	0.2406	0.2838	0.1916	0.0842	0.2758	0.5596
FY37	0.0358	0.2203	0.2561	0.1647	0.1071	0.2718	0.5278
FY38	0.0376	0.1924	0.2299	0.1515	0.0605	0.2120	0.4419
FY39	0.0405	0.1975	0.2380	0.1529	0.0744	0.2273	0.4653
FY40	0.0348	0.1903	0.2251	0.1675	0.0585	0.2260	0.4511
FY41	0.0367	0.1933	0.2300	0.1586	0.0625	0.2211	0.4511
FY42	0.0372	0.1911	0.2283	0.1489	0.1527	0.3015	0.5298
FY43	0.0360	0.1910	0.2290	0.1572	0.0766	0.2339	0.4628
FY44	0.0429	0.2002	0.2431	0.1591	0.0548	0.2139	0.4570
FY45	0.0393	0.1888	0.2281	0.1637	0.0571	0.2208	0.4489
FY46	0.0447	0.1955	0.2402	0.1682	0.0840	0.2522	0.4924
FY47	0.0360	0.1897	0.2257	0.1671	0.1182	0.2853	0.5110
FY48	0.0349	0.1899	0.2248	0.1556	0.0756	0.2311	0.4560
FY49	0.0419	0.2027	0.2446	0.1872	0.0801	0.2673	0.5119
FY50	0.0354	0.1888	0.2242	0.1499	0.0616	0.2116	0.4357
FY51	0.0384	0.1959	0.2343	0.1644	0.1651	0.3296	0.5639
FY52	0.0405	0.1998	0.2402	0.1521	0.0485	0.2005	0.4407
FY53	0.0364	0.1799	0.2162	0.1239	0.0392	0.1631	0.3794
Weighted average:	0.0383	0.2343	0.2726	0.1608	0.0816	0.2424	0.5150
Add: Enabling charge (for details, please see pages that follow)				0.1136	0.0000	0.1136	0.1136
Total tariff:	0.0383	0.2343	0.2726	0.2744	0.0816	0.3559	0.6285

Since KE is a vertically integrated power utility and carry a unique position due to brown field nature of its power plants with entity level consumption, it intends to follow a billing regime for capacity payment based on available (net of outage allowances) basis. Accordingly, in order to recover projected fixed costs, Management has computed capacity part at respective availability/ utilization factor across all power plants of KE. In terms of total fixed cost recovery on an annual basis, KE's proposed Fixed cost component is expected to be indifferent from tariff computation being practiced under Take or Pay regime for other IPPs.

Since KE operates as VIU company, it has a central enabling/support function serving all three business segments of the business. Central costs are allocated to each business segment (generation, transmission and distribution)

Allocation of enabling charge to O&M tariff (Unit 1 & 2)

Average Enabling cost (per annum) Unit 1	Average tariff component (per kWh) Unit 1
PKR 391.9	**PKR 0.1136**

Average Enabling cost (per annum) Unit 2	Average tariff component (per kWh) Unit 2
PKR 393.0	**PKR 0.1136**

- Per Management, enabling costs represent costs apportioned to BQPS III by departments, such as Human Resource Management, Information Technology, Marcom, Business Development (including IPP department), Security, Corporate Affairs, CFO Office and CEO Office etc., for provision of shared services to BQPS III.
- The aforementioned costs are directly incurred by the respective departments and subsequently are re-allocated to the generation, transmission and distribution segments, using re-allocation basis provided by the respective departments (generally based on their own assessment of time spent or relevance of cost between generation, transmission and distribution segments).

- Ultimately, projected cost assigned to generation segment is spread between six plants based on the numbers of unit sent out.
- Such costs are generally covered as part of the administrative costs claim in the fixed O&M local component of the tariff allowed to IPPs.

Key findings

BQPS III includes 2 single shaft units. Accordingly, any reference of similar technology with same configuration of single shaft (common generator for GT and ST) could not be found in Pakistan, however, the closest benchmark with respect to performance parameters were Balloki and HBS. Due to data limitation, IC is not in a position to benchmark overall enabling cost allocation to BQPS III. Accordingly, these have been analyzed at FOM local level.

Source: Management data

Overall BQPS III O&M cost tariff is slightly higher than HBS and lower than Balloki

Tariff components	BQPS III				(A) HBS[1]		(B) Balloki[1]		Average of A - B	
	Unit 1		Unit 2							
	PKR / kWh	%share	PKR / kWh	%share	PKR / kWh	%share	PKR / kWh	%share	PKR / kWh	%share
VOM local	0.0384	6.1%	0.0383	6.1%	-	0.0%	-	0.0%	-	0.0%
VOM foreign	0.2346	37.3%	0.2343	37.3%	0.2656	44.3%	0.2963	46.0%	0.2809	45.2%
Total VOM	**0.2730**	**43.4%**	**0.2726**	**43.4%**	**0.2656**	**44.3%**	**0.2963**	**46.0%**	**0.2809**	**45.2%**
FOM local	0.2745	43.6%	0.2744	43.6%	0.0410	6.8%	0.0413	6.4%	0.0411	6.6%
FOM foreign	0.0820	13.0%	0.0816	13.0%	0.2934	48.9%	0.3062	47.6%	0.2998	48.2%
Total FOM	**0.3565**	**56.6%**	**0.3559**	**56.6%**	**0.3344**	**55.7%**	**0.3475**	**54.0%**	**0.3410**	**54.8%**
Total O&M tariff	**0.6295**	**100.0%**	**0.6285**	**100.0%**	**0.6000**	**100.0%**	**0.6438**	**100.0%**	**0.6219**	**100.0%**

Key technical specifications	BQPS III	NPPMCL - HBS	NPPMCL – Balloki
Net capacity (MW)	899.62	1,207.9	1,198.6
Efficiency (net at LHV)	59.23%	62.4%	61.6%
Fuel	RLNG	RLNG	RLNG
GTs type	SGT5-4000F	GE 9HA-1	GE 9HA-1
Plant configuration	2 x (1GT + 1HRSG + 1ST)	2 GTs + 2 HRSGs + 1 ST	2 GTs + 2 HRSGs + 1 ST
Generation license period	30 years	30 years	30 years
Average availability / utilization factor for tariff benchmarking	88.57% [2]	88.57% [1]	88.57% [1]

Key findings

BQPS III includes 2 single shaft units. Accordingly, any reference of similar technology with same configuration of single shaft (common generator for GT and ST) could not be found in Pakistan, however, the closest benchmark with respect to performance parameters were Balloki and HBS. BQPS III performance parameters are subject to change based on third party / NEPRA tests to be performed at COD.

Overall BQPS III O&M cost tariff is slightly higher than HBS and lower than Balloki.

Cost mix alignment:

Fixed cost ratio in BQPS III is fairly aligned with the benchmarks. Foreign cost component of BQPS III (i.e. average of 50.3% for Unit 1 and Unit 2) is lower than HBS (93.2%) and Balloki (93.6%).

Enabling cost benchmarking:

Enabling costs when analyzed at FOM local level appear on a higher side. This may be attributable to different operating model / governance structure being followed at benchmark power plant.

Source: Management data and NEPRA website

[1] Revised indexed tariff for April to June 2022 quarter adjusted for PKR to USD exchange rate of 206 and latest available CPI of June 2020 (i.e. 269.27 as per NEPRA determinations), adjusted for CPI of 8.9% (FY21) and 9.0% (FY22) respectively. Further, fixed O&M components have been grossed up at 88.57% (representing average projected availability of BQPS III).

[2] Average availability takes into consideration the annual availability of 90% (covering annual scheduled outage & forced outage allowance) along with the impact of periodic major / minor overhauls of GTs / STs in line with outages allowance given to IPPs under applicable Power Policies

Indexations being requested by BQPS III are aligned with recent determinations of NEPRA for comparable thermal power plants

Indexation	BQPS III	HBS	Balloki
Variable O&M – Local	• Indexed with Pak CPI (Quarterly)	• Indexed with Pak CPI (Quarterly)	• Indexed with Pak CPI (Quarterly)
Variable O&M – Foreign	• Indexed with US CPI and USD to PKR exchange rate (Quarterly)	• Indexed with US CPI and USD to PKR exchange rate (Quarterly)	• Indexed with US CPI and USD to PKR exchange rate (Quarterly)
Fixed O&M - Local	• Indexed with Pak CPI (Quarterly)	• Indexed with Pak CPI (Quarterly)	• Indexed with Pak CPI (Quarterly)
Fixed O&M - Foreign	• Indexed with US CPI and USD to PKR exchange rate (Quarterly)	• Indexed with US CPI and USD to PKR exchange rate (Quarterly)	• Indexed with US CPI and USD to PKR exchange rate (Quarterly)

Source: Management data and NEPRA website

5 Adjusted O&M cost and average tariff on HSD operations

Adjusted reference cumulative O&M cost (un-indexed) during FY24 – FY53 unit wise (excluding enabling cost)

Key assumptions for HSD operations

- HSD has been considered by the Management as a back-up fuel for BQPS III.
- Provision of HSD storage tank is not considered under EPC contract, however, interconnection from storage facility of BQPS-II is provided with day tank of BQPS-III (Capacity ~ 3,200M³) through forwarding skid.
- KE has considered to convert 01 storage tanks (Each Capacity ~ 10,000M³) of HFO at BQPS-I to HSD storage tanks. Conversion of HFO tanks to HSD includes complete rehabilitation of tanks, decanting station for tank lorries, HSD forwarding skid for transfer of HSD to BQPS-III and provision of fire water deluge system for HSD system.
- HSD Severity factor of 1.5 i.e., (1hr of HSD ~ 1.5hrs on Gas) has been considered as per OEM data and outages projection is reflected accordingly.
- Following load factor assumptions have been used:

Unit 1	FY	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
	Factor	90.0%	90.0%	87.5%	90.0%	90.0%	90.0%	90.0%	86.2%	90.0%	90.0%	90.0%	90.0%	75.0%	90.0%	90.0%
	FY	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53
	Factor	87.5%	90.0%	90.0%	90.0%	90.0%	86.2%	90.0%	90.0%	90.0%	90.0%	74.9%	90.0%	90.0%	90.0%	90.0%

Unit 2	FY	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
	Factor	90.0%	90.0%	87.5%	90.0%	90.0%	90.0%	90.0%	86.2%	90.0%	90.0%	90.0%	90.0%	75.0%	90.0%	90.0%
	FY	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53
	Factor	87.5%	90.0%	90.0%	90.0%	90.0%	86.2%	90.0%	90.0%	90.0%	90.0%	74.9%	90.0%	90.0%	90.0%	90.0%

- PKR to USD exchange assumption for conversion of foreign cost has been assumed as 206.0.

Adjusted O&M cost (FY24 – FY53) | (excluding enabling cost)

Total O&M cost | PKR 118.9b

Variable | PKR 68.6b (57.7%)

Local	Foreign
PKR 9.8b | (14.3%)	PKR 58.8b | (85.7%)

Fixed | PKR 50.3b (42.3%)

Local	Foreign
PKR 33.4b | (66.3%)	PKR 17.0b | (33.7%)

Key findings

Projected cost has been substantiated as reasonable, subject to identified adjustments addressed during the course of this engagement.

Reference cumulative O&M cost Unit 1 & 2 (un-indexed) during FY24 – FY53 is PKR 59.4b & PKR 59.5b (excluding enabling cost)

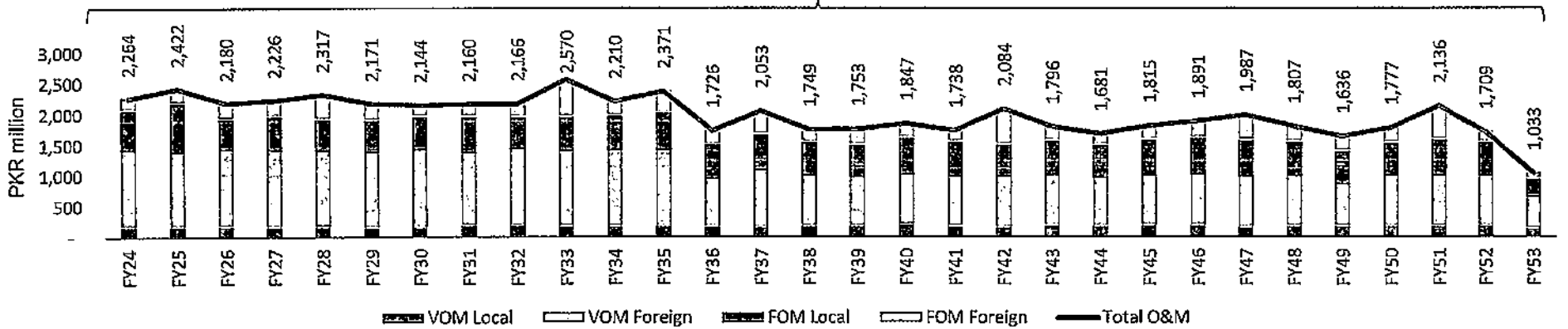
Unit wise bifurcation

Total O&M cost over tariff control period | PKR 59.4b (Unit 1)		Total O&M cost over tariff control period | PKR 59.5b (Unit 2)	
Variable | PKR 34.3b (57.7%)		Variable | PKR 34.3b (57.7%)	
Local PKR 4.9b (14.3%)	Foreign PKR 29.4b (85.7%)	Local PKR 4.9b (14.3%)	Foreign PKR 29.4b (85.7%)
Fixed | PKR 25.2b (42.3%)		Fixed | PKR 25.2b (42.3%)	
Local PKR 16.7b (66.2%)	Foreign PKR 8.5b (33.8%)	Local PKR 16.7b (66.3%)	Foreign PKR 8.5b (33.7%)

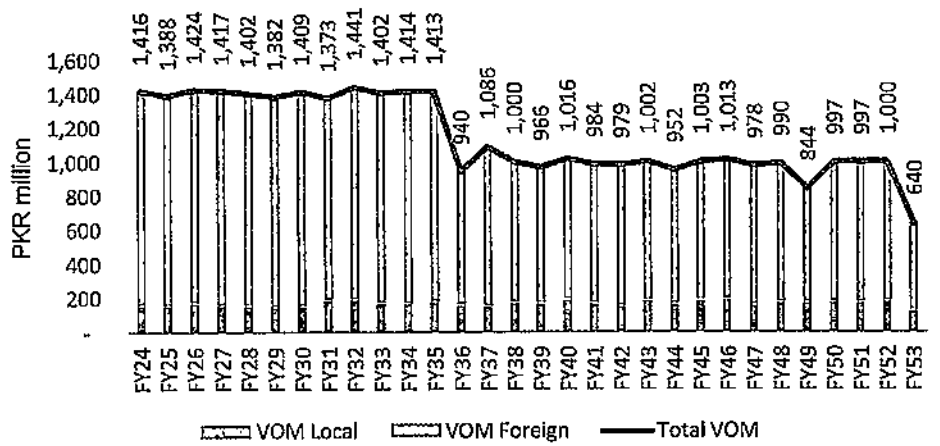
Adjusted total O&M costs mix and trend (unit 1) (excluding enabling cost)

Total adjusted reference O&M cost (un-indexed)

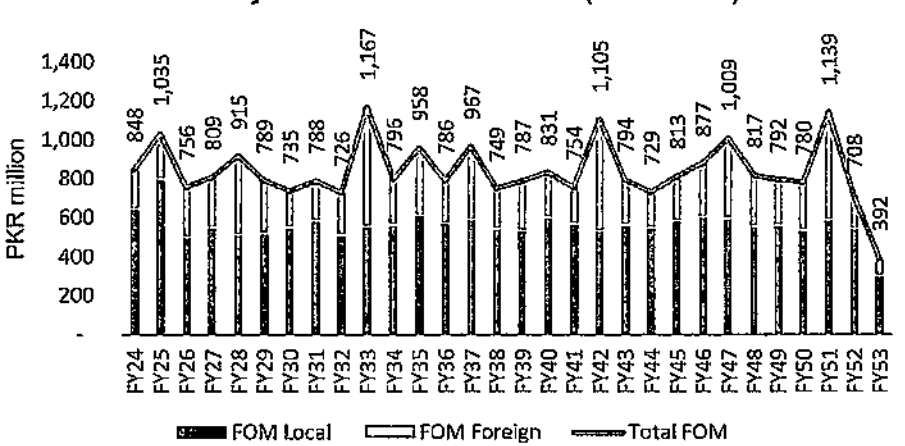
Average availability / utilization: 88.57%



Total adjusted reference VOM cost (un-indexed)



Total adjusted reference FOM cost (un-indexed)



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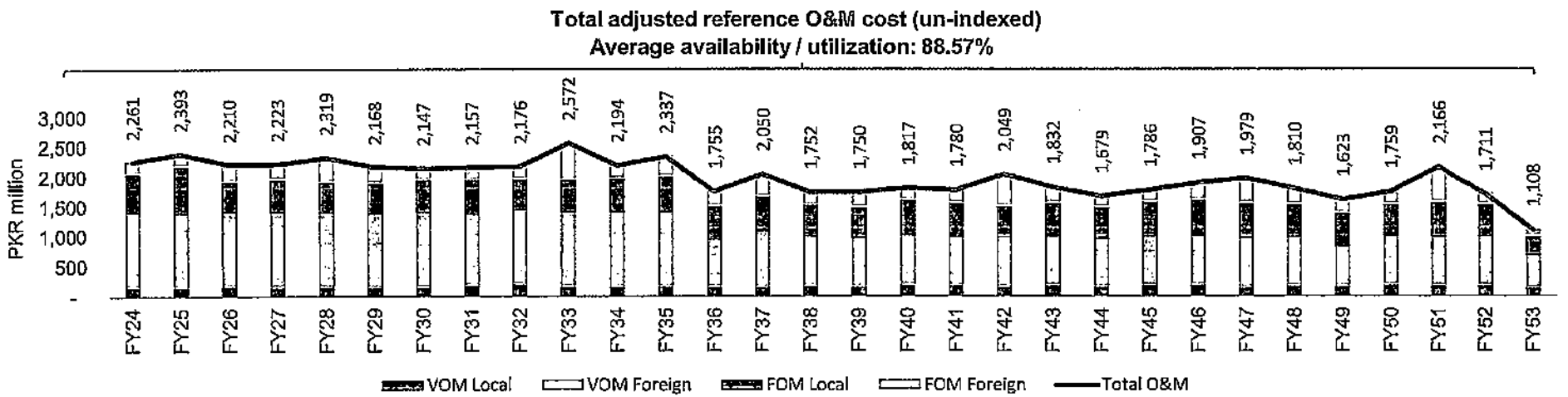

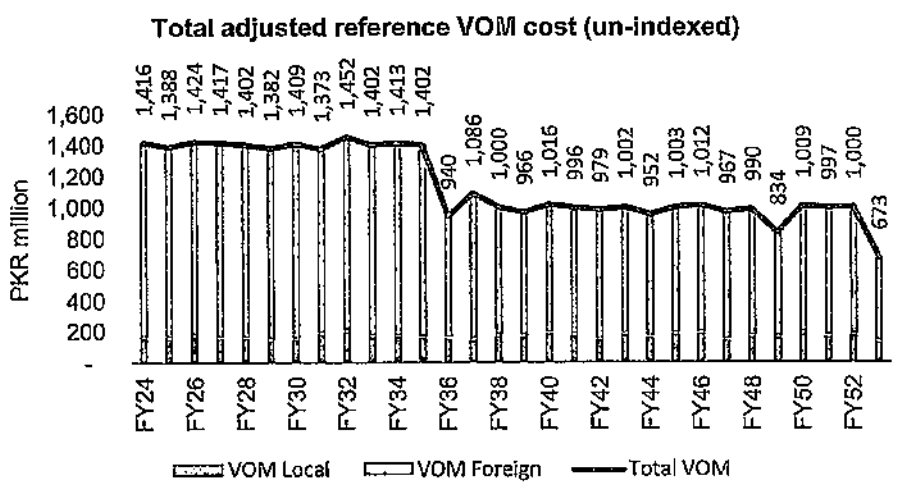

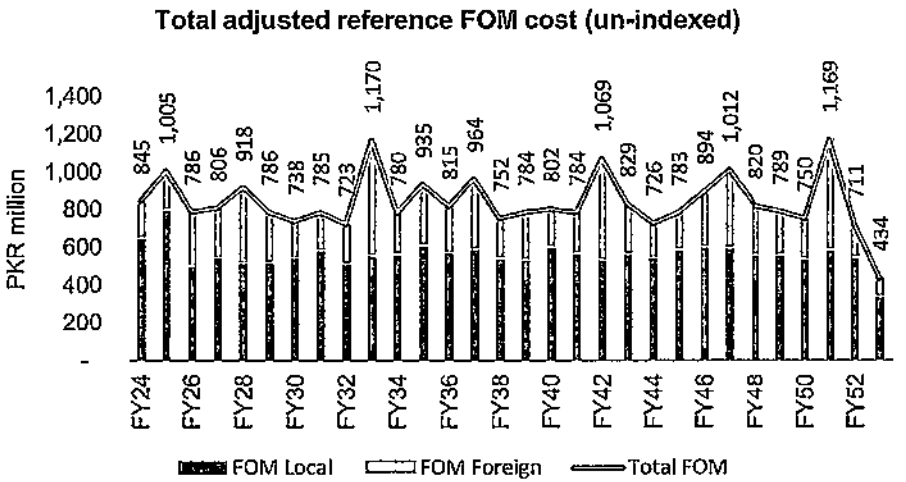

Computation of tariff based on projected plant availability for both FOM and VOM components – (Unit 1)

Keeping the expected fuel mix variation in purview, KE has assumed a slightly rationalized availability factor over the tariff control period. The same has been considered for the tariff computation. Below is the pant availability / load factor used for the tariff computation of both variable and fixed components.

Plant availability / Load factor used for both variable and fixed components:

Unit 1	FY	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
	Factor	90.0%	90.0%	87.5%	90.0%	90.0%	90.0%	90.0%	86.2%	90.0%	90.0%	90.0%	90.0%	75.0%	90.0%	90.0%
	FY	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53
	Factor	87.5%	90.0%	90.0%	90.0%	90.0%	86.2%	90.0%	90.0%	90.0%	90.0%	74.9%	90.0%	90.0%	90.0%	90.0%

Year	Variable O&M			Fixed O&M			Total
	Local	Foreign	Total	Local	Foreign	Total	
FY24	0.0552	0.4470	0.5023	0.2278	0.0730	0.3008	0.8031
FY25	0.0542	0.4382	0.4924	0.2819	0.0851	0.3671	0.8595
FY26	0.0613	0.4582	0.5195	0.1812	0.0947	0.2759	0.7953
FY27	0.0542	0.4485	0.5028	0.1927	0.0943	0.2870	0.7897
FY28	0.0546	0.4426	0.4972	0.1805	0.1440	0.3245	0.8217
FY29	0.0505	0.4397	0.4902	0.1819	0.0981	0.2800	0.7702
FY30	0.0518	0.4481	0.4999	0.1927	0.0681	0.2608	0.7607
FY31	0.0677	0.4410	0.5087	0.2150	0.0769	0.2919	0.8006
FY32	0.0655	0.4455	0.5110	0.1797	0.0778	0.2575	0.7685
FY33	0.0579	0.4396	0.4975	0.1948	0.2194	0.4142	0.9117
FY34	0.0585	0.4434	0.5019	0.1980	0.0843	0.2823	0.7842
FY35	0.0605	0.4407	0.5012	0.2150	0.1249	0.3399	0.8412
FY36	0.0650	0.3354	0.4004	0.2410	0.0935	0.3345	0.7349
FY37	0.0517	0.3337	0.3854	0.2072	0.1357	0.3430	0.7283
FY38	0.0594	0.2953	0.3547	0.1906	0.0752	0.2658	0.6205
FY39	0.0600	0.2924	0.3524	0.1924	0.0947	0.2870	0.6395
FY40	0.0660	0.2943	0.3603	0.2107	0.0840	0.2948	0.6550
FY41	0.0577	0.2913	0.3490	0.1995	0.0682	0.2677	0.6167
FY42	0.0522	0.2953	0.3475	0.1873	0.2046	0.3919	0.7394
FY43	0.0642	0.2915	0.3557	0.1979	0.0839	0.2818	0.6374
FY44	0.0599	0.2928	0.3527	0.2002	0.0700	0.2702	0.6229
FY45	0.0642	0.2916	0.3558	0.2059	0.0824	0.2883	0.6441
FY46	0.0655	0.2941	0.3596	0.2116	0.0997	0.3113	0.6709
FY47	0.0539	0.2931	0.3470	0.2103	0.1476	0.3579	0.7049
FY48	0.0592	0.2922	0.3513	0.1957	0.0941	0.2898	0.6411
FY49	0.0714	0.2884	0.3597	0.2355	0.1020	0.3375	0.6972
FY50	0.0614	0.2924	0.3538	0.1887	0.0880	0.2767	0.6305
FY51	0.0591	0.2947	0.3538	0.2069	0.1973	0.4042	0.7580
FY52	0.0616	0.2931	0.3547	0.1913	0.0600	0.2513	0.6060
FY53	0.0648	0.2764	0.3411	0.1567	0.0524	0.2091	0.5502
Weighted average	0.0595	0.3570	0.4165	0.2025	0.1032	0.3057	0.7222
Add: Enabling charge				0.1429	0.0000	0.1429	0.1429
Total Tariff	0.0595	0.3570	0.4165	0.3454	0.1032	0.4486	0.8650

Since KE is a vertically integrated power utility and carry a unique position due to brown field nature of its power plants with entity level consumption, it intends to follow a billing regime for capacity payment based on available (net of outage allowances) basis. Accordingly, in order to recover projected fixed costs, Management has computed capacity part at respective availability/ utilization factor across all power plants of KE. In terms of total fixed cost recovery on an annual basis, KE's proposed Fixed cost component is expected to be indifferent from tariff computation being practiced under Take or Pay regime for other IPPs.

Computation of tariff based on projected plant availability for both FOM and VOM components – (Unit 2)

Keeping the expected fuel mix variation in purview, KE has assumed a slightly rationalized availability factor over the tariff control period. The same has been considered for the tariff computation. Below is the pant availability / load factor used for the tariff computation of both variable and fixed components.

Plant availability / Load factor used for both variable and fixed components:

Unit 2	FY	23	25	26	27	28	29	30	31	32	33	34	35	36	37	38
	Factor	90.0%	90.0%	87.5%	90.0%	90.0%	90.0%	90.0%	86.2%	90.0%	90.0%	90.0%	90.0%	75.0%	90.0%	90.0%
	FY	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53
	Factor	87.5%	90.0%	90.0%	90.0%	90.0%	86.2%	90.0%	90.0%	90.0%	90.0%	74.9%	90.0%	90.0%	90.0%	90.0%

Year	Variable O&M			Fixed O&M			Total
	Local	Foreign	Total	Local	Foreign	Total	
FY24	0.0552	0.4470	0.5023	0.2278	0.0719	0.2998	0.8020
FY25	0.0542	0.4382	0.4924	0.2819	0.0747	0.3566	0.8490
FY26	0.0613	0.4582	0.5195	0.1812	0.1054	0.2866	0.8061
FY27	0.0542	0.4485	0.5028	0.1927	0.0932	0.2859	0.7887
FY28	0.0546	0.4426	0.4972	0.1805	0.1450	0.3255	0.8227
FY29	0.0505	0.4397	0.4902	0.1819	0.0971	0.2789	0.7691
FY30	0.0518	0.4481	0.4999	0.1927	0.0692	0.2619	0.7617
FY31	0.0677	0.4410	0.5087	0.2150	0.0758	0.2908	0.7995
FY32	0.0697	0.4455	0.5152	0.1797	0.0768	0.2565	0.7717
FY33	0.0579	0.4396	0.4975	0.1948	0.2204	0.4152	0.9127
FY34	0.0585	0.4429	0.5014	0.1980	0.0789	0.2769	0.7783
FY35	0.0563	0.4412	0.4975	0.2150	0.1166	0.3316	0.8291
FY36	0.0650	0.3354	0.4004	0.2410	0.1060	0.3470	0.7475
FY37	0.0517	0.3337	0.3854	0.2072	0.1347	0.3419	0.7273
FY38	0.0594	0.2953	0.3547	0.1906	0.0762	0.2668	0.6215
FY39	0.0600	0.2924	0.3524	0.1924	0.0936	0.2860	0.6384
FY40	0.0660	0.2943	0.3603	0.2107	0.0736	0.2843	0.6446
FY41	0.0619	0.2913	0.3533	0.1995	0.0786	0.2781	0.6314
FY42	0.0522	0.2953	0.3475	0.1873	0.1921	0.3794	0.7269
FY43	0.0642	0.2915	0.3557	0.1979	0.0964	0.2943	0.6499
FY44	0.0599	0.2928	0.3527	0.2002	0.0689	0.2691	0.6218
FY45	0.0642	0.2916	0.3558	0.2059	0.0719	0.2778	0.6336
FY46	0.0655	0.2936	0.3591	0.2116	0.1058	0.3174	0.6765
FY47	0.0497	0.2936	0.3432	0.2103	0.1487	0.3590	0.7022
FY48	0.0592	0.2922	0.3513	0.1957	0.0951	0.2908	0.6422
FY49	0.0671	0.2884	0.3555	0.2355	0.1008	0.3363	0.6918
FY50	0.0657	0.2924	0.3580	0.1887	0.0776	0.2662	0.6242
FY51	0.0591	0.2947	0.3538	0.2069	0.2078	0.4147	0.7685
FY52	0.0616	0.2931	0.3547	0.1913	0.0610	0.2523	0.6070
FY53	0.0620	0.2561	0.3181	0.1559	0.0493	0.2053	0.5233
Weighted average	0.0594	0.3563	0.4157	0.2023	0.1026	0.3050	0.7207
Add: Enabling charge				0.1429	0.0000	0.1429	0.1429
Total tariff	0.0594	0.3563	0.4157	0.3452	0.1026	0.4478	0.8635

Since KE is a vertically integrated power utility and carry a unique position due to brown field nature of its power plants with entity level consumption, it intends to follow a billing regime for capacity payment based on available (net of outage allowances) basis. Accordingly, in order to recover projected fixed costs, Management has computed capacity part at respective availability/ utilization factor across all power plants of KE. In terms of total fixed cost recovery on an annual basis, KE's proposed Fixed cost component is expected to be indifferent from tariff computation being practiced under Take or Pay regime for other IPPs.

Overall variable O&M tariff of BQPS III is higher than HBS and Balloki power plants

Tariff components	BQPS III Unit 1		BQPS III Unit 2		HBS[1]		Balloki[1]	
	PKR / kWh	%share	PKR / kWh	%share	PKR / kWh	%share	PKR / kWh	%share
VOM local	0.0595	14.3%	0.0594	14.3%	-	0.0%	-	0.0%
VOM foreign	0.3570	85.7%	0.3563	85.7%	0.3445	100.0%	0.3760	100.0%
Total VOM	**0.4165**	**100.0%**	**0.4157**	**100.0%**	**0.3445**	**100.0%**	**0.3760**	**100.0%**

Key technical specifications	BQPS III	HBS	Balloki
Net capacity (MW)	714.96	1,207.9	1,198.6
Efficiency (net at LHV)	54.04%	62.4%	61.6%
Fuel	HSD	HSD	HSD
GTs type	SGT5-4000F	GE 9HA-1	GE 9HA-1
Plant configuration	2 x (1GT + 1HRSG + 1ST)	2 GTs + 2 HRSGs + 1 ST	2 GTs + 2 HRSGs + 1 ST
Generation license period	30 years	30 years	30 years
Average availability / utilization factor for tariff benchmarking	88.57% [2]	N/A	N/A

Source: Management data and NEPRA website

Key findings

BQPS III includes 2 single shaft units. Accordingly, any reference of similar technology with same configuration of single shaft (common generator for GT and ST) could not be found in Pakistan, however, the closest benchmark with respect to performance parameters were Balloki and HBS. BQPS III performance parameters are subject to change based on third party / NEPRA tests to be performed at COD.

Overall variable O&M tariff of BQPS III is higher than HBS and Balloki.

CSA numbers are based on OEM quotation i.e., subject to adjustment as per signing of CSA agreement. Moreover, due to common generator in single shaft configuration, ST is also covered under CSA pricing in addition to GTs which may not be required in benchmark projects.

Moreover, one time cost for rehabilitation of BQPS I HFO tanks to HSD, decanting station, forwarding skid and associated system. Higher cost also pertains to extensive maintenance needs related to sea water once through cooling system, corrosive environment and usage of sea water for RO water treatment plant etc.

[1] Revised indexed tariff for April to June 2022 quarter adjusted for PKR to USD exchange rate of 206.

[2] Average availability takes into consideration the annual availability of 90% (covering annual scheduled outage & forced outage allowance) along with the impact of periodic major / minor overhauls of GTs / STs in line with outages allowance given to IPPs under applicable Power Policies

6 Abbreviations

Abbreviations

Periods

Budgeted period	FY23
Forecast period	FY24 – FY53

Abbreviations

AGP	Advanced Gas Path
BQPS I	Bin Qasim Power Station – I
BQPS II	Bin Qasim Power Station – II
BQPS III PP	FY24 – FY53
BQPS III	Bin Qasim Power Station – III
BTU	British Thermal Unit
CAPEX	Capital Expenditure
CEO	Chief Executive Officer
CFO	Chief Financial Officer
COD	Commercial Operations Date
CSA	Comprehensive Services Agreement
CY	Calendar Year
EUR	Euro
FFH	Factored Fired Hours
Financial Consultant	EY Ford Rhodes
FOM	Fixed Operations & Maintenance
FY	Financial Year
GE	General Electric
GT	Gas Turbine
HGPI	Hot Gas Path Inspection
HRSG	Heat Recovery Steam Generator
HSD	High Speed Diesel
HVAC	Heating, Ventilating and Air-Conditioning
I&C	Instrumentation and Controls
IC	Independent Consultant
IE	Independent Engineer
IPP	Independent Power Producer
JV	Joint Venture
KE	K-Electric Limited
KTGEPS	Korangi Town Gas Engine Power Station
KCCPP	Korangi Combined Cycle Power Plant
KV	Kilovolt
kWH	Kilowatt Hour
LHV	Lower Heating Value
LV	Low Voltage
MI	Major Inspection

Abbreviations

HV	High Voltage
MW	Megawatt
MYT	Multi-Year Tariff
NPPMCL	National Power Parks Management Company (Private) Limited
NPPMCL – HBS	National Power Parks Management Company (Private) Limited – Haveli Bahadur Shah plant
NEPRA	National Electric Power Regulatory Authority
O&M	Operations and Maintenance
Pak CPI	Pakistan Consumer Price Index
PKR	Pakistani Rupee
PKRm	PKR millions
PO	Purchase Orders
PTPL	Punjab Thermal Power (Private) Limited
REVEX	Revenue Expenditure
RLNG	Regassified Liquefied Natural Gas
SGEPS	S.I.T.E Gas Engine Power Station
ST	Steam Turbine
Technical cum lead consultant	Operation and Maintenance Solutions (Private) Limited
US CPI	United States Consumer Price Index
USD	United States Dollar
VOM	Variable Operation & Maintenance

Section C
Korangi Combined Cycle Power Plant – (KCCPP)

Table of contents - KCCPP

1. Korangi Combined Cycle Power Plant (KCCPP)

This section covers details of KCCP Plant (referred as "KCCPP"), and tariff being requested.

1.1. Introduction to the plant – KCCPP

KCCPP is a 247.5 MW (ISO Capacity) combined cycle power Plant situated at Korangi Creek area of Karachi. It is part of the overall fleet of generating stations owned by K-Electric and commissioned in the year 2008.

Principal Features

1. The Power Plant is situated within the Karachi city at Korangi Creek area road adjacent PAF Korangi Base Ibrahim Hyderi Karachi.
2. The plant comprises of 4GTs of 48.375 MW each and two STs of 1 x 26.50 MW + 1 x 27.50 MW (Installed Capacity at ISO Condition)
3. The project started its commercial operations in November 2008 to September with four (4) GTs and one (1) ST.
4. Subsequently, second Steam Turbine was added which started its commercial operation on April 30, 2015.
5. KE was granted Generation License (GL/04/2002) on November 18, 2002 and has been modified from time to time to account for additions / deletions of power plants to / from KE's generation fleet.
6. In March 2009, NEPRA issued Modification II to the Generation License no. GL/04/2002 to the Company in accordance with the prevailing regulatory regime, adding KCCP plant in the fleet.

Technical Capability

Plant comprises of 04 Gas Turbine (General Electric, LM6000 PC Sprint), 02 HRSGs and 02 Steam Turbine (General Electric, Thermodyn). Plant comprises of 02 combined cycle blocks each having 02 gas turbines, 01 HRSG and 01 steam turbine. The EPC Contractor for Phase I: 4 GTs + ST-2 was METKA S.A and for Phase II ST-1 EPC Contractor was IEG A.S. Plant can be operated both in combined cycle and simple cycle modes, Primary fuel for the Plant operation is natural gas, supplied by Sui Southern Gas Company Ltd (SSGC) through a dedicated 24-inch pipeline, while the HSD is used backup fuel. Plant is connected to the K-Electric transmission system through 220 KV GIS.

Summary of Plant Performance for last 10 years The Key Factors

The key factors of the plant performance for last 10 years are summarized as follows:

Fiscal Year	Total Energy Supplied (Gross) (GWh)	Average Plant Availability (%)[1]
FY 2012-2013	795.109	88%
FY 2013-2014	798.909	67%
FY 2014-2015	891.552	85%
FY-2015-2016	1364.080	90%
FY-2016-2017	1123.810	85%
FY-2017-2018	1001.010	92%
FY-2018-2019	1256.677	85%

[1] Average Plant Availability = Available Capacity / (Gross Dependable Capacity)

Fiscal Year	Total Energy Supplied (Gross) (GWh)	Average Plant Availability (%)[1]
FY-2019-2020	1157.527	96%
FY-2020-2021	1027.190	91%
FY-2021-2022	596.158	88%

Modifications & Improvements

The upkeep of the plant and equipment has always been the priority; therefore, the Company has invested heavily in replacing, modifying and improving the plant equipment which has made it possible for the Company to supply power to K-Electric's users for a further 14 years.

For details of modifications and improvements, please refer **KCCPP – Annexure A (i).**

Operation Summary

Korangi Power Complex is combined cycle plant in KE fleet with fuel flexibility with options to operate on both gas and liquid fuel. The Company keeps the plant in best shape to offer maximum availability all year round. The year wise load pattern of dispatch (as shown above) from the Company better explains its contribution during the year and the plant's role as part of the total generation projects of KE.

Health & Safety

The facility has been operational for last 1800 Days (As on 20-05-22; Last LTI incident happened in June 2017) without any major incident complying Quality, Health, Process Safety and Environment related standards. It is achieved through good O&M practices and having skilled plant operations team. The plant premises has a first aid facility backed up by a 24/7 ambulance. The Company has well established Process Safety Procedures covering:

i. Hazardous Substance Management

ii. Gas Turbine Fire & Gas System

iii. Plant Fire Suppression System Maintenance & testing

iv. Contractor Safety Management

v. O&M SOPs

Safety Procedures

Please refer **KCCPP – Annexure A (ii)** for Safety procedures.

Project Details

For project details including site details, plant reference conditions & plant machinery details, please refer **KCCPP – Annexure A (iii).**

Fuel Source

a) Indigenous Natural Gas / RLNG from SSGC

Gas (pipeline quality) is supplied by Sui southern Gas Company to KCCPP through a Approx. 4-KM dedicated 24 inch from its network.

Gas Supply is connected with plant battery limit through Gas Receiving station (GRS) where further filtration and metering is performed before being used at fuel gas compressors.

Further, KCCPP GTs required pressure is 46 bar for which compressors are used which is a significant contributor to the auxiliary consumption of the plant i.e., around 7.7 MW.

Further, KE is also considering alternate RLNG supplier so that the requirement of gas pressure is fulfilled considering SSGC is not able to provide gas pressure up to the mark. High pressure RLNG usage will result in saving of auxiliary consumption of 7.7 MW if three Natural Gas Compressors are shut down. Impact of saving of auxiliary consumption if two / one natural gas compressors are shutdown can be calculated based on comparison of with and without compressor result (based on Independent Engineer's heat rate test report conducted in 2019). Impact of the same on Net efficiency has been discussed in below under *Plant Capacity and Heat rate.*

Moreover, agreement with RLNG/ Gas supplier may involve Take or Pay arrangements, for which KE will be required to ensure regular payments for Fuel Charges as per the Gas Supply Agreements regardless of plant operations. Accordingly, KE requests the Authority to allow these costs as pass through in the proposed tariff. Alternatively, the Authority may allow KE to consider the plant as a must run under the Economic Merit Order (EMO) to the extent of Take or Pay Gas arrangements.

b) HSD fuel

HSD fuel is supplied by PSO through tank lorries.

Fuel Transportation and Decanting System

The High-Speed Diesel oil is transported to the site through oil tanker trucks and is decanted through unloading station pumps into the 02 storage tanks. There are 4 decanting pumps 02 remains in operation while 02 remains stand-by pumps. The unloading pumps are designed for unloading 2 oil tankers truck simultaneously in approx. 60 minutes.

Fuel Storage Infrastructure

HSD procured from PSO is stored in 2 HSD storage tanks, both having a capacity of 8,000 m^3 each. Fuel is pumped to 1,500 m^3 day tank through Alfa Laval Purifiers. From Day Tank oil is pumped to Gas Turbine area through forwarding pump while being filtered at 5um level to meet cleanliness level defined by OEM.

Cooling System

The cooling water system is based on sea water which is supplied through intake tunnels and cooling water pits where dedicated pumps are used to supply water to steam turbine condensers, chillers condensers, heat exchangers and return to sea through outlet channel. The secondary cooling system is used for cooling gas turbine/steam turbine/gas compressors and related auxiliaries.

Minimum Loading

Minimum loading of each GT is 25 MW (Gross) based on GE's recommendations (on Combined Cycle Operations). Please refer **KCCPP – Annexure A (iv)** for reference document.

Fire Protection System

The plant has a state-of-the-art Fire Protection System detail of which are given in refer **KCCPP – Annexure A (v)**

Spares & Inventories

In order to ensure reliable operations of the power plant, inventory of worth **PKR 890 million** as of June 2022 is maintained by the Company.

Plant Layout

Please refer KCCPP – **Annexure A (vi)**

Details of Major Equipment

Please refer KCCPP - **Annexure A (vii)**

Remaining Useful Life

The plant has been in operation for the last 14 years (FY09 – FY22) with a remaining licensed useful life ending on August 2039.

Factored Fired Hours operated for each gas turbine is given in the table below:

Gas Turbines	Hours Operated as of 30th June, 2022 Gas	Hours Operated as of 30th June,2022 HSD
1	69,509	1,460
2	56,471	1,295
3	73,365	1,922
4	79,673	2,240
Average	**69,754**	**1,729**

Plant Capacity and Heat Rate

Heat rate test of the Plant was conducted in September 2019 by Independent Engineer, based on which Heat rate was determined for the control period FY 2017 to FY 2023 and plant capacity was updated in the Generation License.

Test results plant at base load were as follows:

Description	KCCP - Gas	KCCP – HSD
Gross Capacity – MW (RSC)	237.078 MW	228.704
Auxiliary – MW	16.250	8.686
Net Capacity – MW (RSC)	**220.828**	**220.018**
Auxiliary %	6.854 %	3.798%
Net Heat Rate LHV Basis – btu / kWh	7379.478	7411.311
Net Efficiency LHV Basis	46.238%	46.040%
Gross Heat rate LHV Basis – btu / kWh	6873.357	7129.679
Gross Efficiency LHV Basis	49.643%	47.858%
Net Heat Rate HHV Basis – btu / kWh	8178.259	7911.771
Net Efficiency HHV Basis	41.722%	43.127%
Gross Heat rate HHV Basis – btu / kWh	7617.354	7611.121
Gross Efficiency HHV Basis	**44.794%**	**44.831%**

Accordingly, Net capacity & Heat rate (Combined cycle – Gas & HSD) for the purpose of Tariff petition has been taken from tests conducted in 2019 (Gas) & 2021 (HSD) as per IE's heat rate test reports.

Further, Net capacity & Heat rate at Open cycle on Gas are based on 3rd party tests results, whereas for HSD it has been calculated from the 3rd party combined cycle test result. KE requests the NEPRA to consider as reference for the purpose of calculation of fuel cost component of tariff.

Category	Gas fuel		HSD fuel	
	Combined cycle	Open cycle	Combined cycle	Open cycle
Gross De rated capacity – MW	237.078	184.468	228.704	180.750
Auxiliary consumption – MW	16.250	13.771	8.686	6.375
Net Capacity – MW	220.828	170.697	220.018	174.375
Auxiliary consumption %	6.85%	7.47%	3.798%	3.53%
Net HHV heat rate – btu / kWh	8178.259	10597.66	7,911.771	9,982.697

In case if RLNG is arranged from any dedicated line / alternate supplier, and compressors are not required, auxiliary consumption and heat rate will accordingly be adjusted based on impacts provided in IE's report as summarized below, please refer **KCCPP - Annexure B** for detailed extract from IE's report.

Description	Combined cycle (with 3 Compressor Load)	Combined cycle (without 3 Compressor Load)
Gross De rated capacity – MW	237.078	237.078
Auxiliary consumption – MW	16.250	8.197
Net Capacity – MW	220.828	228.881
Auxiliary consumption %	6.85%	3.46%
Heat rate btu / kwh	8,178.259	7,890.559

1.2. Tariff Mechanism

This section explains in detail the tariff mechanism of KCCPP to ensure cost reflective tariffs including component wise indexation so that all prudent costs of the plant are adequately recovered.

KE is requesting a two-part tariff, in line with IPPs i.e. Energy payments and Capacity payments on a Take-or-pay mechanism where Capacity payment shall be paid for the Available Capacity and Energy payments for the Net Electrical Output.

Available capacity has been calculated considering annual availability of 90% and additional outage allowance in the year. Accordingly, based on expected incurrence of additional outages, levelized availability of 88.66% has been calculated and has been used as Plant factor for Capacity components, so that Capacity components cover the impact of outages. Details of Outages and billing mechanism have been further discussed in detail in Section 1.3

For indexation purposes, following Indexation factors are proposed to be used sources of which given in the table below:

Indexation Factors	Sources
Local Inflation (CPI)	Pakistan Bureau of Statistics (PBS)
Foreign Inflation (US CPI)	US Bureau of Labor Statistics
Exchange rates (USD)	National Bank of Pakistan
KIBOR	State Bank of Pakistan
LIBOR / SOFR	Intercontinental Exchange /Federal Reserve Bank of New York

1.2.1. Fuel Cost

This component represents the cost of fuel for the Net Electrical Output (NEO) produced by the plant at the allowed efficiency levels and shall be indexed for any fuel price variations.

Net Electrical Output (*NEO*): The net electrical energy expressed in kWh that is generated by the Complex (or any Unit) and delivered to the Interconnection Point as measured by the Metering system.

Fuel price

KCCPP is currently operating on Gas fuel including Indigenous natural gas / RLNG while having HSD as a backup fuel.

NEO is currently recorded through meters at 220kV bus bar and is bifurcated between Indigenous natural gas / RLNG as per mechanism explained below. However, for mix operations on Gas & HSD, Separate gross readings will be taken for GTs fired on respective fuels, whereas ST gross generation on HSD & Gas will be bifurcated considering the proportion of Gas Turbine generation on HSD & Gas to the Total Gas Turbine Generation. Moreover, proportion of gross generation on HSD to total generation will be used to compute complex sent outs on HSD while the balance sent outs will be on Gas. (Sample bill for April 2020 and sample calculation for bifurcation on units generated on Gas and HSD **KCCPP – Annexure C (i)**)

Indigenous Natural Gas / RLNG – Mechanism of billing, pricing, and bifurcation

Prices for Indigenous natural gas and RLNG shall be calculated based on OGRA's notification. Prices of Indigenous natural gas are notified in PKR / mmbtu, whereas Prices of RLNG are notified by OGRA in USD / mmbtu which are then translated into PKR / mmbtu by SSGC using the daily average exchange rates issued by National bank for the month. Accordingly, SSGC mentions the rate in PKR / mmbtu on the bills.

Considering prices of Indigenous natural gas and RLNG are notified in per mmbtu, calorific value is not required for price conversion, unlike Furnace oil and HSD which are notified in PKR / M.ton and liters respectively.

At present, SSGC supplies gas to KE through single pipeline based on available gas quantity and billing is done based on Indigenous natural gas and RLNG (Distribution tariff) based on proportion of Indigenous natural gas & RLNG supplied to KE (determined by SSGC based on RLNG imports).

(Sample bills for the month of April 2020 are enclosed as **KCCPP - Annexure C (ii)**).

Units Generated by the plant are recorded through Energy Meters at the plant and then are bifurcated in Indigenous natural gas and RLNG based on proportion of Indigenous natural gas and RLNG in MMBTUs. MMBTUs for Indigenous natural gas and RLNG are calculated using consumption appearing in SCF on bills and actual calorific value (btu / scf) appearing on the bills (Sample calculation enclosed as **KCCPP - Annexure C (iii)**)

Gas Infrastructure Development Cess (GIDC)

Currently the matter of GIDC is sub-judice and no amount is passed onto the consumers. Subsequently, if any GIDC is paid (pertaining to prior periods) based on court verdict , the same will be included in fuel price PKR / mmbtu.

RLNG from any Dedicated Line / Alternate Supplier

In future, if RLNG is procured from any dedicated line / alternate supplier, the same will be measured through separate meters and energy will be bifurcated in supply from any dedicated line / alternate supplier based on actual MMBTUs, accordingly, to apply separate prices as per respective pricing mechanism.

HSD

HSD price is quoted in PKR / liter on price as per mutual agreement based on Fuel Supply Agreement. Accordingly, Gross Calorific value and conversion factors are required to convert the price in PKR / MMBtu. Sample calculation is provided in the table below:

Description	Unit	Calculation	Amount	Source
HSD price	PKR / liter	a	219.94	Weighted average price of fuel consumed for the month
Gross Calorific value	btu / lb	b	19,731	Actual GCV for the month as per test reports
Conversion factor	lb / kg	c	2.2046	Standard conversion factor
Gross Calorific value	btu / kg	d = b x c	43,499	Calculated
Density	kg / liter	e	0.833	Actual Density for the month as per test reports
Gross Calorific value	btu / liter	f = d x e	36,252	Calculated
HSD price	PKR / MMBtu	g = (a / f) x 10^6	6,066.91	Calculated

Mechanism of Part load adjustment factor

For KCCPP, Net HHV Heat rate of 8,178.259 btu / kWh at base load on Gas fuel - combined cycle, was established based on IE's test with a part load heat rate also given at 85% load.

Considering separate tariff requests for each plant, central economic dispatch plan going forward as explained in **section 5** and the part load adjustment mechanism followed for IPPs, KE is proposing monthly part load adjustment based on actual operations for a month and part load adjustment factor given in the table as per the part load curve. enclosed as **KCCPP - Annexure D (i) to D (iv)** for combined cycle and simple cycle for Gas and HSD respectively. This mechanism of adjustment based on actual part load factor will also be consistent with other IPPs.

Part load adjustment will be based on hourly data for energy generated on plant and available capacity of station, based on which part loading % for each hour will be determined for Gas and HSD fuels. Part load factor for each hour will be calculated based on part load % and part load factors given in Part load table for Gas and HSD fuels (given in as **KCCPP - Annexure D (i) to D (iv)**). Accordingly, a weighted average part load factor for the month will be calculated for Gas and HSD which shall be denominated as PL_{Gas} and PL_{HSD} (Sample calculation for a day enclosed as **KCCPP - Annexure E.**)

Degradation factor

Reference values of heat rate and capacity (Gas – combined cycle and open cycle & HSD – combined Cycle and open cycle) are based on test conducted in 2019 for Gas and in 2021 for HSD and KE would request NEPRA to adjust the heat rate and output for each year based on

degradation table as provided in **KCCPP - Annexure F(i) and F(iv)** which is based on degradation curve given in IE's report.

Simple cycle operations

Although KCCPP is generally run on combined cycle operations, however, in case if Steam Turbine is on outage and the outage is within the allowed outage allowance, as detailed in section *Outage Allowance* and the plant is required to operate to fulfill demand based on Economic Merit Order on pricing of simple cycle operations, KE should be allowed the fuel cost at simple cycle operations.

Further, plant must be operated on simple cycle during startups when GT is synchronized, and ST is under start up. Accordingly, KE requests that fuel cost on units produced during that period shall also be allowed on simple cycle whereas Startup costs should be reduced by fuel cost claimed on units produced during start up as these will be claimed under Fuel cost.

Cost of simple cycle operations is requested to be allowed on both Gas and HSD fuels based on operations if plant is operated due to dispatch based on EMO Ranking on pricing of simple cycle operations. However, for allowing cost of simple cycle operations during startups, EMO ranking of combined cycle shall be relevant considering the intended use.

Heat rates for both combined cycle and open cycle are given under *Plant capacity and heat rate* mentioned above. KE requests that part load and degradation adjustment factor shall be applied on open cycle in the same manner as for combined cycle, based on Part load and degradation curve on simple cycle for Gas and HSD.

Energy generated on simple cycle mode will be separately recorded through logs/DCS data for application of simple cycle heat rate.

Summary of assumptions used for reference tariff

Description	Indigenous natural gas		RLNG		HSD	
	Combined cycle	Simple cycle	Combined cycle	Simple cycle	Combined cycle	Simple cycle
Net HHV heat rate	8,178.259	10,597.656	8,178.259	10,597.656	7911.771	9982.697
Fuel price PKR / MMBtu	857	857	3,300.8	3,300.8	6,066.9	6,066.9
Fuel Component PKR / kWh	7.01	9.08	26.99	34.98	48.00	60.56
RLNG price						
Fuel Price PKR / MMBtu			3,300.8	3,300.8		
HSD price						
HSD price per liter					219.94	219.94
GCV (btu / liter) – please refer section HSD					36,252	36,252

Indexation formula

The fuel cost component of tariff shall be adjusted on account of fuel price variation as per the following mechanism:

Indigenous Natural Gas

$FCCIG_{(Rev)}$	=	$FCCIG_{(Ref)} \times PIG_{(Rev)} / PIG_{(Ref)}$
Where:		
$FCCIG_{(Rev)}$	=	The revised fuel cost component on Indigenous natural gas in PKR / kWh
$FCCIG_{(Ref)}$	=	The reference fuel cost component of **PKR 7.01 / kWh** on Indigenous natural gas for Combined cycle and **PKR 9.08 / kWh** on Simple cycle
$PIG_{(Rev)}$	=	The revised net HHV Indigenous natural gas price notified by the OGRA in PKR / MMBTU
$PIG_{(Ref)}$	=	The reference net HHV Indigenous natural gas price of **PKR 857 / MMBtu**

RLNG

$FCCRLNG_{(Rev)}$	=	$FCCRLNG_{(Ref)} \times PRLNG_{(Rev)} / PRLNG_{(Ref)}$
Where:		
$FCCRLNG_{(Rev)}$	=	The revised fuel cost component on RLNG in PKR / kWh
$FCCRLNG_{(Ref)}$	=	The reference fuel cost component of **PKR 26.99 / kWh** on RLNG for combined cycle and **PKR 34.98 / kWh** on Simple cycle
$PRLNG_{(Rev)}$	=	The revised net HHV RLNG price notified by the OGRA in USD / MMBTU multiplied by exchange rate appearing on SSGC bills
$PRLNG_{(Ref)}$	=	The reference net HHV RLNG price of **PKR 3,300.8 / MMBtu**

HSD (Monthly adjustment based on weighted average price for the month)

$FCCHSD_{(Rev)}$	=	$FCCHSD_{(Ref)} \times PHSD_{(Rev)} / PHSD_{(Ref)} \times CalHSD_{(Ref)} / CalHSD_{(Rev)}$
Where:		
$FCCHSD_{(Rev)}$	=	The revised fuel cost component on HSD in PKR / kWh
$FCCHSD_{(Ref)}$	=	The reference fuel cost component of **PKR 48.00 / kWh** on HSD for combined cycle and **PKR 60.56 / kWh** for simple cycle
$PHSD_{(Rev)}$	=	The revised net HHV HSD price of HSD in PKR / liter based on weighted average formula as given below
$PHSD_{(Ref)}$	=	The reference net HHV HSD price of **PKR 219.94/ liter**
$CalHSD_{(Ref)}$	=	The revised Calorific value of HSD for the month in btu / liter as per lab tests done by reputable labs based on frequency mechanism defined in **KCCPP – Annexure G**
$CalHSD_{(Rev)}$	=	The reference Calorific value of HSD of **36,252 btu / liter**

Calculation of Weighted average HSD price for a month

HSD	Legend	Stock in Liters	Amount - PKR	Weighted average price
		i	ii	iii = ii / i
Opening	A	4,824,108	1,061	
Purchases	B	-	-	
Available for consumption	C = A + B	4,824,108	1,061	**219.94**
Less: Consumption	D	(440,080)	(97)	
Closing	E = C - D	4,384,027	964	

The calculated $FCCIG_{(Rev)}$, $FCCRLNG_{(Rev)}$ and $FCCHSD_{(Rev)}$ shall be adjusted with weighted average part load factor for the month based on calculation as explained in *Mechanism of Part load Adjustment Factor* and degradation factor under section *Degradation Factor*.

Fuel cost components

$FCCIG_{(Rev)(adj)}$	=	$FCCIG_{(Rev)} \times PL_{Gas} \times D_y$
$FCCIG\text{-}SC_{(Rev)(adj)}$	=	$FCCIG\text{-}SC_{(Rev)} \times PL_{Gas} \times D_y$
$FCCRLNG_{(Rev)(adj)}$	=	$FCCRLNG_{(Rev)} \times PL_{Gas} \times D_y$
$FCCRLNG\text{-}SC_{(Rev)(adj)}$	=	$FCCRLNG\text{-}SC_{(Rev)} \times PL_{Gas} \times D_y$
$FCCHSD_{(Rev)(adj)}$	=	$FCCHSD_{(Rev)} \times PL_{dHSD} \times D_y$
$FCCHSD\text{-}SC_{(Rev)(adj)}$	=	$FCCHSD\text{-}SC_{(Rev)} \times PL_{dHSD} \times D_y$
Where;		
SC	=	Simple cycle
PL_{Gas}	=	Weighted average Part load factor for the month for Gas operations as calculated on mechanism explained under section *"Mechanism of Part load Adjustment factor"* for combined cycle and simple cycle operations, respectively
PL_{dHSD}	=	Weighted average Part load factor for the month for HSD operations as calculated on mechanism explained under section *"Mechanism of Part load Adjustment factor"* for combined cycle and simple cycle operations, respectively
D_y	=	Degradation factor for the year based on degradation table given in **KCCPP - Annexure F (i) and Annexure F (iii) for Gas and HSD respectively**

1.2.2. O&M Expenses

Under the existing MYT structure, capital expenditure for maintenance of plant is allowed as investment plan and becomes part of Regulatory Asset base, whereas revenue expenses are allowed as part of O&M expenses.

However, as explained above, KE is proposing a tariff for remaining life of generation plant with structure in line with IPPs where both capex and revex nature of expenditures are allowed through Fixed and Variable O&M. This will help to have better visibility and align the tariff structure with CTBCM requirement and industry practice.

Accordingly, proposed O&M expenses are bifurcated in Variable and Fixed, and then further bifurcated in Forcign and local, based on nature of expenses for applying relevant indexations.

Bifurcation of O&M is as follows:

Variable O&M local

The Variable O&M Local represents plant maintenance costs consisting of both parts and services which are procured from local market in local currency by the Company. Being variable in nature, these costs are linked to plants' operating hours and incurred on some specific machine operating hours intervals.

For tariff calculation purposes, KE has calculated levelized Variable O&M Local keeping in view costs of FY 2022 and based on projected Variable O&M local for the remaining useful life of the plant, including maintenance expenses being incurred at regular intervals of hours recommended by OEM, which shall be indexed with Pak CPI at the start of each quarter.

Accordingly, levelized variable O&M cost per year **PKR 95 million per year** (translating into **PKR 0.06 / kWh** at reference CPI of **158.48** which shall be indexed with Pak CPI at the start of each quarter.

Variable O&M local (levelized)

Category	Amount – PKR million	Units at plant factor - GWh	O&M Per unit – PKR / kWh
Gas	95	1,715.04	0.0553
HSD	98	1,708.75	0.0571

Indexation formula:

$Var.\ Local.\ O\&M_{(Rev)}$	=	$Var.\ Local\ O\&M_{(Ref)} \times CPI_{(Rev)} / CPI_{(Ref)}$
Where;		
$Var.\ Local.\ O\&M_{(Rev)}$	=	Revised Variable O&M local Component of Tariff
$Var.\ Local\ O\&M_{(Ref)}$	=	Reference Variable O&M local Component of Tariff
$CPI_{(Rev)}$	=	Revised CPI – notified by Pakistan Bureau of Statistics latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
$CPI_{(Ref)}$	=	Reference CPI of **158.48** average for FY 2022

Variable O&M Foreign

The Variable O&M Foreign is for imported Gas Turbine capital spare parts, electrical spares and technical services required. Further, KE has a CSA with GE whereby GE provides planned / unplanned (limited) parts and repair services for the maintenance of GTs which mainly include Hot Section Exchange (HSE) and Major Overhauled (MOH).

KE is contractually bound for paying quarterly payment to GE for above services, fee of which is Fixed & Variable in nature. Variable Fee is linked with Plant running hours whereas, fixed fee is payable on quarterly basis.

For tariff calculation purposes, KE has calculated levelized Variable O&M Foreign keeping in view costs of FY 2022 and based on projected Variable O&M Foreign for the remaining useful life of the plant, including maintenance expenses being incurred at regular intervals of hours recommended by OEM which shall be indexed with US CPI and exchange rates at the start of each quarter.

Accordingly, levelized variable O&M Foreign component cost per year is estimated at **PKR 1,978 million** per year translating into **PKR 1.15 / kWh** at reference USD CPI of **282.03** and exchange rate of **PKR 206 / USD,** based on projected expenses which shall be indexed based on US CPI and exchange rates at the start of each quarter.

Variable O&M foreign (levelized)

Category	Amount – PKR million	Units at plant factor - GWh	O&M Per unit – PKR / kWh
Gas	1,978	1,715.04	1.1534
HSD	2,746	1,708.75	1.6070

Indexation formula:

Var. Foreign. O&M$_{(Rev)}$	=	**Var. Foreign O&M$_{(Ref)}$ x USCPI$_{(Rev)}$ / USCPI$_{(Ref)}$ x ER$_{(Rev)}$ / ER$_{(Ref)}$**
Where;		
Var. Foreign. O&M$_{(Rev)}$	=	Revised Variable O&M Foreign Component of Tariff
Var. Foreign O&M$_{(Ref)}$	=	Reference Variable O&M Foreign Component of Tariff
USCPI$_{(Rev)}$	=	The revised US CPI (All Urban Consumers) notified by US Bureau of Labor Statistics latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
USCPI$_{(Ref)}$	=	The reference US CPI of **282.03** average for FY 2022
ER$_{(Rev)}$	=	The Revised TT & OD selling rate of USD as notified by National bank latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
ER$_{(Ref)}$	=	The reference exchange rate of **PKR 206 / USD** as of FY2022

Fixed O&M local

Fixed costs are incurred to ensure plant's availability irrespective of its operations. This component includes both plant maintenance expenses and necessary allied costs of salaries and wages, third party services, transport etc.

For tariff calculation purposes, KE has calculated levelized Fixed O&M Local considering FY 22 costs and based on the projected Fixed O&M local for the remaining useful life of the plant which shall be indexed with Pak CPI at the start of each quarter.

Accordingly, levelized Fixed O&M local component cost per year is estimated at **PKR 910 million** per year translating into **PKR 0.53 / kW/h** (based on units at plant factor) at reference Pak CPI of **158.48** (Average FY 22) based on projected expenses which shall be indeed based on Pak CPI at the start of each quarter.

Fixed O&M local (levelized)

Category	Amount – PKR million	Units at plant factor - GWh	O&M Per unit – PKR / kWh
Gas	910	1,715.04	0.5304
HSD	910	1,708.75	0.5324

Indexation formula:

Fix. Local. O&M$_{(Rev)}$	=	**Fix. Local O&M$_{(Ref)}$ x CPI$_{(Rev)}$ / CPI$_{(Ref)}$**
Where;		
Fix. Local. O&M$_{(Rev)}$	=	Revised Fixed O&M local Component of Tariff
Fix. Local O&M$_{(Ref)}$	=	Reference Fixed O&M local Component of Tariff
CPI$_{(Rev)}$	=	Revised CPI notified by Pakistan Bureau of Statistics latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
CPI$_{(Ref)}$	=	Reference CPI of **158.48 average FY 2022**

Fixed O&M Foreign

Fixed costs are incurred to ensure plant's availability irrespective of its operations. These costs are critical to ensure availability and continued operations of the plant.

The Fixed O&M Foreign component consists of CSA fee, and routine maintenances of ST, HRSG & balance of plant.

For tariff calculation purpose, KE has calculated Fixed cost foreign based on FY 2022 costs and projected Fixed cost foreign which shall be indexed to US CPI and exchange rates at the start of each quarter.

Accordingly, levelized Fixed O&M foreign component cost per year is estimated at **PKR 522 million** per year translating into **PKR 0.30 / kW/h** at reference US CPI of **282.03** average FY 2022 based on projected expenses which shall be indexed based on USD CPI and exchange rate at the start of each quarter.

Fixed O&M Foreign (levelized)

Category	Amount – PKR million	Units at plant factor - GWh	O&M Per unit – PKR / kWh
Gas	522	1,715.04	0.3043
HSD	522	1,708.75	0.3055

Indexation formula:

Fix. Foreign. O&M$_{(Rev)}$	=	**Fix. Foreign O&M$_{(Ref)}$ x USCPI$_{(Rev)}$ / USCPI$_{(Ref)}$ x ER$_{(Rev)}$ / ER$_{(Ref)}$**
Where;		
Fix. Foreign. O&M$_{(Rev)}$	=	Revised Fixed O&M Foreign Component of Tariff
Fix. Foreign O&M$_{(Ref)}$	=	Reference Fixed O&M Foreign Component of Tariff
USCPI$_{(Rev)}$	=	The revised US CPI (All Urban Consumers) notified by US Bureau of Labor Statistics latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
USCPI$_{(Ref)}$	=	The reference US CPI of **282.03 average** FY 2022
ER$_{(Rev)}$	=	The Revised TT & OD selling rate of USD as notified by National bank latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
ER$_{(Ref)}$	=	The reference exchange rate of **PKR 206 / USD** as of FY2022

For breakup of O&M (levelized), please refer **KCCPP - Annexure H**

O&M costs both Variable & Fixed (local / foreign) have been validated and benchmarked by Independent Consultant, report of which is enclosed as **KCCPP – Annexure I.**

1.2.3. Insurance

KE requests an insurance premium up to 1% of EPC cost consistent with the insurance cost allowed to IPPs that shall be adjusted annually as per actual subject to maximum limit of 1% of EPC.

Insurance cost based on EPC cost

EPC Cost	USD 175 Mn
1% of EPC cost	USD 1.75 Mn
Reference exchange rate	PKR 206 / USD
1% of EPC Cost	PKR 360.90 Mn
Ins(Ref) Gas at 88.66% plant factor	PKR 0.2104 / kWh
Ins(Ref) HSD at 88.66% plant factor	PKR 0.2112 / kWh

Insurance component shall be adjusted with actual cost at start of the year

$\mathbf{Ins_{(Ref)(adj)}}$	=	$\mathbf{Ins_{(Ref)} \times P_{(Act)} / P_{(Ref.)}}$
Where;		
$\mathbf{Ins_{(Ref)(adj)}}$	=	Adjusted Reference Insurance Component of Tariff
$Ins_{(Ref)}$	=	Reference Insurance Component of Tariff
$P_{(Ref)}$	=	Reference Premium USD 1.75 million
$P_{(Act.)}$	=	Actual Premium in USD or USD 1.75 million (1% of EPC cost) whichever is lower

Further, insurance component shall be adjusted quarterly based on below formula

$\mathbf{Ins_{(Rev)}}$	=	$\mathbf{Ins_{(Ref)(adj)} \times ER_{(Rev)} / ER_{(Ref)}}$
Where;		
$\mathbf{Ins_{(Ref)(adj)}}$	=	Adjusted reference Insurance component of Tariff
$ER_{(Rev)}$	=	The Revised TT & OD selling rate of USD as notified by National bank latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
$ER_{(Ref)}$	=	The reference exchange rate of **PKR 206 / USD** (projected) as of FY2022

1.2.4. Return on Regulatory Asset Base and Depreciation

Regulatory Asset Base

Regulatory Asset Base shall comprise of written down value of plant excluding surplus on revaluation and including Intangibles (mainly software used for regulated business) and CWIP at start of control period, which will be depreciated each year based on remaining useful life of the plant.

Regulatory asset base based on current structure at the end of FY 2023 will be locked and used as a basis for proposed MYT and further additions to RAB shall only be based on any project-based addition / modification to the plant subject to NEPRA's approval for which a onetime request will be submitted for adjustment in tariff components.

With regard to RAB, KE has projected RAB as of FY 2023 at **PKR 18,477 million** and accordingly, requests NEPRA to actualize the same at the start of the next term i.e. July 2023 based on audited financial statements.

RAB movement is enclosed as **KCCPP - Annexure J**. Once RAB at end of FY 2023 will be finalized post audit of financial statements, KE will file **KCCPP - Annexure J** with updated opening RAB and accordingly related tariff components, including RoRB and Depreciation will be updated.

Return

Return shall be calculated based on Return on Equity, cost of debt and Debt to Equity ratio

Debt to Equity ratio

Debt to equity ratio is proposed to be 70:30 as allowed in current MYT subject to discussion in Main section.

Cost of Debt

Like existing MYT, cost of debt for local component will be calculated based on 3-month KIBOR plus a spread of 2.5% and cost of debt for foreign component is calculated based on 3-month LIBOR, spread 4.5% and hedging cost based on difference of 3-month KIBOR and 3 month LIBOR plus a hedging cost spread.

Accordingly, cost of debt has been calculated using reference 3-month KIBOR of **15.16% as of FY2022**, reference 3-month LIBOR of **2.29%** as of FY 2022.

KE proposes KIBOR, LIBOR / SOFR and hedging cost to be indexed at the start of each quarter going forward based on actual.

Local to Foreign debt ratio

Considering no foreign debt is currently drawn for KCCPP, Debt has been taken at local for cost of debt.

Accordingly, Return on Regulatory Base – Cost of Debt (RoRBCoD) comes out to **PKR 1.29 / kW/h** at **88.66%** plant factor for FY 2024. For year wise tariff components for Gas and HSD, please refer Tariff table.

RoRB – Local component of Cost of debt

$RoRBCoD\ Local_{(Rev)}$	=	**RoRBCoD Local $_{(Ref)}$ for relevant year x $CoD\ Local_{(Rev)}$ / $CoD\ Local_{(Ref)}$**
Where;		
$RoRBCoD\ Local_{(Rev)}$	=	Revised Local RoRB cost of debt component of tariff
$RoRBCoD_{(Ref)}$	=	Reference Foreign RoRB cost of debt component of tariff
$CoD\ Local_{(Rev)}$	=	$KIBOR_{(Rev)}$ + 2.5%
$CoD\ Local_{(Ref)}$	=	$KIBOR_{(Ref)}$ + 2.5%
$KIBOR_{(Rev)}$	=	The revised 3-month KIBOR as published by State Bank of Pakistan latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
$KIBOR_{(Ref)}$	=	The reference 3-month KIBOR of **15.16%** as of FY22

Cost of Equity

Keeping in view currently allowed returns, return on equity of USD based 15% is proposed that shall be indexed based on changes in USD to PKR exchange rate at the start of each quarter.

For the purpose of Exchange rate indexation, indexation with reference to FY 2016 has been calculated considering weightage of RAB each year till FY 2023 in line with mechanism used by NEPRA in the current MYT. Accordingly, reference indexed cost of equity has been calculated using reference current exchange rate of **PKR 206 / USD**. Accordingly, KE requests the Authority to consider the actual average exchange rate of FY23 at the time of actualization of RAB at FY23 as mentioned in **"Regulatory Asset Base"** section above. Please refer calculation in **KCCPP - Annexure K (i).**

Accordingly, Return on Regulatory Base – Cost of Equity (RoRBCoE) comes out to **PKR 0.97 / kWh** for FY 2024 considering USD RoE of **15%** and indexed RoE of **30.90%** at exchange rate of **PKR 206 / USD**. For year wise tariff components for Gas and HSD, please refer Tariff table.

Indexation formula is given below. Further, an illustration for RoE indexation is given in **KCCPP - Annexure K (ii).**

RoRB – Component of Cost of Equity

$RoRBCoE_{(Rev)}$	=	**$RoRBCoE_{(Ref)}$ for relevant year x $ER_{(Rev)} / ER_{(Ref)}$**
Where;		
$RoRBCoE_{(Rev)}$	=	Revised RoRB cost of equity component of tariff
$RoRBCoE_{(Ref)}$	=	Reference RoRB cost of equity component of tariff
$ER_{(Rev)}$	=	The Revised TT & OD selling rate of USD as notified by National bank of Pakistan latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
$ER_{(Ref)}$	=	The Reference exchange rate of **PKR 206 / USD**

Depreciation

Depreciation shall be calculated as straight line based on written down value of RAB at the end of FY 2023 (Current control period) and remaining useful life at the end of Control period

Accordingly, Depreciation component comes out to **PKR 0.67 / kW/h** for FY 2024. For year wise tariff components for Gas and HSD, please refer Tariff table.

1.2.5. Cost of Working Capital

KE requests NEPRA for working capital mechanism based on below formula, consistent with IPPs.

Legend	Working Capital Components
A	Cost of Stores & spares inventory
B	Cost of Fuel Inventory
C	Cost of Fuel in Receivable cycle based on 30 days receipt period and 7 days payment period on RLNG fuel with 17% sales tax – based on 88.66% utilization factor, to be actualized every quarter.
D	Cost of SBLC (currently included based on SBLC given to SSGC, will be updated in future)

Working capital component has been calculated for the control period based on current movement of balances year on year and reference KIBOR of 15.16%% plus a short term spread **2%**.

Cost of working capital shall be indexed with actual KIBOR and change in fuel prices, on a **quarterly basis.** Further, reference component shall be updated in future through a request in case of any change in circumstances for example introduction of HSD inventory.

Based on above, working capital component comes out to **PKR 0.64/ kW/h** for FY 2024. For year wise tariff components for Gas and HSD, please refer Tariff tables.

Working Capital requirement shall be indexed through updating the template enclosed in **KCCPP - Annexure L** at each quarter including update in SBLC cost pursuant to any changes / addition in the arrangement(s).

1.2.6. Pass through items

Similar to the current MYT and as allowed to IPPs, KE proposes the following items to be allowed as pass-through costs in the new MYT.

Corporate tax and WWPF / WWF

Currently, KE is an integrated entity therefore Corporate tax and WPPF / WWF on overall company level is a pass through item within MYT.

Considering that legal structure will remain same, KE is proposing that Corporate tax and WPPF / WWF shall be passed through to consumers in Supply Tariff.

However, going forward, in case of any change in legal structure whereby a Corporate tax and WWF / WPPF is separately levied on Generation plant, same shall be passed through as done in case of IPPs.

Unrecovered cost of Current MYT

Any unrecovered cost of Current MYT shall be pass through in tariff.

Startup Charges

Startup: Any startup of a Gas / HSD Unit that is necessary for a station to comply with the Dispatch requirements / Instructions and that results in the synchronization with the grid system.

Consistent with industry practice, KE requests the Authority to allow start up charges, as defined below.

In any month, if a startup occurs in a financial year, KE shall be allowed to claim "Start-Up charges" based on Reference start up charges indexed with relevant indices, including fuel prices and electricity tariff as requested below

"Start-Up Charge" shall consist of two components and is calculated as follows:

Start-Up Charge = MDI Charge+ Reference Unit Start-Up Charges.

a) **MDI Charge:** The MDI charge shall be based on maximum demand recorded during the relevant month at startup and shall be calculated based on the then applicable MDI rate in Rs/kW, from time to time,

b) **Reference Unit Start-Up Charge**: This cost will cover the consumables, fuel and equivalent operating hours consumed for the start-ups.

The Start-Up Charges for each Start-Up shall be calculated as follows:

SC_M	=	$MDIR_x \times N1 + ((SCPI_{Ref} \times SCFadjust_{PI}) + ((SCFC_{Ref} \times SCFadjust_{FC})) \times N2$
Where:		
SC_M	=	The Start Up Charges during the Month M
$MDIR_x$	=	Total fixed charges for the month due to Distributing segment during the relevant month (based on MDI for the month and MDI charge) divided by the total number of Start Ups performed during the month.
N1	=	The number of Start-ups to be claimed, unless any shutdowns claimed during the relevant month in which case this will be considered as zero.
N2	=	The number of Start-ups to be claimed
$SC_{(Ref)}$	=	The Reference Start-Up Charge as given below. Consists of the following two components:
$SCPI_{Ref}$	=	The Reference Start-Up Charge for the Power Import from Transmission System during GT Startup till Synchronization.
$SCFadjust_{PI}$	=	The Startup Charges Adjustment Factor for the hour h for the Import of Power from Transmission Network as per following formula: **$SCFadjust_{PI}$ = $WAVCT\text{-}B5_{(Rev)}$ / $WAVCT\text{-}B5_{(Ref)}$** where: **$WACT\text{-}B5_{(Rev)}$** = Weighted Average of the latest notified variable consumer tariff for the Industrial Consumer Category (B-5) based on a weightage of 4:20 for Peak & Off-Peak Rates respectively. **$WACT\text{-}B5_{(Ref)}$** = Weighted Average of the reference notified variable consumer tariff for the Industrial Consumer Category (B-5) based on a weightage of 4:20 for Peak & Off-Peak Rates (i.e. Rs. 30.33 per kWh & Rs. 23.55 per kWh) respectively **(i.e. Rs. 24.68 per kWh)**
$SCFC_{Ref}$	=	The Reference Start-Up Charge for the Fuel Consumed during GT Startup till Synchronization including ST Synchronization, if applicable.
$SCFadjust_{FC}$	=	The Startup Charges Adjustment Factor for the hour h for the consumption of fuel as per the following formula:

	For Gas[2] – $SCFadjust_{FC} = FCCG_{Rev} / FCCG_{Ref}$ For HSD – $SCFadjust_{FC} = FCCHSD_{Rev} / FCCHSD_{Ref}$

TYPE OF START (Gas) – Note	Reference Single GT StartUp Charges	Reference one third Complex StartUp Charges (1 GT x ST)	Reference two third Complex Start-Up Charges(2GTs x ST)	Reference three fourth Complex Start-Up Charges(3GTs x ST)	Reference Complex Start-Up Charges(4GTs x 2ST) – Note
	PKR million				
Hot Start:					
Total Cost	0.18	1.39	2.71	4.17	5.45
Recovery based on Simple Cycle	-	(1.02)	(2.05)	(3.24)	(4.32)
Net Claim	**0.18**	**0.37**	**0.66**	**0.93**	**1.13**
Warm Start:					
Total Cost	0.18	2.62	5.16	7.42	9.79
Recovery based on Simple Cycle	-	(2.09)	(4.18)	(6.07)	(8.09)
Net Claim	**0.18**	**0.53**	**0.98**	**1.35**	**1.70**
Cold Start:					
Total Cost	0.18	3.84	7.61	11.32	15.00
Recovery based on Simple Cycle	-	(3.16)	(6.31)	(9.47)	(12.62)
Net Claim	**0.18**	**0.68**	**1.30**	**1.86**	**2.38**

TYPE OF START (HSD) – Note	Reference Single GT StartUp Charges	Reference one third Complex StartUp Charges (1 GT x ST)	Reference two third Complex Start-Up Charges(2GTs x ST)	Reference three fourth Complex Start-Up Charges(3GTs x ST)	Reference Complex Start-Up Charges(4GTs x 2ST) – Note
	PKR million				
Hot Start:					
Total Cost	0.14	2.14	4.21	6.62	8.78
Recovery based on Simple Cycle	-	(1.85)	(3.70)	(5.84)	(7.79)
Net Claim	**0.14**	**0.29**	**0.51**	**0.78**	**0.99**
Warm Start:					
Total Cost	0.14	4.19	8.30	12.06	16.03
Recovery based on Simple Cycle	-	(3.77)	(7.55)	(10.96)	(14.61)
Net Claim	**0.14**	**0.42**	**0.75**	**1.10**	**1.42**
Cold Start:					
Total Cost	0.14	6.24	12.39	18.58	24.73
Recovery based on Simple Cycle	-	(5.70)	(11.39)	(17.09)	(22.79)
Net Claim	**0.14**	**0.54**	**1.00**	**1.49**	**1.94**

Note: Furthermore, recovery on units sent to grid has been based on simple cycle tariff, to be allowed separately for NEO.

References:

Part Load Adjustment Factor: 1.1487 (Gas) / 1.0633 (HSD)

[2] Proportion of Indigenous Gas & RLNG in both Reference & Revised FCCG will be calculated based on the actual mix of Indigenous Gas & RLNG used as appearing in SSGC Bills for the relevant month in which Startup Cost is being claimed whereas Reference and Revised Fuel Cost Component will be calculated as per Section 1.2.1 above.
Furthermore, in case Gas is made available through Dedicated Line/ Alternate Supplier as discussed in Section 1.2.1 above, then separate costs will be calculated and submitted to the Authority for approval.

Black Start Cost

Black Start : Any startup of HSD Unit having black startup facility, that is necessary for the Company to comply with a Dispatch Instruction or a Revised Dispatch Instruction, that results in restoring power supply to the respective power plant, and to a part of an electric grid without relying on the external electric power transmission network to recover from a total or partial shutdown of the transmission network. KE requests the Authority to allow black start charges, as defined below.

In any month, KE shall be allowed to claim "Black-start charges" based on Reference Black-start charges indexed with relevant indices, including fuel prices and electricity tariff as requested below.

"Black-start Charges" shall consist of consumables, fuel and equivalent operating hours consumed for the black-start.

The Black-start Charges for each Start-up shall be calculated as follows:

BSC_M	=	$(BSC_{Ref} \times BSCFadjust_h) \times N)$
Where:		
BSC_M	=	the Black-Start Charges during the Month M;
BSC_{Ref}	=	the Reference Black-Startup Charge as given in the table below.
N	=	The number of black startups to be claimed
$BSC_{(Ref)}$	=	The Reference Black-Startup Charge as given below.
$BSCFadjust_h$	=	The Black-start Charges Adjustment Factor for the hour h; where, For HSD – $SHCFadjust_h = FCCHSD_{Rev} / FCCHSD_{Ref}$

Type of Start	Cost
PKR million	
Black Start (2xGTs)	0.98

Shutdown Cost

Shutdown: Any shutdown of a Gas / HSD Unit that is necessary for a station to comply with the Dispatch requirements / Instructions which results in the de synchronization with the grid system.

KE requests the Authority to allow shutdown charges, as defined below.

In any month, KE shall be allowed to claim "Shutdown charges" based on Reference Shutdown charges indexed with relevant indices, including fuel prices and electricity tariff as requested below.

"Shutdown Charge" shall consist of two components and is calculated as follows:

Shutdown Charge = MDI Charge+ Reference Unit Shutdown Charges.

a) **MDI Charge:** The MDI charge shall be based on maximum demand recorded during the relevant month at shutdown and shall be calculated based on the then applicable MDI rate in Rs/kW, from time to time,

b) **Reference Unit Shutdown Charge**: This cost will cover the consumables, fuel and equivalent operating hours consumed for the shutdown.

The Shutdown Charges for each Shutdown shall be calculated as follows:

SHC_M	=	$MDIR_x \times N1 + ((SHCPI_{Ref} \times SHCFadjust_{PI}) + ((SHCFC_{Ref} \times SHCFadjust_{FC})) \times N2$
Where:		
SHC_M	=	The Shutdown Charges during the Month M
$MDIR_x$	=	Total fixed charges for the month due to Distributing segment during the relevant month (based on MDI for the month and MDI charge) divided by the total number of Shutdowns performed during the month.
N1	=	The number of Shutdowns to be claimed, unless any startups claimed during the relevant month in which case this will be considered as zero.
N2	=	The number of Shutdowns to be claimed
$SHC_{(Ref)}$	=	The Reference Shutdown Charge as given below. Consists of the following two components:
$SHCPI_{Ref}$	=	The Reference Shutdown Charge for the Power Import from Transmission System till GT & ST are in Standby mode.
$SHCFadjust_{PI}$	=	The Shutdown Charges Adjustment Factor for the hour h for the Import of Power from Transmission Network as per following formula: **$SHCFadjust_{PI}$ = WAVCT-$B5_{(Rev)}$ / WAVCT-$B5_{(Ref)}$** where: **WACT-$B5_{(Rev)}$** = Weighted Average of the latest notified variable consumer tariff for the Industrial Consumer Category (B-5) based on a weightage of 4:20 for Peak & Off-Peak Rates respectively. **WACT-$B5_{(Ref)}$** = Weighted Average of the reference notified variable consumer tariff for the Industrial Consumer Category (B-5) based on a weightage of 4:20 for Peak & Off-Peak Rates (i.e. Rs. 30.33 per kWh & Rs. 23.55 per kWh) respectively **(i.e. Rs. 24.68 per kWh)**
$SHCFC_{Ref}$	=	The Reference Shutdown Charge for the Fuel Consumed during GT & ST (if applicable) De-Synchronization till Flame-Off.
$SHCFadjust_{FC}$	=	The Shutdown Charges Adjustment Factor for the hour h for the consumption of fuel as per the following formula: For Gas[3] – $SHCFadjust_{FC}$ = $FCCG_{Rev}$ / $FCCG_{Ref}$ For HSD – $SHCFadjust_{FC}$ = $FCCHSD_{Rev}$ / $FCCHSD_{Ref}$

Type of Shutdown	Reference Single GT Shutdown Charges	Reference One Fourth Complex Shutdown Charges (1 GTxST)	Reference Half Complex Shutdown Charges(2GTsxST)	Reference Three Fourth Complex Shutdown Charges (3GTs x 2 ST)	Reference Complex Shutdown Charges (4GTs x 2 ST)
	PKR million				
Gas – PKR	0.28	0.36	0.57	0.70	0.76
HSD – PKR	0.16	0.24	0.32	0.50	0.58

[3] Proportion of Indigenous Gas & RLNG in both Reference & Revised FCCG will be calculated based on the actual mix of Indigenous Gas & RLNG used as appearing in SSGC Bills for the relevant month in which Shutdown Cost is being claimed whereas Reference and Revised Fuel Cost Component will be calculated as per Section 1.2.1 above.
Furthermore, in case Gas is made available through Dedicated Line/ Alternate Supplier as discussed in Section 1.2.1 above, then separate costs will be calculated and submitted to the Authority for approval.

Costs pursuant to Import of Power during Non-Operational Hours

Costs of Import of Power for the period when plant is stand-by but not in operation, in accordance with EMO is requested to be passed through in Tariff.

The Power Import Charges for each month shall be based on actual amount billed by the Supply business based on Import readings recorded, including monthly MDI / Fixed Charges paid to Supply Business for fixed capacity dedicated for plant startup operations. Amount billed shall be reduced by any MDI Charges recovered under Startup & Shutdown Costs as per mechanism explained in this petition.

1.3. Billing Mechanism

Billing shall be based on a Take-or-pay mechanism where Capacity payment shall be paid for the Available Capacity and Energy payments for the Net Electrical Output.

Available capacity for a month shall be based on hourly Annual Dependable Capacity after considering outages in each year.

Annual Dependable Capacity shall be based on ADC Test to be carried out at start of each year, to be carried out by Plant team and results of which shall be submitted to NEPRA.

NEO will be based on energy recorded through meters as explained in above sections.

1.3.1. Capacity Payments

Capacity cost includes Fixed O&M local, Fixed O&M foreign, Insurance, Working capital, RoRB – cost of debt, RoRB – cost of equity and Depreciation which are detailed in above sections. Capacity payment shall be made on a monthly basis as per formula detailed below:

Monthly Capacity Payment

CapacityPayment	=	**CapacityPrice x $AvailCap_m$ x DO_y**
Where:		
CapacityPayment	=	the Capacity Payment, in Rupee, paid for a Month;
$AvailCap_m$	=	Aggregate Available capacity, in kWh, for the month based on Hourly Available capacity
CapacityPrice	=	(Fixed O&M local + Fixed O&M foreign, working capital + RoRB – cost of debt + RoRB – cost of equity + insurance) for the relevant month after indexations as explained above.
DO_y	=	the output degradation factor, as given in **KCCPP - Annexure F(ii)** for Gas and **F(iv)** for HSD, for the relevant year.

Capacity payment shall be separately calculated for Gas and HSD based on Available capacity, in kWh on HSD / Gas and their respective Capacity components. For the purpose of calculation of Available capacity on HSD, capacity shall be considered based on actual operations on HSD, and remaining capacity shall be considered to be available on Gas.

Further, available capacity shall also be adjusted with ambient temperature as per the table given in **KCCPP – Annexure M.** Moreover, example for calculation of hourly available capacity payment of Gas is also given in **KCCPP – Annexure N.**

Outages

- Plant will maintain Annual Availability of 90% considering annual outages of 10%. In addition, in case of periodic overhauls, following GT / ST wise maintenance outage days shall be allowed:

- **17 Days (408 hours)** of schedule outages Per GT & ST,
- **7.58 Days (182 hours) of** Maintenance outages per GT & ST
- **11.93 Days (286 hours)** of forced outages Per GT & ST

Maintenance Outage will be required as follows:

- Total 4.58 Days / GT/ year for compressor offline water washing
- 3.0 Days / GT / year for Semi Annual Inspection.

Further, Additional outages will be required as below:

- ST Major Overhaul at every (50,000 hours) - in which case the Company shall be entitled to **an additional Thirteen (13) days** of Scheduled Outage periods.
- Sea water intake channel dredging at every 5 years, in which case the company shall be entitled to **an additional Thirteen (13) days** of scheduled outage period.
- GT Generator Overhaul at every 64,000 Hours, in which case the company shall be entitled to **an additional Three (3) days** of scheduled outage period. However, Gas turbine generators (GTGs) are air cooled and due to environmental conditions 64K maintenance scope are encountered early at around 48,000 Hours.
- Sea water intake tunnel cleaning in FY-24, in which case the company shall be entitled to **an additional Twenty Eight (28) days** of Scheduled Outage periods.
- ST Generator Overhaul at every 96,000 Hours, in which case the company shall be entitled to **an additional Eight (8) days** of scheduled outage period.

These overhauls will be required when plant will reach the required Factored Fired hours. Based on annual availability of 90% and expected occurrence of Additional Outages, Levelized Plant factor (considering all type of outages mentioned above) has been calculated as 88.66%. **Please refer KCCPP - Annexure O.**

For the purpose of calculation of Availability, 20% annual operation on HSD has been assumed with remaining capacity on Gas, and outage schedule has been made accordingly. In case if HSD operations exceed 20% in a year impacting average availability over the life, KE will file a one-time adjustment to adjust the availability % used in the tariff.

The plant will be considered as available when plant is standby including periods when gas is unavailable as the same is not under KE's control. KE remains in continuous engagements with SSGC for resolution of this matter and is also working on alternative options.

1.3.2. Energy Payments

Energy cost includes:

- Fuel cost (including Indigenous natural gas, RLNG & HSD),
- Variable O&M local & Variable O&M foreign which are detailed in above sections multiplied by degradation factor of relevant year.

The Energy Price shall be calculated using the Reference Fuel Cost Component during the year as follows:

Fuel	NEO for the month	Fuel	Variable O&M local	Variable O&M Foreign	Total Variable O&M	Output Degradation factor	Variable O&M after Degradation factor	EPP per unit	Energy payment
	A	b	c	d	e=c+d	f	g=exf	h=b+g	i=axh
	kWh	PKR / kWh	PKR / kWh	PKR / kWh	PKR / kWh	Factor	PKR / kWh	PKR / kWh	PKR
Natural Gas – Combined cycle	Units	$FCCIG_{(Rs/kWh)}$	Var. Local. $O\&M_{(Rs/)}$	Var. Foreign. $O\&M_{(Rs/)}$	Calculated	Relevant factor	Calculated	Calculated	Calculated
Natural Gas – Simple	Units	FCCIG-SC$_{(Rs/Unit)}$	Var. Local. $O\&M_{(Rs/)}$	Var. Foreign. $O\&M_{(Rs/)}$	Calculated	Relevant factor	Calculated	Calculated	Calculated
RLNG – Combined cycle	Units	FCCRLNG $_{(Rs/Unit)}$	Var. Local. $O\&M_{(Rs/)}$	Var. Foreign. $O\&M_{(Rs/)}$	Calculated	Relevant factor	Calculated	Calculated	Calculated
RLNG – Simple	Units	FCCRLNG-SC$_{(Rs/Unit)}$	Var. Local. $O\&M_{(Rs/)}$	Var. Foreign. $O\&M_{(Rs/)}$	Calculated	Relevant factor	Calculated	Calculated	Calculated
HSD – Combined cycle	Units	$FCCHSD_{(Rs/Unit)}$	Var. Local. $O\&M_{(Rs/)}$	Var. Foreign. $O\&M_{(Rs/)}$	Calculated	Relevant factor	Calculated	Calculated	Calculated
HSD – Simple cycle	Units	FCCHSD-SC$_{(Rs/Unit)}$	Var. Local. $O\&M_{(Rs/)}$	Var. Foreign. $O\&M_{(Rs/)}$	Calculated	Relevant factor	Calculated	Calculated	Calculated
Total	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated

1.4. O&M Sharing Mechanism

KE is proposing to share the savings in O&M, if any, in proportion of 60:40 for Consumers: KE, which shall be calculated at completion of Overhaul cycle.

Overhaul cycle shall include:

- One Major Overhaul for each GT at every 50K fired hours
- One Hot Section Exchange (HSE) for each GT at every 25K factored fired hours
- One Minor overhaul for ST at every 25K hours
- One Major overhaul for ST at every 50K hours

Overhaul cycle shall be completed when

- Major inspections/overhaul of all GTs are completed at every 50K fired hours; and
- Major overhaul of ST is completed at every 50K hours.

At completion of Overhaul cycle, any savings in O&M shall be shared in 60:40 for Consumers: KE, where is in case of Loss, it shall be carried forward to future years to set off with expenses of future years.

For the purpose of calculation of sharing of O&M savings/ (loss) at the completion of each major overhaul cycle, O&M expenses (O&M Expenses as per Profit & Loss Account & Addition to CWIP) as per the audited financial statements shall be used.

An illustration of sharing mechanism for one cycle is given in **KCCPP - Annexure P.** Same shall be applicable for next overhaul cycles till the end of plant life.

1.5. Other items

Items generally covered under PPA

Unlike previous MYT, KE has proposed Tariff structure in line with IPPs. In case of IPPs, certain modalities / charges are governed under the Power Purchase Agreement, which have been included in the petition. However, detailed modalities and other remaining terms will be agreed in a "Service Level Agreement" for which KE has prepared and Annexed a Head of Terms (please refer, **KCCPP Annexure Q**). Full scope SLA will be prepared and submitted for NEPRA's approval based on Tariff determination.

Alternate Supplier of RLNG

In case of any additional requirements on account of arranging RLNG through an Alternative Supplier as detailed in **Section 1.1 - Plant Capacity and Heat Rate** above, KE will submit details of the proposal separately to NEPRA for approval. Post approval of the Authority, KE will file a one-time adjustment for reference tariff components, based on allowed investment, Net capacity and heat rate impacts.

Costs pursuant to Unbundling in future

KE is an integrated utility and therefore there are certain synergies in common costs. In future, if there is any legal unbundling, KE will file for a onetime adjustment for additional costs pursuant to that.

Alternate Supplier of RLNG

In case of any additional requirements on account of arranging RLNG through an Alternative Supplier as detailed in **Section 1.2.1 - Plant Capacity and Heat Rate** above, KE will submit details of the proposal separately to NEPRA for approval. Post approval of the Authority, KE will file a one-time adjustment for reference tariff components, based on allowed investment, Net capacity and heat rate impacts.

Costs pursuant to Force Majeure Events

Costs related to a Force Majeure Events are allowed to IPPs and accordingly KE also request those to be passed through in Tariff. Details and modalities of force majeure events will be included under the SLA, pursuant to the Terms of Agreements as explained in **KCCPP – Annexure Q**, in line with agreements of other IPPs.

1.6. Summary of Base Tariff FY 2024 & Indexation Mechanism

In view of the foregoing and considering the significant changes in tariff structure, following component wise indexation mechanism is being requested to ensure recovery of prudent costs critical to ensure quality of service.

Tariff Components	RLNG PKR / kWh	HSD PKR / kWh	Indexation Mechanism	Reference Rates
Energy cost Fuel cost	26.99	48.00	• Indexation with fuel price & CV (for HSD) • Impact of allowed part load and degradation factor (monthly)	• Net HHV RLNG price of PKR 3,300.8 / MMBtu • Net HHV HSD price of PKR 219.94/ liter • Calorific value of HSD of 36,252 btu / liter
Variable O&M – local	0.06	0.06	• Indexed with Pak CPI (Quarterly)	• Average CPI of 158.48 for FY 2022
Variable O&M - Foreign	1.15	1.61	• Indexed with US CPI and USD to PKR exchange rate (Quarterly)	• Average US CPI of 200 for FY 22 • Exchange rate of PKR 206 / USD as of FY 22
Energy cost subtotal	**28.20**	**49.66**		
Capacity cost Fixed O&M - local	0.53	0.53	• Indexed with Pak CPI (Quarterly)	• Average CPI of 158.48 for FY 2022
Fixed O&M - Foreign	0.30	0.31	• Indexed with US CPI and USD to PKR exchange rate (Quarterly)	• Average US CPI of 203.03 for FY 22 • Exchange rate of PKR 206 / USD as of FY2022
Insurance	0.21	0.21	• Indexed with USD to PKR exchange rate – quarterly • Annual actualization based on capping of 1% of EPC cost (in USD terms)	• Exchange rate of PKR 206 / USD as of FY23
Working Capital	0.64	0.64	• Indexed with KIBOR (Quarterly) and change in fuel prices.	• KIBOR of 15.16% as of FY22
RoRB - Cost of Debt Local	1.29	1.30	• Indexed with KIBOR (Quarterly) • Recalculated based on RAB changes due to addition of specific project approved by NEPRA	• KIBOR of 15.16% as of FY22
RoRB - Cost of Equity	0.97	0.97	• Indexed with USD to PKR exchange rate • Recalculated based on RAB changes due to addition of specific project approved by NEPRA	• Exchange rate of PKR 206 / USD as of FY2022
Depreciation	0.67	0.67	• Recalculated based on RAB changes due to addition of specific project approved by NEPRA	
Capacity cost subtotal	**4.61**	**4.63**		
Total Base Tariff – FY 2024	**32.81**	**54.29**		
Levelized tariff	**31.67**	**53.14**		

Tariff Components	RLNG PKR / kWh	HSD PKR / kWh	Indexation Mechanism	Reference Rates
Energy cost Fuel cost – Simple cycle	34.98	60.56	• Indexation with fuel price & CV (for HSD) • Impact of allowed part load and degradation factor (monthly)	• Net HHV RLNG price of PKR 3,300.8 / MMBtu • Net HHV HSD price of PKR 219.94/ liter • Calorific value of HSD of 36,252 btu / liter
Fuel cost – Ind gas - CC	7.01	n/a	• Indexation with fuel price • Impact of allowed part load and degradation factor (monthly)	• Net HHV Ind Gas price of PKR 857 / MMBTU
Fuel cost – Ind gas - OC	9.08	n/a	• Indexation with fuel price • Impact of allowed part load and degradation factor (monthly)	• Net HHV Ind Gas price of PKR 857 / MMBTU

Please refer following tariff tables for year wise tariffs.

K-Electric Limited
Generation Plants Tariff Petition
KCCPP
Tariff table - FY 2024 and onwards

Gas Fuel - RLNG

Gross Capacity	237.1	MW	Exchange rate	206	PKR / USD
Net Capacity	220.8	MW	KIBOR	15.16%	%
Units at full capacity	1,934.5	GWh	LIBOR	2.29%	%

		Energy Purchase Price (PKR / kWh)				Capacity Purchase Price PKR / kW / hour at 88.66% Plant factor											
Year	FY	Fuel cost - FCC RLNG	Variable O&M - local	Variable O&M - Foreign	EPP	Fixed O&M - local	Fixed O&M - Foreign	Insurance	RoRB - Cost of debt - local	RoRB - Cost of debt - foreign	RoRB - Cost of Equity	Depreciation	Working capital	CPP	Total tariff - PKR / kWh	Total tariff - Cents / kWh	CPP - PKR / kW / month
		a	b	c	d=a+b+c	e	f	g	h	i	j	k	l	m=sum(e:l)	n=d+m	o=n/206	p
1	2024	26.99	0.06	1.15	28.20	0.53	0.30	0.21	1.29	-	0.97	0.67	0.64	4.61	32.81	15.93	3,366
2	2025	26.99	0.06	1.15	28.20	0.53	0.30	0.21	1.21	-	0.91	0.67	0.64	4.47	32.67	15.86	3,261
3	2026	26.99	0.06	1.15	28.20	0.53	0.30	0.21	1.13	-	0.84	0.67	0.64	4.32	32.53	15.79	3,156
4	2027	26.99	0.06	1.15	28.20	0.53	0.30	0.21	1.04	-	0.78	0.67	0.64	4.18	32.38	15.72	3,050
5	2028	26.99	0.06	1.15	28.20	0.53	0.30	0.21	0.96	-	0.72	0.67	0.64	4.03	32.24	15.65	2,945
6	2029	26.99	0.06	1.15	28.20	0.53	0.30	0.21	0.88	-	0.66	0.67	0.64	3.89	32.09	15.58	2,840
7	2030	26.99	0.06	1.15	28.20	0.53	0.30	0.21	0.80	-	0.60	0.67	0.64	3.75	31.95	15.51	2,735
8	2031	26.99	0.06	1.15	28.20	0.53	0.30	0.21	0.71	-	0.54	0.67	0.64	3.60	31.81	15.44	2,630
9	2032	26.99	0.06	1.15	28.20	0.53	0.30	0.21	0.63	-	0.47	0.67	0.64	3.46	31.66	15.37	2,524
10	2033	26.99	0.06	1.15	28.20	0.53	0.30	0.21	0.55	-	0.41	0.67	0.64	3.31	31.52	15.30	2,419
11	2034	26.99	0.06	1.15	28.20	0.53	0.30	0.21	0.47	-	0.35	0.67	0.64	3.17	31.37	15.23	2,314
12	2035	26.99	0.06	1.15	28.20	0.53	0.30	0.21	0.38	-	0.29	0.67	0.64	3.03	31.23	15.16	2,209
13	2036	26.99	0.06	1.15	28.20	0.53	0.30	0.21	0.30	-	0.23	0.67	0.64	2.88	31.09	15.09	2,104
14	2037	26.99	0.06	1.15	28.20	0.53	0.30	0.21	0.22	-	0.16	0.67	0.64	2.74	30.94	15.02	1,998
15	2038	26.99	0.06	1.15	28.20	0.53	0.30	0.21	0.14	-	0.10	0.67	0.64	2.59	30.80	14.95	1,893
16	2039	26.99	0.06	1.15	28.20	0.53	0.30	0.21	0.06	-	0.04	0.67	0.64	2.45	30.65	14.88	1,788
17	2040	26.99	0.06	1.15	28.20	0.53	0.30	0.21	0.04	-	0.03	0.67	0.64	2.42	30.63	14.87	1,770
Average tariff		26.99	0.06	1.15	28.20	0.53	0.30	0.21	0.64	-	0.48	0.67	0.64	3.47	**31.67**	**15.37**	2,530

PKR 31.67 / kWh **US Cents 15.37 / kWh**

Fuel cost component -

RLNG - Simple cycle	34.98
Indigenous Gas - combined cycle	7.01
Indigenous Gas - Simple cycle	9.08

K-ELECTRIC LIMITED

K-Electric Limited **HSD fuel**
Generation Plants Tariff Petition
KCCPP
Tariff table - FY 2024 and onwards

Gross Capacity	228.7	MW	Exchange rate	206	PKR / USD
Net Capacity	220.0	MW	KIBOR	15.16%	%
Units at full capacity	1,927.4	GWh	LIBOR	2.29%	%

		Energy Purchase Price (PKR / kWh)				Capacity Purchase Price PKR / kW / hour at 88.66% Plant factor											
Year	FY	Fuel cost - FCC HSD	Variable O&M - local	Variable O&M - Foreign	EPP	Fixed O&M - local	Fixed O&M - Foreign	Insurance	RoRB - Cost of debt - local	RoRB - Cost of debt - foreign	RoRB - Cost of Equity	Depreciation	Working capital	CPP	Total tariff - PKR / kWh	Total tariff - Cents / kWh	CPP - PKR / kW / month
		a	b	c	d=a+b+c	e	f	g	h	i	j	k	l	m=sum(e:l)	n=d+m	o=n/206	p
1	2024	48.00	0.06	1.61	49.66	0.53	0.31	0.21	1.30	-	0.97	0.67	0.64	4.63	54.29	26.36	3,378
2	2025	48.00	0.06	1.61	49.66	0.53	0.31	0.21	1.21	-	0.91	0.67	0.64	4.48	54.15	26.29	3,273
3	2026	48.00	0.06	1.61	49.66	0.53	0.31	0.21	1.13	-	0.85	0.67	0.64	4.34	54.00	26.21	3,167
4	2027	48.00	0.06	1.61	49.66	0.53	0.31	0.21	1.05	-	0.79	0.67	0.64	4.19	53.86	26.14	3,062
5	2028	48.00	0.06	1.61	49.66	0.53	0.31	0.21	0.96	-	0.72	0.67	0.64	4.05	53.71	26.07	2,956
6	2029	48.00	0.06	1.61	49.66	0.53	0.31	0.21	0.88	-	0.66	0.67	0.64	3.90	53.57	26.00	2,850
7	2030	48.00	0.06	1.61	49.66	0.53	0.31	0.21	0.80	-	0.60	0.67	0.64	3.76	53.42	25.93	2,745
8	2031	48.00	0.06	1.61	49.66	0.53	0.31	0.21	0.72	-	0.54	0.67	0.64	3.62	53.28	25.86	2,639
9	2032	48.00	0.06	1.61	49.66	0.53	0.31	0.21	0.63	-	0.48	0.67	0.64	3.47	53.13	25.79	2,534
10	2033	48.00	0.06	1.61	49.66	0.53	0.31	0.21	0.55	-	0.41	0.67	0.64	3.33	52.99	25.72	2,428
11	2034	48.00	0.06	1.61	49.66	0.53	0.31	0.21	0.47	-	0.35	0.67	0.64	3.18	52.85	25.65	2,322
12	2035	48.00	0.06	1.61	49.66	0.53	0.31	0.21	0.39	-	0.29	0.67	0.64	3.04	52.70	25.58	2,217
13	2036	48.00	0.06	1.61	49.66	0.53	0.31	0.21	0.30	-	0.23	0.67	0.64	2.89	52.56	25.51	2,111
14	2037	48.00	0.06	1.61	49.66	0.53	0.31	0.21	0.22	-	0.17	0.67	0.64	2.75	52.41	25.44	2,006
15	2038	48.00	0.06	1.61	49.66	0.53	0.31	0.21	0.14	-	0.10	0.67	0.64	2.60	52.27	25.37	1,900
16	2039	48.00	0.06	1.61	49.66	0.53	0.31	0.21	0.06	-	0.04	0.67	0.64	2.46	52.12	25.30	1,794
17	2040	48.00	0.06	1.61	49.66	0.53	0.31	0.21	0.04	-	0.03	0.67	0.64	2.43	52.10	25.29	1,777
Average tariff		48.00	0.06	1.61	49.66	0.53	0.31	0.21	0.64	-	0.48	0.67	0.64	3.48	**53.14**	**25.80**	2,539

PKR 53.14 / kWh **US Cents 25.8 / kWh**

Fuel cost component -

HSD - Simple cycle	60.56

KCCPP - Annexures

List of Annexures

Annexure	Description
KCCPP – Annexure A (i)	Modifications and Improvements Performed for Impeoving Performance of the Plant
KCCPP – Annexure A (ii)	Safety procedures
KCCPP – Annexure A (iii)	Projects details
KCCPP – Annexure A (iv)	Minimum Loading
KCCPP – Annexure A (v)	Fire protection system
KCCPP – Annexure A (vi)	Plant layout
KCCPP – Annexure A (vii)	Details of Major Equipment
KCCPP – Annexure B	Adjustment of heat rate & aux. consumption based on exclusion of gas compressor
KCCPP – Annexure C (i)	Bifurcation of units generated on Gas/HSD
KCCPP – Annexure C (ii)	Sample bill for April (Indigenous natural gas / RLNG)
KCCPP – Annexure C (iii)	Sample calculation for Indigenous natural gas / RLNG
KCCPP – Annexure D (i)	Part load Adjustment Factor table - Gas - CC
KCCPP – Annexure D (ii)	Part load Adjustment Factor table - Gas - OC
KCCPP – Annexure D (iii)	Part load Adjustment Factor table - HSD - CC
KCCPP – Annexure D (iv)	Part load Adjustment Factor table - HSD - OC
KCCPP – Annexure E	Sample calculation for weighted average part load factor - Gas
KCCPP – Annexure F (i)	Degradation table -Net Heat rate HHV (Gas)
KCCPP – Annexure F (ii)	Degradation table -Net Output (gas)
KCCPP – Annexure F (iii)	Degradation table -Net Heat rate HHV (HSD)
KCCPP – Annexure F (iv)	Degradation table -Net Output (HSD)
KCCPP – Annexure G	HSD Calorific value frequency mechanism
KCCPP – Annexure H	O&M Break up (levelized)
KCCPP – Annexure I	Consultant Report (Separate document)
KCCPP – Annexure J	RAB movement
KCCPP – Annexure K (i)	Calculation of indexed RoE
KCCPP – Annexure K (ii)	RoE indexation illustration
KCCPP – Annexure L	Calculation of working capital
KCCPP – Annexure M	Output adjustment due to amb. Temperature
KCCPP – Annexure N	Capacity sample calculation
KCCPP – Annexure O	Outage Schedule and plant factor
KCCPP – Annexure P	O&M Sharing Mechanism
KCCPP – Annexure Q	Head of Terms

KCCPP – Annexure A (i)

Modifications and Improvements Performed for Improving Performance of the Plant

Modification	Dates
Addition of 4th gas compressor to ensure reliability and availability.	April 2011
Modification of gas compressors for mechanical integrity in low suction pressure operational scenarios.	June 2010
Addition of emergency diesel generators to avoid 4 hours lockout in case of blackout situation	March 2010
Addition of Island mode operational capabilities	March 2015
Conversion of 2 Simple Cycle GTs in Combined Cycle	April 2015
Contractual service Agreement (CSA) with GE for gas turbine maintenance	January 2012
Addition of Black Start capability	October 2021
Commissioning of Gas Turbine on Liquid Fuel for base load operation	April 2021

KCCPP – Annexure A (ii)

Safety procedures

Master List of all KCCPP SOP's		
S#	Document Code #	Description
1	HSE-POL-0001	KPC Worldwide (WWF) Green Office Policy
2	GEN-HSE-0001	KPC HSE Manual
3	HSE-SOP-0001	Hazard Identification & Risk Assessment
4	HSE-SOP-0002	Control of Records
5	HSE-SOP-0039	Work Permit system for Nonoperational Area
6	HSE-SOP-0003	Emergency Preparedness and Response
7	HSE-SOP-0004	Non-Conformity, Corrective and Preventive Action
8	HSE-SOP-0005	Internal Audits
9	HSE-SOP-0006	Documentation and Control of Documents
10	HSE-SOP-0007	Management Review
11	HSE-SOP-0008	Incident & Investigation Reporting
12	HSE-SOP-0009	Communication, Participation and Consultation
13	HSE-SOP-0010	Performance Measurement and Monitoring
14	HSE-SOP-0011	Competence, Training & Awareness
15	HSE-SOP-0012	Legal and Other Requirements
16	HSE-SOP-0013	Contractor Safety Induction
17	HSE-SOP-0014	Ionization Radiation for Non-Destructive Testing
18	HSE-SOP-0015	Incident Prevention Plan
19	HSE-SOP-0016	B-Level Safety Committee Meetings
20	HSE-SOP-0017	Aspect & Impact Analysis
21	HSE-SOP-0018	Waste Management
22	HSE-SOP-0020	Training and Authorization of Work permit
23	HSE-SOP-0022	Noise Exposure Control Management
24	HSE-SOP-0023	Chemical Storage & Handling
25	HSE-SOP-0024	Hot Work
26	HSE-SOP-0025	Confined Space Entry
27	HSE-SOP-0026	Odd Hours heavy movement protocol
28	HSE-SOP-0028	Animal Infestation
29	HSE-SOP-0029	Resource Conservation
30	HSE-SOP-0030	Polychlorinated Bi phenyl (PCB) Management
31	HSE-SOP-0031	Electromotive force (EMF) Monitoring & Management
32	HSE-SOP-0032	Illumination Management Procedure
33	HSE-SOP-0033	SFT of Gas turbine Generator Electrical Testing
34	HSE-SOP-0034	SFT of Steam turbine Generator Electrical Testing
35	HSE-SOP-0035	Plant Ambulance Management
36	HSE-SOP-0036	Environment Legal Register
37	HSE-SOP-0037	Environment Incident Reporting
38	HSE-SOP-0038	Hazardous Substance Management
39	HSE-SOP-0040	Indoor Air Quality
40	HSE-SOP-0041	PPE's Management
41	HSE-SOP-0043	Management of Technology Change

Master List of all KCCPP SOP's		
S#	Document Code #	Description
42	HSE-SOP-0044	Working at Height
43	HSE-SOP-0045	Rigging and Hoisting
44	HSE-SOP-0046	Fire Extinguishers Replenishment Procedure
45	HSE-SOP-0049	Chance Find Procedure
46	HSE-SOP-0050	D-Level Safety Committee Meetings
47	HSE-SOP-0051	Housekeeping Audit Procedure
48	HSE-SOP-0052	Ladder Management Procedure
49	HSE-SOP-0068	Gas Turbine Fire & Gas Maintenance System
50	HSE-SOP-0077	Fire Suppression System Maintenance & Testing

KCCPP – Annexure A (iii)

Project Details

Site Details

1. The Plant is located at Korangi Creek area adjacent to PAF Korangi Base Ibrahim Hyderi in the District East of Karachi, Sindh Province.
2. Area is classified as Seismic Zone II A.
3. The site is at an elevation of 5.5 m above mean sea level (MSL).

Plant Reference Condition

Reference Conditions at the Plant Site are:

- Ambient Air Temperature = 30 deg. C
- Total Barometric Pressure = 1013.2 mbar
- Relative Humidity = 60 %
- Sea water temperature = 25 deg C
- Power Factor = 0.85
- System Frequency = 50 Hz
- HSD Fuel Supply Temperature = 30 deg C
- Gas Fuel Supply Temperature = 25 deg C
- HSD Fuel (LHV) = 18,400 BTU/LB
- Gas fuel (LHV)= 47,925 KJ/KG

Plant Configuration

Technology	Combine Cycle Power Plant
Type of fuel	Natural Gas / RLNG – Primary, HSD – Backup
Equipment	Gas Turbines & Steam Turbines
Units	4 x 48.375 Gas turbines, 1 x 26.5MW Steam Turbine and 1 x 27.5 MW Steam turbines
Output	247.5 MW ISO Installed
Make	Gas Turbine – GE, Steam Turbine – G.E. Thermodyn
Model	Gas Turbine – LM6000PC NDW SPRINT, Steam Turbine – full condensing

Plant Characteristics (Performance Test Values June 2019 Gas Fuel)

Gross installed capacity at mean site conditions on Gas fuel	237.078 MW
Auxiliary Consumption on Gas fuel	16.25 MW (6.85%)
Net Plant capacity on Gas fuel	220.828 MW
Net Plant efficiency (LHV)	46.238 %
Net Plant efficiency (HHV)	41.722 %
Generation voltage	11.5 KV for G.T. 11.0 KV for S.T.
Grid voltage	220 KV
Frequency	50 HZ
Power factor	Leading - 0.95 for All GTs, 0.90 for both STs Lagging - 0.85 for both GTs and STs
Ramp up rate of generators	5 MW/ min each GT 0.4MW/min (Cold) for both Steam Turbine 1MW/min(Hot) for both Steam Turbine
Time required to reach (complex) full load	6-8 Hrs (From cold startup)

Frequency Limits

The generators are capable of maintaining constant output for system frequency range of 48.5 to 51.5 Hz in accordance with the requirements.

Voltage Limits

The plant is capable to operate continuously within the voltage range of 220 kV +/- 10%.

Reactive Power

The plant is designed to operate with reactive capability of 0.95 (Leading) / 0.85 (Lagging).

Noise

The noise level is less than 85 dB(A) which fall within the EPA prescribed environmental limits.

Water Resources

Main water resource for meeting KCCPP is sea water for both cooling purpose and Demin Water Production. Sea Water for Cooling water is primarily used as once through and is primarily used for close cooling water circuit cooling, for steam turbine condensers, gas turbine chillers condensers. In-addition there are two Reverse Osmosis plant which uses sea water for production of Demineralized water which is used in Boilers and Gas Turbine sprint and De-NOx System

KCCPP – Annexure A (iv) – Minimum loading details

GE
Gas Power - Aero
Position Paper #23
Rev F
February 1, 2016
16415 Jacintoport Blvd
Houston, Tx 77015
USA
T 001-832-964-1309

LM Gas Turbine Minimum Load Operations

Introduction

Many times during commissioning, maintenance and troubleshooting periods it becomes necessary to operate the TM2500, LM2X, LM6000, LMS100 at low output power levels. This position paper provides recommendations for operating the LM gas turbine during these situations.

Description

The LM GT can be operated indefinitely and without restriction at very low loads such as for maintenance and/or emergency situations. Operation for extended periods at low load may result in the following:

- Premature Wear of VBV system, as applicable
- Noise from VBV system, as applicable
- Reduced Fuel efficiency
- Fuel manifold coking when operating on liquid fuel

Conclusion

Operating the TM2500, LM2X, LM6000, LMS100 at synchronous idle or light load conditions should not be part of the normal operation. Optimal fuel efficiency is achieved when the LM GT is running at or near maximum output power.

Randy Klean
Randy Klein
Chief Engineer - Electrical

Ref: KPC/MI/2021/587
Date: 27th September 2021

NEPRA Query:

- Reasons as well as supporting data (OEM) regarding minimum loading of KPC

KE Response:

Reference: GE Position Paper # 23, Rev F, dated 1st February 2016, titled "LM Gas Turbines Minimum Load Operations" (attached)

Operating LM6000 Gas Turbines at synchronous idle or light load conditions should not be part of the normal operation because operating gas turbines at low load for extended period may result in the following bad impacts:

- Premature Wear of Variable Bleed Valve system, as applicable
- Noise from Variable Bleed Valve system, as applicable
- Reduced Fuel efficiency
- Fuel manifold coking when operating on liquid fuel

However, sometimes during commissioning, maintenance, troubleshooting or any other emergency situation, it becomes necessary to operate the gas turbine at low load conditions. OEM allows to operate the turbine at low load in such conditions, keeping in mind the bad impacts mentioned above. Therefore, as soon as the specific condition of part load operation is over, the turbine should be back to full load.

Imtiaz Alam
Operations Head KPC

Muhammed Abdullah Khan
Plant Head KPC

There is no min load limit defined by OEM for GTs. However, as CCPP is a combined cycle Power Plant therefore to maintain Steam Turbine on minimum load of 6MW we need to run GT on at least 25MW

K-ELECTRIC LIMITED

Reference: GE Oil & Gas Document Code RNTIC072864, Rev 1 Dated 17th December 2013 Page 33, Para 13.11 (Control System Functional Description)

13.11 Generator Power control

- Power control can be selected at any time, the inlet pressure being then controlled by the turbine HP by pass.
- Power control is a cascade function of the governor which gives raise/lower command to the speed reference of the speed/load control so that generator power matches the power set point. The speed loop being in control (with droop), any grid frequency variation will instantaneously affect the STG power. On a longer term issue, the power loop will slowly bring back the power to the set point.
- The minimum set point is fixed at 6 MW and maximum at 28.1 MW
- The selection to power control can be done either from GE HMI or remotely from DCS. The set point will then be local at first. Power set point is changed from the governor key pad with fast ramp selection (100 kW/s) by raise/ lower action. In this way the operator must respect the loading schedule by himself.
- De-selection of power control is done either on the governor key pad or by giving a raise/lower command (either from DCS or from GE HMI)
- The selection in remote set point can be done either locally from the governor keypad or remotely from DCS. The governor set point is then modified by raise/lower orders from DCS. The value of power set point is send to the DCS by a 4-20mA signal.

KCCPP – Annexure A (v)

Fire Protection System

1. **Fire area, fire escape and evacuation passage**

All building of the plant has been provided with a specific and dedicated "Emergency Evacuation Map" posted at the entrance and other conspicuous locations to warn and update the entrants of the buildings about the route to be taken to assembly point, in case of any emergency.

Also, every building has been provided with the adequate number of emergency evacuations passageways (exit doors) which are always kept healthy and unobstructed to be easily accessible during any emergency.

2. **Evacuation Channels**

Plant has dedicated emergency warning system (Emergency alarm, walkie-talkie, hot lines), while role and responsibilities for every employee is clearly documents in the plant Emergency Response Procedure and refresher training sessions imparted and also evacuation drills performed to verify their effectiveness.

Moreover, dedicated Fire Wardens are assigned for individual buildings to ensure the complete evacuation of the employees in case of actual emergency.

Plant has also dedicated assembly point, where every individual must report after hearing the emergency alarm and then a robust headcount management system is followed.

3. **Fire-fighting system and fire extinguisher**

As per NFPA requirement Fire detection, Fire suppression and firefighting systems are available at plant (including fire hydrant network, water deluge system, gaseous suppression system and foam fire suppression system). Adequate number of fire extinguishers have also been installed across the plant premises (indoor as well as outdoor) and different training sessions are imparted among the team for its operation throughout the year.

4. **Fire pump and alarm monitoring**

Plant has a dedicated fire water network covering all locations asper fire risk assessment, along with NFPA compliant fire pumps and water storage facility (supporting ample time of firefighting).

Early detection of the fire is given the paramount importance which ensures that fire is detected at the incipient stage. These (smoke detectors) are widespread across the plant and integrated with plant fire siren system. Multiple manual call points are also installed across the plant for actuation of the fire siren, upon observing any fire emergency.

Equipment for fire protection

Fire and Gas Detection & Alarm system

Following type of Fire and gas Detections & Alarm system are installed on different locations in KCCPP:

Systems installed
Beam Detector
Flame Detectors
Heat Detectors
Manual Call Point
Smoke Detectors
Control Module
Monitoring Module
Bell
Interface Module
Sounder
Extinguisher Release

Fire, Water & Foam Suppression System

Description	Area/Location
Water Hydrant	Plant Operational Area
Monitor Hydrant	Foam monitor, FGC area / store area
Sprinklers (Water)	HSD Tanks
Hose Cabinets	Plant Operation and non-operational Area
Fixed Water Spray	NA
Deluge System	SUTs, AUTS, Services Transformers
Foam	Foam Suppression system for Diesel storage and day tanks, STG-1 Lube oil Skid and STG-2 Lube oil Skid. All plant area, (foam trolleys & cylinders)

Fire Suppressions Systems, Water & Foam (Type & Capacity)

Area Name / Equipment	Type	Capacity
STG-1 Lube Oil Skid and Bearings	AFFF 3%	400 L
STG-2 Lube Oil Skid and Bearings	AFFF 3%	200 L
HSD Storage and Day Tanks	AFFF 3%	3000L

Fire Suppressions Systems Gaseous

Area Name / Equipment	Type
New ST MCC	NOVEC 1230
New Electrical Switchgear Room	NOVEC 1230
New Electrical Battery Room	NOVEC 1230
CCR Switchgear	FM 200
CCR Switchgear Basement	FM 200
CCR Battery Room	FM 200
GIS Switchgear Basement	FM 200
GIS Control Room Basement	FM 200
Gas Turbines X 4 Nos.	Co2

Fire Pumps

Name	Make/ Model/ S. No.	Power, RPM Flow & Head
Jockey (Pump)		
Motor	Make: SAER S.No: 2572350 & 3432276 Model: 0P65/5	Power: 9.2 kW RPM: 2850
Pump	SAER ELETTROPOMPE, ITALY TYPE: 0P65/5 SERIAL: 2572352	Rpm: 2850 Hp:12,5 Kw:9,2 Q:10-40 m^3/h H:123-143 m
Electric(Pump)		
Motor	Make: MEZ KEZMAROK S.No: 14314 Model: Y2 315L2-4	Power: 200 kW RPM: 1490
Pump	Model # 250-CVE-460-32 Make: SIGMA	RPM : 1450 Flow : 478 m3/hr
Diesel (Pump)		
Engine	MAKE, ORIGIN: HYUNDAI MARINE DIESEL ENGINE, MADE IN KOREA MODEL: P6D33TI ENGINE: D6CA7138176 MFGDATE:2007	OUT PUT:410 PS, 1800 RPM
Pump	MAKE, ORIGIN :DRAKOS POLEMIS, MADE IN EUROPE MODEL :LDP X 200 – 500 S. NO:52713 YEAR:2007	RPM : 1800 Flow : 690 m3/hr

Manually operated Fire Extinguishers

FIRE EXTINGUISHER INVENTORY			
TYPE	Weight / Size	Quantity	
		On Plant	Spare In Fire Store
CO_2	5 Kg	83	16
CO_2 (Trolley)	25 kg	12	04
DCP	6 Kg	82	09
DCP (Trolley)	25 kg	11	01
AFFF[T] MOBILE HYD	100 Liter	01	03
AFFF[T] MOBILE HYD	150 Liter	03	0
AFFF[T] MOBILE HYD	500 Liter	01	0
AFFF Fire Extinguisher	09 Liter	02	06
AFFF Fire Extinguisher	30 Ltr	04	0
	TOTAL	**199**	**39**

Fire Control Panel

Location of Installation & Utility	Utility
Location: CCR,	Plant Operational Area Fire Detection System (FDS)
Location: CCR,	Plant Non-Operational Area FDS
Location: CCR,	Extension FDS
Location: CCR,	Old SWGR Fire Fighting System (FFS)
Location: CCR,	Old SWGR Basement FFS
Location: CCR,	Old Battery Room FFS
Location: GIS,	Gas Insulated Station (GIS) FDS
Location: GIS,	GIS FFS
Location: ST Hall,	AUT 3 Deluge
Location: ST Hall,	AUT 4 Deluge
Location: ST Hall,	Lube Oil Tank Foam
Location: ST Hall,	New MCC FFS
Location: Electrical Building,	Extension Battery Room FFS
Location: Electrical Building,	Extension SWGR FFS
Location: Electrical Building,	SUT 4 Deluge
Location: Electrical Building,	Extension FDS
Location: ECR,	ECR FDS
Location: Management Block,	Management Block FDS
Location: IT Server Room,	IT Server Room FDS
Location: KPC Auditorium,	Auditorium FDS

KCCPP – Annexure A (vi)

Plant Layout

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KCCPP – Annexure A (vii)

Details of Major Equipment

Gas Turbines

Parameter	Unit Numbers			
	GT. 1	GT. 2	GT. 3	GT. 4
Manufacturer, country	General Electric USA			
Type/Model	LM 6000 PC sprint			
Speed	3627			
Rated Capacity (ISO Rating)	48.375 MW			
Air Inlet Conditions	With Inlet cooling	With Inlet cooling	With Inlet cooling	With Inlet cooling
Air Filtration, Type	Static	Static	Static	Static
Compressor Stages	05 LP,14 HP	05 LP,14 HP	05 LP,14 HP	05 LP,14 HP
Turbine Stages	02 HP, 05 LP	02 HP, 05 LP	02 HP, 05 LP	02 HP, 05 LP
Compressor Pressure Ratio	01:30	01:30	01:30	01:30
Combustor, type and number	Single Annular Combustor	Single Annular Combustor	Single Annular Combustor	Single Annular Combustor
Fuel	Natural Gas/Liquid Fuel	Natural Gas/Liquid Fuel	Natural Gas/Liquid Fuel	Natural Gas/Liquid Fuel
Fuel Gas / Fuel Oil inlet Pr.	46 bar /92.38 Bar			
Evaporative Cooling	Not Installed			
Exhaust Gas Temperature, °C	450-460			
Exhaust Bypass Stack	Yes	Yes	Yes	Yes
Starting System	Hydraulic	Hydraulic	Hydraulic	Hydraulic
Control System	GE Micronet Simplex			
Type of Fire Protection - Detection - Suppression	CO2 Suppression	CO2 Suppression	CO2 Suppression	CO2 Suppression

Heat Recovery Steam Generators

Parameter	HRSG 1	HRSG 2
Manufacturer	Istroenergo Group, a.s. (IEG)	METKA Metal Construction
Country of Manufacture	Slovakia	Greece
Year	2013	2007
Type/Model	HRSG of vertical type, double pressure	
Capacity, tons/hr	HP steam: 57 bar(a) / 408°C / 92 tph; LP steam: 7 bar(a) / 242°C / 31 tph	HP steam: 57 bar(a) / 408°C / 91 tph; LP steam: 7 bar(a) / 242°C / 30.6 tph
Rated Heat Output, MMBTU/hr		
Heat source	Exhaust Gas from GT-1/2	Exhaust Gas from GT-3/4
HP Steam pressure, barg	57	57
HP Steam temperature, °C	408	408
HP Steam flow, t/h	92.15	91.3
LP Steam pressure, barg	7	7
xLP Steam temperature, °C	242	242
LP Steam Flow, t/h	31.14	30.6
Total HRSG Thermal Output, kW (th)	99757 KW (th) (Natural Gas) 85661 KW (th) (Fuel Oil)	98650 KW (th) (Natural Gas) 79913 KW (th) (Fuel Oil)
Control System, Make & Type	Honeywell, C200 & C300	Honeywell, C200 & C300
Parameters recorded at Online Boiler Water Analyzer	PH and Conductivity of condensate, PH, silica, conductivity and O2 content of Feedwater,	PH and Conductivity of condensate, PH, conductivity and O2 content of Feedwater, PH and conductivity of HP & LP drums.
Parameters recorded at Online Steam Analyzer	HP and LP Superheated steam conductivity	HP and LP Superheated steam conductivity

Steam Turbines

Parameter	ST 1	ST 2
Manufacturer	GE, France	
Year	2013	2007
Model	GE Thermodyn "MC" series	
Serial Number	V01870	1010
Type	Impulse-type Multivalve Condensing	
Stages	09	09
Speed	4727	4450
Casing		
HP Steam pressure, bara	54	54
HP Steam temperature, °C	404.1	404.7
Exhaust Steam Cooling	Water Cooled Condenser	Water Cooled Condenser
LP Steam inlet pressure, bara	6	6
LP Steam inlet temperature, oC	241.5	240
Control System, Make & Type	PAC Systems™ RX3i (GE Fanuc)	PAC Systems™ RX3i (GE Fanuc)
Type & Specs of Lube Oil	Mineral Oil Total Preslia 46	Mineral Oil Total Preslia 46
Type & Specs of Control Oil	Equizis ZS-32, Total	Equizis ZS-32, Total
Type of Fire Protection on Bearings	Foam Suppression System	Foam Suppression System
Type of Fire Protection on Oil System	Foam Suppression System	Foam Suppression System

Diesel Engines (Emergency/Black Start Generators)

Parameter	Unit #1	Unit #2	Unit #3	Unit #3
Packager	Siemens	Siemens	Siemens	Siemens
Year	2007	2007	2007	2007
Model	DG 1250	DG 1250	DG 1250	DG 1000
Serial Number	DGS 3819	DGS 3818	DGS 3829	DGS 3443
Normal/Standby/Max output Power	1250 KVA	1250 KVA	1250 KVA	1000 KVA
Voltage	400 V	400 V	400 V	400 V

Generator

Parameter	GT 1	GT 2	GT 3	GT 4
Manufacturer, Country	Meidensha, Japan	Meidensha, Japan	Meidensha, Japan	Meidensha, Japan
Year of Manufacture	2005	2005	2006	2006
Type/Model	EK-AFT / 800LL04	EK-AFT / 800LL04	EK-AFT / 800LL04	EK-AFT / 800LL04
Serial Number	1A6220RJ1	1A6221RJ1	1A6222 RJ1	1A6223 RJ1
Rating, MVA	64.5			
Voltage/Frequency/Power Factor	11.5kV/50 Hz/0.85			
Speed, rpm	3000			
Insulation Class	F	F	F	F
Excitation Type	Brushless DC Excitation (PMG)	Brushless DC Excitation (PMG)	Brushless DC Excitation (PMG)	Brushless DC Excitation (PMG)

Protection	Beckwith Electric M-3425A	Beckwith Electric M-3425A	Beckwith Electric M-3425A	Beckwith Electric M-3425A
Efficiency	98.3%	98.3%	98.3%	98.3%
Cooling -Stator winding -Stator Core -Rotor	Air Cooled (All)	Air Cooled (All)	Air Cooled (All)	Air Cooled (All)
Type of Fire Protection - Exciter - Generator	CO_2 Suppression	CO_2 Suppression	CO_2 Suppression	CO_2 Suppression

Steam Turbine Generator

Parameter	STG 1	STG 2
Manufacturer	GE, UK	Brush, Holland
Year of Manufacture	2014	2007
Model	Frame A183H4	DG185ZP-04
Serial Number	UK.C.Y.20224.01.40.01	410126
Rating MVA	35.750	33.125
Voltage, kV	11.0	11.0
Speed, rpm	1500	1500
Frequency, Hz	50	50
Power Factor	0.80	0.80
Insulation Class	F	F, temp rise to B
Protection	G60 Protection Relay	G60 Protection Relay
Cooling Medium	Air	Air
Excitation Type	Brushless DC Excitation (PMG)	Brushless DC Excitation (PMG)
Efficiency	98.68%	98.26%
Cooling Stator winding Stator Core Rotor	IC8A1W7 (Air Cooled, Via Water Cooler)	IC8A1W7 (Air Cooled, Via Water Cooler)
Type of Fire Protection - Exciter - Generator	None	None

Transformers

Gas Turbine Generator Step up Transformer

Parameter	GT 1 and GT2	GT 3 and GT4
Manufacturer	Electroputere	Electroputere
Country of Origin	Romania	Romania
Year	2007	2007
International Standard of Manufacture	60076/60354 – CS07	60076/60354 – CS07
Model/Type	Oil Filled, Conservator Type	Oil Filled, Conservator Type
Serial Number	142646	142647
Rating MVA	115/57.5/57.5	115/57.5/57.5
HV/LV	220/11.5/11.5	220/11.5/11.5
Tap	17	17
Cooling	ONAF	ONAF
Separation	Separate Main Tank and OLTC	Separate Main Tank and OLTC
Deluge Fire Protection	Water Based	Water Based
Dissolved Gas Monitoring	Offline, Sample Based	Offline, Sample Based
Fire Separation	Fire Wall	Fire Wall
Containment	Secondary Containment	Secondary Containment
Frequency	50 Hz	50 Hz
Oil Capacity	45000 kg	45000 kg
Specifications of Oil	Mineral oil according to IEC 60296	Mineral oil according to IEC 60296
Type of - Fire Detection - Suppression	Pressurized Air Trapped Glass Bulbs Water Based Deluge	Pressurized Air Trapped Glass Bulbs Water Based Deluge

Steam Turbine Generator Step up Transformer

Parameter	ST 01	ST 02
Manufacturer	XD Jinan Transformer Co. Ltd	Getra SpA
Country of Origin	China	Italy
Year	2014	2008
International Standard of Manufacture	IEC 60076	IEC 60076
Type	SFZ-40000/220	Oil Filled, Conservator Type
Serial Number	1EJ 710 10229.1	T3C0579E0000
Rating MVA	40	35
HV/LV Voltage kV	220 / 11	220 / 11
Tap	17	17
Cooling	ONAF	ONAF
Separation	Separate Main Tank and OLTC	Separate Main Tank and OLTC
Deluge Fire Protection	Water Based	Water Based
Dissolved Gas Monitoring	Offline, Sample Based	Offline, Sample Based
Fire Separation	None	None
Containment	Secondary Containment	Secondary Containment
Frequency	50 Hz	50 Hz
Oil Capacity (kg)	37600	19000
Specifications of Oil	Mineral oil according to IEC 60296	Mineral oil according to IEC 60296

Auxiliary Transformers

Parameter	AUT 01	AUT 02	AUT 03	AUT 04
Manufacturer	Electroputere		XD Jinan Transformer Co. Ltd	
Year	2007	2007	2014	2014
International Standard	60076	60076	60076	60076
Model/Type	Oil Filled, Conservator Type		SFZ-5000/11.5	
Serial Numbers	142648	142649	20140253	20140252
Rating (MVA)	18.5	18.5	5	5
Voltage/Frequency	11.5 / 6.6 / 50 Hz	11.5 / 6.6 / 50 Hz	11.5 / 6.6 / 50 Hz	11.5 / 6.6 / 50 Hz
Tap	17	17	17	17
Cooling	ONAF	ONAF	ONAF	ONAF
Spec/Brand of Oil	Mineral oil according to IEC 60296	Mineral oil according to IEC 60296	Mineral oil according to IEC 60296	Mineral oil according to IEC 60296

Parameter	Service Transformer					
	01	02	03	04	05	06
Manufacturer	France transfo	France transfo	France transfo	France transfo	XD Jinan Transformer Co. Ltd	XD Jinan Transformer Co. Ltd
Year	2007	2007	2007	2007	2014	2014
International Standard	IEC 60076-1	IEC 60076-1	IEC 60076-1	IEC 60076-1	IEC 60076	IEC 60076
Model/Type					SCLB10-2000/6.6	SCLB10-2000/6.6
Serial Numbers	415411-01	415412-01	415411-02	415412-02	14040318	14040319
Rating(KVA)	3150	3150	3150	3150	2000	2000
Voltage/Frequency	6.6/0.4kV/50 Hz	6.6/0.4kV/50 Hz	6.6/0.4kV/50 Hz	6.6/0.4kV/50 Hz	6.6/0.4kV/50 Hz	6.6/0.4kV/50 Hz
Tap	Check	Check	Check	Check	5	5
Cooling	ONAN	ONAN	ONAN	ONAN	Air Natural	Air Natural
Spec/Brand of Oil	Mineral oil according to IEC 60296				Dry	Dry

KCCPP – Annexure B

Adjustment of heat rate & aux. consumption based on exclusion gas compressor

Extracts from Independent Consultant's (NESPAK) Report

TABLE-47. COMPARISON OF PRIMARY TEST # 1 PERFORMANCE PARAMETERS WITH/WITOUT COMPRESSORS' LOAD

Sr. No	Description of Performance Parameters	Test Results With Compressors Load		Test Results Without Compressors Load	
		Output (MW)		Output (MW)	
1	3 Compressors' Load	7.7415			
2	Gross Power Output Un-Corrected	227.000		227.000	
3	Gross Power Output Corrected	237.078		237.078	
4	Net Power Output Un-Corrected	210.775		218.517	
5	Net Power Output Corrected	220.828		228.881	
		Heat Rate (BTU/kWh)	Thermal Efficiency %	Heat Rate (BTU/kWh)	Thermal Efficiency %
1	Gross Heat Rate Un-Corrected (LHV)	6912.153	49.364	6912.153	49.364
2	Gross Heat Rate Un-Corrected (HHV)	7660.349	44.543	7660.349	44.543
3	Gross Heat Rate Corrected (LHV)	6873.357	49.643	6873.357	49.643
4	Gross Heat Rate Corrected (HHV)	7617.354	44.794	7617.354	44.794
5	Net Heat Rate Un-Corrected (LHV)	7444.266	45.836	7180.531	47.519
6	Net Heat Rate Un-Corrected (HHV)	8250.060	41.359	7957.777	42.878
7	Net Plant Heat Rate Corrected (LHV)	7379.478	46.238	7119.876	47.924
8	Net Plant Heat Rate Corrected (HHV)	8178.259	41.722	7890.559	43.243

KCCPP – Annexure C (i)

HSD / RLNG Sample calculation

	Dated: 11th July 2021		A	B	C	D	E	F	G
S.no	Description	Unit	GT-1	GT-2	ST-1	GT-3	GT-4	ST-2	Total
1	Energy meter reading at start of HSD operation	MWHR	-	1,782,829	-	2,474,402	-	-	-
2	Energy meter reading at End of HSD operation	MWHR	-	1,783,053	-	2,474,529	-	-	-
3	Total GT-Generation on HSD (2-1)	MWHR	-	224	-	127	-	-	352
4	Energy meter reading at start of Day	MWHR	2,315,400	1,782,829	495,622	2,474,362	2,821,581	1,409,376	-
5	Energy meter reading at End of Day	MWHR	2,316,321	1,783,053	495,922	2,474,529	2,822,355	1,409,607	-
6	Total Complex Generation (5-4)	MWHR	921	224	298	166	774	231	2,614
7	Total GT-Generation on gas (5-3)	MWHR	921	-	-	39	774	-	1,734
8	*ST-Generation on gas fuel (ST-1=(A7+B7)/(A6+B6)*C6) (ST-2=(D7+E7)/(D6+E6)*F6)	MWHR	-	-	239	-	-	199	439
9	ST-Generation on HSD fuel (6-8)	MWHR	-	-	58	-	-	31	89
10	Total Complex Generation on gas fuel (7+8)	MWHR	921	-	239	39	774	199	2,173
11	Total Complex Generation on HSD fuel (3+9)	MWHR	-	224	58	127		31	441

*Steam Turbine generation on HSD is calculated based weighted average on daily basis. No separate energy metering is available.

Sent out energy distribution			KCR Circuit I	KCR Circuit II	Total
12	Export(Sent out Energy meter reading) at start of the day	MWHR	2,272,388	2,255,978	
13	Export(Sent out Energy meter reading) at end of the day	MWHR	2,273,634	2,257,106	
14	Total Export(sent out energy for the day) (13-12)	MWHR	1,246	1,128	2,374.00
15	Import(Sent out Energy meter reading) at start of the day	MWHR	2,541	2,243	
16	Import(Sent out Energy meter reading) at end of the day	MWHR	2,541	2,243	
17	Total Export(sent out energy for the day) (16-15)	MWHR			
18	Total Complex Net sent out (14-17)	MWHR	1,246	1,128	2,374.00
19	Total Complex Net sent out on Gas (G10/G6*G18)	MWHR			1,973.51
20	Total Complex Net sent out on HSD (18-19)	MWHR			400.49

Note: Above is of one day generation data. For the whole month, Day wise of the same is cumulated.

Calculation methodology of sent out energy distribution will be revised after commissioning of new circuit D08 and D09, presently it is under testing/cocommissioning phase.

KCCPP – Annexure C (ii)

Indigenous natural gas Sample Bills April 2020

Sui Southern Gas Company Limited
SSGC Block 14, Sir Shah Suleman Road, Gulshan-e-Iqbal, Karachi 75300 www.sgc.com.pk

SSGC General Sales Tax Number [illegible]

KESC KORANGI THERMAL POWER STATION (KTPS-1)
K - Electric Limited
Plot No. 1,
[illegible]

Billing Group: [illegible]

For emergencies and complaints please call
1199

SERVICE WITH A SMILE
Contact your Neighborhood Customer Facilitation Center at [illegible]

ACCOUNT INFORMATION

Customer Number:	8688117075 (6)
Billing Month:	Apr- 2020
Tariff/Customer Class:	IND
GST/NTN Number:	1200271600728

Issue Date: 04-May 2020

ACCOUNT SUMMARY AS OF

Previous Balance (Rs.)	Current Charges (Rs.)	Payable Within Due Date (Rs.)	Late Payment Surcharge (Rs.)	Payment After Due Date (Rs.)	Due Date
7,022,867,090	311,997,859	7,334,864,949		7,334,864,949	19 May 2020

MONTHLY CONSUMPTION

METER INFORMATION

METER No.	CURRENT DATE	CURRENT READING	PREVIOUS DATE	PREVIOUS READING	MEASURED QTY (SCM)
[illegible]	30-Apr-2020	[illegible]	31-Mar-2020	[illegible]	[illegible]
[illegible]	30-Apr-2020		31-Mar-2020		[illegible]

SMS CODE	GCV (BTU/SCF)	MMBTU	No. OF MONTHS	PRESSURE	TEMPERATURE
	[illegible]	[illegible]	01	1	1

BILL & PAYMENT HISTORY

Month	Bill Amount (Rs.)	Payment Date	Amount (Rs.)

BILL CALCULATION

ACTUAL BILL CONSUMPTIVE

COMPUTATION OF CURRENT GAS CHARGES

SLAB	CMs	MMBTU	RATE/ MMBTU (Rs.)	AMOUNT (Rs.)

IMPORTANT MESSAGES

CURRENT CHARGES (Rs.)

Gas Charges	[illegible]
Meter Rent	2,500
General Sales Tax	[illegible]
Withholding Tax @ 4%	
Other Charges	
Less: Provisional Bill Corrections	
Adjustments - Debit	
Adjustments - Credit	

Sui Southern Gas Company Limited
Block 14, Sir Shah Suleman Road
Gulshan-e-Iqbal, Karachi 75300
SSGC www.ssgc.com.pk

M/S KESC KORANGI THERMAL POWER STATION (KTPS-1)
K - Electric Limited
Plot No. 1,

Customer Number	Total Amount Due	Due Date	After Due Date
8688117075 (6)	7,334,864,949	19 May 2020	7,334,864,949

K-ELECTRIC LIMITED

Sui Southern Gas Company Limited

SSGC Block 14, Sir Shah Suleman Road, Gulshan-e-Iqbal, Karachi 75300 www.ssgc.com.pk

SSGC General Sales Tax Number 02-04-6028-001-19

KESC KORANGI THERMAL POWER STATION (KTPS-2)
K - Electric Limited
Plot No. 1,
Ibrahim Haydri Korangi Creek, Near PAF Base Korangi

Billing Group: (A-11/0108885 /00)

For emergencies and complaints please call **1199**

SERVICE WITH A SMILE
Contact your Neighborhood
Customer Facilitation Center at:
SIR SHAH SULEMAN ROAD
GULSHAN-E-IQBAL
NEAR CIVIC CENTER. TEL
99021047

ACCOUNT INFORMATION

Customer Number:	7070404620 (3)
Billing Month	Apr- 2020
Tariff/Customer Class	IND
GST/NTN Number:	1200271600728

Issue Date: 04-May 2020

ACCOUNT SUMMARY AS OF

Previous Balance (Rs.)	Current Charges (Rs.)	Payable Within Due Date (Rs.)	Late Payment Surcharge (Rs.)	Payment After Due Date (Rs.)	Due Date
7,046,014,874	323,748,772	7,369,763,646		7,369,763,646	19 May 2020

MONTHLY CONSUMPTION

METER INFORMATION

METER No.	CURRENT DATE	CURRENT READING	PREVIOUS DATE	PREVIOUS READING	MEASURED QTY (SCM)
13403410	10-Apr-2020	43340083	31-Mar-2020	29549017	11791132
RLNG VOL	10-Apr-2020		31-Mar-2020		4121095

SMS CODE	GCV (BTU/SCF)	MMBTU	No. OF MONTHS	PRESSURE	TEMPERATURE
	988.821533	335,808.072948	01	1	1

BILL & PAYMENT HISTORY

Month	Bill Amount (Rs.)	Payment Date	Amount (Rs.)

BILL CALCULATION

ACTUAL BILL CONSUMPTIVE

COMPUTATION OF CURRENT GAS CHARGES

SLAB	CMs	MMBTU	RATE/ MMBTU (Rs.)	AMOUNT (Rs.)

IMPORTANT MESSAGES

CURRENT CHARGES (Rs.)

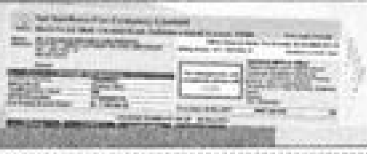
Gas Charges	276,706,853
Meter Rent	2,500
General Sales Tax	47,040,419
Withholding Tax @ 4%	
Other Charges	
Less: Provisional Bill Corrections	
Adjustments - Debit	
Adjustments - Credit	

VIEW YOUR GAS BILL ONLINE

گیس بل ویب سائٹ سے حاصل کیجئے

آپ اپنا DUPLICATE گیس بل گھر بیٹھے ہماری ویب سائٹ
www.ssgc.com.pk
سے حاصل کرسکتے ہیں۔ دیگر معلومات اور شکایات کے لئے
۱۱۹۹ پر کال کیجئے

Sui Southern Gas Company Limited



Visit our website at www.ssgc.com.pk to view and download your duplicate gas bill.

For inquiries and assistance, please call 1199.

1199

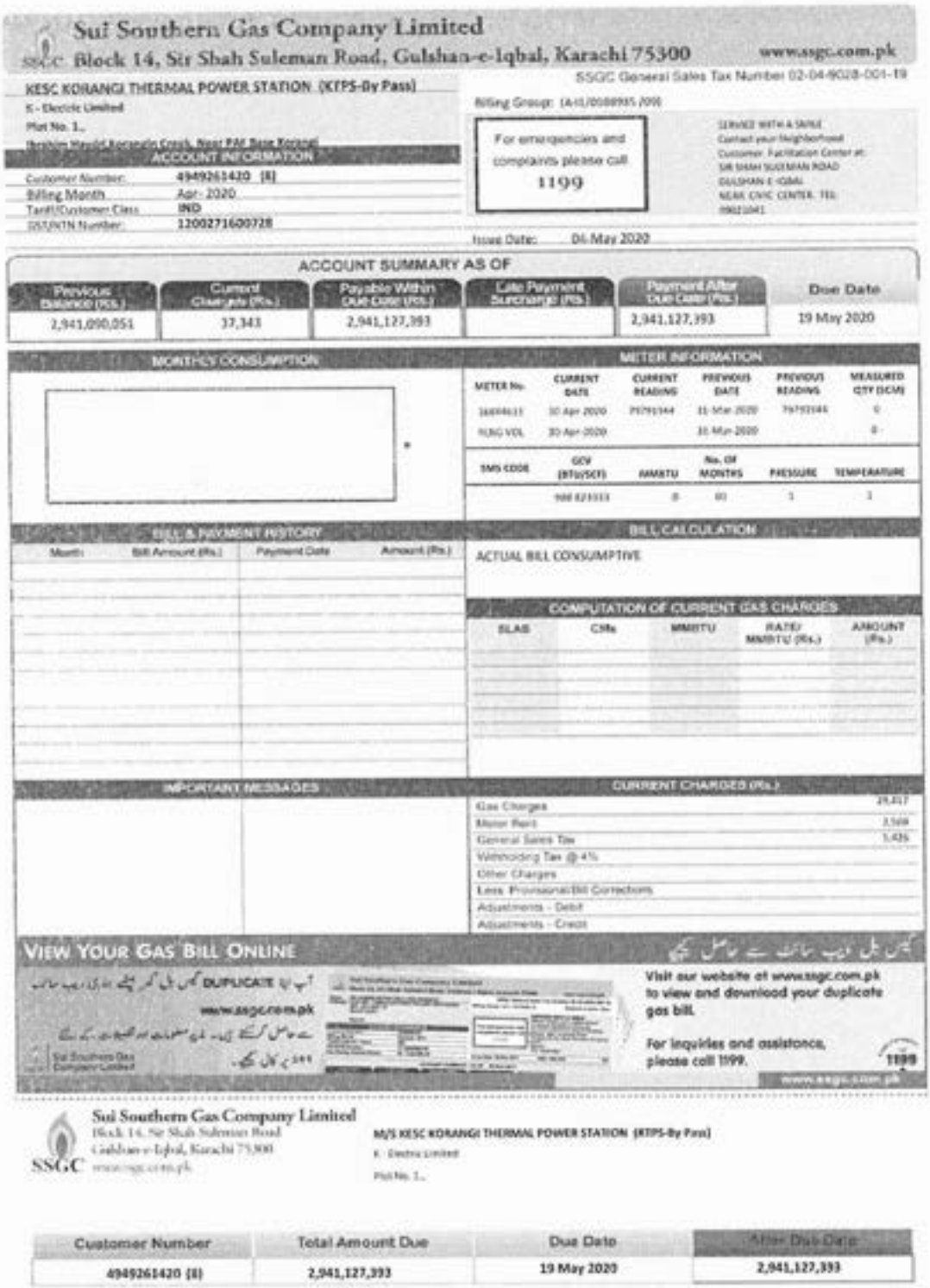
www.ssgc.com.pk

Sui Southern Gas Company Limited
Block 14, Sir Shah Suleman Road
Gulshan-e-Iqbal, Karachi 75300
SSGC www.ssgc.com.pk

M/S KESC KORANGI THERMAL POWER STATION (KTPS-2)
K - Electric Limited
Plot No. 1,

Customer Number	Total Amount Due	Due Date	After Due Date
7070404620 (3)	7,369,763,646	19 May 2020	7,369,763,646

K-ELECTRIC LIMITED



Sui Southern Gas Company Limited
Block 14, Sir Shah Suleman Road, Gulshan-e-Iqbal, Karachi 75300 www.ssgc.com.pk

KESC KORANGI THERMAL POWER STATION (KTPS-By Pass)
K - Electric Limited
Plot No. 1,,

SSGC General Sales Tax Number 02-04-9028-001-19

Billing Group: (A-II/0088995 /09)

For emergencies and complaints please call 1199

SERVICE WITH A SMILE
Contact your Neighborhood Customer Facilitation Center at: SIR SHAH SULEMAN ROAD GULSHAN E IQBAL NEAR CIVIC CENTER. TEL: 09021041

ACCOUNT INFORMATION

Customer Number:	4949261420 (E)
Billing Month:	Apr - 2020
Tariff/Customer Class:	IND
GST/NTN Number:	1200271600728

Issue Date: 04-May-2020

ACCOUNT SUMMARY AS OF

Previous Balance (Rs.)	Current Charges (Rs.)	Payable Within Due Date (Rs.)	Late Payment Surcharge (Rs.)	Payment After Due Date (Rs.)	Due Date
2,941,090,051	37,343	2,941,127,393		2,941,127,393	19 May 2020

MONTHLY CONSUMPTION

METER INFORMATION

METER No.	CURRENT DATE	CURRENT READING	PREVIOUS DATE	PREVIOUS READING	MEASURED QTY (SCM)
16894611	30 Apr 2020	79791944	31 Mar 2020	79753945	0
RLNG VOL	30 Apr 2020		31 Mar 2020		0

SMS CODE	GCV (BTU/SCF)	AMBTU	No. Of MONTHS	PRESSURE	TEMPERATURE
	908.823333	0	01	1	1

BILL & PAYMENT HISTORY

Month	Bill Amount (Rs.)	Payment Date	Amount (Rs.)

BILL CALCULATION

ACTUAL BILL CONSUMPTIVE

COMPUTATION OF CURRENT GAS CHARGES

SLAB	CMs	MMBTU	RATE/ MMBTU (Rs.)	AMOUNT (Rs.)

IMPORTANT MESSAGES

CURRENT CHARGES (Rs.)

Gas Charges	29,417
Meter Rent	3,569
General Sales Tax	5,426
Withholding Tax @ 4%	
Other Charges	
Less Provisional Bill Corrections	
Adjustments - Debit	
Adjustments - Credit	

VIEW YOUR GAS BILL ONLINE

گیس بل ویب سائٹ سے حاصل کیجئے

آپ اپنا DUPLICATE گیس بل گھر بیٹھے ہماری ویب سائٹ www.ssgc.com.pk سے حاصل کرسکتے ہیں۔ مزید معلومات کے لیے 1199 پر کال کیجئے۔

Visit our website at www.ssgc.com.pk to view and download your duplicate gas bill.

For inquiries and assistance, please call 1199.

Sui Southern Gas Company Limited
Block 14, Sir Shah Suleman Road
Gulshan-e-Iqbal, Karachi 75300
www.ssgc.com.pk

M/S KESC KORANGI THERMAL POWER STATION (KTPS-By Pass)
K - Electric Limited
Plot No. 1,,

Customer Number	Total Amount Due	Due Date	After Due Date
4949261420 (E)	2,941,127,393	19 May 2020	2,941,127,393

RLNG Sample Bills April 2020

K-ELECTRIC LIMITED

Sui Southern Gas Company Limited

SSGC Block 14, Sir Shah Suleman Road, Gulshan-e-Iqbal, Karachi 75300 www.ssgc.com.pk

SSGC General Sales Tax Number 02-04-9028-001-19

KESC KORANGI THERMAL POWER STATION (KTPS)
K - Electric Limited
Plot No. 1,
[illegible]

Billing Group: [illegible]

For emergencies and complaints please call **1199**

[illegible] Contact your Neighborhood Customer Facilitation Centre at Sir Shah Suleman Road Gulshan-e-Iqbal Near Civic Center. Tel. [illegible]

ACCOUNT INFORMATION

Customer Number:	8688117075 (6)
Billing Month	April 2020
Tariff/Customer Class	IND
GST/NTN Number:	1200271600728

Issue Date: 04 May 2020

ACCOUNT SUMMARY AS OF

Previous Balance (Rs.)	Current Charges (Rs.)	Payable Within Due Date (Rs.)	Late Payment Surcharge (Rs.)	Payment After Due Date (Rs.)	Due Date
	264,103,255	264,103,255	3,961,549	268,064,804	06 May 2020

MONTHLY CONSUMPTION

METER INFORMATION

METER No.	CURRENT DATE	CURRENT READING	PREVIOUS DATE	PREVIOUS READING	MEASURED QTY (SCM)
13143203	30 Apr 2020		01 Apr 2020		4,072,403

SMS CODE	GCV (BTU/SCF)	MMBTU	No. OF DAYS	PRESSURE	TEMP
	988.023133	142,929.95483		1	1

BILL & PAYMENT HISTORY

Month	Bill Amount (Rs.)	Payment Date	Amount (Rs.)

BILL CALCULATION

Tariff $ = 165.23
Tariff Rs. 1578.8

COMPUTATION OF CURRENT GAS CHARGES

SLAB	CMs	MMBTU	RATE/ MMBTU (Rs.)	AMOUNT (Rs.)

GID CESS

IMPORTANT MESSAGES

CURRENT CHARGES (Rs.)

Gas Charges	225,729,278
Meter Rent	
General Sales Tax	38,373,977
Withholding Tax @ 4%	
Other Charges	
Less: Provisional Bill Corrections	
Adjustments - Debit	
Adjustments - Credit	

VIEW YOUR GAS BILL ONLINE

Visit our website at www.ssgc.com.pk to view and download your duplicate gas bill.

For inquiries and assistance, please call 1199.

www.ssgc.com.pk

Sui Southern Gas Company Limited
Block 14, Sir Shah Suleman Road
Gulshan-e-Iqbal, Karachi 75300
SSGC www.ssgc.com.pk

M/S KESC KORANGI THERMAL POWER STATION (KTPS)
K - Electric Limited
Plot No. 1,

Customer Number	Total Amount Due	Due Date	After Due Date
8688117075 (|)	264,103,255	06 May 2020	268,064,804

K-ELECTRIC LIMITED

Sui Southern Gas Company Limited

SSGC Block 14, Sir Shah Suleman Road, Gulshan-e-Iqbal, Karachi 75300   www.ssgc.com.pk

SSGC General Sales Tax Number 02-04-9026-001-19

KESC KORANGI THERMAL POWER STATION (KTPS)
K - Electric Limited
Plot No. 1,
[illegible]

Billing Group: [illegible]

For emergencies and complaints please call **1199**

SERVICE WITH A SMILE
Contact your Neighborhood Customer Facilitation Center at:
SIR SHAH SULEMAN ROAD
GULSHAN-E-IQBAL
NEAR CIVIC CENTER. TEL:
[illegible]

ACCOUNT INFORMATION

Customer Number:	7070404620 (3)
Billing Month	April 2020
Tariff/Customer Class	IND
GST/NTN Number:	1200271600728

Issue Date: 04 May 2020

ACCOUNT SUMMARY AS OF

Previous Balance (Rs.)	Current Charges (Rs.)	Payable Within Due Date (Rs.)	Late Payment Surcharge (Rs.)	Payment After Due Date (Rs.)	Due Date
	273,894,926	273,894,926	4,108,424	278,003,350	06 May 2020

MONTHLY CONSUMPTION

METER INFORMATION

METER No.	CURRENT DATE	CURRENT READING	PREVIOUS DATE	PREVIOUS READING	MEASURED QTY (SCM)
[illegible]	30 Apr 2020		01 Apr 2020		[illegible]

SMS CODE	GCV (BTU/SCF)	MMBTU	No. OF DAYS	PRESSURE	TEMP
	[illegible]	[illegible]		1	1

BILL & PAYMENT HISTORY

Month	Bill Amount (Rs.)	Payment Date	Amount (Rs.)

BILL CALCULATION

Tariff $ = 165.23
Tariff Rs. 1579.3

COMPUTATION OF CURRENT GAS CHARGES

SLAB	CMs	MMBTU	RATE/MMBTU (Rs.)	AMOUNT (Rs.)

GID CESS

IMPORTANT MESSAGES

CURRENT CHARGES (Rs.)

Gas Charges	[illegible]
Meter Rent	
General Sales Tax	[illegible]
Withholding Tax @ 4%	
Other Charges	
Less: Provisional Bill Corrections	
Adjustments - Debit	
Adjustments - Credit	

Sui Southern Gas Company Limited
Block 14, Sir Shah Suleman Road
Gulshan-e-Iqbal, Karachi 75300
SSGC www.ssgc.com.pk

M/S KESC KORANGI THERMAL POWER STATION (KTPS)
K - Electric Limited
Plot No. 1,

Customer Number	Total Amount Due	Due Date	After Due Date
7070404620 ()	273,894,926	06 May 2020	278,003,350

K-ELECTRIC

KCCPP – Annexure C (iii)

Description	Unit	Legend	SSGC Meter No. 18143203	SSGC Meter No. 13403410	SSGC Meter No. 16844633
Current month reading	SCM	A	53,129,058	43,740,989	79,791,944
Previous month reading	SCM	B	39,835,996	29,949,657	79,791,944
Total Consumption	SCM	C = A - B	13,293,062	13,791,332	0
RLNG Consumption	SCM	D	4,072,403	4,223,388	0
Natural Gas consumption	SCM	E = C - D	9,220,659	9,567,944	0
Conversion factor (from SCM to SCF)	SCF/SCM	F	35.49	35.49	35.49
NG conversion from SCM to SCF	SCF	G = E x F	327,277,209	339,603,710	0
RLNG conversion from SCM to SCF	SCF	H = D x F	144,545,492	149,904,539	0
Gross Heating Value (GCV)	BTU/SCF	I	989	989	989
NG MMBTUs	MMBTU	J = G x I / 10^6	323,619	335,808.07	0.00
RLNG MMBTUs	MMBTU	K = H x I / 10^6	142,930	148,229.11	0.00
Total MMBTUs	MMBTU	L = J + K	466,549	484,037.18	0.00
Generation on Gas	MWH	M	124489.7		
Generation on RLNG	MWH	N = K / L x M	38130.5		
Generation on NG	MWH	O = M - N	86359.2		

KCCPP – Annexure D (i)

Part load Adjustment Factor table – Gas - CC

Correction Factor on Gas fuel for Combined Cycle	Percent Load Factor
1.0000	100.00%
1.0069	95.00%
1.0143	90.00%
1.0232	85.00%
1.0347	80.00%
1.0033	75.00%
1.0104	71.00%
1.0183	67.00%
1.0280	64.00%
1.0400	60.00%
1.0545	56.00%
1.0726	53.00%
1.0428	49.00%
1.0525	47.00%
1.0633	44.00%
1.0763	42.00%
1.0924	40.00%
1.1121	37.00%
1.1362	35.00%
1.1692	32.00%
1.2133	30.00%
1.0643	25.00%
1.0759	24.00%
1.0888	22.00%
1.1041	21.00%
1.1229	20.00%
1.1459	19.00%
1.1741	17.00%
1.2116	16.00%

Note: Use linear interpolation when the load variation values fall between the stated values

KCCPP – Annexure D (ii)

Part load Adjustment Factor table – Gas - OC

Percent Load Factor	Correction Factor on Gas fuel for Simple Cycle
100.00%	1.0000
95.00%	1.0047
91.00%	1.0112
86.00%	1.0209
81.00%	1.0333
75.00%[4]	0.9981
72.00%	1.0027
68.00%	1.0090
64.00%	1.0185
61.00%	1.0307
57.00%	1.0460
53.00%	1.0663
50.00%[5]	1.0281
48.00%	1.0343
45.00%	1.0426
40.00%	1.0695
35.00%	1.1126
30.00%	1.2243
25.00%[6]	1.0448
20.00%	1.0924
15.00%	1.2630
10.00%	2.2755

Note: Use linear interpolation when the load variation values fall between the stated values

[4] Heat Rate Values from 75% to 53% assumes 03 gas turbines in operation, this assumes 01 gas turbine will be shutdown
[5] Heat Rate Values from 50% to 30% assumes 02 gas turbines in operation , this assumes 02 gas turbine will be shutdown
[6] Heat Rate Values from 25% to 10% assumes 01 gas turbine in operation , this assumes 03 gas turbine will be shutdown

KCCPP – Annexure D (iii)

Part load Adjustment Factor table – HSD - CC

Correction Factor on HSD fuel for Combined Cycle	Percent Load Factor
1.000	100.00%
1.0051	95.00%
1.0109	90.00%
1.0193	85.00%
1.0294	80.00%
1.0070	75.00%
1.0126	71.00%
1.0197	67%
1.0287	63%
1.0396	60%
1.0488	56%
1.0598	52%
1.0339	49%
1.0410	47%
1.0495	44%
1.0600	42%
1.0727	39%
1.0841	37%
1.0942	34%
1.1074	32%
1.1195	30%
1.1367	27%
1.0507	25%
1.0593	24%
1.0697	22%
1.0824	21%
1.0977	20%
1.1116	19%
1.1251	17%
1.1390	16%
1.1582	15%

Note: Use linear interpolation when the load variation values fall between the stated values

KCCPP – Annexure D (iv)

Part load Adjustment Factor table – HSD - OC

Percent Load Factor	Correction Factor on HSD fuel for Simple Cycle
100.00%	1.0000
95.00%	1.0039
90.00%	1.0080
85.00%	1.0148
80.00%	1.0228
75.00%[7]	1.0033
71.00%	1.0074
68.00%	1.0117
64.00%	1.0188
60.00%	1.0270
56.00%	1.0394
52.00%	1.0500
50.00%[8]	1.0093
45.00%	1.0184
40.00%	1.0347
35.00%	1.0592
30.00%	1.1014
25.00%[9]	1.029
20.00%	1.0604
15.00%	1.1396
10.00%	1.5381

Note: Use linear interpolation when the load variation values fall between the stated values

[7] Heat Rate Values from 75% to 52% assumes 03 gas turbines in operation, this assumes 01 gas turbine will be shutdown

[8] Heat Rate Values from 50% to 30% assumes 02 gas turbines in operation , this assumes 02 gas turbine will be shutdown

[9] Heat Rate Values from 25% to 10% assumes 01 gas turbine in operation , this assumes 03 gas turbine will be shutdown

K-Electric Limited
Generation Plants Tariff Petition
KCCPP
Annexure-I - Part Load Adjustment Example

Partial Load Sample Calculation of a GAS Complete Power Plant in Operation

KCCPP

Time	Date	Net Dependable Capacity - Unconcurred MW	Forced Outage MW	Planned Outage MW	Forced Derated MW	Planned Derated MW	Available Capacity (post planned and forced outages) MW	Gas Hourly Net Load MW (from energy meters)	HSD Hourly Net Load MW (from energy meters)	Amb Temp. ®	Ambient Temp. Correction	Adjusted Available Capacity	Load Factor - Gas	Load factor - HSD							Correction factor - Gas	Correction factor - HSD	Gas - Adjusted Net MB	HSD - Adjusted Net MB	Gas - numbers	HSD - numbers
		a	b	c	d	e	f = a-b-c-d-e	g	g1	h	i	j = f / i	k = g / j	l = g1 / j	m	n	o	p	q	r	s	t	u	(j-m)* Benchmark Net MB	(j-m)* Benchmark Net MB		
1:00:00 AM	15-May	335.8	0	0	0	0	335	139	99	30	1.004	335.43	50%	35%	(0.24)	2.14	(7.68)	13.73	-11.9430	1.4753	1.7928	1.0455	1.0455	8,693	8,244	844	434
2:00:00 AM	15-May	336.8	0	0	0	0	335	135	95	30	1.002	335.43	50%	35%	(0.24)	2.14	(7.68)	13.73	-11.9430	1.4753	1.7928	1.0396	1.0396	8,284	8,052	817	478
3:00:00 AM	15-May	336.8	0	0	0	0	335	135	95	30	0.986	334.39	70%	35%	(2.83)	17.30	(49.04)	46.33	-27.5395	1.2859	1.7934	1.0083	1.0313	8,245	8,019	1,455	458
4:00:00 AM	15-May	336.8	0	0	0	0	335	135	95	28	0.993	333.83	70%	35%	(3.06)	19.06	(61.28)	49.38	-28.9161	1.3268	1.7934	1.0323	1.0515	8,179	8,169	1,407	438
5:00:00 AM	15-May	336.8	0	0	0	0	335	139	119	30	0.997	335.83	50%	50%	(0.24)	2.09	(7.24)	13.52	-11.8274	1.4628	1.7935	1.0477	1.0488	8,358	8,228	863	958
6:00:00 AM	15-May	336.8	0	0	0	0	335	139	119	30	1.002	336.43	50%	50%	(0.24)	2.14	(7.68)	13.73	-11.9430	1.4753	1.7935	1.0496	1.0496	8,401	8,259	844	958
7:00:00 AM	15-May	336.8	0	0	0	0	335	139	119	32	1.007	335.19	50%	50%	(0.25)	2.20	(7.84)	13.91	-11.9798	1.4924	1.7935	1.0514	1.0508	8,435	8,281	948	931
8:00:00 AM	15-May	336.8	0	0	0	0	335	139	119	33	1.014	337.77	51%	50%	(0.26)	2.31	(8.22)	14.19	-12.1475	1.5249	1.7935	1.0541	1.0497	8,635	8,281	948	903
9:00:00 AM	15-May	336.8	0	0	0	0	335	139	119	33	1.015	336.39	51%	50%	(0.27)	2.36	(8.51)	14.54	-12.4173	1.5677	1.7935	1.0548	1.0495	8,643	8,259	951	903
10:00:00 AM	15-May	336.8	0	0	0	0	335	139	119	34	1.020	334.43	51%	50%	(0.28)	2.45	(8.84)	14.80	-12.6357	1.5753	1.7935	1.0599	1.0498	8,686	8,335	957	916
11:00:00 AM	15-May	336.8	0	0	0	0	335	139	119	40	1.054	331.84	54%	50%	(0.41)	3.03	(13.30)	17.87	-14.3447	1.7967	1.7935	1.0695	1.0498	8,856	8,335	957	916
12:00:00 PM	15-May	336.8	0	0	0	0	335	139	119	38	1.049	333.03	52%	50%	(0.31)	2.69	(9.19)	15.74	-13.0907	1.6419	1.7935	1.0650	1.0498	8,726	8,335	930	916
1:00:00 PM	15-May	336.8	0	0	0	0	335	139	119	37	1.059	328.64	53%	50%	(0.33)	2.83	(9.91)	16.23	-13.3569	1.6784	1.7935	1.0726	1.0498	8,756	8,335	853	916
2:00:00 PM	15-May	336.8	0	0	0	0	335	139	119	36	1.071	326.37	53%	50%	(0.36)	2.98	(10.52)	16.74	-13.6405	1.7183	1.7935	1.0774	1.0498	8,756	8,335	853	916
3:00:00 PM	15-May	336.8	0	0	0	0	335	139	119	37	0.988	333.31	49%	50%	(0.33)	3.01	(9.93)	15.21	-13.3455	1.6783	1.7935	1.0645	1.0498	8,518	8,335	940	916
4:00:00 PM	15-May	336.8	0	0	0	0	335	139	119	38	0.993	332.43	49%	50%	(0.33)	3.05	(9.93)	15.35	-13.3799	1.6881	1.7935	1.0662	1.0498	8,556	8,335	941	916
5:00:00 PM	15-May	336.8	0	0	0	0	335	139	119	39	0.997	331.11	50%	50%	(0.33)	3.09	(9.94)	15.53	-13.4274	1.6924	1.7935	1.0690	1.0498	8,593	8,335	944	916
6:00:00 PM	15-May	336.8	0	0	0	0	335	139	119	39	1.002	330.43	50%	50%	(0.34)	3.14	(9.98)	15.73	-13.5410	1.6795	1.7935	1.0690	1.0498	8,593	8,335	944	916
7:00:00 PM	15-May	336.8	0	0	0	0	335	139	119	41	1.007	329.19	50%	50%	(0.35)	3.20	(10.04)	15.95	-13.6706	1.6981	1.7935	1.0719	1.0498	8,635	8,335	948	916
8:00:00 PM	15-May	336.8	0	0	0	0	335	139	119	42	1.014	327.77	51%	50%	(0.36)	3.28	(10.27)	16.28	-13.7375	1.7215	1.7935	1.0741	1.0498	8,672	8,335	948	916
9:00:00 PM	15-May	336.8	0	0	0	0	335	139	119	43	1.021	326.29	51%	50%	(0.37)	3.36	(10.51)	16.54	-13.8171	1.7477	1.7935	1.0768	1.0498	8,715	8,335	951	916
10:00:00 PM	15-May	336.8	0	0	0	0	335	0	0	34	1.030	314.45	0%	100%	-	-	-	-	0.0000	0.0000	1.7935	1.0000	1.0000	-	7,913	-	1,745
11:00:00 PM	15-May	336.8	0	0	0	0	335	0	0	35	1.049	312.04	0%	100%	-	-	-	-	0.0000	0.0000	1.7935	0.9999	1.0000	-	7,913	-	1,745
12:00:00 AM	15-May	336.8	0	0	0	0	335	0	0	37	1.055	314.19	0%	100%	-	-	-	-	0.0000	0.0000	1.7935	0.9999	1.0000	-	7,913	-	1,745
Total								3439	2753																	21,811	21,459
Benchmark Efficiency (Total numbers/Total MWh)																										33.44%	46.71%
Adjustment factor (Benchmark Efficiency / Net Efficiency)																										1.397	1.397

Reference - Gas			Reference - HSD		
Load	Net GE	Net MB	Load	Net GE	Net MB
321	42.73%	8179	227	43.13%	7912

KCCPP – Annexure F (i) (Gas)

Degradation table –Net Heat rate HHV

Net Heat Rate Degradation Factor - HHV

FY	Gas Turbine					Complex (100% LF)		Correction Factor
	Permanent	Recoverable	Total	Efficiency		Efficiency		
				Tested	Revised	Tested	Revised	
19*	0.00%	1.46%	1.46%	32.20%	32.20%	41.72%	41.72%	1.0000
19	0.00%	1.52%	1.52%	32.20%	32.18%	41.72%	41.71%	1.0003
20	0.00%	2.36%	2.36%	32.20%	31.91%	41.72%	41.46%	1.0064
21	0.00%	3.02%	3.02%	32.20%	31.70%	41.72%	41.23%	1.0120
22	0.00%	3.35%	3.35%	32.20%	31.60%	41.72%	41.11%	1.0149
23	0.00%	2.60%	2.60%	32.20%	31.84%	41.72%	41.20%	1.0127
24	0.00%	3.56%	3.56%	32.20%	31.54%	41.72%	41.02%	1.0171
25	0.00%	3.96%	3.96%	32.20%	31.41%	41.72%	40.89%	1.0204
26	0.00%	0.56%	0.56%	32.20%	32.49%	41.72%	41.87%	0.9964
27	0.00%	1.97%	1.97%	32.20%	32.03%	41.72%	41.45%	1.0065
28	0.00%	2.99%	2.99%	32.20%	31.71%	41.72%	41.21%	1.0123
29	0.00%	0.56%	0.56%	32.20%	32.49%	41.72%	41.26%	1.0111
30	0.00%	3.33%	3.33%	32.20%	31.61%	41.72%	41.07%	1.0158
31	0.00%	3.81%	3.81%	32.20%	31.46%	41.72%	40.91%	1.0198
32	0.00%	4.15%	4.15%	32.20%	31.35%	41.72%	40.80%	1.0227
33	0.00%	1.42%	1.42%	32.20%	32.21%	41.72%	41.59%	1.0033
34	0.00%	2.60%	2.60%	32.20%	31.84%	41.72%	41.22%	1.0122
35	0.00%	3.46%	3.46%	32.20%	31.57%	41.72%	40.97%	1.0183
36	0.00%	3.08%	3.08%	32.20%	31.68%	41.72%	41.13%	1.0144
37	0.00%	3.63%	3.63%	32.20%	31.51%	41.72%	40.92%	1.0195
38	0.00%	4.01%	4.01%	32.20%	31.40%	41.72%	40.78%	1.0232
39	0.00%	0.79%	0.79%	32.20%	32.42%	41.72%	41.71%	1.0003
40	0.00%	2.13%	2.13%	32.20%	31.98%	41.72%	41.30%	1.0101

* 3rd party Heat Rate Test (Jun-2019)

FY 19 - 22 : As per actual FFH

FY 23-39 : As per 88.7% Utilization

KCCPP – Annexure F (ii) (Gas)

Degradation table –Net Output HHV

Net Output Degradation Factor - CC

FY	Total Degradation Combined Cycle	Tested Combined Cycle Output (MW)	Revised Combined Cycle Output (MW)	Correction Factor
19*	2.72%	220.83	220.83	1.0000
19	3.84%	220.83	220.58	1.0011
20	4.61%	220.83	216.74	1.0089
21	5.99%	220.83	213.84	1.0327
22	6.66%	220.83	212.43	1.0394
23	6.95%	220.83	210.80	1.0223
24	6.56%	220.83	212.79	1.0178
25	7.56%	220.83	210.74	1.0479
26	1.35%	220.83	223.88	0.9861
27	4.17%	220.83	217.77	1.0140
28	5.99%	220.83	213.84	1.0327
29	4.00%	220.83	216.04	1.0038
30	5.96%	220.83	213.88	1.0325
31	7.18%	220.83	211.39	1.0448
32	8.07%	220.83	209.00	1.0566
33	3.96%	220.83	220.39	1.0004
34	5.48%	220.83	214.98	1.0272
35	7.08%	220.83	211.59	1.0437
36	5.35%	220.83	215.17	1.0261
37	6.64%	220.83	212.09	1.0412
38	7.85%	220.83	210.06	1.0513
39	1.31%	220.83	222.03	0.9919
40	4.03%	220.83	211.63	1.0094

Net Output Degradation Factor - OC

FY	Total Degradation Open Cycle	Tested Open Cycle Output (MW)	Revised Open Cycle Output (MW)	Correction Factor
19*	2.89%	170.70	170.70	1.0000
19	3.02%	170.70	170.47	1.0013
20	3.02%	170.70	167.14	1.0213
21	6.47%	170.70	164.79	1.0358
22	7.19%	170.70	163.66	1.0430
23	4.75%	170.70	167.56	1.0187
24	7.01%	170.70	161.54	1.0412
25	8.07%	170.70	162.28	1.0518
26	0.56%	170.70	176.01	0.9810
27	4.16%	170.70	166.56	1.0127
28	6.47%	170.70	164.87	1.0351
29	1.03%	170.70	173.93	0.9814
30	6.39%	170.70	164.93	1.0350
31	7.67%	170.70	162.59	1.0499
32	8.86%	170.70	161.47	1.0571
33	2.77%	170.70	170.90	0.9988
34	5.53%	170.70	166.10	1.0284
35	7.39%	170.70	163.34	1.0450
36	5.47%	170.70	165.05	1.0278
37	7.19%	170.70	163.66	1.0430
38	8.20%	170.70	162.69	1.0521
39	1.39%	170.70	173.28	0.9851
40	4.56%	170.70	162.99	1.0141

* 3rd party Heat Rate Test (Jun-2015)
FY 19 - 22 : As per actual FTH
FY 23-39 : As per 85.7% Utilization

KCCPP – Annexure F (iii) (HSD)

Degradation table - Net Heat rate HHV

Net Heat Rate Degradation Factor - HHV

FY	Gas Turbine					Complex (100% LF)		Correction Factor
	Permanent	Recoverable	Total	Efficiency		Efficiency		
				Calculated	Revised	Tested	Revised	
21*	2.00%	6.34%	8.34%	34.18%	34.18%	43.13%	43.13%	1.0000
22	2.00%	7.05%	9.05%	34.18%	33.94%	43.13%	42.94%	1.0043
23	2.00%	6.31%	8.31%	34.18%	34.19%	43.13%	43.08%	1.0011
24	2.00%	8.15%	10.15%	34.18%	33.57%	43.13%	42.66%	1.0110
25	2.00%	7.48%	9.48%	34.18%	33.80%	43.13%	42.80%	1.0078
26	2.00%	3.42%	5.42%	34.18%	35.21%	43.13%	43.79%	0.9848
27	2.00%	6.67%	8.67%	34.18%	34.07%	43.13%	42.98%	1.0035
28	2.00%	6.29%	8.29%	34.18%	34.20%	43.13%	43.12%	1.0002
29	2.00%	4.15%	6.15%	34.18%	34.94%	43.13%	43.60%	0.9893
30	2.00%	7.44%	9.44%	34.18%	33.81%	43.13%	42.79%	1.0078
31	2.00%	6.54%	8.54%	34.18%	34.11%	43.13%	42.98%	1.0035
32	2.00%	8.46%	10.46%	34.18%	33.47%	43.13%	42.55%	1.0135
33	2.00%	5.85%	7.85%	34.18%	34.35%	43.13%	43.14%	0.9996
34	2.00%	4.69%	6.69%	34.18%	34.75%	43.13%	43.38%	0.9941
35	2.00%	7.26%	9.26%	34.18%	33.87%	43.13%	42.78%	1.0080
36	2.00%	6.71%	8.71%	34.18%	34.05%	43.13%	42.94%	1.0044
37	2.00%	4.30%	6.30%	34.18%	34.89%	43.13%	43.47%	0.9920
38	2.00%	7.69%	9.69%	34.18%	33.72%	43.13%	42.65%	1.0113
39	2.00%	4.18%	6.18%	34.18%	34.94%	43.13%	43.50%	0.9914
40	2.00%	6.88%	8.88%	34.18%	34.00%	43.13%	42.81%	1.0073

* 3rd party Heat Rate Test (Jun-2021)
FY 22 : As per actual Operating Hours
FY 23-40 : As per 88.7% Utilization

KCCPP – Annexure F (iv) (HSD)

Degradation table – Net Output

Net Output Degradation Factor - CC

FY	Total Degradation Combined Cycle	Tested Combined Cycle Output (MW)	Revised Combined Cycle Output (MW)	Correction Factor
21*	11.68%	220.02	220.02	1.0000
22	12.88%	220.02	217.40	1.0120
23	13.44%	220.02	220.55	0.9976
24	14.44%	220.02	214.11	1.0276
25	13.24%	220.02	216.64	1.0156
26	7.05%	220.02	230.75	0.9535
27	12.71%	220.02	217.77	1.0103
28	11.64%	220.02	220.11	0.9996
29	7.22%	220.02	230.28	0.9554
30	13.17%	220.02	216.36	1.0169
31	11.69%	220.02	219.99	1.0001
32	14.87%	220.02	213.22	1.0319
33	11.49%	220.02	220.43	0.9981
34	8.93%	220.02	226.25	0.9725
35	13.44%	220.02	216.22	1.0176
36	12.23%	220.02	218.82	1.0055
37	7.40%	220.02	229.85	0.9572
38	13.79%	220.02	215.48	1.0211
39	8.65%	220.02	226.90	0.9697
40	11.24%	220.02	216.62	1.0156

Net Output Degradation Factor - CC

FY	Total Degradation Simple Cycle	Calculated Open Cycle Output (MW)	Revised Open Cycle Output (MW)	Correction Factor
21*	14.12%	174.38	174.38	1.0000
22	15.50%	174.38	172.00	1.0138
23	13.77%	174.38	174.99	0.9965
24	17.31%	174.38	168.98	1.0319
25	15.90%	174.38	171.33	1.0178
26	8.43%	174.38	184.89	0.9431
27	15.09%	174.38	172.69	1.0098
28	14.02%	174.38	174.55	0.9990
29	8.85%	174.38	184.06	0.9474
30	15.99%	174.38	173.18	1.0187
31	14.00%	174.38	174.57	0.9989
32	17.77%	174.38	168.24	1.0365
33	13.58%	174.38	175.32	0.9946
34	10.57%	174.38	180.79	0.9645
35	15.90%	174.38	171.32	1.0178
36	14.59%	174.38	173.56	1.0047
37	8.91%	174.38	183.95	0.9480
38	16.32%	174.38	170.63	1.0220
39	10.09%	174.38	181.69	0.9597
40	15.48%	174.38	172.04	1.0136

* 3rd party Heat Rate Test (Jun-2021)
FY 22 : As per actual Operating Hours
FY 23-35 : As per 88.7% Utilisation
Open cycle calculated from combined cycle results as test was not conducted on open cycle

KCCPP – Annexure G

HSD Calorific value mechanism

a. KCCPP has two main storage tanks of 8000 m³ each and one day tank of 1500 m³ for holding inventory of HSD.

b. Per day consumption of one GT is approximately 276 m3 at base load.

c. The oil is transferred from main storage tanks to day tank after going through a purifier system which removes moisture content from the oil.

d. Diesel samples will be collected from HSD forwarding pump discharge (installed after the day tank) in 500ml sample bottle daily when any of the GT is in operation on HSD.

e. A 05-liter Sample bottle will be placed in the lab control and be marked as Diesel composite sample for 10 days with specific date range mentioned

f. This diesel from the 500-ml bottle collected as mentioned in para d above, will be poured into 05-liter sample bottle placed in the laboratory with its cap tightly closed.

g. This 5-liter composite sample bottle will be kept in a locker with lock and key.

h. 500ml sample will be collected on daily basis as long as any of the GT is in service on diesel fuel and sample will be poured in the same 5liter sample bottle to maintain a 10-days composite sample

i. If no GT runs on the diesel fuel for whole day [24hrs] then no sample will be collected on that day.

j. On every tenth day composite sample will be sent to third party lab for HEATING VALUE testing.

k. The month CV will be the weighted average of 1 to 3 samples (Depending on running of GT).

KCCPP – Annexure H – O&M break up

Gas

KCCPP O&M Levelized per year

PKR million

Major Activities	Fixed		Variable		Total
	Foreign	local	Foreign	local	
CSA	126.48	-	514.11	-	640.59
Plant O&M Cost - excluding CSA	395.53	251.27	1,464.17	94.82	2,205.79
Overhead Cost	-	658.42	-	-	658.42
Total	**522.01**	**909.69**	**1,978.28**	**94.82**	**3,504.80**

HSD

KCCPP O&M Levelized per year

PKR million

Major Activities	Fixed		Variable		Total
	Foreign	local	Foreign	local	
CSA / LTSA	126.48	-	514.11	-	640.59
Plant O&M Cost - excluding LTSA	395.53	251.27	2,231.87	97.42	2,976.09
Overhead Cost	-	658.42	-	0.09	658.51
Total	**522.01**	**909.69**	**2,745.98**	**97.51**	**4,275.19**

K-Electric Limited
Generation Plants Tariff Petition
KCCPP
Annexure J - RAB Movement

Description	Legend	Unit	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031	FY 2032	FY 2033	FY 2034
RoRB movement														
Assets without revaluation														
Opening		PKR Mn		32,231	32,231	32,231	32,231	32,231	32,231	32,231	32,231	32,231	32,231	32,231
Capitalization		PKR Mn		-	-	-	-	-	-	-	-	-	-	-
Disposal		PKR Mn		-	-	-	-	-	-	-	-	-	-	-
Closing	a	PKR Mn	32,231	32,231	32,231	32,231	32,231	32,231	32,231	32,231	32,231	32,231	32,231	32,231
Accumulated Depreciation														
Opening		PKR Mn		13,755	14,897	16,040	17,183	18,325	19,468	20,611	21,753	22,896	24,039	25,181
Depreciation for the year		PKR Mn		1,143	1,143	1,143	1,143	1,143	1,143	1,143	1,143	1,143	1,143	1,143
Depreciation - Disposal		PKR Mn		-	-	-	-	-	-	-	-	-	-	-
Closing	b	PKR Mn	13,755	14,897	16,040	17,183	18,325	19,468	20,611	21,753	22,896	24,039	25,181	26,324
Net Book Value - Operating Assets only	c = a + b	PKR Mn	18,477	17,334	16,191	15,049	13,906	12,763	11,621	10,478	9,335	8,193	7,050	5,907
Capital Work in Progress														
Opening		PKR Mn		-	-	-	-	-	-	-	-	-	-	-
Capex		PKR Mn		-	-	-	-	-	-	-	-	-	-	-
Transfer to Fixed Assets		PKR Mn		-	-	-	-	-	-	-	-	-	-	-
Closing	d	PKR Mn	-	-	-	-	-	-	-	-	-	-	-	-
Net RAB	e = c + b	PKR Mn	18,477	17,334	16,191	15,049	13,906	12,763	11,621	10,478	9,335	8,193	7,050	5,907
Average RAB - PKR	f = average of e	PKR Mn		17,905	16,763	15,620	14,477	13,335	12,192	11,049	9,907	8,764	7,621	6,479
RoRB break up														
Equity Portion	g	%		30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%
Debt Portion	h	%		70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%
Local Component	i	%		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Foreign Component	j	%		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
KIBOR	k	%		15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%
Spread on KIBOR	l	%		2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%
Local Borrowing rate	m = k + l	%		17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%
LIBOR	n	%		2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%
Hedge	o	%		15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%
Spread	p	%		4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Foreign borrowing Rate	q = n + o + p	%		22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%
Indexed Return on Foreign Equity	r	%		30.90%	30.90%	30.90%	30.90%	30.90%	30.90%	30.90%	30.90%	30.90%	30.90%	30.90%

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Annexure J - RAB Movement

Description	Legend	Unit	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031	FY 2032	FY 2033	FY 2034
RoRB and Depreciation amounts														
Cost of Debt - Local	s	PKR Mn		2,213	2,072	1,931	1,790	1,648	1,507	1,366	1,225	1,083	942	801
Cost of Debt - Foreign	t	PKR Mn		-	-	-	-	-	-	-	-	-	-	-
Cost of Equity	u	PKR Mn		1,660	1,554	1,448	1,342	1,236	1,130	1,024	918	812	707	601
Depreciation	v	PKR Mn		1,143	1,143	1,143	1,143	1,143	1,143	1,143	1,143	1,143	1,143	1,143
Calculation of Tariff components														
Gas - CC														
Net Capacity	w	MW		220.828	220.828	220.828	220.828	220.828	220.828	220.828	220.828	220.828	220.828	220.828
Plant factor	x	%		88.66%	88.7%	88.7%	88.7%	88.7%	88.7%	88.7%	88.7%	88.7%	88.7%	88.7%
Net Capacity units at plant factor	y = w x 24 x 365 x (x/1000)	GWh		1,715.04	1,715.04	1,715.04	1,715.04	1,715.04	1,715.04	1,715.04	1,715.04	1,715.04	1,715.04	1,715.04
Tariff components on Gas - CC														
Cost of Debt - Local	z = s / y	PKR / kWh		1.2906	1.2083	1.1259	1.0435	0.9612	0.8788	0.7964	0.7141	0.6317	0.5494	0.4670
Cost of Debt - Foreign	aa = t / y	PKR / kWh		-	-	-	-	-	-	-	-	-	-	-
Cost of Equity	ab = u / y	PKR / kWh		0.9678	0.9061	0.8443	0.7825	0.7208	0.6590	0.5972	0.5355	0.4737	0.4120	0.3502
Depreciation	ac = v / y	PKR / kWh		0.6663	0.6663	0.6663	0.6663	0.6663	0.6663	0.6663	0.6663	0.6663	0.6663	0.6663
HSD - CC														
Net Capacity	ad	MW		220.018	220.018	220.018	220.018	220.018	220.018	220.018	220.018	220.018	220.018	220.018
Plant factor	ae	%		88.66%	88.7%	88.7%	88.7%	88.7%	88.7%	88.7%	88.7%	88.7%	88.7%	88.7%
Net Capacity units at plant factor	af	GWh		1,708.75	1,708.75	1,708.75	1,708.75	1,708.75	1,708.75	1,708.75	1,708.75	1,708.75	1,708.75	1,708.75
Tariff components on HSD - CC														
Cost of Debt - Local	ag = s / af	PKR / kWh		1.2954	1.2127	1.1300	1.0474	0.9647	0.8820	0.7994	0.7167	0.6340	0.5514	0.4687
Cost of Debt - Foreign	ah = t / af	PKR / kWh		-	-	-	-	-	-	-	-	-	-	-
Cost of Equity	ai = u / af	PKR / kWh		0.9714	0.9094	0.8474	0.7854	0.7234	0.6614	0.5994	0.5375	0.4755	0.4135	0.3515
Depreciation	aj = v / af	PKR / kWh		0.6687	0.6687	0.6687	0.6687	0.6687	0.6687	0.6687	0.6687	0.6687	0.6687	0.6687

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Annexure J - RAB Movement

Description	Legend	Unit	FY 2035	FY 2036	FY 2037	FY 2038	FY 2039	FY 2040
RoRB movement								
Assets without revaluation								
Opening		PKR Mn	32,231	32,231	32,231	32,231	32,231	32,231
Capitalization		PKR Mn	-	-	-	-	-	-
Disposal		PKR Mn	-	-	-	-	-	-
Closing	a	PKR Mn	32,231	32,231	32,231	32,231	32,231	32,231
Accumulated Depreciation								
Opening		PKR Mn	26,324	27,467	28,609	29,752	30,895	32,037
Depreciation for the year		PKR Mn	1,143	1,143	1,143	1,143	1,143	194
Depreciation - Disposal		PKR Mn	-	-	-	-	-	-
Closing	b	PKR Mn	27,467	28,609	29,752	30,895	32,037	32,231
Net Book Value - Operating Assets only	c = a + b	PKR Mn	4,765	3,622	2,479	1,337	194	-
Capital Work in Progress								
Opening		PKR Mn	-	-	-	-	-	-
Capex		PKR Mn	-	-	-	-	-	-
Transfer to Fixed Assets		PKR Mn	-	-	-	-	-	-
Closing	d	PKR Mn	-	-	-	-	-	-
Net RAB	e = c + b	PKR Mn	4,765	3,622	2,479	1,337	194	-
Average RAB - PKR	f = average of e	PKR Mn	5,336	4,193	3,051	1,908	765	97
RoRB break up								
Equity Portion	g	%	30%	30%	30%	30%	30%	30%
Debt Portion	h	%	70%	70%	70%	70%	70%	70%
Local Component	i	%	100%	100%	100%	100%	100%	100%
Foreign Component	j	%	0%	0%	0%	0%	0%	0%
KIBOR	k	%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%
Spread on KIBOR	l	%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%
Local Borrowing rate	m = k + l	%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%
LIBOR	n	%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%
Hedge	o	%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%
Spread	p	%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Foreign borrowing Rate	q = n + o + p	%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%
Indexed Return on Foreign Equity	r	%	30.90%	30.90%	30.90%	30.90%	30.90%	30.90%

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Annexure J - RAB Movement

Description	Legend	Unit	FY 2035	FY 2036	FY 2037	FY 2038	FY 2039	FY 2040
RoRB and Depreciation amounts								
Cost of Debt - Local	s	PKR Mn	660	518	377	236	95	12
Cost of Debt - Foreign	t	PKR Mn	-	-	-	-	-	-
Cost of Equity	u	PKR Mn	495	389	283	177	71	9
Depreciation	v	PKR Mn	1,143	1,143	1,143	1,143	1,143	194
Calculation of Tariff components								
Gas - CC								
Net Capacity	w	MW	220.828	220.828	220.828	220.828	220.828	220.828
Plant factor	x	%	88.7%	88.7%	88.7%	88.7%	88.7%	88.7%
Net Capacity units at plant factor	y = w x 24 x 365 x (x/1000)	GWh	1,715.04	1,715.04	1,715.04	1,715.04	1,715.04	291.32
Tariff components on Gas - CC								
Cost of Debt - Local	z = s / y	PKR / kWh	0.3846	0.3023	0.2199	0.1375	0.0552	0.0412
Cost of Debt - Foreign	aa = t / y	PKR / kWh	-	-	-	-	-	-
Cost of Equity	ab = u / y	PKR / kWh	0.2884	0.2267	0.1649	0.1031	0.0414	0.0309
Depreciation	ac = v / y	PKR / kWh	0.6663	0.6663	0.6663	0.6663	0.6663	0.6663
HSD - CC								
Net Capacity	ad	MW	220.018	220.018	220.018	220.018	220.018	220.018
Plant factor	ae	%	88.7%	88.7%	88.7%	88.7%	88.7%	88.7%
Net Capacity units at plant factor	af	GWh	1,708.75	1,708.75	1,708.75	1,708.75	1,708.75	290.25
Tariff components on HSD - CC								
Cost of Debt - Local	ag = s / af	PKR / kWh	0.3860	0.3034	0.2207	0.1380	0.0554	0.0413
Cost of Debt - Foreign	ah = t / af	PKR / kWh	-	-	-	-	-	-
Cost of Equity	ai = u / af	PKR / kWh	0.2895	0.2275	0.1655	0.1035	0.0415	0.0310
Depreciation	aj = v / af	PKR / kWh	0.6687	0.6687	0.6687	0.6687	0.6687	0.6687

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Annexure K (i) - Calculation of Indexed RoE

Particulars		FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2023 - closing
		Actualized							Forecasted	
Average Exchange rates	PKR / USD	104.82	104.81	110.01	136.17	158.38	160.21	178.03	206.00	206.00
RAB amount - Generation	PKR mn	20,474	21,164	20,381	20,238	19,545	20,365	19,647	18,477	**18,477**
Additions, net of Depreciation & Disposals during the year	PKR mn		689	(783)	(143)	(693)	820	(718)	(1,171)	-

Year wise Indexation based on exchange rates (a)

FY 2016	%		-0.01%	4.95%	29.91%	51.10%	52.84%	69.84%	96.53%	96.53%
FY 2017	%			4.96%	29.92%	51.11%	52.86%	69.86%	96.55%	96.55%
FY 2018	%				23.78%	43.97%	45.63%	61.83%	87.26%	87.26%
FY 2019	%					16.31%	17.65%	30.74%	51.28%	51.28%
FY 2020	%						1.16%	12.41%	30.07%	30.07%
FY 2021	%							11.12%	28.58%	28.58%
FY 2022	%								15.71%	15.71%
FY 2023	%									0.00%

Calculated with reference to exchange rate of a relevant year vs exchange rate of base year for example 16.31% in FY 2019 calculated as PKR 158.38 / USD divided by PKR 136.17 / USD

Year wise break up of RAB

FY 2016	PKR mn	20,474	20,474	20,474	20,474	20,474	20,474	20,474	20,474	20,474
FY 2017	PKR mn		689	689	689	689	689	689	689	689
FY 2018	PKR mn			(783)	(783)	(783)	(783)	(783)	(783)	(783)
FY 2019	PKR mn				(143)	(143)	(143)	(143)	(143)	(143)
FY 2020	PKR mn					(693)	(693)	(693)	(693)	(693)
FY 2021	PKR mn						820	820	820	820
FY 2022	PKR mn							(718)	(718)	(718)
FY 2023	PKR mn								(1,171)	(1,171)
Total RAB	PKR mn	**20,474**	**21,164**	**20,381**	**20,238**	**19,545**	**20,365**	**19,647**	**18,477**	**18,477**

Weightage of RAB (b)

FY 2016	PKR mn	100%	97%	100%	101%	105%	101%	104%	111%	111%
FY 2017	PKR mn	-	3%	3%	3%	4%	3%	4%	4%	4%
FY 2018	PKR mn	-	-	-4%	-4%	-4%	-4%	-4%	-4%	-4%
FY 2019	PKR mn	-	-	-	-1%	-1%	-1%	-1%	-1%	-1%
FY 2020	PKR mn	-	-	-	-	-4%	-3%	-4%	-4%	-4%
FY 2021	PKR mn	-	-	-	-	-	4%	4%	4%	4%
FY 2022	PKR mn	-	-	-	-	-	-	-4%	-4%	-4%
FY 2023	PKR mn	-	-	-	-	-	-	-	-6%	-6%
Total	PKR mn	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Year wise Indexation - considering RAB weightage [c = (a x b)]

FY 2016	%		0.0%	5.0%	30.3%	53.5%	53.1%	72.8%	107.0%	107.0%
FY 2017	%		-	0.2%	1.0%	1.8%	1.8%	2.5%	3.6%	3.6%
FY 2018	%		-	-	-0.9%	-1.8%	-1.8%	-2.5%	-3.7%	-3.7%
FY 2019	%		-	-	-	-0.1%	-0.1%	-0.2%	-0.4%	-0.4%
FY 2020	%		-	-	-	-	0.0%	-0.4%	-1.1%	-1.1%
FY 2021	%		-	-	-	-	-	0.5%	1.3%	1.3%
FY 2022	%		-	-	-	-	-	-	-0.6%	-0.6%
FY 2023	%		-	-	-	-	-	-	-	-
Total Indexation	%		**0.0%**	**5.1%**	**30.4%**	**53.4%**	**53.0%**	**72.6%**	**106.0%**	**106.0%**

RoE - USD based (d)	15.0%
Indexation (e)	106.0%
RoE - Indexed at PKR 206 / USD [f = d x (1 + e)]	**30.90%**

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Annexure K (ii) - Illustration for RoE Indexation

Indexation for the quarter	Q1 - FY 2024
Date of indexation	July 3, 2023

Description	Unit	Legend	Gas	HSD
Reference RoRB Cost of Equity component for FY 2024	PKR / kWh	a	0.9678	0.9714
TT & OD selling rate of USD as notified by National bank of Pakistan at June 30, 2023	PKR / USD	b	250	250
Reference exchange rate	PKR / USD	c	206.00	206.00
Indexed RoRB Cost of Equity component for FY 2024	PKR / kWh	d = a x b / c	1.1745	1.1789

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Annexure L - Calculation of Working capital

Fuel cost on receivable cycle - RLNG	Unit	Legend	FY 2024
KIBOR	%	a	15.16%
Spread	%	b	2.00%
Total	%	c = a + b	17.16%
1 Fuel cost receivable cycle			
Receipt - days	days	d	30
Payment - days	days	e	7
Net days	days	f = d - e	23
RLNG bill			
Net capacity	MW	g	221
Load factor	%	h	89%
Units for 365 days	GWh	i = g x h x 24 x 365 / 10^3	1,715
Allowed Heat Rate for the Quarter	btu / kWh	j	8,178
Reference price	PKR / MMBtu	k	3,301
Amount for 365 days	PKR / kWh	l = i x j x k / 10^6	46,297
Amount for outstanding days	PKR Mn	m = f x l / 365	2,917
With sales tax	PKR Mn	n = m x (1 + 17%)	3,413
Cost of working capital	PKR Mn	o = c x n	586
2 Cost of SBLC			
Daily gas	MMBTu	p = g x j x 1,000 / 10^6	43,344
60 days	MMBTu	q = p x 60	2,600,624
Amount of 60 days	PKR Mn	r = k x q / 10^6	8,584
Actual SBLC given	%	s	960
Lower of 60 days or Actual	PKR Mn	t = Lower of r or s	960
SBLC cost (actual with cap of 0.5%)		t1	0.5%
Cost of SBCL		t2 = t x t1	5
3 Cost of HSD inventory			
HSD Price	PKR / litre	u	220
GST	%	v	17%
HSD Price including GST	PKR / litre	w = u x (1 + v)	257
Net Capacity	MW	w1	220
HSD Price	PKR / MMBTu	w2 = u / y x 10^6	6,067
Allowed Heat Rate for the Quarter	btu / kWh	x	**7,912**
Calorific value	btu / litre	y	**36,252**
Litres for 7 days	litres	**z = w1 x 1000 x 24 x 7/(y / x)**	**8,066,866**
Amount	**PKR Mn**	**ab = z x w /10^6**	**2,075.85**
Cost of HSD	**PKR Mn**	**ac = ab X c**	**356.22**
4 Cost of other inventory			
Inventory amount	PKR Mn	ad	890
Cost	PKR Mn	ae = ad x c	153
Total cost of working capital	**PKR Mn**	**af = t2 + ac + ae + o**	**1,100**
Net Capacity units at plant factor			
Gas - CC	GWh	ag	1,715
HSD - CC	GWh	ah	1,709
Gas - CC	PKR / kWh	ai = af / ag	0.6411
HSD - CC	PKR / kWh	aj = af / ah	0.6435

KCCPP – Annexure M

Output adjustment due to Amp. Temperature

Output (Gas) adjustment in Temperature

Ambient Temperature (Celsius)	Correction Factor	Station Net Capacity (MW)
1	0.986	224.00
2	0.975	226.39
3	0.968	228.13
4	0.963	229.32
5	0.960	230.04
6	0.959	230.38
7	0.958	230.44
8	0.959	230.27
9	0.960	229.95
10	0.962	229.54
11	0.964	229.08
12	0.966	228.59
13	0.968	228.12
14	0.970	227.67
15	0.972	227.27
16	0.973	226.91
17	0.975	226.60
18	0.976	226.32
19	0.977	226.08
20	0.978	225.85
21	0.979	225.62
22	0.980	225.38
23	0.981	225.10
24	0.982	224.76
25	0.984	224.35
26	0.987	223.83
27	0.989	223.20
28	0.993	222.43
29	0.997	221.51
30	1.00	220.83
31	1.007	219.19
32	1.014	217.77
33	1.021	216.19
34	1.030	214.45
35	1.039	212.56
36	1.049	210.55
37	1.059	208.44
38	1.071	206.27
39	1.082	204.05
40	1.094	201.84
41	1.106	199.68

Ambient Temperature (Celsius)	Correction Factor	Station Net Capacity (MW)
42	1.117	197.61
43	1.128	195.69
44	1.138	193.97
45	1.147	192.51
46	1.154	191.38
47	1.158	190.66
48	1.160	190.43
49	1.157	190.80
50	1.151	191.89

Output (HSD) adjustment in Temperature

Ambient Temperature (Celsius)	Correction Factor	Station Net Capacity (MW)
1	0.98771	222.757
2	0.97673	225.259
3	0.96883	227.097
4	0.96346	228.363
5	0.96015	229.149
6	0.95850	229.543
7	0.95813	229.632
8	0.95873	229.488
9	0.96002	229.180
10	0.96177	228.763
11	0.96380	228.283
12	0.96594	227.777
13	0.96807	227.274
14	0.97012	226.795
15	0.97202	226.352
16	0.97374	225.951
17	0.97528	225.595
18	0.97664	225.280
19	0.97787	224.996
20	0.97902	224.733
21	0.98014	224.477
22	0.98131	224.209
23	0.98261	223.912
24	0.98414	223.565
25	0.98597	223.148
26	0.98822	222.642
27	0.99095	222.027
28	0.99427	221.287
29	0.99824	220.406
30	1.00000	220.018
31	1.00840	218.185
32	1.01469	216.832
33	1.02182	215.320
34	1.02978	213.655
35	1.03856	211.850
36	1.04810	209.921
37	1.05833	207.891
38	1.06915	205.788
39	1.08040	203.645
40	1.09191	201.499

Ambient Temperature (Celsius)	Correction Factor	Station Net Capacity (MW)
41	1.10346	199.390
42	1.11479	197.363
43	1.12560	195.467
44	1.13554	193.756
45	1.14420	192.289
46	1.15114	191.130
47	1.15585	190.352
48	1.15775	190.038
49	1.15624	190.288
50	1.15061	191.218

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Annexure N - Capacity Sample Calculation

Capacity Payment Sample Calculation

KCCP

Time	Date	Net Dependable Capacity (With degradation adjusted) MW	Forced Outage MW	Planned Outage MW	Forced Derated MW	Planned Derated MW	Available Capacity (post planned and forced outages) MW	Amb Temp	Ambient Temp. Correction	Adjusted available Capacity due to Temp	Impact of Temp. Ckt	Available Capacity MW	Outages MW	HSO Available Capacity MW (As per actual Dispatch)	Gas Available Capacity MW	HSD Capacity Tariff Rs/kWh	C.m Capacity Tariff Rs/kWh	Capacity Payment PKR - Mn
		a	b	c	d	e	f = a-b-c-d-e	g	h	i=f/h	j = f - i	k = i + j	l = b+c+d+e	m	n	o	p	q = (m x o) + (n x p)
1:00:00 AM	1-Jul	221	0	0	0	0	221	35	1.0389	213	8	221	0	55	166	3.48	3.47	0.766
2:00:00 AM	1-Jul	221	55	0	0	0	166	40	1.0941	152	14	166	55	55	111	3.48	3.47	0.575
3:00:00 AM	1-Jul	221	0	0	55	0	166	27	0.9894	168	-2	166	55	55	111	3.48	3.47	0.575
4:00:00 AM	1-Jul	221	0	0	0	0	221	28	0.9953	222	-2	221	0	55	166	3.48	3.47	0.766
5:00:00 AM	1-Jul	221	0	55	0	0	166	29	0.9969	166	-1	166	55	110	56	3.48	3.47	0.578
6:00:00 AM	1-Jul	221	0	0	0	50	171	30	1.0018	171	0	171	50	110	61	3.48	3.47	0.593
7:00:00 AM	1-Jul	221	0	0	0	0	221	31	1.0071	219	2	221	0	110	111	3.48	3.47	0.767
8:00:00 AM	1-Jul	221	0	0	0	0	221	32	1.0142	218	3	221	0	110	111	3.48	3.47	0.767
9:00:00 AM	1-Jul	221	0	0	0	0	221	33	1.0215	216	5	221	0	110	111	3.48	3.47	0.767
10:00:00 AM	1-Jul	221	0	0	0	0	221	34	1.0298	214	6	221	0	110	111	3.48	3.47	0.767
11:00:00 AM	1-Jul	221	0	0	0	0	221	35	1.0389	213	8	221	0	110	111	3.48	3.47	0.767
12:00:00 PM	1-Jul	221	110	0	0	0	111	36	1.0488	106	5	111	110	110	1	3.48	3.47	0.385
1:00:00 PM	1-Jul	221	0	0	0	0	221	37	1.0594	208	12	221	0	110	111	3.48	3.47	0.767
2:00:00 PM	1-Jul	221	0	0	0	0	221	38	1.0706	206	15	221	0	110	111	3.48	3.47	0.767
3:00:00 PM	1-Jul	221	0	0	0	0	221	27	0.9894	223	-2	221	0	110	111	3.48	3.47	0.767
4:00:00 PM	1-Jul	221	0	0	0	0	221	28	0.9919	222	-2	221	0	110	111	3.48	3.47	0.767
5:00:00 PM	1-Jul	221	0	0	0	0	221	29	0.9969	222	-1	221	0	110	111	3.48	3.47	0.767
6:00:00 PM	1-Jul	221	0	0	0	0	221	30	1.0018	220	0	221	0	110	111	3.48	3.47	0.767
7:00:00 PM	1-Jul	221	180	0	0	0	41	31	1.0071	41	0	41	180	110	-69	3.48	3.47	0.143
8:00:00 PM	1-Jul	221	0	0	0	0	221	32	1.0142	218	3	221	0	110	111	3.48	3.47	0.767
9:00:00 PM	1-Jul	221	0	0	0	0	221	33	1.0215	216	5	221	0	110	111	3.48	3.47	0.767
10:00:00 PM	1-Jul	221	0	0	0	0	221	34	1.0298	214	6	221	0	221	0	3.48	3.47	0.768
11:00:00 PM	1-Jul	221	0	0	0	0	221	35	1.0389	213	8	221	0	221	0	3.48	3.47	0.768
12:00:00 AM	1-Jul	221	0	0	0	0	221	33	1.0215	216	5	221	0	221	0	3.48	3.47	0.768
Total										4687		4795	505	2753		6.05	6.05	16.650

K-Electric Limited
Generation Plants Tariff Petition
KCCPP
Annexure O - Outage schedule and Plant factor

Description	Legend	FY-24	FY-25	FY-26	FY-27	FY-28	FY-29	FY-30	FY-31	FY-32	FY-33	FY-34	FY-35	FY-36	FY-37	FY-38	FY-39	FY-40	Total
Hours	a	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	408
Days	b	366	365	365	365	366	365	365	365	366	365	365	365	366	365	365	365	62	5,906
Hours in a year	c = a x b	8,784	8,760	8,760	8,760	8,784	8,760	8,760	8,760	8,784	8,760	8,760	8,760	8,784	8,760	8,760	8,760	1,488	141,744
1 Annual outages																			
Gross Capacity - MW																			
GT-1		45.7	45.7	45.7	45.7	45.7	45.7	45.7	45.7	45.7	45.7	45.7	45.7	45.7	45.7	45.7	45.7	45.7	45.7
GT-2		47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0
GT-3	d	45.1	45.1	45.1	45.1	45.1	45.1	45.1	45.1	45.1	45.1	45.1	45.1	45.1	45.1	45.1	45.1	45.1	45.1
GT-4		46.5	46.5	46.5	46.5	46.5	46.5	46.5	46.5	46.5	46.5	46.5	46.5	46.5	46.5	46.5	46.5	46.5	46.5
ST-1		26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3
ST-2		24.7	24.7	24.7	24.7	24.7	24.7	24.7	24.7	24.7	24.7	24.7	24.7	24.7	24.7	24.7	24.7	24.7	24.7
Plant		235.4	235.4	235.4	235.4	235.4	235.4	235.4	235.4	235.4	235.4	235.4	235.4	235.4	235.4	235.4	235.4	235.4	235.4
Scheduled outage days																			
GT-1		24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	5.0	398.3
GT-2		24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	5.0	398.3
GT-3	e	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	5.0	398.3
GT-4		24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	5.0	398.3
ST-1		24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	5.0	398.3
ST-2		24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	5.0	398.3
Forced outage days																			
GT-1		11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	2.0	192.9
GT-2		11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	2.0	192.9
GT-3	f	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	2.0	192.9
GT-4		11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	2.0	192.9
ST-1		11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	2.0	192.9
ST-2		11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	2.0	192.9
Total Annual outage days																			
GT-1		36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	7.0	591.2
GT-2		36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	7.0	591.2
GT-3	g = e + f	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	7.0	591.2
GT-4		36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	7.0	591.2
ST-1		36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	7.0	591.2
ST-2		36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	7.0	591.2
Plant		219.1	219.1	219.1	219.1	219.1	219.1	219.2	219.1	219.1	219.1	219.1	219.1	219.1	219.1	219.1	219.1	42.2	3,547.2
Total Annual outage %																			
GT-1		10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	11.3%	10.0%
GT-2		10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	11.3%	10.0%
GT-3	h = g / b	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	11.3%	10.0%
GT-4		10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	11.3%	10.0%
ST-1		10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	11.3%	10.0%
ST-2		10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	11.3%	10.0%
Plant	i = w. average g / d	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	11.3%	10.0%
Annual Availability %	j = 100% - i	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	89%	90%
2 Overhauls																			
Cumulative hours																			
GT-1		86,629	94,513	102,397	110,281	118,188	126,072	133,956	141,840	149,747	157,631	165,515	173,399	181,306	189,190	197,074	204,958	206,397	
GT-2		73,417	81,310	89,194	97,078	104,985	112,869	120,753	128,637	136,545	144,428	152,312	160,196	168,104	175,987	183,871	191,755	191,755	
GT-3		90,947	98,831	106,715	114,599	122,506	130,390	138,274	146,158	154,065	161,949	169,833	177,717	185,624	193,508	201,392	209,276	209,276	
GT-4		97,373	105,457	113,341	121,225	129,132	137,016	144,900	152,784	160,691	168,575	176,459	184,343	192,250	200,134	208,018	215,902	215,902	
ST-1		57,432	65,296	73,180	81,064	88,971	96,855	104,739	112,623	120,530	128,414	136,298	144,182	152,089	159,973	167,857	175,741	175,741	
ST-2		96,209	104,092	111,976	119,860	127,768	135,652	143,535	151,419	159,327	167,211	175,094	182,978	190,886	198,770	206,653	214,537	214,537	

K-Electric Limited
Generation Plants Tariff Petition
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Annexure O - Outage schedule and Plant factor

Description	Legend	FY-24	FY-25	FY-26	FY-27	FY-28	FY-29	FY-30	FY-31	FY-32	FY-33	FY-34	FY-35	FY-36	FY-37	FY-38	FY-39	FY-40	Total
Overhauls																			
GT-1								64K**											
GT-3		Tunnel Cleaning + GT-1/2 64K**						64K**											
GT-5				Sea Water Dredging				64K**		Sea Water Dredging				64K**	Sea Water Dredging + GT-1/2 64K**+ST-1 50K				
GT-4					64K**							64K**							
ST-1		50K				25K			50K										
ST-2						50K							50K	96K					

*Overhauls are included based on factored fired hours. Accordingly, these events will occur when respective factored fired hours will be obtained
**As Gas turbine generators (GTGs) are air cooled therefore 64K maintenance scope are encountered early due to environmental conditions, further being combined cycle, outage of Gas Turbine will also impact proportionate unavailability of Steam turbine.
50k= MOH
64k= GT Generator OH
96k= ST Generator OH

GT/ST Overhauls (additional outage will not be required, covered in schedule outage)																		
GT-1			25K	50K			25K				25K	50K				25K		
GT-2			25K				25K	50K			25K							
GT-3				25K	50K			25K				25K	50K					
GT-4		25K			25K	50K				25K			25K	50K				
ST-1		50K			25K			50K			25K							
ST-2			25K			50K			25K			50K						

50K= GT major overhaul*
25k= GT minor overhaul (fuel section exchange)
25k= ST minor overhaul

*As per OEM, MOH is based on FH at 50K interval. And HSE is based on FFH of mix fuel ratio. In following schedule, MOH is fixed at 50K FH interval. And HSE is following 20% HSD FFH. In cycle, MOH coming very next year of HSE, HSE scope in MOH will be condition based.

Overhaul - days																			
GT-1		28	-	-	13	-	-	3	-	13	-	-	-	-	13	-	-	-	70
GT-2		28	-	-	13	-	-	3	-	13	-	-	-	-	13	-	-	-	70
GT-3	a	28	-	-	13	-	-	5	-	13	-	-	-	3	13	-	-	-	73
GT-4		28	-	-	13	3	-	-	-	13	-	3	-	-	13	-	-	-	73
ST-1		28	13	-	13	-	8	3	13	13	-	-	-	-	13	-	-	-	104
ST-2		28	-	-	13	2	13	2	-	13	-	2	13	8	13	-	-	-	106
Plant		**168**	**13**	**-**	**78**	**5**	**21**	**14**	**13**	**78**	**-**	**5**	**13**	**11**	**78**	**-**	**-**	**-**	**496**
Overhaul - %																			
GT-1		7.7%	0.0%	0.0%	3.6%	0.0%	0.0%	0.8%	0.0%	3.6%	0.0%	0.0%	0.0%	0.0%	3.6%	0.0%	0.0%	-	1.2%
GT-2		7.7%	0.0%	0.0%	3.6%	0.0%	0.0%	0.8%	0.0%	3.6%	0.0%	0.0%	0.0%	0.0%	3.6%	0.0%	0.0%	-	1.2%
GT-3		7.7%	0.0%	0.0%	3.6%	0.0%	0.0%	0.8%	0.0%	3.6%	0.0%	0.0%	0.0%	0.8%	3.6%	0.0%	0.0%	-	1.2%
GT-4	i = a / b	7.7%	0.0%	0.0%	3.6%	0.8%	0.0%	0.0%	0.0%	3.6%	0.0%	0.8%	0.0%	0.0%	3.6%	0.0%	0.0%	-	1.2%
ST-1		7.7%	3.6%	0.0%	3.6%	0.0%	2.2%	0.8%	3.6%	3.6%	0.0%	0.0%	0.0%	0.0%	3.6%	0.0%	0.0%	-	1.8%
ST-2		7.7%	0.0%	0.0%	3.6%	0.4%	3.6%	0.4%	0.0%	3.6%	0.0%	0.4%	3.6%	2.2%	3.6%	0.0%	0.0%	-	1.8%
Plant	**m = w. average k / d**	**7.7%**	**0.4%**	**0.0%**	**3.6%**	**0.2%**	**0.6%**	**0.6%**	**0.4%**	**3.6%**	**0.0%**	**0.2%**	**0.4%**	**0.4%**	**3.6%**	**0.0%**	**0.0%**		**1.3%**

3 Annual outages + Overhaul

Outage days - Annual + Overhaul																			
GT-1		64.51	37	37	50	37	37	43	37	50	37	37	37	37	50	37	37	7	661
GT-2		64.51	37	37	50	37	37	43	37	50	37	37	37	37	50	37	37	7	661
GT-3	n = g + k	64.51	37	37	50	37	37	43	37	50	37	37	37	40	50	37	37	7	664
GT-4		64.51	37	37	50	40	37	37	37	50	37	40	37	37	50	37	37	7	664
ST-1		64.51	50	37	50	37	45	40	50	50	37	37	37	37	50	37	37	7	695
ST-2		64.51	37	37	50	38	50	38	37	50	37	38	50	45	50	37	37	7	697
Plant		**387**	**232**	**219**	**297**	**224**	**240**	**219**	**232**	**297**	**219**	**224**	**232**	**230**	**297**	**219**	**219**	**42**	**4,043**
Outage % - Annual + Overhaul																			
GT-1		17.6%	10.0%	10.0%	13.6%	10.0%	10.0%	10.8%	10.0%	13.5%	10.0%	10.0%	10.0%	10.0%	13.6%	10.0%	10.0%	11.3%	11.2%
GT-2		17.6%	10.0%	10.0%	13.6%	10.0%	10.0%	10.8%	10.0%	13.5%	10.0%	10.0%	10.0%	10.0%	13.6%	10.0%	10.0%	11.3%	11.2%
GT-3	o = n / b	17.6%	10.0%	10.0%	13.6%	10.0%	10.0%	10.8%	10.0%	13.5%	10.0%	10.0%	10.0%	10.8%	13.6%	10.0%	10.0%	11.3%	11.2%
GT-4		17.6%	10.0%	10.0%	13.6%	10.8%	10.0%	10.0%	10.0%	13.5%	10.0%	10.8%	10.0%	10.0%	13.6%	10.0%	10.0%	11.3%	11.2%
ST-1		17.6%	13.6%	10.0%	13.6%	10.0%	12.2%	10.8%	13.6%	13.5%	10.0%	10.0%	10.0%	10.0%	13.6%	10.0%	10.0%	11.3%	11.8%
ST-2		17.6%	10.0%	10.0%	13.6%	10.4%	13.6%	10.4%	10.0%	13.5%	10.0%	10.4%	13.6%	12.2%	13.6%	10.0%	10.0%	11.3%	11.8%
Plant	**p = w. average o / d**	**17.6%**	**10.4%**	**10.0%**	**13.6%**	**10.2%**	**10.6%**	**10.6%**	**10.4%**	**13.5%**	**10.0%**	**10.2%**	**10.4%**	**10.4%**	**13.6%**	**10.0%**	**10.0%**	**11.3%**	**11.3%**
Availability	q = 100% - p	82.4%	89.6%	90.0%	86.4%	89.8%	89.4%	89.4%	89.6%	86.5%	90.0%	89.8%	89.6%	89.6%	86.4%	90.0%	90.0%	88.7%	88.69%

Note-1: Based on annual availability of 90% and expected occurrence of Additional Outages, Levelized Plant factor (considering all type of outages mentioned above) has been calculated as 88.69%.
Note-2: For the purpose of calculation of Availability, 20% annual operation on HSD has been assumed with remaining 80% operation on Gas, and outage schedule has been made accordingly.
Note-3: For capacity determination third party heat rate test values has been used.

K-ELECTRIC LIMITED

K-Electric Limited
Generation Plants Tariff Petition
RCOP
Annexure P - O&M Sharing Mechanism

Description	Legend	Unit	FY-24	FY-25	FY-26	FY-27	FY-28	FY-29	FY-30	FY-31
Hours	a	no.	24	24	24	24	24	24	24	24
Days	b	no.	365	365	365	365	365	365	365	365
Hours in a year	c = a x b	no.	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760

Overhauls

Shall be replaced with Actual occurrence

GT-1			Minor OH	Major OH				
GT-2			Minor OH				Minor OH	Major OH
GT-3				Minor OH	Major OH			
GT-4		Minor OH			Minor OH	Major OH		
ST-1		Major OH						
ST-2			Minor OH			Major OH		

**Overhauls are included based on factored fired hours. Accordingly, these events will occur when respective factored fired hours will be achieved*

O&M components - Gas Combined cycle

Tariff components
[Shall be replaced with actual quarterly indexed tariff components]

Variable - local	d	PKR / kWh	0.0486	0.0690	0.0530	0.0509	0.0529	0.0527	0.0527	0.0527
Variable - Foreign	e	PKR / kWh	0.7905	0.8877	0.4649	2.4686	1.3372	1.4444	1.4444	1.4444
Fixed - local	f	PKR / kWh	0.6581	0.6102	0.5568	0.5167	0.4886	0.5060	0.5060	0.5060
Fixed - Foreign	g	PKR / kWh	0.4167	0.4084	0.3972	0.3561	0.4935	0.2503	0.2503	0.2503
Net Capacity	h	MW	220.8	220.8	220.8	220.8	220.8	220.8	220.8	220.8
Availability factor [Shall be replaced with Actual]	i	%	85.2%	83.6%	89.5%	88.4%	86.3%	90.0%	87.0%	89.1%
Available capacity	j = h x i x c	GWh	1,647.6	1,617.7	1,730.7	1,709.7	1,669.1	1,741.0	1,683.5	1,722.8
Dispatch factor [Shall be replaced with Actual]	j1	%	100%	100%	100%	100%	100%	100%	100%	100%
Units sent out	k = i x j1	GWh	1,647.6	1,617.7	1,730.7	1,709.7	1,669.1	1,741.0	1,683.5	1,722.8

Recovery in tariff

Variable - local	l = d x k	PKR mn	80	112	92	87	88	92	89	91
Variable - Foreign	m = e x k	PKR mn	1,303	1,452	805	4,221	2,232	2,515	2,432	2,488
Fixed - local	n = f x j	PKR mn	1,084	987	964	883	815	881	852	872
Fixed - Foreign	o = g x j	PKR mn	687	662	687	609	824	436	421	431
Total	p	PKR mn	**3,153**	**3,213**	**2,547**	**5,800**	**3,959**	**3,923**	**3,794**	**3,882**

Cost
[Shall be replaced with actual cost incurred]

O&M expenses as per Financial statements		PKR mn	1,931	1,887	1,847	1,932	3,214	2,524	2,640	2,290
Addition to CWIP as per Financial statements		PKR mn	1,221	1,241	1,131	1,254	2,343	1,882	1,960	1,727
Total	q	PKR mn	**3,152**	**3,128**	**2,978**	**3,186**	**5,556**	**4,406**	**4,600**	**4,017**
Over / (Under) Recovery	**r = p - q**	**PKR mn**	**2**	**85**	**(430)**	**2,614**	**(1,597)**	**(483)**	**(807)**	**(135)**

Over / (Under) Recovery - Movement

Opening	s	PKR mn	-	2	86	(344)	2,270	673	190	(617)
Addition	t = r	PKR mn	2	85	(430)	2,614	(1,597)	(483)	(807)	(135)
Closing	**u**	**PKR mn**	**2**	**86**	**(344)**	**2,270**	**673**	**190**	**(617)**	**(751)**

Sharing Timeline - based on occurrence on Overhaul of last component in One cycle for 4 GTs and 2 ST, and at the end of life - Note			Sharing on completion of MOH of GT
Over / (Under Recovery)	v = u	PKR mn	(751)
In case of (Under recovery) - carry forward	w = if v < 0	PKR mn	(751)
In case of Over recovery - sharing	x = if v > 0	PKR mn	-
- Consumer - 60%	y = X x 60%	PKR mn	-
- KE - 40%	z = X x 40%	PKR mn	-

Sharing of consumer to be credited in next invoice.

One Overhaul cycle shall include one:
- One 50k for each GT
- One 25k for each GT
- One Major overhaul for each ST after every 50k operating hours
- One Minor overhaul for each ST after every 25k operating hours

In case of First overhaul cycle, 25k for one ST has already been incurred before FY 2024

KCCPP – Annexure Q

Head of Terms

POWER PURCHASE AGREEMENT

TERM SHEET

This Term Sheet dated xxx (the "Date of Signing") is a summary of the principal and indicative terms for inclusion in the Power Purchase Agreement (the "PPA") to be entered into between XX Generating Station (Plant) which is part of KE's generation fleet, and Transmission/Load Dispatch Center (LDC) of KE (individually a "Party" and together the "Parties") in relation to the sale and purchase of electrical energy. The terms and conditions contained in this non-binding term sheet are indicative and non-binding in nature. Any such obligation or agreement will be created only by the execution of a definitive power purchase agreement (the "PPA") by Seller and Buyer (as defined below, and collectively the "Parties"), the provisions of which, if so executed, will supersede this Term Sheet and all other agreements, if any, related to this document and the proposed transaction.

Sr #	Terms	Description
1)	Seller	KCCPP
2)	Buyer	Load Dispatch Center (LDC) / Supply
3)	Purpose of PPA	The Plant shall sell all electrical energy generated by it to the Buyer based on the dispatch instructions issued by Buyer and the fuel available with Seller to meet such dispatch in line with the agreed availability plan between buyer and seller
4)	Plant	[.] *Description of plant to be added*
5)	Product	The **"Product"** to be delivered and sold by Seller and received and purchased by Buyer consists of: (a) all energy, or Buyer's applicable portion, expressed in MWh, generated by the Plant and delivered to the delivery point/interconnection point **("Delivered Energy")** b) all other plant output including capacity and ancillary services c) Black start facility, if applicable
6)	Term	The term of the PPA shall be effective on the **Effective Date** (to be defined in the PPA) and shall terminate XX Contract Years or the expiry of the regulatory license of the Plant, whichever is earlier, following the Effective Date **("Term").** **"Contract Year"** means each consecutive 12-month period during the Term that commences on the first day of July following the Effective Date, and every July 1st thereafter. The first Contract Year shall be a partial year, commencing on the Effective Date.
7)	Contract Capacity	The Contract Capacity shall be XX MW (net, at reference condition)
8)	Sale and Purchase of Energy and Capacity	Buyer shall have exclusive right of energy and capacity of the Plant. Subject to terms of PPA, The Seller shall: (i) Make available to the Buyer the Declared Available Capacity up to the Contract Capacity (ii) Deliver and sell to Buyer at the interconnection point, the dispatched net electrical output Subject to the terms of PPA, the Buyer shall, in accordance with NEPRA approved tariff: (i) Pay Declared Available Capacity (Take or Pay mechanism) (ii) Pay for the dispatched and delivered net electrical output

Sr #	Terms	Description
9)	Metering	Buyer's share of the Delivered Energy shall be measured using electric metering devices. The Metering System shall be in place prior to the delivery of net electrical output to the interconnection point. Seller shall maintain and Buyer shall inspect such electric metering devices In accordance with the agreed terms and conditions between buyer and seller and approved by NEPRA.
10)	Billing	The PPA shall contain provisions pursuant to which Seller shall send Buyer monthly invoices in form and method determined by the Parties, showing the amount due to the Seller for the relevant month, specifying MWs supplied, all billing parameters, rates and factors and all other data relevant to the calculation of payments.
11)	Net Heat Rate	The Plant shall perform at a Net Heat Rate (NHR) of XXXX as witnessed and/or approved by NEPRA. Necessary Corrections shall be applicable on part load operations.
12)	Annual Operational Plan	At the beginning of each Year, the Plant shall submit to the Buyer, its Annual Operational Plan, which shall include but not be limited to the following: - Planned Outage Schedule - Maintenance Outage Schedule - Forced Outages Allowance - Annual Availability - Minimum Dispatch requirements as per technical limits - Fuel allocation as available from the Fuel Supplier Upon receipt of the Plants' Annual Operational Plan, the Buyer shall review and provide timely feedback on the operational plan based on the following: - The Year's demand forecast - Economic Merit Order Projection (tentative) to be provided to the seller - System constraints including planned outages in the network if any, to be provided to the Seller. - Annual Dispatch Plan (tentative) - to be provided to the Seller annually. Upon review of the Plant's Annual Operational Plan, both Parties shall mutually agree to the final plan for the upcoming contract year
13)	Plant Availability and Dispatch	Seller shall achieve availability of no less than XX%, The Plant shall be responsible for the availability of the Complex for Dispatch by the Buyer. Upon receipt of a notice of Dispatch from the Buyer, the Seller shall generate and deliver the Net Electrical Output at the Interconnection Point in accordance with the technical limits as per grid code and all applicable standards/prudent practices. The Seller shall give prompt notice to the Buyer regarding any changes to availability of the Complex caused by events such as: (i) Force Majeure Event; (ii) Scheduled Outage; (iii) Forced Outage; (iv) Partial Forced Outage; and (v) Any other event which causes alteration in availability

Sr #	Terms	Description
14)	Operation and Maintenance Costs	Seller will bear all costs and expenses for Operations and Maintenance of the Plant and any other costs up to the delivery /interconnection point for the performance of Seller's obligations under the PPA (collectively, the "Seller Costs"). Any ancillary services costs to be excluded from the Seller Costs shall be discussed in the PPA.
15)	Others	The PPA will also include, among other things, the following covenants, terms, and/or conditions: • Seller will insure operate, maintain, manage, replace, repair, study, test, and otherwise use the Plant up to its battery limits in accordance with (i) Seller's obligations in the PPA, and the OEM Manual(s), (ii) Prudent electrical and utility practices, and (iii) all applicable laws (including environmental laws), consents, and governmental approvals, including all applicable standards and guidelines adopted from time to time by governmental authorities • Seller will schedule and perform required maintenance according to the PPA • Seller will insure against all insurable risks with coverage in an amount not less than full replacement cost and on terms specified in the PPA.
16)	Fuel Supply	The Seller shall make its best efforts for the availability and allocation of Main fuel to the Gen Station to maintain guaranteed availability and to meet dispatch notifications. The Seller shall also make its best efforts to maintain the inventory of Back-up Fuel for xx days and ensure the readiness of Plant to operate on Back-up Fuel to maintain guaranteed availability and meet dispatch notifications. The Seller shall also be responsible to obtain consent from the Buyer, prior to operations based on Back-up Fuel. In no event the Seller shall be required to operate the Plant on HSD for a period exceeding xx hours in any Year, provided that prior consent has been solicited from Buyer for any additional hours.
17)	Start-ups and Minimum Load	The Seller shall make technical references available to the Buyer concerning the required times for Start-Ups and minimum complex/machine loading
18)	Island Mode	The Seller shall be responsible to make the plant fully capable of operating on Island Mode, to the extent consistent with the Technical Limits, for recovery from a local or widespread electrical blackout through its Black Start Facility and voltage reduction to effect load curtailment.
19)	Black Start Facility	The Seller shall be responsible to ensure readiness of Black Start Facility all the time in order to start the Plant in case of widespread electrical blackout to operate the Plant in Island Mode.
20)	Billing	Relevant Payment Terms for Energy shall be 30 days. The Buyer shall pay the Seller the Capacity Payments for the available capacity for each month (70% in advance and 30% immediately after month end) and energy payments for dispatched and delivered net electrical output for the relevant month.
21)	Liquidated Damages	To be discussed between the Parties
22)	Force Majeure	Force Majeure Events and the obligations, duties, compensation, and recourse available to each Party during such events including but not limited to **PPFME** (Pakistan Political Events that occur inside or directly involve Pakistan) and **CLFME** (any Change in Law to the extent of Force Majeure Event) shall be negotiated and finalized in the PPA. The PPA will also include a termination right for extended force majeure that impacts Party's ability to perform under the contract.
23)	Events of Default	The PPA will include standard events of default, as appropriate.

Sr #	Terms	Description
24)	Termination	The PPA will include standard terms for Termination. However, Parties agree that there shall not be any Termination for Convenience in the PPA.
25)	Dispute Resolution	In the event of any disputes between the Parties, the Parties shall seek to resolve the same in the following order: 1. Through mutual discussion involving Steering Committee 2. If the dispute in question is not resolved through mutual discussions, then senior management of KE shall resolve the disputes. Other terms & conditions for settlement of disputes shall be mutually agreed between the Parties
25)	Indemnification	Seller shall indemnify Buyer against any damages (unless resulting from Buyer's gross negligence or willful misconduct). Buyer shall indemnify Seller against any damages (unless resulting from Seller's gross negligence or willful misconduct).
26)	Governing Law	Laws of Pakistan
27)	Confidentiality	Each Party shall be required to keep the terms and provisions, of the PPA and this Term Sheet, confidential and prohibited from disclosing such terms to any third party, subject to certain limited exceptions specified in the PPA.

K-Electric Limited

IC Report on O&M cost evaluation – Korangi Combined Cycle Power Plant ("KCCPP") Plant

30 November 2022

Consortium of Independent Consultant

OMS

EY
Building a better working world

Reliance Restricted

Chief Financial Officer
K-Electric Limited
KE House, 39-B
Sunset Boulevard, D.H.A. Phase 2
Karachi, Pakistan

Project Power – IC Report on O&M cost evaluation of KCCPP **30 November 2022**

Dear Sir

In accordance with your instructions, we have performed the work set out in our Purchase Order (No: 7500048189) dated 29 March 2022 (the "Engagement Agreement") in connection with the evaluation of forecast of operations and maintenance cost of owned power generation plants prepared by K-Electric Limited ("KE" or the "Client" or "you"), as part of seeking stand-alone tariff for each power plant under IPP mode from National Electric Power Regulatory Authority ("NEPRA") ("the Project" or "Project Power" or the "Transaction").

Purpose of our report and restrictions on its use

This engagement is of due diligence in nature and accordingly this due diligence report ("Report") on Korangi Combined Cycle Power Plant ("KCCPP") has been prepared by consortium comprising OMS (Private) Limited ("OMS" or "Technical cum lead consultant") and EY Ford Rhodes ("EY" or "Financial Consultant") (hereinafter jointly referred as "Independent Consultant" or "IC", "We" or "Our") based on their respective technical and commercial analysis performed in accordance with the scope agreed vide Engagement Agreement. The supplementary analysis performed by IC during the course of this engagement has been compiled and submitted to KE separately.

This Report has been prepared on the specific instructions of KE, solely for the purpose of the Transaction and should not be used or relied upon for any other purpose. This Report (or any portion or summary of it) may not be quoted, referred to or shown to any other parties except as provided in the Engagement Agreement.

We accept no responsibility or liability to any person other than to KE, or to such party to whom we have agreed in writing to accept our responsibility in respect of this Report, and accordingly if such other persons choose to rely upon any of the contents of this Report they do so at their own risk.

Nature and scope of the services and limitations

The nature and scope of the services, including the basis and limitations, are detailed in the Engagement Agreement.

Whilst each part of our Report addresses different aspects of our work, the entire Report together with Appendices should be read for a full understanding of our findings and advice.

"Banner headlines" used in this Report are intended only to act as an introduction to the page concerned and should be read in conjunction with rest of the page. They are not intended to represent any recommendation, conclusion or finding.

Our work was completed on 30 November 2022. Therefore, our Report does not take account of events or circumstances arising after that date and we have no responsibility to update the Report for such events or circumstances.

This Report has been finalized based on the data, explanations and feedback provided by the Client during the course of engagement.

Nature and scope of the services and limitations (cont'd)

IC highlights that our Report do not include any recommendation to you on your future course of action. Any decision to proceed with tariff petition may entail consideration of several factors, some of which IC may not be aware of. The evaluation of these factors or advising you on any business decision does not form part of scope of our work of this Report. You should therefore consider the appropriateness of the Report in light of your own objectives and financial situation.

While EY has performed a review of the Operations and Maintenance ("O&M") cost model, we have not assessed the contents of the model i.e. the financial statements or roll-forward for their appropriateness for financial reporting (as per applicable framework) or taxation authorities. Further, as summarized in section 2 of the Report, our review is based on the data and agreements / quotations of the respective power plants made available to IC during the course of the engagement. Reasonableness of O&M costs has been performed by OMS in detail based on substantial review of relevant supporting documents, wherever available. Additionally, we perform our work in the capacity of IC and have not assessed any agreements for their authenticity / legality from a legal and tax perspective.

IC has reported broadly on matters, which Consortium members have noted and which appear significant to us for the purpose of technical and commercial due diligence. In addition, please note that:

a) Our work in connection with this engagement is of a different nature to that of an audit or a review of information, as those terms are understood in applicable international auditing standards. Consequently, we give no assurance on such information.

b) Our scope of work was limited to the review and analysis of information made available to EY by the management of KE, physical site visit and discussions with key management personnel of KE.

c) We have relied on the information provided during the course of engagement and have assumed the genuineness of all the documents and the signatures thereon as if they were originals and also assumed that the scanned or soft copies conform to the original.

d) Transactions, data and events which were not recorded and which were not disclosed to us may not have been identified during our due diligence.

Detailed findings of technical due diligence performed by OMS have been placed in the appendices to this Report with summary findings and considerations highlighted in different sections of the Report.

The contents of our Report have been reviewed by KE management, who have confirmed to us their factual accuracy. Further, feedback provided on the draft Report has been duly addressed, wherever deemed appropriate.

We appreciate the co-operation extended by the KE team during the course of this engagement. Please do not hesitate to contact us if you have any questions about this engagement or if we may be of any further assistance.

Yours faithfully

For and on behalf of OMS (Private) Limited (Technical cum lead consultant)

Abu Adil (Senior General Manager)

For and on behalf of EY Ford Rhodes (Financial consultant)

Rana Nadeem Idrees (Partner)

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1 Key considerations

Key considerations

Key consideration	Commentary	Findings / Recommendation	Pg. no.
Plant operating profile and availability / utilization factor assumption	► Under an integrated MYT regime, KE had a consolidated O&M *tariff component based on projected operating profile and load* factor of its plants. ► Since, KE is planning to seek standalone O&M cost tariff for each plant, including KCCPP, therefore, Management has assumed projected plant availability / utilization factor of 88.66% (i.e. the maximum achievable average availability / utilization factor during remaining plant life). ► Aforementioned assumption of projected plant utilization to match projected plant availability has been kept aligned with other IPPs, for the sake of tariff petition. ► KCCPP configuration includes 04 × GTs, 02 × HRSG & 02 × ST. ► *Since NEPRA determined the performance of complex through* 3rd party test i.e., Gross Capacity: 237.078 MW, Net Output: 220.828 MW, Net Efficiency (HHV): 41.722% and auxiliary consumption of 16.250MW (6.854%), therefore, it is implied that the same shall stand accepted as such.	► Major cost events and the variable cost annual spend *profile* during the requested tariff control period has been assessed keeping in view forecast availability/utilization. ► Since variable costs, including event based costs, are claimed based on actual utilization of the plant, risk of claiming any extra cost for lower actual utilization is negligible. ► The availability/utilization/load factor assumed by KE is reflective of the brownfield nature of the plant and expected maintenance requirements over its remaining useful life.	n.a.
Methodology applied for preparing O&M tariff	► KE intends to submit its petition for each of its owned power generation plant under IPP mode. ► Previously, NEPRA has considered the Revex component of O&M cost for the immediately preceding year (reference year) and accordingly determined the O&M tariff component. In this particular case, KE is submitting its petition in advance for tariff period commencing from FY24 in the current fiscal year. Therefore, for the purpose of O&M cost estimation, FY22 audited numbers have been used.	► KE would need to assess its readiness to address any additional information required during tariff determination process. ► The findings of this Report are also expected to provide comfort around O&M cost estimation of KE, during the tariff determination process.	n.a.

Key considerations

Key consideration	Commentary	Findings / Recommendation	Pg. no.

Reclassification of expenses between foreign and local components and other adjustments	▸ The adjustments mainly reflect the impact of:
	  ▸ update of exchange rate assumption by KE from PKR 185 to PKR 206 in case of foreign components of VOM and FOM costs (i.e. with a cumulative increase of PKR 3.23b in VOM foreign and PKR 0.85b in FOM foreign).
	  ▸ reclassification/revisit of costs suggested by IC in local and foreign components of VOM and FOM.
	▸ These adjustments translated into a net cumulative reduction of PKR 0.46b in FOM and a net cumulative increase of PKR 6.79b in VOM over the requested tariff control period. Consequently, average per kWh VOM cost increased by PKR 0.2476 and average per kWh FOM cost decreased by PKR 0.0169.
		▸ KE has evaluated and concurred with the identified adjustments of IC and accordingly reflected those in its adjusted average tariff computation.
		▸ The adjusted average tariff has been included in the later sections of this Report.
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Basis used for estimating O&M costs	▸ Basis of estimations can be summarized in four broad categories:
	  ▸ Linked to latest available POs/quotations;
	  ▸ Management estimate/past experience;
	  ▸ Based on FY22 values and SAP history; and
	  ▸ Linked to CSA
	▸ IC has substantiated the reasonableness of estimations on sample basis (covering ~82.4% of value) through checking of POs, quotations, SAP history, underlying agreements and / other relevant data / basis considered by the Management.
		▸ Estimation basis used by the management were found reasonable / consistent with the historical benchmarks, underlying agreements and / or historical basis.
		▸ As highlighted above, some re-classification adjustments (between local / foreign and variable / fixed components) and cost reductions were identified by IC. These have been agreed with KE and accordingly have been addressed in the adjusted average tariff computation of KE, shown in later sections of this Report.
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Key considerations

Key consideration	Commentary	Findings / Recommendation	Pg. no.
Benchmarking of O&M costs on Gas Fuel PKR/kWh KCCPP: 2.0435 HCPC: 2.4685	▸ From technical compatibility perspective, KCCPP tariff has been benchmarked against estimated indexed tariff of HCPC plant for FY22. ▸ For the purpose of benchmarking, HCPC current tariff has been computed based on (a) VOM cost publicly available as per NTDC's periodic Economic Merit Order (EMO) subject to forex rate adjustment; and (b) Escalable component of the Capacity Charges as per June 1999 (per KE/IC market insights), subject to 88.66% load factor and local CPI adjustments until FY22. ▸ Fixed cost ratio in KCCPP is less than the benchmark by 21.1%. This is compensated by higher VOM cost ratio in KCCPP by 21.1%. ▸ Foreign cost component of KCCPP is 71.3%. **Enabling cost benchmarking:** ▸ Due to lack of publicly available data about benchmark projects, enabling costs were analyzed at overall FOM level and were found reasonable.	▸ Overall KCCPP O&M cost tariff is lower as compared to the benchmark power plant. ▸ HCPC is considered as close benchmark of KCCPP as it is using the same technology. Since HCPC does not fall under NEPRA tariff determination regime, HCPC's tariff is not available in public domain. However, based on general market insights of IC/KE, power plant operating under 1994 power policy used to have energy and capacity charge with in their tariff.	33

O&M cost indexations	▸ KCCPP average tariff is expected to be indexed as follows:
	  ▸ Local costs: Pak CPI Quarterly
	  ▸ Foreign costs: US CPI and Exchange rate Quarterly variation
		▸ The requested indexations are aligned with benchmark projects and recent determinations by NEPRA for other thermal power projects.	34

Key considerations

Key consideration	Commentary	Findings / Recommendation	Pg. no.

Plant operations on HSD as a back-up fuel	▸ KCCPP is already commissioned on HSD (backup fuel), Heat Rate Test conducted by 3rd party in June 2021 and witnessed by NEPRA Representative.
	▸ Heat Rate test was conducted at base load (100%) and part load (85%), test results were shared with NEPRA for approval.
	▸ The decision of NEPRA was notified on August 04, 2022 for the control period (2021~2023) with the following remarks.
	  ▸ In general, Generation on HSD; being expensive fuel; shall be avoided and shall be justified by KE if required generation on HSD
	  ▸ HSD heat rate is approved only at base load operation
	▸ NEPRA approved HSD Heat Rate numbers for prevailing tariff control period are as below
	FY-2021: 7911.771 btu/kWh (HHV)
	FY-2022: 7950.183 btu/kWh (HHV)
	FY-2023: 7921.728 btu/kWh (HHV)
		▸ HSD O&M cost estimation is based on following key assumptions:
		  ▸ Degradations on HSD as compared to Gas fuel are significantly higher. It is worth mentioning that the severity factor with HSD operation is two (1 OH=2 FFH) i.e. double to the severity factor as on gas (1 OH = 1 FFH).
		  ▸ If the plant is operated on HSD only, the life of Hot Gas path components (Hot Section-HS) will be half , as compared to, if the plant is operated on gas fuel.
		  ▸ Each Gas Turbine will undergo Hot Section (HS) hardware replacement after every 12.5K operating hours on HSD, which is 25K if operated on gas.
		  ▸ Net Capacity on HSD (RSC): 220.018MW
		  ▸ Net Efficiency (HHV) at RSC: 43.127%.
		▸ It is suggested that operational constraints, such as, procurement, handling and storage of liquid fuel, should be carefully considered while setting the cap for HSD based plant operations at any given point in time.
		▸ As fuel risk is parked with IPP, from power purchaser /regulator perspective, optimum availability is expected to be made available by IPP and hence leaving the fuel mix decision purely at IPP end.
			36, 37

Unbundling consideration	▸ KCCPP plant is currently operating under the umbrella of overall KE system. Accordingly, cost structure may change going forward, in case Management decides to unbundle the utility into distinct business segments.	▸ KE is suggested to seek adequate openers (e.g. those related to the recovery of legitimate incremental O&M costs that may arise in future due to potential unbundling of the utility) in its tariff petition.	n.a.

Key considerations

Key consideration	Commentary	Findings / Recommendation	Pg. no.
Other commercial considerations	▸ Since KE is using an in-house model for O&M operations, opportunity of embedding certain costs and risks (as part of third-party O&M contractor scope) with performance guarantee mechanism and indirect reflection in fixed or variable O&M charge is not available to KE. Consequently, such costs and risks are being parked with/borne by KE instead of a third party and hence bear a cost recovery challenge. However, KE does not envisage any cost increase due to continuation of an in-house operating model.	▸ KE, in consultation with its legal team, should consider reiterating the legitimate cost recovery principal enshrined within the prevalent tariff regulatory framework while finalizing and framing request for the O&M cost components of the tariff.	n.a.

2 Project background and scope of work

KE has hired consortium of OMS and EY for the independent evaluation of projected O&M costs for KCCPP

Background

- K-Electric Limited ("KE") is the only vertically integrated power utility of Pakistan.
- KE carries out operations and maintenance of its power generation plants, including major overhauls, under service contracts with OEMs and/or in-house (with or without vendors support), as applicable.
- KE's existing integrated-Multi Year Tariif ("MYT") period is due to expire on 30 June 2023.
- As part of its preparatory work for next MYT petition, KE has internally decided to opt out of MYT for generation component of its business and is in the process of applying separate generation tariff for the following owned power generation plants, covering their remaining useful economic lives as tariff control period:
  - Bin Qasim Power Station – I ("BQPS I")
  - Bin Qasim Power Station – II ("BQPS II")
  - Bin Qasim Power Station – III ("BQPS III")
  - S.I.T.E Gas Engine Power Station ("SGEPS")
  - Korangi Town Gas Engines Power Station ("KTGEPS")
  - Korangi Combined Cycle Power Plant ("KCCPP")
- KE has prepared an O&M cost forecast for each of these power plants for the purpose of tariff petioning. For this purpose, O&M costs have been derived keeping in view historical and forecast revenue expenditure ("REVEX") and capital expenditure ("CAPEX") for each plant.
- KE hired a consortium comprising OMS (Private) Limited ("Technical cum lead consultant") and EY ("Financial Consultant") (hereinafter together referred to as "Independent Consultant" or "IC") for the independent evaluation of the aforesaid projected O&M costs.

O&M costs related to generation segment are reflected in audited financial statements as expenses incurred in generation and additions to CWIP – generation segment

Historical generation O&M cost – KE system

Figures in PKRm		FY17A	FY18A	FY19A	FY20A	FY21A	FY22A
REVEX	A	4,751	4,695	5,195	5,054	5,322	4,770
CAPEX	B	9,003	6,877	6,429	4,521	5,656	4,505
Total		13,754	11,572	11,624	9,575	10,978	9,275

Reconciliation with audited financial statements

Figures in PKRm	FY17A	FY18A	FY19A	FY20A	FY21A	FY22A
O&M expenditure	4,751	4,695	5,195	5,054	5,322	4,770
Add: Depreciation & Amortization	7,648	9,061	9,878	11,729	11,436	11,657
O&M expenditure total	**12,399**	**13,756**	**15,073**	**16,783**	**16,758**	**16,427**
O&M expenditure support cost	1,089	920	1,138	986	1,223	1,273
Add: Depreciation & Amortization support dept	43	55	68	82	85	212
O&M expenditure total	**1,132**	**974.56**	**1,206**	**1,068**	**1,308**	**1,485**
Expenses incurred in generation as per AFS	**13,531**	**14,731**	**16,279**	**17,851**	**18,066**	**17,912**

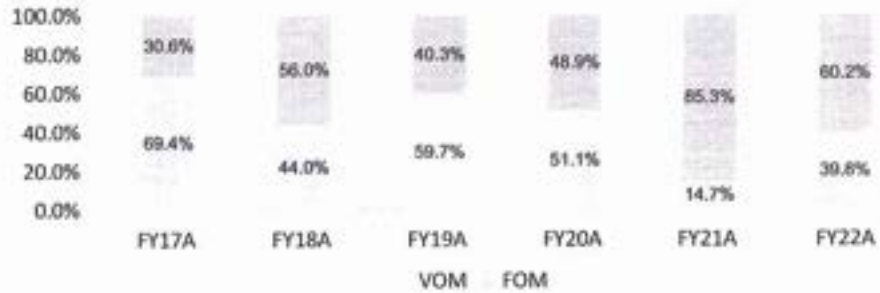
Figures in PKRm	FY17A	FY18A	FY19A	FY20A	FY21A	FY22A
Generation – Plant and machinery additions	7,509	6,385	6,857	4,234	5,059	4,162
Generation – Others	1,494	492	-428	287	597	343
Sub-total	**9,003**	**6,877**	**6,429**	**4,521**	**5,656**	**4,505**
Add: BQPS III Project Cost	0	30	14	16,625	45,372	21,819
CWIP additions as per AFS	**9,003**	**6,907**	**6,443**	**21,146**	**51,028**	**26,324**

Source: Management data and KE Annual Reports

Historical generation O&M cost – KCCPP

Figures in PKRm	FY17A	FY18A	FY19A	FY20A	FY21A	FY22A
REVEX	800	775	1,008	895	1,172	1,087
CAPEX	1,576	379	1,002	540	2,078	1,096
Total	2,376	1,154	2,010	1,435	3,250	2,183

Source: Management data



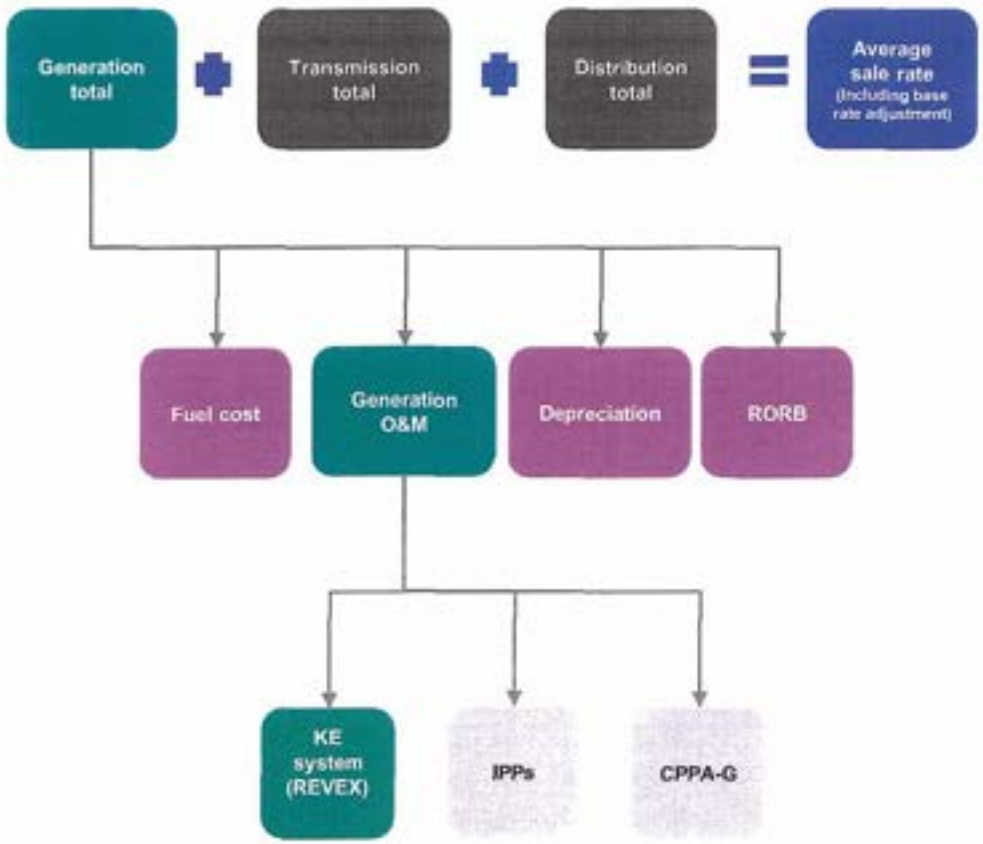
Breakdown of KCCPP O&M cost in variable and fixed components

Figures in PKRm	FY17A	FY18A	FY19A	FY20A	FY21A	FY22A
Variable O&M local	121	87	151	95	83	58
Variable O&M foreign	1,527	421	1,048	638	395	810
Sub-total variable O&M	1,648	508	1,199	733	478	868
Fixed O&M local	563	560	669	592	1,059	865
Fixed O&M foreign	165.25	85.99	141.81	109.56	1,713	450.43
Sub-total fixed O&M	728	646	811	702	2,772	1,315
Total	2,376	1,154	2,010	1,435	3,250	2,183

- Per management, since existing MYT does not bifurcate O&M into variable and fixed costs and accordingly, therefore costs are being maintained in the form of REVEX and CAPEX only. According to the Management, for the purposes of comparison with the proposed O&M bifurcation into fixed and variable cost going forward, historical O&M costs have been bifurcated based on assumptions similar to that of projected O&M costs.

Composition and comparability limitations of existing MYT

Current Integrated Multi-Year Tariff structure determined by NEPRA



- KE's current Multi Year Tariff is an Integrated MYT which includes costs and returns for all three segments i.e. Generation (all plants), Transmission and Distribution based on Regulatory Asset Base (RAB).
- While the underlying costs for three segments are defined in the current MYT determination, certain components such as base rate component and working capital component are not bifurcated segment wise.
- Similarly, plant wise tariff bifurcation in case of generation segment is not available within the MYT.
- Current MYT includes below components:
  - Fuel cost based on allowed benchmarks (indexed value for the month of June 2022 was PKR 21.72/kWh*);
  - RoRB and Depreciation components which cover for Returns on Regulatory Asset base (indexed value for the month of June 2022 was PKR 1.13/kWh* for generation); and
  - Operation and maintenance costs for generation, that are covered through:
    - O&M component allowed for Revex expenses (indexed value for the month of June 2022 was PKR 0.59/kWh*); and
    - Capital nature expenses allowed as investments and included in Regulatory Asset Base
- As explained above, base rate and working capital components are given on Company level, which include coverage for Generation segment as well.
- Accordingly, MYT in its current form is not comparable with the O&M cost tariff being requested under IPP mode.

Source: Management data

* Tariff values based on total units sold basis

Scope of work of IC

Scope of work	Responsibility	
	OMS (Lead cum Technical Consultant)	**EY** (Financial Consultant)
Comment on the historical and projected operating profile of plant	✓	
Review and evaluate grouping of O&M activities under fixed and variable components	✓	✓
Review bifurcation of expenses in foreign and local components	✓	✓
Review and evaluate completeness of O&M costs	✓	
Review and evaluate assumptions used for projecting O&M costs	✓	✓
Evaluate enabling / associated cost loading over O&M cost component of isolated plant	✓	✓
Identify gaps in costing and provide estimates to fill those gaps	✓	
Benchmarking of O&M costs against those of comparable projects	✓	✓
Consider inventory in hand and consider its periodic depletion till end of term	✓	

3 Technical specifications of the plant

Key technical specification and plant configuration of KCCPP

Korangi Combined Cycle Power Plant (KCCPP)

- KCCPP is a 247.5 MW combined cycle power Plant
- KCCPP is situated at Korangi Creek area road adjacent PAF Korangi Base Ibrahim Hyderi Karachi.
- The plant comprises of:
  - 4 Gas Turbines (GT)
    - Each having capacity of 48.375 MW each and
  - 2 Steam Turbines, having capacity of 1 x 26.50 MW + 1 x 27.50 MW (Installed Capacity at ISO Condition)
- The project (unit # 1&2) achieved their commercial operations on November 17, 2008, whereas, unit # 3 & 4 achieved their commercial operations on March 25 & 26, 2009 respectively,
- NEPRA issued Generation License # GL/04/2002 to K-Electric on November 18, 2002 and subsequent modifications time to time for distinctly placed six power generation stations. The latest GL modification approved on February 19, 2021 i.e., NEPRA/R/LAG-05/8872-76 to the Company in accordance with the prevailing regulatory regime & project useful life is determined as 30 years from commercial operation date (COD)
- It has been in operation for the last 14 years and is supposed to enter its final year of operations by 2039.
- As per prevailing industrial practice, remaining timeline from FY24 (16 years) of generation license is considered as remaining "Useful life of KCCPP" i.e., till 2039. Considering O&M history and operating profile of plant; the requirement of detailed testing for calculation of equipmentwise remaining life assessment is not foreseen. As per IPPs model of tariff petition, it is suggested to fully depreciate plant value over remaining useful life till FY-2039.

Category	Description
Technology	Combined cycle power plant
Configuration	2 X (2GT + 1HRSG + 1ST)
Type of fuel	Natural Gas – Primary, HSD / RLNG – Backup
Equipment	Gas Turbines & Steam Turbines
Units	4 x 48.375 Gas turbines, 1 x 26.5MW Steam Turbine and 1 x 27.5 MW Steam turbines
Capacity	247.5 MW ISO Installed
Make	Gas Turbine – GE, Steam Turbine – G.E. Thermodyn
Model	Gas Turbine – LM6000PC NDW SPRINT, Steam Turbine – full condensing

Plant past performance key indicators and heat rate results

Last 6-year performance

Performance indicator	FY17	FY18	FY19	FY20	FY21	FY22
Availability (%) [1]	85.34%	92.15%	84.56%	95.95%	91.07%	87.79%
Reliability (%) [2]	95.84%	98.09%	96.62%	99.46%	99.21%	99.21%

Heat rate test results

	On GAS	ON HSD
Description	Values	Values
Gross Capacity – MW (RSC)	237.078	228.704
Auxiliary – MW	16.250	8.686
Net Capacity – MW	220.828	220.018
Net Heat Rate LHV Basis – Btu / kWh	7,379.478	7411.311
Net Efficiency LHV Basis –	46.238%	46.040%
Auxiliary Consumption	6.854%	3.798%
Gross Heat rate LHV Basis – Btu / kWh	6,873.357	7129.679
Gross Efficiency LHV Basis	49.643%	47.858%
Net Heat Rate HHV Basis – Btu / kWh	8,178.259	7911.771
Net Efficiency HHV Basis	41.722%	43.127%
Gross Heat rate HHV Basis – Btu / kWh	7,617.354	7611.121
Gross Efficiency HHV Basis	44.794%	44.831%

1. Availability % = Available Capacity / Gross Dependable Capacity
2. Reliability = (Period Hours – Forced Outage Hours) / Period Hours

KCCPP unit wise accumulated operating hours and maintenance strategy

Fired hours

Below table reflects unit wise accumulated fired hours until 30 June 2022.

Unit No.	Accumulated hours (until 30 June 2022)
GT-1	70,969
GT-2	57,766
GT-3	75,287
GT-4	81,913
ST-1	41,752
ST-2	80,548

Maintenance strategy

Below table reflects maintenance strategy of major equipment based on OEM recommendations and site conditions.

Unit description	Maintenance category	Recurrence interval (fired hours)
Gas Turbine	Major	50,000
	Minor	25,000
GT Reduction Gear Box	Major	32,000
GT Generator	Major	64,000
	Minor	25,000
Steam Turbine	Major	50,000
	Minor	25,000
ST Reduction Gear Box	Major	32,000
ST Generator	Major	96,000
	Minor	32,000

Planned maintenance summary of major equipment

S/No.	Last Maintenance Performed	Equipment Number	Starting Date	Completion Date
1	GT Swapping Activity for Major Overhauled	GT-4	18-Jan-16	23-Jan-16
2	GT Swapping Activity for Major Overhauled	GT-1	10-Apr-21	15-Apr-21
3	GT Swapping Activity for Major Overhauled	GT-2	10-Jan-17	15-Jan-17
4	GT Swapping Activity for Major Overhauled	GT-3	9-Aug-17	13-Aug-17
1	GT RGB Major Overhauled	GT-1	27-Jan-22	2-Feb-22
2	GT RGB Major Overhauled	GT-2	1-May-11	16-May-11
3	GT RGB Major Overhauled	GT-3	18-Feb-21	24-Feb-21
4	GT RGB Major Overhauled	GT-4	25-Feb-21	2-Mar-21
1	Major Overhauled	GTG-1	8-Feb-18	23-Feb-18
2	Major Overhauled	GTG-2	24-Jan-18	8-Feb-18
3	Major Overhauled	GTG-3	1-Feb-22	15-Feb-22
4	Major Overhauled	GTG-4	10-Feb-21	24-Feb-21
1	Minor Inspection	ST-1	2-Feb-19	18-Feb-19
2	Major Overhauled (Limited Scope)	ST-1 RGB	3-Mar-21	4-Mar-21
3	Major Overhauled	ST-2	15-Jan-17	26-Feb-17
4	Major Overhauled	ST-2 RGB	24-Jan-17	19-Feb-17
1	Minor Inspection	STG-1	10-Feb-20	19-Feb-20
2	Minor Inspection	STG-2	9-Feb-18	18-Feb-18
3	Major Overhauled	STG-2	1-Feb-22	1-Mar-22

Summary of projected planned outage of main equipment (FY-2024 to FY-2039) on gas fuel inline with OEM recommendation – GAS TURBINES

S/No.	Gas Turbines	GT Serial No.	Maintenance Type	Maintenance Year	Outage Days
1	GT 50K Maintenance	191-570	Major	FY27	6
2	GT 25K Maintenance	191-570	Minor	FY31	9
3	GT 50K Maintenance	191-570	Major	FY35	6
4	GT 25K Maintenance	191-592	Minor	FY25	9
5	GT 50K Maintenance	191-592	Major	FY29	6
6	GT 25K Maintenance	191-592	Minor	FY33	9
7	GT 50K Maintenance	191-592	Major	FY37	6
8	GT 50K Maintenance	191-596	Major	FY27	6
9	GT 25K Maintenance	191-596	Minor	FY31	9
10	GT 50K Maintenance	191-596	Major	FY35	6
11	GT 25K Maintenance	191-602	Minor	FY24	9
12	GT 50K Maintenance	191-602	Major	FY28	6
13	GT 25K Maintenance	191-602	Minor	FY32	9
14	GT 50K Maintenance	191-602	Major	FY36	6
15	GT 25K Maintenance	191-830	Minor	FY27	9
16	GT 50K Maintenance	191-830	Major	FY31	6
17	GT 25K Maintenance	191-830	Minor	FY35	9

Summary of projected planned outage of main equipment (FY-2024 to FY-2039) on gas fuel inline with OEM recommendation – Gas Turbines reduction gear box

S/No.	Gas Turbine Main Reduction Gear Box	GT numbers	Maintenance type	Maintenance year	Outage days
1	GT 32K Maintenance	GT-1	Major	FY28	8
2	GT 64K Maintenance		Major	FY32	8
3	GT 32K Maintenance		Major	FY36	8
4	GT 64K Maintenance	GT-2	Major	FY25	8
5	GT 32K Maintenance		Major	FY30	8
6	GT 64K Maintenance		Major	FY35	8
7	GT 32K Maintenance	GT-3	Major	FY27	8
8	GT 64K Maintenance		Major	FY31	8
9	GT 32K Maintenance		Major	FY35	8
10	GT 32K Maintenance	GT-4	Major	FY27	8
11	GT 64K Maintenance		Major	FY31	8
12	GT 32K Maintenance		Major	FY35	8

Summary of projected planned outage of main equipment (FY-2024 to FY-2039) on gas fuel inline with OEM Recommendation – Gas turbine generator

S/No.	Gas Turbine Generators	GT numbers	Maintenance type	Maintenance year	Outage days
1	GTG 64K Maintenance	GT-1	Major	FY24	20
2	GTG 25K Maintenance		Minor	FY27	3
3	GTG 64K Maintenance		Major	FY30	20
4	GTG 25K Maintenance		Minor	FY34	3
5	GTG 64K Maintenance		Major	FY37	20
6	GTG 64K Maintenance	GT-2	Major	FY24	20
7	GTG 25K Maintenance		Minor	FY27	3
8	GTG 64K Maintenance		Major	FY30	20
9	GTG 25K Maintenance		Minor	FY34	3
10	GTG 64K Maintenance		Major	FY37	20
11	GTG 25K Maintenance	GT-3	Minor	FY27	3
12	GTG 64K Maintenance		Major	FY30	20
13	GTG 25K Maintenance		Minor	FY33	3
14	GTG 64K Maintenance		Major	FY36	20
15	GTG 25K Maintenance	GT-4	Minor	FY24	3
16	GTG 64K Maintenance		Major	FY28	20
17	GTG 25K Maintenance		Minor	FY31	3
18	GTG 64K Maintenance		Major	FY34	20

Summary of projected planned outage of main equipment (FY-2024 to FY-2039) on gas fuel inline with OEM Recommendation – ST-1/STG-1

Steam Turbine-1	Maintenance type	Maintenance year	Outage days
Overhaul ST-1 50K Maintenance	Major	FY-25	30
Overhaul ST-1 25K Maintenance	Minor	FY28	15
Overhaul ST-1 50K Maintenance	Major	FY-31	30
Overhaul ST-1 25K Maintenance	Minor	FY34	15
Overhaul ST-1 50K Maintenance	Major	FY-37	30
ST RGB 32K Maintenance	Major	FY26	8
ST RGB 64K Maintenance	Major	FY30	8
ST RGB 32K Maintenance	Major	FY34	8
ST RGB 64K Maintenance	Major	FY38	8
Steam Turbine-1 Generator			
STG 32K Maintenance	Minor	FY24	4
STG 96K Maintenance	Major	FY29	25
STG 32K Maintenance	Minor	FY33	4
STG 32K Maintenance	Minor	FY37	4

Summary of projected planned outage of main equipment (FY-2024 to FY-2039) on gas fuel inline with OEM recommendation – (ST-2/STG-2)

Steam Turbine-2	Maintenance type	Maintenance year	Outage days
ST-2 25K Maintenance	Minor	FY26	15
ST 50K Maintenance	Major	FY-29	30
ST-2 25K Maintenance	Minor	FY32	15
ST-2 50K Maintenance	Major	FY-35	30
ST-2 25K Maintenance	Minor	FY-39	15
ST RGB 64K Maintenance	Major	FY28	8
ST RGB 32K Maintenance	Major	FY32	8
ST RGB 64K Maintenance	Major	FY36	8
Steam Turbine-2 Generator			
STG 32K Maintenance	Minor	FY28	4
STG 32K Maintenance	Minor	FY32	4
STG 96K Maintenance	Major	FY36	25

Strategic spares and inventory available in the warehouse

KCCPP inventory balances (excluding fuels) as at 30 June 2022		
Department wise high value items including consumables		
Department	**No. of Items**	**Amount in PKR**
Mechanical	168	352,723,916
Electrical	53	82,555,006
Instrument & Control	50	49,640,456
Performance	1	2,381,009
HSEQ	1	1,111,138
Operation	1	404,233
Revex / Other Consumables	7,953	811,814,015
Total	**8,375**	**1,300,629,773**

- In KCCPP project cost, certain level of capital spares for plant equipment and its auxiliaries were provided by EPC contractor & are being replenished as per consumption rate.
- GT strategic parts are maintained under CSA w.r.t. requirement of each scheduled outage i.e., 50k, 25k etc.
- ST strategic spares are maintained as per outage requirement i.e., 50k, 25k, 32k, 64k and STG 32k, 96k etc.
- Other auxiliary system spares and routine maintenance spares of GT, ST, HRSG & BOP are maintained according to their requirements. minimum / maximum quantities of these spares are defined in SAP and reordered accordingly.
- Consumables are managed under Revex which majorly comprise of lube oil, air intake filters and BOP equipment spares.
- Total inventory given in the inventory list is carried at **PKR 1,300,629,773** which requires regular replenishment for smooth O&M of plant during its remaining useful life.

Key findings

Overall spares availability and inventory management was found reasonable to ensure the plant availability / maintenance requirement.

4

Adjusted O&M cost and average tariff on gas operations

Key assumptions

Key assumptions

- As per generation license, precise commercial operations end date for KCCPP is 19 August 2039. However, for the sake of simplicity, KE has projected the O&M costs for period FY24 – FY39 ("KCCPP PP"). The impact of additional period rounded to the nearest month has been illustrated on the following slides for ease of reference and understanding.
- Projected availability / utilization factor varies throughout the years as follows considering 80% Gas and 20% HSD operations:

FY	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
Factor	82.4%	89.6%	90.0%	86.4%	89.8%	89.4%	89.4%	89.6%	86.5%	90.0%	89.8%	89.6%	89.6%	86.4%	90.0%	90.0%

- The average utilization/load factor is reflective of the brownfield nature of the plant and expected maintenance requirements over its remaining useful life.
- Average availability during FY17 – FY22 was 89.48%, whereas, average availability assumed during FY24 – FY39 works out to be 88.66%, keeping in view the anticipated maintenance requirements for the plant
- Foreign currencies other than USD are first converted to equivalent USD based on their respective exchange rate parity with USD (assumed 1.05, 1.21, 0.15, 0.01, and 1.0 for EUR, GBP, CNY, JPY and USD respectively). Subsequently, USD based values are converted to equivalent PKR using assumed PKR to USD conversion rate of 206.0, as per 30th June 2022 (as per NBP).
- The projected O&M costs originally estimated by the management of KE was based on PKR to USD exchange rate of 185. Towards the finalization of IC work, this assumption has been updated to PKR 206 for each USD. Accordingly, the adjusted reference tariff is also reflective of exchange rate assumption update.

Adjusted reference cumulative O&M cost (un-indexed) during FY24 – FY39 is PKR 53.0b (excluding enabling cost)

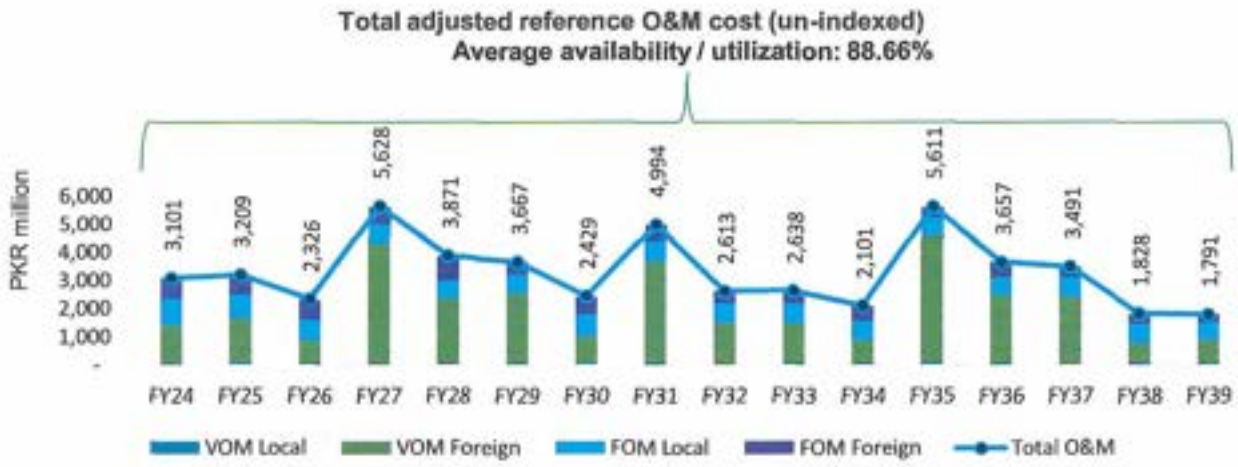
Adjusted O&M cost (FY24 – FY39) (excluding enabling cost)		Summary of identified adjustments reflected in the adjusted O&M cost	
Total O&M cost | PKR 53.0b		Total O&M cost: PKR + 6.33b A: PKR + 2.25b | B: PKR +4.08b	
Variable | PKR 33.2b (62.6%)		Total VOM cost: PKR + 5.37b A: PKR + 3.57b | B: PKR +3.23b	
Local PKR 1.5b (4.6%)	Foreign PKR 31.7b (95.4%)	Local: PKR + 1.43 A: PKR + 1.43b	Foreign: PKR + 5.37b A: PKR + 2.14b B: + 3.23b
Fixed | PKR 19.8b (37.4%)		Total FOM cost: PKR - 0.46b A: PKR - 1.27b | B: PKR +0.85b	
Local PKR 11.4b (57.8%)	Foreign PKR 8.4b (42.2%)	Local: PKR +2.80 A: PKR + 2.80b	Foreign: PKR - 3.26 A: PKR - 4.11 B: + 0.85b

After considering additional period (2 months) until expiry of the generation license, the aggregate increase in the total O&M cost (excluding enabling cost) is PKR 562.2 million.

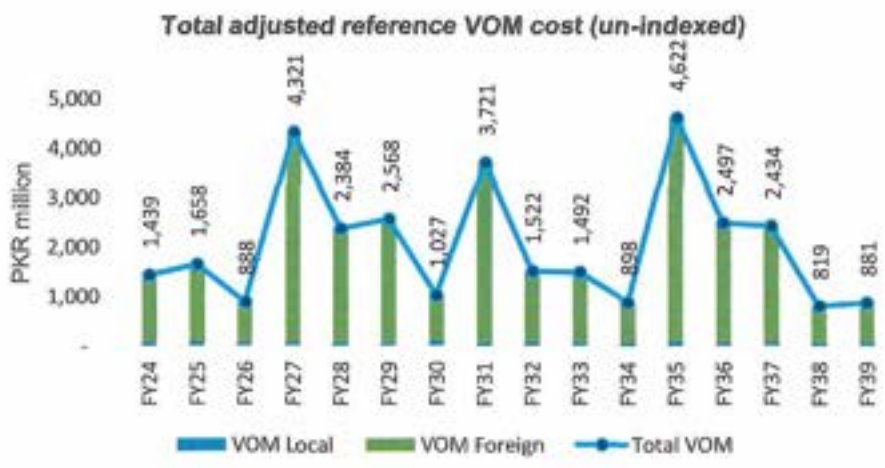
Source: Management data

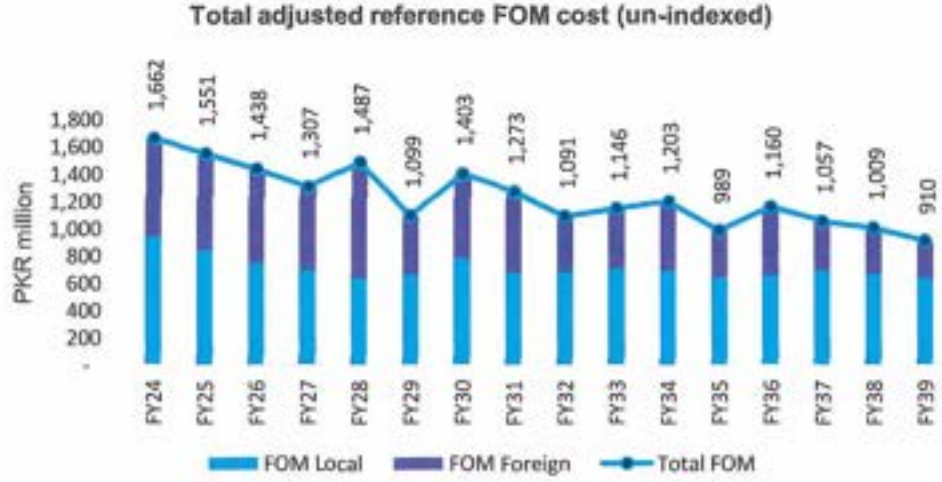
Legend: Cost reduction ↓ Cost increase ↑ A: Estimated cumulative adjustments identified by IC B: Estimated exchange rate update impact

Adjusted total O&M costs mix and trend (excluding enabling cost)



Historical analysis (FY 17 – 22)	
Average availability (%)	89.48
Average utilization (%)	49.1
Average annual total O&M (PKR million)	1,944.2





Computation of tariff based on projected plant availability for both FOM and VOM components

Keeping the expected fuel mix variation in purview, KE has assumed slightly rationalized availability factor over the tariff control period. The same has been considered for tariff computation. Below is the pant availability / load factor used for the tariff computation of both variable and fixed components.

FY	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
Factor	82.4%	89.6%	90.0%	86.4%	89.8%	89.4%	89.4%	89.6%	86.5%	90.0%	89.8%	89.6%	89.6%	86.4%	90.0%	90.0%

Year	Variable O&M			Fixed O&M			Total
	Local	Foreign	Total	Local	Foreign	Total	
FY24	0.0523	0.8508	**0.9031**	0.5946	0.4485	**1.0431**	**1.9462**
FY25	0.0683	0.8883	**0.9565**	0.4899	0.4051	**0.8949**	**1.8515**
FY26	0.0523	0.4580	**0.5102**	0.4347	0.3913	**0.8260**	**1.3363**
FY27	0.0523	2.5321	**2.5844**	0.4162	0.3653	**0.7815**	**3.3659**
FY28	0.0523	1.3199	**1.3722**	0.3689	0.4871	**0.8560**	**2.2282**
FY29	0.0523	1.4327	**1.4850**	0.3876	0.2483	**0.6359**	**2.1209**
FY30	0.0683	0.5254	**0.5937**	0.4553	0.3560	**0.8112**	**1.4050**
FY31	0.0523	2.0946	**2.1469**	0.3959	0.3384	**0.7343**	**2.8812**
FY32	0.0523	0.8579	**0.9101**	0.4111	0.2411	**0.6522**	**1.5624**
FY33	0.0523	0.8045	**0.8568**	0.4075	0.2508	**0.6583**	**1.5151**
FY34	0.0523	0.4645	**0.5168**	0.3997	0.2930	**0.6928**	**1.2096**
FY35	0.0683	2.5976	**2.6659**	0.3718	0.1986	**0.5704**	**3.2363**
FY36	0.0523	1.3876	**1.4398**	0.3798	0.2894	**0.6692**	**2.1090**
FY37	0.0523	1.4032	**1.4554**	0.4182	0.2142	**0.6324**	**2.0878**
FY38	0.0523	0.4182	**0.4705**	0.3827	0.1967	**0.5794**	**1.0498**
FY39	0.0523	0.4537	**0.5060**	0.3674	0.1553	**0.5226**	**1.0286**
Weighted average	0.0553	1.1535	1.2088	0.4167	0.3044	0.7210	1.9298
Add: Enabling charge (for details, please see pages that follow)				0.1137	-	**0.1137**	**0.1137**
Total tariff	0.0553	1.1535	1.2088	0.5304	0.3044	0.8348	2.0435

Since KE is a vertically integrated power utility and carry a unique position due to brown field nature of its power plants with entity level consumption, it intends to follow a billing regime for capacity payment based on available (net of outage allowances) basis. Accordingly, in order to recover projected fixed costs, Management has computed capacity part at respective availability/ utilization factor across all power plants of KE. In terms of total fixed cost recovery on an annual basis, KE's proposed Fixed cost component is expected to be indifferent from tariff computation being practiced under Take or Pay regime for other IPPs .

Weighted average tariff including additional 62 days:

FY24-40	**0.0553**	**1.1535**	**1.2088**	**0.5304**	**0.3044**	**0.8348**	**2.4035**

Since KE operates as VIU company, it has a central enabling/support function serving all three business segments of the business. Central costs are allocated to each business segment (generation, transmission and distribution)

Allocation of enabling charge to O&M tariff

Average Enabling cost (per annum)	Weighted average tariff component (per kWh)
PKR 195.1m	**PKR 0.1137**

- Per Management, enabling costs represent costs apportioned to KCCPP by departments, such as Human Resource Management, Information Technology, Marcom, Business Development (including IPP department), Security, Corporate Affairs, CFO Office and CEO Office etc., for provision of shared services to KCCPP.
- The aforementioned costs are directly incurred by the respective departments and subsequently are re-allocated to the generation, transmission and distribution segments, using re-allocation basis provided by the respective departments (generally based on their own assessment of time spent or relevance of cost between generation, transmission and distribution segments).
- Ultimately, projected cost assigned to generation segment is spread between six plants based on the numbers of unit sent out.
- Such costs are generally covered as part of the administrative costs claim in the fixed O&M local component of the tariff allowed to IPPs.

Key findings

HCPC is considered a close benchmark for KCCPP since it uses same technology. As HCPC does not fall under NEPRA tariff determination regime, HCPC tariff is not available in public domain. However, based on general market insights of KE/IC, power plants operating under 1994 power policy used to have energy and capacity charge within their tariff. Escalable component of Capacity Charge was meant to cover salaries and wages, administrative costs and repair and maintenance costs. In the absence of visibility on the tariff or cost break-up of HCPC, IC is not in a position to benchmark enabling cost allocation to KCCPP. Accordingly, these have been analyzed on total FOM basis and were found reasonable.

Source: Management data

Overall O&M tariff of KCCPP is less than the identified benchmark power plant

Tariff components	KCCPP		Habibullah Coastal Power Limited[1]	
	PKR / kWh	%share	PKR / kWh	%share
Variable O&M – Local	0.0553	2.7%		
Variable O&M – Foreign	1.1535	56.4%		
Sub-total	**1.2088**	**59.2%**	**0.9417***	**38.1%**
Fixed O&M – Local	0.5304	26.0%		
Fixed O&M – Foreign	0.3044	14.9%		
Sub-total	**0.8347**	**40.8%**	**1.5268**	**61.9%**
Total O&M tariff	**2.0435**	**100.0%**	**2.4685**	**100.0%**

Key technical specifications	KCCPP	Habibullah Coastal
Net capacity (MW)	220.8 MW	126 MW
Efficiency (net at HHV)	41.722%	41.860%
Fuel	Natural Gas/HSD	Natural Gas/HSD
GTs type	LM 6000 Gas Turbine	LM 6000 Gas Turbine
Plant configuration	2 X (2GT + 1HRSG + 1ST)	3 GTs + 3 HRSG + 1 ST
Generation license period	30 Years	30 Years
Average availability / utilization factor for tariff benchmarking	88.66% [2]	88.66% [1,2]

Key findings

From technical compatibility perspective, KCCPP average tariff has been benchmarked against estimated indexed tariff of HCPC plant for FY22. HCPC is considered as close benchmark of KCCPP as it is using the same technology. Since HCPC does not fall under NEPRA tariff determination regime, HCPC's tariff is not available in public domain. However, based on general market insights of IC/KE, power plant operating under 1994 power policy used to have energy and capacity charge with in their tariff. Escalable component of energy charge was meant to cover salaries and wages, administrative cost and repair and maintenance costs.

Total KCCPP O&M cost tariff is lower than HCPC despite KCCPP having higher auxiliary consumption (6.854%) attributed to gas compressors (2) requirement.

Cost mix alignment:

Fixed cost ratio in KCCPP is less than the benchmark by 21.1%. This is compensated by higher VOM cost ratio in KCCPP by 21.1%. Foreign cost component of KCCPP is 71.3%, however, due to data limitation of IPP, comparison of foreign cost is not possible.

Enabling cost benchmarking:

Enabling costs when analyzed at overall FOM level are found reasonable.

[1] Revised indexed tariff for April to June 2022 quarter adjusted for PKR to USD exchange rate of 206 and latest available CPI of June 2020 (i.e. 269.27 as per NEPRA determinations), adjusted for CPI of 8.9% (FY21) and 9.0% (FY22) respectively. Further, fixed O&M components have been grossed up at 88.66% (representing average projected availability of KCCPP).

[2] Average availability takes into consideration the annual availability of 90% (covering annual scheduled outage & forced outage allowance) along with the impact of periodic major / minor overhauls of GTs / STs in line with outages allowance given to IPPs under applicable Power Policies

* For comparison purpose, VOM cost component has been assumed to be foreign and adjusted for USD exchange rate of 206.

Source: Management data and NEPRA website

Indexations being requested by KCCPP are aligned with recent determinations of NEPRA for thermal power plants

Indexation	KCCPP	Habibullah Coastal
Variable O&M – Local	Indexed with Pak CPI (Quarterly)	Not available
Variable O&M – Foreign	Indexed with US CPI and USD to PKR exchange rate (Quarterly)	
Fixed O&M - Local	Indexed with Pak CPI (Quarterly)	
Fixed O&M - Foreign	Indexed with US CPI and USD to PKR exchange rate (Quarterly)	

Source: Management data and NEPRA website

5 O&M cost and average tariff on HSD operations

Key assumptions for HSD operations

Key assumptions for HSD operations

- As per generation license, precise commercial operations end date for KCCPP is 19 August 2039. However, for the sake of simplicity, KE has projected the O&M costs for KCCPP PP. The impact of additional period rounded to the nearest month has been illustrated on the following slides for ease of reference and understanding.
- HSD has been considered by the Management as a back-up fuel for KCCPP.
- HSD system including storage tanks, filtration & forwarding skid is already installed and commissioned at KCCPP
- 3rd party heat rate test on HSD was conducted by KE in June 2021 and heat rate approved by NEPRA at base load operations (100%).
- The Summary of performance parameters (based on based on 3rd party heat rate test) are reflected below for reference
  - Gross Output (RSC): 228.704MW
  - Net Output (RSC): 220.018MW
  - Auxiliary Consumption: 8.686MW
  - Net Heat Rate (HHV): 7,911.771 btu/kWh
  - Net Efficiency (HHV): 43.127%
  - Net Heat Rate (LHV): 7,411.311 btu/kWh
  - Net Efficiency (LHV): 46.04%
- Auxiliary consumption of KCCPP plant is reduced from 16.225MW (reference to 3rd party test on Gas in 2019) to 8.686MW (reference to 3rd party test on HSD in 2021) due to shut down of gas compressors and associated auxiliaries.
- HSD is procured from PSO under existing FSA (Fuel Supply Agreement), transported through tank lorries at site, decanted through unloading pumps and stored in 02 storage tanks (Capacity~ 8,000M^3/each). HSD is further purified as per OEM filtration requirement, stored in day tank (Capacity ~ 1,500M^3) and pumped to Gas Turbine area through forwarding pumps.
- HSD operating hours at Gas Turbine units from COD till 30 June 2022 are as follows.
  - GT-1: 1,460 hrs.
  - GT-2: 1,295 hrs.
  - GT-3: 1,922 hrs.
  - GT-4: 2,240 hrs.
- Following load factor assumptions have been used:

FY	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
Load factor	82.4%	89.6%	90.0%	86.4%	89.8%	89.4%	89.4%	89.6%	86.5%	90.0%	89.8%	89.6%	89.6%	86.4%	90.0%	90.0%

- PKR to USD exchange assumption for conversion of foreign cost has been assumed as 206.0.

Reference cumulative O&M cost (un-indexed) during FY24 – FY39 is PKR 65.3b (excluding enabling)

Key assumptions for HSD operations

Total O&M cost over tariff control period | PKR 65.3b

Variable | PKR 45.5b (69.7%)

Local	Foreign
PKR 1.6b (3.4%)	PKR 43.9b (96.6%)

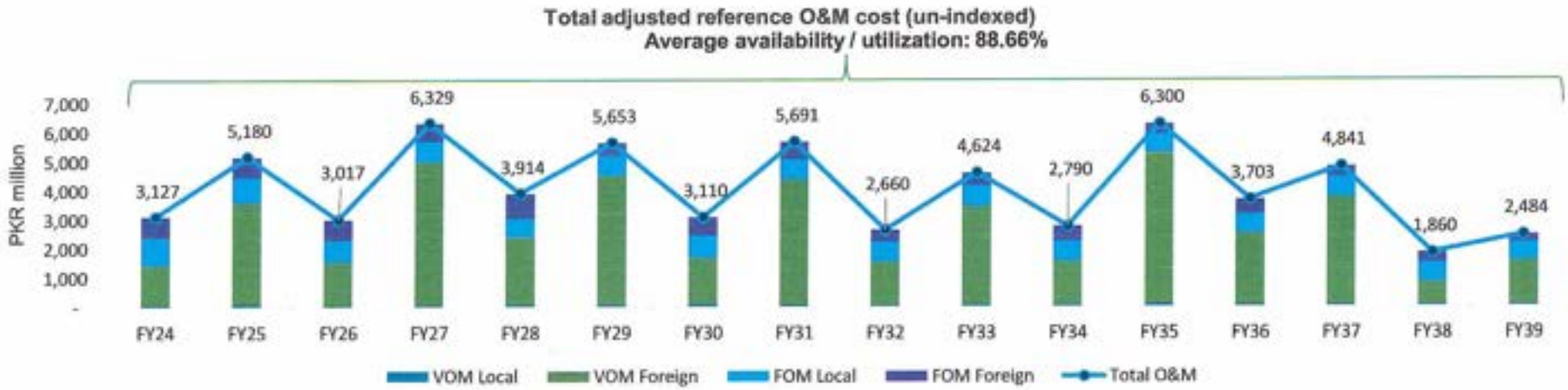
Fixed | PKR 19.8b (30.3%)

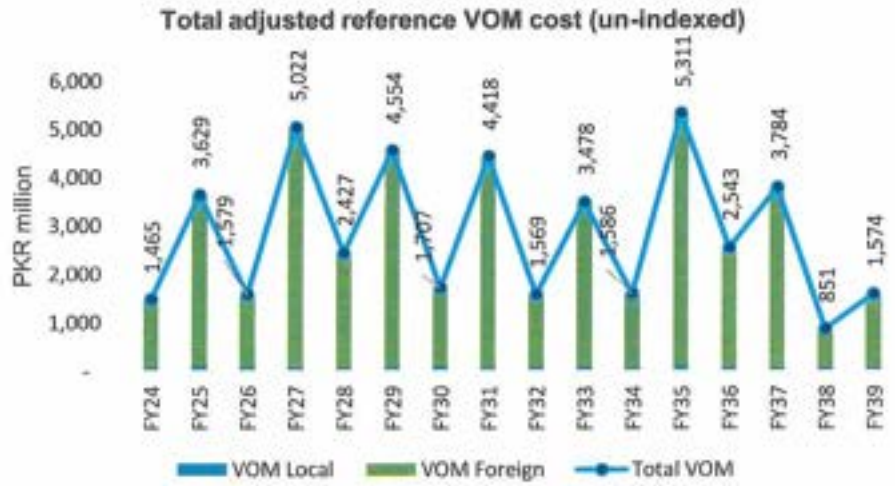
Local	Foreign
PKR 11.4b (57.8%)	PKR 8.4b (42.2%)

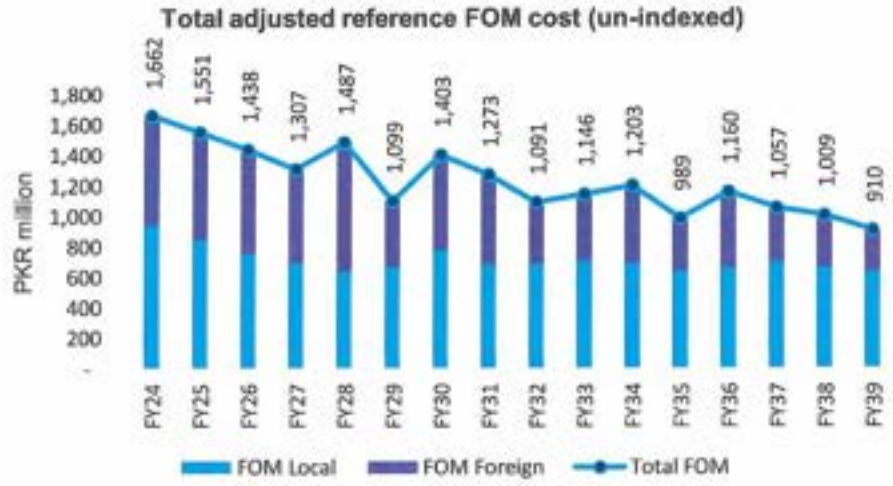
After considering additional period (2 months) until expiry of the generation license, the aggregate increase in the total O&M cost (excluding enabling cost) is PKR 693.1 million.

Source: Management data

Adjusted total O&M costs mix and trend (excluding enabling cost)







Computation of tariff based on projected plant availability for both FOM and VOM components

Keeping the expected fuel mix variation in purview, KE has assumed slightly rationalized availability factor over the tariff control period. The same has been considered for tariff computation. Below is the pant availability / load factor used for the tariff computation of both variable and fixed components.

FY	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
Load factor	82.4%	89.6%	90.0%	86.4%	89.8%	89.4%	89.4%	89.6%	86.5%	90.0%	89.8%	89.6%	89.6%	86.4%	90.0%	90.0%

Year	Variable O&M			Fixed O&M			Total
	Local	Foreign	Total	Local	Foreign	Total	
FY24	0.0524	0.8700	**0.9225**	0.5968	0.4501	**1.0469**	**1.9694**
FY25	0.0682	2.0334	**2.1016**	0.4917	0.4066	**0.8982**	**2.9998**
FY26	0.0557	0.8543	**0.9100**	0.4363	0.3928	**0.8291**	**1.7391**
FY27	0.0557	2.9590	**3.0148**	0.4178	0.3666	**0.7844**	**3.7992**
FY28	0.0524	1.3493	**1.4017**	0.3703	0.4889	**0.8592**	**2.2609**
FY29	0.0557	2.5877	**2.6435**	0.3890	0.2492	**0.6382**	**3.2817**
FY30	0.0714	0.9195	**0.9908**	0.4570	0.3573	**0.8142**	**1.8051**
FY31	0.0524	2.5061	**2.5585**	0.3973	0.3397	**0.7370**	**3.2955**
FY32	0.0557	0.8855	**0.9413**	0.4127	0.2420	**0.6546**	**1.5959**
FY33	0.0557	1.9495	**2.0052**	0.4090	0.2517	**0.6607**	**2.6659**
FY34	0.0524	0.8642	**0.9166**	0.4012	0.2941	**0.6953**	**1.6120**
FY35	0.0714	3.0032	**3.0746**	0.3732	0.1993	**0.5725**	**3.6471**
FY36	0.0557	1.4161	**1.4718**	0.3812	0.2904	**0.6717**	**2.1435**
FY37	0.0524	2.2188	**2.2713**	0.4197	0.2150	**0.6348**	**2.9060**
FY38	0.0524	0.4381	**0.4905**	0.3841	0.1974	**0.5815**	**1.0721**
FY39	0.0524	0.8549	**0.9074**	0.3687	0.1559	**0.5246**	**1.4320**
Weighted average	0.0571	1.6070	1.6641	0.4182	0.3055	0.7237	2.3878
Add: Enabling charge				0.1142	-	**0.1142**	**0.1142**
Total tariff	0.0571	1.6070	1.6641	0.5324	0.3055	0.8379	2.5019

Weighted average tariff including additional 62 days:

FY24-40	**0.0571**	**1.6070**	**1.6641**	**0.5324**	**0.3055**	**0.8379**	**2.5019**

Since KE is a vertically integrated power utility and carry a unique position due to brown field nature of its power plants with entity level consumption, it intends to follow a billing regime for capacity payment based on available (net of outage allowances) basis. Accordingly, in order to recover projected fixed costs, Management has computed capacity part at respective availability/ utilization factor across all power plants of KE. In terms of total fixed cost recovery on an annual basis, KE's proposed Fixed cost component is expected to be indifferent from tariff computation being practiced under Take or Pay regime for other IPPs .

Overall VOM tariff of KCCPP is higher than identified benchmark power plants

Tariff components	KCCPP		Saif Power[1]		Sapphire Power[1]		Halmore Power[1]		Orient Power[1]	
	PKR / kWh	%share	PKR / kWh	%share	PKR / kWh	%share	PKR / kWh	%share	PKR / kWh	%share
VOM local	0.0571	3.4%	-	0.0%	-	0.0%	-	0.0%	-	0.0%
VOM foreign	1.6070	96.6%	1.4167	100.0%	1.4008	100.0%	1.4233	100.0%	0.9458	100.0%
Total VOM	**1.6641**	**100.00%**	**1.4167**	**100.0%**	**1.4008**	**100.0%**	**1.4233**	**100.0%**	**0.9458**	**100.0%**
Total O&M tariff (including enabling)	**1.6641**		**1.4167**		**1.4008**		**1.4233**		**0.9458**	

Key technical specifications	KCCPP	Saif Power	Sapphire Power	Halmore Power	Orient Power
Net capacity (RSC)	220 MW	209 MW	209 MW	209 MW	209 MW
Fuel	NG/HSD	NG/HSD	NG/HSD	NG/HSD	NG/HSD
Plant configuration	2×(2GTs+1 HRSGs + 1 ST)	2 GTs + 2 HRSGs + 1 ST	2 GTs + 2 HRSGs + 1 ST	2 GTs + 2 HRSGs + 1 ST	2 GTs + 2 HRSGs + 1 ST
Net efficiency (LHV)	46.04%	48.5%	48.5%	48.5%	48.5%
Generation license period	30 Years	30 years	30 years	30 years	25 years
Average utilization factor	88.66% [2]	N/A	N/A	N/A	N/A

Key findings

From technical compatibility perspective (CCPP, fuel type and performance parameters etc.), KCCPP average tariff has been benchmarked against estimated indexed tariffs of 4 sisters (6FA) for FY22.

The exact benchmark of KCCPP i.e., similar technology in CCPP mode could not be found in NEPRA tariff determination regime. HCPCL as considered was fuel gas operations benchmark has limited HSD operations data available in public domain.

Overall VOM tariff of KCCPP is higher than 6FA Plants.

Cost mix alignment:

VOM cost in KCCPP is more than the benchmark due to extensive maintenance needs related to sea water once through cooling system and subsequent dredging requirement, low efficiency as compared to benchmarks, corrosive environment and usage of sea water for RO water treatment plant etc.

Source: Management data and NEPRA website

[1] Revised indexed tariff for July to September 2022 quarter adjusted for PKR to USD exchange rate of 206.

[2] Average availability takes into consideration the annual availability of 90% (covering annual scheduled outage & forced outage allowance) along with the impact of periodic major / minor overhauls of GTs / STs in line with outages allowance given to IPPs under applicable Power Policies.

Indexations being requested by KCCPP are aligned with determinations of NEPRA for 6FA power plants

Indexation	KCCPP	Saif Power	Sapphire Power	Halmore Power	Orient Power
Variable O&M – Local	Indexed with Pak CPI (Quarterly)	-	-	-	-
Variable O&M – Foreign	Indexed with US CPI and USD to PKR exchange rate (Quarterly)	Indexed with US CPI and USD to PKR exchange rate (Quarterly)	Indexed with US CPI and USD to PKR exchange rate (Quarterly)	Indexed with US CPI and USD to PKR exchange rate (Quarterly)	Indexed with US CPI and USD to PKR exchange rate (Quarterly)
Fixed O&M - Local	Indexed with Pak CPI (Quarterly)	Indexed with WPI (Quarterly)	Indexed with WPI (Quarterly)	Indexed with WPI (Quarterly)	Indexed with WPI (Quarterly)
Fixed O&M – Foreign	Indexed with US CPI and USD to PKR exchange rate (Quarterly)	Indexed with US CPI and USD to PKR exchange rate (Quarterly)	Indexed with US CPI and USD to PKR exchange rate (Quarterly)	Indexed with US CPI and USD to PKR exchange rate (Quarterly)	Indexed with US CPI and USD to PKR exchange rate (Quarterly)

6 Annexures

Abbreviations

Periods

Historical period	FY17 and FY22
Budgeted period	FY23
Forecast period	FY24 – FY39

Abbreviations

AGP	Advanced Gas Path
BQPS I	Bin Qasim Power Station – I
BQPS II	Bin Qasim Power Station – II
BQPS III	Bin Qasim Power Station – III
BTU	British Thermal Unit
CAPEX	Capital Expenditure
CEO	Chief Executive Officer
CFO	Chief Financial Officer
CI	Carbon Intensity
COD	Commercial Operations Date
CSA	Comprehensive Services Agreement
CY	Calendar Year
FFH	Factored Fire Hours
Financial Consultant	EY Ford Rhodes
FOM	Fixed Operations & Maintenance
FYXA	Historical Financial Year X ended 30th June
GE	General Electric
GT	Gas Turbine
HGPI	Hot Gas Path Inspection
HRSG	Heat Recovery Steam Generator
HSD	High Speed Diesel
HSDO	High Speed Diesel Oil
HSE	Health, Safety and Environment
HVAC	Heating, Ventilating and Air-Conditioning
I&C	Instrumentation and Controls
IC	Independent Consultant
IE	Independent Engineer
IPP	Independent Power Producer
JV	Joint Venture
KE	K-Electric Limited
KTGEPS	Korangi Town Gas Engine Power Station
KCCPP	Korangi Combined Cycle Power Plant
KCCPP PP	FY24 – FY39
KV	Kilovolt
kWH	Kilowatt Hour
LHV	Lower Heating Value
LV	Low Voltage
MI	Major Inspection

Abbreviations

HV	High Voltage
MW	Megawatt
MYT	Multi-Year Tariff
NEPRA	National Electric Power Regulatory Authority
NESPAK	National Engineering Services Pakistan
NGC	Natural Gas Compressors
O&M	Operations and Maintenance
Pak CPI	Pakistan Consumer Price Index
PKR	Pakistani Rupee
PKRm	PKR Millions
Pos	Purchase Orders
RAB/WDV	Regulatory Asset Base/Written Down Value
REVEX	Revenue Expenditure
RLNG	Regassified Liquefied Natural Gas
RSC	Rotor Side Converter
SGEPS	S.I.T.E Gas Engine Power Station
ST	Steam Turbine
Technical cum lead consultant	OMS (Private) Limited
US CPI	United States Consumer Price Index
USD	United States Dollar
VOM	Variable Operation & Maintenance
WTP	Water Treatment Plant
6FA	Four (4) sisters

K-ELECTRIC
Energy That Moves Life

Section D

Korangi Town Gas Engine Power Station – (KTGEPS)

Table of Contents - KTGEPS

1. Korangi Town Gas Engine Power Station - KTGEPS

This section covers details of Korangi Town Gas Engine Power Station Plant (referred as "KTGEPS") and tariff being requested.

1.1. Introduction to the plant – KTGEPS

KTGEPS is a 107.312 MW combined cycle power plant (ISO Capacity) situated at Korangi Industrial area of Karachi. It is part of the overall fleet of generating stations owned by KE.

Principal Features

1. The Power Plant is situated in Korangi Area.
2. The plant comprises of 32 Gas Engines of 3.041 MW each and 01 ST of 10.00 MW (ISO Capacity)
3. Gas engines started its commercial operation in August 2009 to December 2009
4. Subsequently, Steam Turbine completed Reliability Run Test (RRT) on March 01, 2016.
5. KE was granted Generation License (GL/04/2002) on November 18, 2002 and has been modified from time to time to account for additions / deletions of power plants to / from KE's generation fleet.
6. In August 2013, NEPRA issued Modification IV to the Generation License no. GL/04/2002 to the Company in accordance with the prevailing regulatory regime, adding KTGEPS in the fleet.

Technical Capability

The installed generation capacity of KTGTPS is 107.312 MW (Gross ISO) with Gross capacity of 95.51 MW[1] (Corrected at RSC) dedicated power into the K-Electric system.

The prime movers for the power plant were manufactured at the Jenbacher production facilities in Austria known for manufacturing of natural gas engines. The JGS 620 GS-N.L series of engines installed at the power plant are well designed, reliable and economical in operation. For combined cycle operation Steam Turbine make NG-Allen and 32 WHRSG make Descon have been installed to enhance plant capacity and efficiency.

The plant was built by Orient Energy Systems ("OES"). The Plant O&M is being maintained by K-Electric Limited (KE). Further, KE has a Material Stream Agreement (MSA) with OES whereby OES provides parts for Gas Engines running hour based maintenance/overhauls and services.

[1] As per Generation license

Summary of Plant Performance for last 10 years

The Key Factors

The key factors of the plant performance for last 10 years are summarized as follows:

Fiscal Year	Total Energy Supplied (Gross) (GWh)	Average Plant Availability (%)*
*FY-13	327	99%
*FY-14	393	99%
FY-15	435	87%
FY-16	500	87%
FY-17	389	88%
FY-18	323	88%
FY-19	390	90%
FY-20	313	88%
FY-21	381	84%
FY-22	122	97%

For Major Overhaul details, please refer table given in **KTGEPS – Annexure A (i)**

Modifications & Improvements

The upkeep of the plant and equipment has always been the priority, which has made it possible for the Company to proudly supply power to KE's users as per demand.

For Major Activities performed for improving performance of the Plant, please refer **KTGEPS – Annexure A (i)**.

Operation Summary

The power generated by the plant is transmitted through KE grid stations which are supplying power to Karachi city's major industrial and commercial customers. It is for this reason that it has always been the aim of KE to keep the plant in best shape in order to offer the maximum availability all year round.

Health & Safety

The facility has been operational since beginning without any major incident complying Quality, Health, Process Safety and Environment related standards. It is achieved through good O&M practices and having skilled plant operations team. The plant premises has a first aid facility backed up by a 24/7 ambulance.

The Company has well established Process Safety Procedures covering:

- Hazardous Substance Management
- Emergency Preparedness and Response
- Permit to Work Procedure
- Compressed Gas Cylinders Handling and Storage

[2] Average Plant Availability = Available Capacity / (Gross Dependable Capacity)
* Prior to FY-15 Section outages (i.e., when 8 engines are out) have been used to calculate Station's available capacity

Safety Procedures

KTGEPS has acquired following ISO certifications,

1. Occupational Health & Safety Management System – ISO 45001:2015
2. Environmental Management System – ISO 14001:2015
3. Quality Management System – ISO 9001:2015
4. Energy Management System (EnMS) – ISO 50001:2018
5. Asset Management System (AMS) – ISO 55001:2014

For list of HSEQ Safety Procedures: please refer **KTGEPS – Annexure A (ii).**

Project Details

For project details including site details, plant reference conditions & plant machinery details, please refer **KTGEPS – Annexure A (iii).**

Fuel Source

KTGEPS plant uses indigenous natural gas as a fuel at plant site for generation which is supplied through pipeline by SSGC to KTGEPS. Citing shortage of Indigenous gas, SSGC has included RLNG in supply since April 2018, however, it is supplied from the same pipeline.

Plant requires minimum gas pressure of 2 bars, however, often has to face Gas pressure issues, for which SSGC gives reason that the plant is located at tail end and pressure issues are faced due to area dynamics.

In order to cope with the issue of shortage of gas / gas pressure, KE is in continuous engagements with SSGC and discussions on draft Gas Supply Agreements (GSA) are also on going.

Further, KE is also considering alternate suppliers of gas / RLNG and in this regard, once a feasible option is identified, KE would request for NEPRA's approval for the supplier along with a modification in tariff, if required.

Moreover, agreement with RLNG/ Gas supplier may involve Take or Pay arrangements, for which KE will be required to ensure regular payments for Fuel Charges as per the Gas Supply Agreements regardless of plant operations. Accordingly, KE requests the Authority to allow these costs as pass through in the proposed tariff. Alternatively, the Authority may allow KE to consider the plant as a must run under the Economic Merit Order (EMO) to the extent of Take or Pay Gas arrangements.

Cooling System

Engines cooling water is closed circuit which is cooled through air cooled radiators installed on each engine. Dedicated cooling towers are also available to cater hot ambient conditions.

Air cooled condenser (ACC) is used as condenser for Steam turbine operation to dissipate heat & condense steam turbine exhaust to maintain rated vacuum level inside turbine exhaust system for Steam turbine operation. Further, ST Lube Oil and Generator cooling is being done through separate cooling water modules.

Minimum Loading

Minimum loading of each Engine is 1.3695 MW (Gross) based on GE's recommendations. Please refer **KTGEPS – Annexure A (iv)** for reference document.

Fire Protection System

The plant has a state-of-the-art Fire Protection System detail of which are given in refer **KTGEPS – Annexure A (v).**

Spares & Inventories

In order to ensure reliability of the plant and to avoid down time, the Company maintains an inventory of worth **PKR 380 million** as of June 2022.

Plant Layout

For plant layout, please refer **KTGEPS – Annexure A (vi).**

Details of Major Equipment

For details of Major Equipment, please refer **KTGEPS – Annexure A (vii)**

Remaining Useful Life

The plant has been in operation since 2009 with a remaining licensed useful life ending on August 2039.

Factored Fired Hours operated for each gas engine is given in the table below:

Gas Engines	Hours Operated as of 30th June, 2022
E11	61,717
E12	64,566
E13	57,781
E14	61,991
E15	55,894
E16	62,611
E17	61,528
E18	62,033
E21	67,940
E22	63,155
E23	61,880
E24	65,187
E25	63,745
E26	65,071
E27	64,148
E28	63,498
E31	58,444
E32	60,442
E33	47,813

Gas Engines	Hours Operated as of 30th June, 2022
E34	58,697
E35	61,368
E36	56,257
E37	57,343
E38	54,146
E41	62,519
E42	64,006
E43	63,205
E44	62,010
E45	65,131
E46	58,861
E47	64,215
E48	60,228
Average	**61,170**

Plant Capacity and Heat Rate

Heat rate and capacity test was conducted for the plan by Independent Engineer in July 2019, based on which Heat rate was determined for the Current MYT 2017 – 2023 and plant capacity was updated in the Generation License.

Test results at base load were as follows:

Description	KTGEPS
Gross Capacity – MW (RSC)	95.513
Auxiliary – MW	3.462
Net Capacity – MW (RSC)	**92.051**
Auxiliary	3.625%
Net Heat Rate LHV Basis – btu / kWh	8149.987
Net Efficiency LHV Basis	41.867%
Gross Heat rate LHV Basis – btu / kWh	7854.548
Gross Efficiency LHV Basis	43.442%
Net Heat Rate HHV Basis – btu / kWh	**9038.043**
Net Efficiency HHV Basis	37.753%
Gross Heat rate HHV Basis – btu / kWh	8710.412
Gross Efficiency HHV Basis	39.173%

Accordingly, Net capacity & Heat rate (Combined cycle) for the purpose of Tariff petition has been taken from Generation license which is based on tests conducted in 2019 as per IE's heat rate test reports.

Further, capacity & Heat rate at Open cycle were also conducted by IE, based on which values are given in the table below:

Category	Gas fuel	
	Combined cycle	Open cycle
Gross capacity – MW	95.513	87.272
Auxiliary consumption – MW	3.462	2.747
Net Capacity – MW	92.051	84.525
Auxiliary consumption %	3.625%	3.148%
Net HHV heat rate – btu / kWh	9038.043	9825.183

1.2. Tariff Mechanism

This section explains in detail the tariff mechanism of KTGEPS to ensure cost reflective tariffs including component wise indexation so that all prudent costs of the plant are adequately recovered.

KE is requesting a two part tariff, in line with IPPs i.e. Energy payments and Capacity payments on a Take-or-pay mechanism where Capacity payment shall be made for the Available Capacity and Energy payments for the Net Electrical Output.

Available capacity has been calculated considering annual availability of 90% and additional outage allowance in the year in which Overhaul is occurring. Accordingly, based on expected incurrence of Overhauls, levelized availability of **87.81%** has been calculated and has been used as Plant factor for Variable O&M and Capacity components, so that Capacity components cover the impact of outages. Details of Outages and billing mechanism have been further discussed in detail in **Section 1.3**.

For indexation purposes, following Indexation factors are proposed to be used sources of which given in the table below:

Indexation Factors	Sources
Local Inflation (CPI)	Pakistan Bureau of Statistics (PBS)
Foreign Inflation (US CPI)	US Bureau of Labor Statistics
Exchange rates (USD)	National Bank of Pakistan
KIBOR	State Bank of Pakistan
LIBOR / SOFR	Intercontinental Exchange /Federal Reserve Bank of New York

1.2.1. Fuel Cost

This component represents the cost of fuel for the Net Electrical Output (NEO) produced by the plant at the allowed efficiency levels and shall be indexed for any fuel price variations.

Net Electrical Output: The net electrical energy expressed in kWh that is generated by the Complex (or any Unit) and delivered to the Interconnection Point as measured by the Metering system.

Fuel price

KTGEPS operates on Gas (Indigenous Natural Gas / RLNG), supplied by SSGC. NEO is currently recorded through meters at bus bar (132 KV) and is bifurcated between Indigenous Natural Gas / RLNG as per mechanism explained below

Indigenous Natural Gas / RLNG – Mechanism of billing, pricing, and bifurcation

Prices for Indigenous Natural Gas and RLNG shall be calculated based on OGRA's notification. Prices of Indigenous Natural Gas are notified in PKR / mmbtu, whereas Prices of RLNG are notified by OGRA in USD / mmbtu which are then translated into PKR / mmbtu by SSGC using the daily average exchange rates issued by National bank for the month. Accordingly, SSGC mentions the rate in PKR / mmbtu on the bills.

Considering prices of Indigenous Natural Gas and RLNG are notified in per mmbtu, calorific value is not required for price conversion.

SSGC supplies gas to KE through single pipeline based on available gas quantity and billing is done based on Indigenous Natural Gas and RLNG (Distribution tariff) based on proportion of Indigenous Natural Gas & RLNG supplied to KE (determined by SSGC based on RLNG imports).

(Sample bills for the month of April 2020 are enclosed as **KTGEPS - Annexure B (i)**)

Units Generated by the plant are recorded through Energy Meters at the plant and then are bifurcated in Indigenous Natural Gas and RLNG based on proportion of Indigenous Natural Gas and RLNG in MMBTUs. MMBTUs for Indigenous Natural Gas and RLNG are calculated using consumption appearing in SCF on bills and actual calorific value (btu / scf) appearing on the bills (Sample calculation enclosed as **KTGEPS - Annexure B (ii)**)

Gas Infrastructure Development Cess (GIDC)

Currently the matter of GIDC is sub-judice and no amount is passed onto the consumers. Subsequently, if any GIDC is paid (pertaining to prior periods) based on court verdict, the same will be included in fuel price PKR / mmbtu.

RLNG from any Dedicated Line / Alternate Supplier

In future, if RLNG is procured from any dedicated line / alternate supplier, the same will be measured through separate meters and energy will be bifurcated in supply from any dedicated line / alternate supplier based on actual MMBTUs, accordingly, to apply separate prices as per respective pricing mechanism.

Mechanism of Part load adjustment factor

For KTGEPS, Net HHV Heat rate of 9,038.043 btu / kWh at base load on Combined cycle, was established based on IE's test with part load heat rate also given at 75% load. Considering separate tariff requests for each plant, central economic dispatch plan going forward as explained in **section 5** and the part load adjustment mechanism followed for IPPs, KE is proposing monthly part load adjustment based on actual operations for a month and part load adjustment factor given in the table as per the part load curve in **KTGEPS - Annexure C (i) to C(ii)** for Combined cycle and open cycle operations, respectively. This mechanism of adjustment based on actual part load factor will also be consistent with other IPPs.

Part load adjustment will be based on hourly data for energy generated on plant and available capacity based on which part loading % for each hour will be determined. Part load factor for each hour will be calculated based on part load % and part load factors given in Part load table (given in **KTGEPS - Annexure C (i) to C(ii)**). Accordingly, a weighted average part load factor for Gas for the month will be calculated which shall be denominated as PL_{Gas} (Sample calculation for a day enclosed as **KTGEPS - Annexure D.)**

Degradation factor

Reference values of heat rate and capacity (Combined cycle & open cycle) are based on test conducted in 2019 and KE would request NEPRA to adjust the heat rate and output for each year based on degradation table as provided in **KTGEPS - Annexure E(i) and E(ii)** which is based on degradation curve given in IE's report.

Simple cycle operations

Although KTGEPS is generally run on combined cycle operations, however, in case if Steam Turbine is on outage and the outage is within the allowed outage allowance, as detailed in section *Outage Allowance* and the plant is required to operate to fulfill demand based on Economic Merit Order on pricing of simple cycle operations, KE should be allowed the fuel cost at simple cycle operations.

Further, plant must be operated on simple cycle during startups when Engine(s) is synchronized, and ST is under start up. Accordingly, KE requests that fuel cost on units produced during that period shall also be allowed on simple cycle whereas Startup costs should be reduced by fuel cost claimed on units produced during start up as these will be claimed under Fuel cost.

Cost of simple cycle operations is requested to be allowed if plant is operated due to dispatch based on EMO Ranking on pricing of simple cycle operations. However, for allowing cost of simple cycle operations during startups, EMO ranking of combined cycle shall be relevant considering the intended use.

Heat rates for both open and combined cycle, are given under *Plant capacity and heat rate* above. KE requests that part load and degradation adjustment factor shall be applied on simple cycle in the same manner as for combined cycle, based on Part load and degradation curve.

Energy generated on simple cycle mode will be separately recorded through logs for application of simple cycle heat rate.

Summary of assumptions used for reference tariff

Description	Indigenous Natural Gas		RLNG	
	Combined cycle	Simple cycle	Combined cycle	Simple cycle
Net HHV heat rate - btu / kWh	9,038	9,825	9,038	9,825
Fuel price PKR / mmbtu	857	857	3,301	3,301
Fuel Component PKR / kWh	7.75	8.42	29.83	32.43
RLNG price				
Fuel Price PKR / mmbtu			3,301	3,301

Indexation formula

The fuel cost component of tariff shall be adjusted on account of fuel price variation as per the following mechanism:

Indigenous Natural Gas

$FCCIG_{(Rev)}$	=	$FCCIG_{(Ref)} \times PIG_{(Rev)} / PIG_{(Ref)}$
Where:		
$FCCIG_{(Rev)}$	=	The revised fuel cost component on Indigenous Natural Gas in PKR / kWh
$FCCIG_{(Ref)}$	=	The `reference fuel cost component of **PKR 7.75 / kWh** on Indigenous Natural Gas for Combined cycle and **PKR 8.42 / kWh** on Simple cycle
$PIG_{(Rev)}$	=	The revised net HHV Indigenous Natural Gas price notified by the OGRA in PKR / MMBTU
$PIG_{(Ref)}$	=	The reference net HHV Indigenous Natural Gas price of **PKR 857 / MMBtu**

RLNG

$FCCRLNG_{(Rev)}$	=	$FCCRLNG_{(Ref)} \times PRLNG_{(Rev)} / PRLNG_{(Ref)}$
Where:		
$FCCRLNG_{(Rev)}$	=	The revised fuel cost component on RLNG in PKR / kWh
$FCCRLNG_{(Ref)}$	=	The reference fuel cost component of **PKR 29.83 / kWh** on RLNG for combined cycle and **PKR 32.43 / kWh** on Simple cycle
$PRLNG_{(Rev)}$	=	The revised net HHV RLNG price notified by the OGRA in USD / MMBTU multiplied by exchange rate appearing on SSGC bills
$PRLNG_{(Ref)}$	=	The reference net HHV RLNG price of **PKR 3,301 / MMBtu**

The calculated $FCCIG_{(Rev)}$ and $FCCRLNG_{(Rev)}$ shall be adjusted with weighted average part load factor for the month based on calculation as explained in *Mechanism of Part load Adjustment Factor* and degradation factor under section *Degradation Factor*.

Fuel cost components

$FCCIG_{(Rev)(adj)}$	=	$FCCIG_{(Rev)} \times PL_{Gas} \times D_y$
$FCCIG\text{-}SC_{(Rev)(adj)}$	=	$FCCIG\text{-}SC_{(Rev)} \times PL_{Gas} \times D_y$
$FCCRLNG_{(Rev)(adj)}$	=	$FCCRLNG_{(Rev)} \times PL_{Gas} \times D_y$
$FCCRLNG\text{-}SC_{(Rev)(adj)}$	=	$FCCRLNG\text{-}SC_{(Rev)} \times PL_{Gas} \times D_y$
Where;		
SC	=	Simple cycle
PL_{Gas}	=	Weighted average Part load factor for the month for Gas operations as calculated on mechanism explained under section *"Mechanism of Part load Adjustment factor"* for combined cycle and simple cycle operations, respectively
D_y	=	Degradation factor for the year based on degradation table given in **KTGEPS - Annexure E (i)**

1.2.2. O&M Expenses

Under the existing MYT structure, capital expenditure for maintenance of plant is allowed as investment plan and becomes part of Regulatory Asset base, whereas revenue expenses are allowed as part of O&M expenses.

However, as explained above, KE is proposing a tariff for remaining life of generation plant with structure in line with IPPs where both capex and revex nature of expenditures are allowed

through Fixed and Variable O&M. This will help to have better visibility and align the tariff structure with CTBCM requirement and industry practice.

Accordingly, proposed O&M expenses are bifurcated in Variable and Fixed, and then further bifurcated in Foreign and local, based on nature of expenses for applying relevant indexations.

Bifurcation of O&M is as follows:

Variable O&M local

The Variable O&M Local represents plant maintenance costs consisting of both parts and services which are procured in local currency by the Company. Being variable in nature, these costs are linked to plants' operating hours and incurred on some specific machine operating hours intervals.

For tariff calculation purposes, KE has calculated levelized Variable O&M Local keeping in view costs of FY 2022 and based on projected Variable O&M local for the remaining useful life of the plant, including maintenance expenses being incurred at regular intervals of hours recommended by OEM, which shall be indexed with Pak CPI at the start of each quarter.

Accordingly, levelized variable O&M cost per year **PKR 31 million per year** translating into **PKR 0.04 / kWh** at reference CPI of **158.48** average as of FY 2022 which shall be indexed with Pak CPI at the start of each quarter.

Variable O&M local (levelized)

Category	Amount – PKR million	Units at plant factor – GWh	O&M Per unit – PKR / kWh
Variable O&M - local	30.75	708.05	0.0434

Indexation formula:

$Var. Local. O\&M_{(Rev)}$	=	$Var. Local O\&M_{(Ref)} x CPI_{(Rev)} / CPI_{(Ref)}$
Where;		
$Var. Local. O\&M_{(Rev)}$	=	Revised Variable O&M local Component of Tariff
$Var. Local O\&M_{(Ref)}$	=	Reference Variable O&M local Component of Tariff
$CPI_{(Rev)}$	=	Revised CPI – notified by Pakistan Bureau of Statistics latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
$CPI_{(Ref)}$	=	Reference CPI of 158.48 average for FY 2022

Variable O&M Foreign

The Variable O&M Foreign is for imported Gas Engine & Steam Turbine capital spare parts, electrical spares and technical services required. Further, KE has a Material Stream Agreement (MSA) with OES whereby OES provides parts for Gas Engines running hour based maintenance/overhauls and services (where applicable).

For tariff calculation purposes, KE has calculated levelized Variable O&M Foreign keeping in view costs of FY 2022 and based on projected Variable O&M Foreign for the remaining useful life of the plant, including maintenance expenses being incurred at regular intervals of hours recommended by OEM which shall be indexed with US CPI and exchange rates at the start of each quarter.

Accordingly, levelized variable O&M Foreign component cost per year is estimated at **PKR 970 million** per year translating into **PKR 1.37 / kWh** at reference USD CPI of **282.03** and

exchange rate of **PKR 206 / USD as of FY 2022,** based on projected expenses which shall be indexed based on US CPI and exchange rates at the start of each quarter.

Variable O&M Foreign (levelized)

Category	Amount – PKR million	Units at plant factor – GWh	O&M Per unit – PKR / kWh
Variable O&M - Foreign	970.23	708.05	1.3703

Indexation formula:

Var. Foreign. $O\&M_{(Rev)}$	=	Var. Foreign $O\&M_{(Ref)}$ x $USCPI_{(Rev)}$ / $USCPI_{(Ref)}$ x $ER_{(Rev)}$/ $ER_{(Ref)}$
Where;		
Var. Foreign. $O\&M_{(Rev)}$	=	Revised Variable O&M Foreign Component of Tariff
Var. Foreign $O\&M_{(Ref)}$	=	Reference Variable O&M Foreign Component of Tariff
$USCPI_{(Rev)}$	=	The revised US CPI (All Urban Consumers) notified by US Bureau of Labor Statistics latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
$USCPI_{(Ref)}$	=	The reference US CPI of **282.03 average** for FY 2022
$ER_{(Rev)}$	=	The Revised TT & OD selling rate of USD as notified by National bank latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
$ER_{(Ref)}$	=	The reference exchange rate of **PKR 206.00 / USD** as of FY2022

Fixed O&M local

Fixed costs are incurred to ensure plant's availability irrespective of its operations. This component includes both plant maintenance expenses and necessary allied costs of salaries and wages, third party services, transport etc.

For tariff calculation purposes, KE has calculated levelized Fixed O&M Local considering FY 22 costs and based on the projected Fixed O&M local for the remaining useful life of the plant which shall be indexed with Pak CPI at the start of each quarter.

Accordingly, levelized Fixed O&M local component cost per year is estimated at **PKR 286 million** per year translating into **PKR 0.40 / kW/h (based on units at plant factor)** at reference Pak CPI of **158.48** (Average FY 22) based on projected expenses which shall be indeed based on Pak CPI at the start of each quarter.

Fixed O&M local (levelized)

Category	Amount – PKR million	Units at plant factor – GWh	O&M Per unit – PKR / kWh
Fixed O&M - local	285.76	708.05	0.4036

Indexation formula:

Fix. Local. O&M$_{(Rev)}$	=	Fix. Local O&M$_{(Ref)}$ x CPI$_{(Rev)}$ / CPI$_{(Ref)}$
Where;		
Fix. Local. O&M$_{(Rev)}$	=	Revised Fixed O&M local Component of Tariff
Fix. Local O&M$_{(Ref)}$	=	Reference Fixed O&M local Component of Tariff
CPI$_{(Rev)}$	=	Revised CPI notified by Pakistan Bureau of Statistics latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
CPI$_{(Ref)}$	=	Reference CPI of **158.48 average as of FY 2022**

Fixed O&M Foreign

Fixed costs are incurred to ensure plant's availability irrespective of its operations. These costs are critical to ensure availability and continued operations of the plant, jobs include Radiator Motor Replacement, Control System Upgradation – Section & Corrective / Emergency Parts (E&IC) etc.

For tariff calculation purpose, KE has calculated Fixed cost foreign based on FY 2022 costs and projected Fixed cost foreign which shall be indexed to US CPI and exchange rates at the start of each quarter.

Accordingly, levelized Fixed O&M foreign component cost per year is estimated at **PKR 22 million** per year translating into **PKR 0.03 / kW/h** at reference US CPI of **282.03** average FY 2022 and exchange rate of **PKR 206 / USD** as of FY 2022 based on projected expenses which shall be indexed based on USD CPI and exchange rate at the start of each quarter.

Fixed O&M Foreign (levelized)

Category	Amount – PKR million	Units at plant factor – GWh	O&M Per unit – PKR / kWh
Fixed O&M – Foreign	21.89	708.05	0.0309

Indexation formula:

Fix. Foreign. O&M$_{(Rev)}$	=	Fix. Foreign O&M$_{(Ref)}$ x USCPI$_{(Rev)}$ / USCPI$_{(Ref)}$ x ER$_{(Rev)}$ / ER$_{(Ref)}$
Where;		
Fix. Foreign. O&M$_{(Rev)}$	=	Revised Fixed O&M Foreign Component of Tariff
Fix. Foreign O&M$_{(Ref)}$	=	Reference Fixed O&M Foreign Component of Tariff
USCPI$_{(Rev)}$	=	The revised US CPI (All Urban Consumers) notified by US Bureau of Labor Statistics latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
USCPI$_{(Ref)}$	=	The reference US CPI of **282.03 average** FY 2022
ER$_{(Rev)}$	=	The Revised TT & OD selling rate of USD as notified by National bank latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
ER$_{(Ref)}$	=	The reference exchange rate of **PKR 206 / USD** as of FY 2022

For breakup of O&M (levelized), please refer **KTGEPS - Annexure F**

O&M costs both Variable & Fixed (local / foreign) have been validated and benchmarked by Independent Consultant, report of which is enclosed as **KTGEPS– Annexure G.**

1.2.3. Insurance

KE requests an insurance premium up to 1% of EPC cost consistent with the insurance cost allowed to IPPs that shall be adjusted annually as per actual subject to maximum limit of 1% of EPC.

Insurance cost based on EPC cost

EPC Cost	USD 84.39 Mn
1% of EPC cost	USD 0.8439 Mn
Reference exchange rate	PKR 206 / USD
1% of EPC Cost	PKR 173.84 Mn
Ins(Ref) Gas at plant factor	PKR 0.2455 / kWh

Insurance component shall be adjusted with actual cost at start of the year

$\mathbf{Ins_{(Ref)(adj)}}$	=	$\mathbf{Ins_{(Ref)} \times P_{(Act)} / P_{(Ref)}}$
Where;		
$\mathbf{Ins_{(Ref)(adj)}}$	=	Adjusted Reference Insurance Component of Tariff
$Ins_{(Ref)}$	=	Reference Insurance Component of Tariff
$P_{(Ref)}$	=	Reference Premium USD 0.8439 million at **PKR 206 / USD**
$P_{(Act.)}$	=	Actual Premium in USD or USD 0.8439 million (1% of EPC cost) whichever is lower

Further, insurance component shall be adjusted quarterly based on below formula

$\mathbf{Ins_{(Rev)}}$	=	$\mathbf{Ins_{(Ref)(adj)} \times ER_{(Rev)} / ER_{(Ref)}}$
Where;		
$\mathbf{Ins_{(Ref)(adj)}}$	=	Adjusted reference Insurance component of Tariff
$ER_{(Rev)}$	=	The Revised TT & OD selling rate of USD as notified by National bank latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
$ER_{(Ref)}$	=	The reference exchange rate of **PKR 206 / USD** as of FY2022

1.2.4. Return on Regulatory Asset Base and Depreciation

Regulatory Asset Base

Regulatory Asset Base shall comprise of written down value of plant excluding surplus on revaluation and including Intangibles (mainly software used for regulated business) and CWIP at start of control period, which will be depreciated each year based on remaining useful life of the plant.

Regulatory asset base based on current structure at the end of FY 2023 will be locked and used as a basis for proposed MYT and further additions to RAB shall only be based on any project-based addition / modification to the plant subject to NEPRA's approval for which a onetime request will be submitted for adjustment in tariff components.

With regard to RAB, KE has projected RAB as of FY 2023 at **PKR 3,221 million** and accordingly, requests NEPRA to actualize the same at the start of the next term i.e. July 2023 based on audited financial statements.

RAB movement is enclosed as **KTGEPS - Annexure H**. Once RAB at end of FY 2023 will be finalized post audit of financial statements, KE will file **KTGEPS - Annexure H** with updated opening RAB and accordingly related tariff components, including RoRB and Depreciation will be updated.

Return

Return shall be calculated based on Return on Equity, cost of debt and Debt to Equity ratio

Debt to Equity ratio

Debt to equity ratio is proposed to be 70:30 as allowed in current MYT, subject to discussion in Main **section**.

Cost of Debt

Like existing MYT, cost of debt for local component will be calculated based on 3-month KIBOR plus a spread of 2.5% and cost of debt for foreign component is calculated based on 3-month LIBOR, spread 4.5% and hedging cost based on difference of 3 month KIBOR and 3-month LIBOR plus a hedging cost spread.

Accordingly, cost of debt has been calculated using reference 3-month KIBOR of **15.16%** as of FY22 reference 3-month LIBOR of **2.29%** as of FY22.

KE proposes KIBOR, LIBOR / SOFR and hedging cost to be indexed at the start of each quarter going forward based on actual.

Local to Foreign debt ratio

Considering no foreign debt is currently drawn for KTGEPS, Debt has been taken at local for cost of debt.

Accordingly, Return on Regulatory Base – Cost of Debt (RoRBCoD) comes out to **PKR 0.54 / kW/h** at **87.81%** plant factor for FY 2024. For year wise tariff components, please refer Tariff table.

RoRB – Local component of Cost of debt

$RoRBCoD\ Local_{(Rev)}$	=	$RoRBCoD\ Local_{(Ref)}$ for relevant year x $CoD\ Local_{(Rev)}$ / $CoD\ Local_{(Ref)}$
Where;		
$RoRBCoD\ Local_{(Rev)}$	=	Revised Local RoRB cost of debt component of tariff
$RoRBCoD_{(Ref)}$	=	Reference Foreign RoRB cost of debt component of tariff
$CoD\ Local_{(Rev)}$	=	$KIBOR_{(Rev)}$ + 2.5%
$CoD\ Local_{(Ref)}$	=	$KIBOR_{(Ref)}$ + 2.5%
$KIBOR_{(Rev)}$	=	The revised 3 month KIBOR as published by State Bank of Pakistan latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
$KIBOR_{(Ref)}$	=	The reference 3 month KIBOR of **15.16%** as of FY22

Cost of Equity

Keeping in view currently allowed returns, return on equity of USD based 15% is proposed that shall be indexed based on changes in USD to PKR exchange rate at the start of each quarter.

For the purpose of Exchange rate indexation, indexation with reference to FY 2016 has been calculated considering weightage of RAB each year till FY 2023 in line with mechanism used by NEPRA in the current MYT. Accordingly, reference indexed cost of equity has been calculated using reference current exchange rate of **PKR 206 / USD**. Accordingly, KE requests the Authority to consider the actual average exchange rate of FY23 at the time of actualization of RAB at FY23 as mentioned in **"Regulatory Asset Base"** section above. Please refer calculation in **KTGEPS - Annexure I (i).**

Accordingly, Return on Regulatory Base – Cost of Equity (RoRBCoE) comes out to **PKR 0.50 / kWh** for FY 2024 considering USD RoE of **15%** and indexed RoE of **37.98%** at exchange rate of **PKR 206 / USD**. For year wise tariff components, please refer Tariff table.

Indexation formula is given below. Further, an illustration for RoE indexation is given in **KTGEPS - Annexure I (ii).**

RoRB – Component of Cost of Equity

$RoRBCoE_{(Rev)}$	=	**$RoRBCoE_{(Ref)}$ for relevant year x $ER_{(Rev)}$ / $ER_{(Ref)}$**
Where;		
$RoRBCoE_{(Rev)}$	=	Revised RoRB cost of equity component of tariff
$RoRBCoE_{(Ref)}$	=	Reference RoRB cost of equity component of tariff
$ER_{(Rev)}$	=	The Revised TT & OD selling rate of USD as notified by National bank of Pakistan latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
$ER_{(Ref)}$	=	The Reference exchange rate of **PKR 206 / USD as of FY22**

Depreciation

Depreciation shall be calculated as straight line based on written down value of RAB at the end of FY 2023 (Current control period) and remaining useful life at the end of Control period.

Accordingly, Depreciation component comes out to **PKR 0.28 / kW/h** for FY 2024. For year wise tariff components, please refer Tariff table.

1.2.5. Cost of Working Capital

KE requests NEPRA for working capital mechanism based on below formula, consistent with IPPs.

Legend	Working Capital Components
A	Cost of Stores & spares inventory
B	Cost of Fuel inventory (not applicable)
C	Cost of Fuel in Receivable cycle based on 30 days receipt period and 7 days payment period on RLNG fuel with 17% sales tax – based on 87.81% plant factor, to be actualized every quarter.
D	Cost of SBLC (currently included based on SBLC given to SSGC allocated to KTGEPS plant, will be updated in future in case of any new agreement)

Working capital component has been calculated for the control period based on current movement of balances year on year and reference KIBOR of 15.16% plus a short term spread **2%.**

Cost of working capital shall be indexed with actual KIBOR and change in fuel prices, on a **quarterly basis.** Further, reference component shall be updated in future through a request in case of any change in circumstances.

Based on above, working capital component comes out to **PKR 0.47 / kWh as of FY 2024.** For year wise tariff, please refer Tariff table.

Working Capital requirement shall be indexed through updating the template enclosed in **KTGEPS - Annexure J** at each quarter including update in SBLC cost pursuant to any changes / addition in the arrangement(s).

1.2.6. Pass through items

Similar to the current MYT and as allowed to IPPs, KE proposes the following items to be allowed as pass-through costs in the new MYT.

Corporate tax and WWPF / WWF

Currently, KE is an integrated entity therefore Corporate tax and WPPF / WWF on overall company level is a pass through item within MYT.

Considering that legal structure will remain same, KE is proposing that Corporate tax and WPPF / WWF shall be passed through to consumers in Supply Tariff.

However, going forward, in case of any change in legal structure whereby a Corporate tax and WWF / WPPF is separately levied on Generation plant, same shall be passed through as done in case of IPPs.

Unrecovered cost of Current MYT

Any unrecovered cost of Current MYT shall be pass through in tariff.

Startup Charges

Startup: Any startup of a Gas Unit that is necessary for a station to comply with the Dispatch requirements / Instructions and that results in the synchronization with the grid system.

Consistent with industry practice, KE requests the Authority to allow start up charges, as defined below.

In any month, if a startup occurs in a Financial year, KE shall be allowed to claim "Start-Up charges" based on Reference start up charges indexed with relevant indices, including fuel prices and electricity tariff as requested below

"Start-Up Charge" shall consist of two components and is calculated as follows:

Start-Up Charge = MDI Charge + Reference Unit Start-Up Charges.

a) **MDI Charge:** The MDI charge shall be based on maximum demand recorded during the relevant month at startup and shall be calculated based on the then applicable MDI rate in Rs/kW, from time to time,

b) **Reference Unit Start-Up Charge:** This cost will cover the consumables, fuel and equivalent operating hours consumed for the start-ups.

The Start-Up Charges for each Start-Up shall be calculated as follows:

SC_M	=	$MDIR_x \times N1 + ((SCPI_{Ref} \times SCFadjust_{PI}) + ((SCFC_{Ref} \times SCFadjust_{FC})) \times N2$
Where:		
SC_M	=	The Start Up Charges during the Month M
$MDIR_x$	=	Total fixed charges for the month due to Distributing segment during the relevant month (based on MDI for the month and MDI charge) divided by the total number of Start Ups performed during the month.
N1	=	The number of Start ups to be claimed, unless any shutdowns claimed during the relevant month in which case this will be considered as zero.
N2	=	The number of Start ups to be claimed
$SC_{(Ref)}$	=	The Reference Start-Up Charge as given below. Consists of the following two components:
$SCPI_{Ref}$	=	The Reference Start-Up Charge for the Power Import from Transmission System during GT Startup till Synchronization.
$SCFadjust_{PI}$	=	The Startup Charges Adjustment Factor for the hour h for the Import of Power from Transmission Network as per following formula: **$SCFadjust_{PI}$ = WAVCT-$B4_{(Rev)}$ / WAVCT-$B4_{(Ref)}$** where: **WACT-$B4_{(Rev)}$** = Weighted Average of the latest notified variable consumer tariff for the Industrial Consumer Category (B-4b) based on a weightage of 4:20 for Peak & Off-Peak Rates respectively. **WACT-$B4_{(Ref)}$** = Weighted Average of the reference notified variable consumer tariff for the Industrial Consumer Category (B-4b) based on a weightage of 4:20 for Peak & Off-Peak Rates (i.e. Rs. 30.33 per kWh & Rs. 24.43 per kWh) respectively **(i.e. Rs. 25.41 per kWh)**
$SCFC_{Ref}$	=	The Reference Start-Up Charge for the Fuel Consumed during GT Startup till Synchronization including ST Synchronization, if applicable.
$SCFadjust_{FC}$	=	The Startup Charges Adjustment Factor for the hour h for the consumption of fuel as per the following formula:

		For Gas[3] – $SCFadjust_{FC} = FCCG_{Rev} / FCCG_{Ref}$ For HSD – $SCFadjust_{FC} = FCCHSD_{Rev} / FCCHSD_{Ref}$

TYPE OF START (Gas) – Note	Reference Single GT StartUp Charges	Reference one third Complex StartUp Charges (16 Engines x ST)	Reference two third Complex Start-Up Charges(24 Engines x ST)	Reference Complex Start-Up Charges(32 Engines x ST) – Note
	PKR million			
Hot Start: Total Cost	0.01	3.08	4.62	6.15
Recovery based on Simple Cycle	-	(3.05)	(4.58)	(6.10)
Net Claim	0.01	0.03	0.04	0.05
Warm Start: Total Cost	0.01	4.16	6.23	8.31
Recovery based on Simple Cycle	-	(4.13)	(6.19)	(8.26)
Net Claim	0.01	0.03	0.04	0.05
Cold Start: Total Cost	0.04	5.50	8.23	10.97
Recovery based on Simple Cycle	-	(5.39)	(8.09)	(10.78)
Net Claim	0.04	0.11	0.14	0.19

Note: Furthermore, recovery on units sent to grid has been based on simple cycle tariff, to be allowed separately for NEO.

Shutdown Cost

Shutdown: Any shutdown of a Gas Unit that is necessary for a station to comply with the Dispatch requirements / Instructions which results in the de synchronization with the grid system.

KE requests the Authority to allow shutdown charges, as defined below.

In any month, KE shall be allowed to claim "Shutdown charges" based on Reference Shutdown charges indexed with relevant indices, including fuel prices and electricity tariff as requested below.

"Shutdown Charge" shall consist of two components and is calculated as follows:

Shutdown Charge = MDI Charge+ Reference Unit Shutdown Charges.

a) **MDI Charge:** The MDI charge shall be based on maximum demand recorded during the relevant month at shutdown and shall be calculated based on the then applicable MDI rate in Rs/kW, from time to time,

[3] Proportion of Indigenous Gas & RLNG in both Reference & Revised FCCG will be calculated based on the actual mix of Indigenous Gas & RLNG used as appearing in SSGC Bills for the relevant month in which Startup Cost is being claimed whereas Reference and Revised Fuel Cost Component will be calculated as per Section 1.2.1 above.
Furthermore, in case Gas is made available through Dedicated Line/ Alternate Supplier as discussed in Section 1.2.1 above, then separate costs will be calculated and submitted to the Authority for approval.

b) Reference Unit Shutdown Charge: This cost will cover the consumables, fuel and equivalent operating hours consumed for the shutdown.

The Shutdown Charges for each Shutdown shall be calculated as follows:

SHC_M	=	$MDIR_x \times N1 + ((SHCPI_{Ref} \times SHCFadjust_{PI}) + ((SHCFC_{Ref} \times SHCFadjust_{FC})) \times N2$
Where:		
SHC_M	=	The Shutdown Charges during the Month M
$MDIR_x$	=	Total fixed charges for the month due to Distributing segment during the relevant month (based on MDI for the month and MDI charge) divided by the total number of Shutdowns performed during the month.
N1	=	The number of Shutdowns to be claimed, unless any startups claimed during the relevant month in which case this will be considered as zero.
N2	=	The number of Shutdowns to be claimed
$SHC_{(Ref)}$	=	The Reference Shutdown Charge as given below. Consists of the following two components:
$SHCPI_{Ref}$	=	The Reference Shutdown Charge for the Power Import from Transmission System till GT & ST are in Standby mode.
$SHCFadjust_{PI}$	=	The Shutdown Charges Adjustment Factor for the hour h for the Import of Power from Transmission Network as per following formula: **$SHCFadjust_{PI}$ = WAVCT-$B4_{(Rev)}$ / WAVCT-$B4_{(Ref)}$** where: **WACT-$B4_{(Rev)}$** = Weighted Average of the latest notified variable consumer tariff for the Industrial Consumer Category (B-4b) based on a weightage of 4:20 for Peak & Off-Peak Rates respectively. **WACT-$B4_{(Ref)}$** = Weighted Average of the reference notified variable consumer tariff for the Industrial Consumer Category (B-4b) based on a weightage of 4:20 for Peak & Off-Peak Rates (i.e. Rs. 30.33 per kWh & Rs. 24.43 per kWh) respectively **(i.e. Rs. 25.41 per kWh)**
$SHCFC_{Ref}$	=	The Reference Shutdown Charge for the Fuel Consumed during GT & ST (if applicable) De-Synchronization till Flame-Off.
$SHCFadjust_{FC}$	=	The Shutdown Charges Adjustment Factor for the hour h for the consumption of fuel as per the following formula: For Gas[4] – $SHCFadjust_{FC} = FCCG_{Rev} / FCCG_{Ref}$ For HSD – $SHCFadjust_{FC} = FCCHSD_{Rev} / FCCHSD_{Ref}$

Type of Shutdown	Reference Single Section Shutdown Charges (Open Cycle)	Reference Half Complex Shutdown Charges (16 Engines x ST)	Reference 3 Sections Shutdown Charges (24 Engines x ST)	Reference Complex Shutdown Charges (32 Engines x ST)
	PKR million			
Gas	0.01	0.02	0.03	0.04

[4] Proportion of Indigenous Gas & RLNG in both Reference & Revised FCCG will be calculated based on the actual mix of Indigenous Gas & RLNG used as appearing in SSGC Bills for the relevant month in which Shutdown Cost is being claimed whereas Reference and Revised Fuel Cost Component will be calculated as per Section 1.2.1 above.
Furthermore, in case Gas is made available through Dedicated Line/ Alternate Supplier as discussed in Section 1.2.1 above, then separate costs will be calculated and submitted to the Authority for approval.

1.3. Billing Mechanism

Billing shall be based on a Take-or-pay mechanism where Capacity payment shall be paid for the Available Capacity and Energy payments for the Net Electrical Output.

Available capacity for a month shall be based on hourly Annual Dependable Capacity after considering outages in each year.

Annual Dependable Capacity shall be based on ADC Test to be carried out at start of each year, to be carried out by Plant team and results of which shall be submitted to NEPRA.

NEO will be based on energy recorded through meters as explained in above sections.

1.3.1. Capacity Payments

Capacity cost includes Fixed O&M local, Fixed O&M foreign, Insurance, Working capital, RoRB – cost of debt, RoRB – cost of equity and Depreciation which are detailed in above sections. Capacity payment shall be made on a monthly basis as per formula detailed below:

Monthly Capacity Payment

CapacityPayment	=	**CapacityPrice x AvailCap$_m$ x DO$_y$**
Where:		
CapacityPayment	=	the Capacity Payment, in Rupee, paid for a Month;
AvailCap$_m$	=	Aggregate Available capacity, in kWh, for the month based on Hourly Available capacity
CapacityPrice	=	(Fixed O&M local + Fixed O&M foreign, working capital + RoRB – cost of debt + RoRB – cost of equity + insurance) for the relevant month after indexations as explained above.
DO$_y$	=	the output degradation factor, as given in **KTGEPS - Annexure E (ii)** for Combined cycle, for the relevant year. Output degradation is not relevant for Open cycle.

Further, available capacity shall also be adjusted with ambient temperature as per the table given in **KTGEPS – Annexure K.** Moreover, example for calculation of hourly available capacity payment of Gas is also given in **KTGEPS – Annexure L.**

Outages

Plant will maintain Annual Availability of 90% considering annual outages of 10%. In addition, in case of periodic overhauls, following outage days shall be allowed;

- **21.5 Days (516 hours)** of Maintenance outages Per Engine & ST,
- **15 Days (360 hours)** of forced outages Per Engine & ST

Further, Additional outages will be required for Overhauls as below:

- Engine 60,000 Operating Hours Maintenance - in which case the Company shall be entitled to **an additional forty (40) days** of Maintenance Outage periods.
- Engine 30,000 Operating Hours Maintenance - in which case the Company shall be entitled to **an additional twenty five (25) days** of Maintenance Outage periods.
- ST Major Inspection at 40,000 operating hours interval in which case the Company shall be entitled to **an additional Thirty Five (35) days** of Maintenance Outage periods.

These overhauls will be required when plant will reach the required Operating hours. Based on annual availability of 90% and expected occurrence of Overhauls, Levelized Plant factor has been calculated as **87.81%. Please refer KTGEPS - Annexure M**

The plant will be considered as available when plant is standby including periods when gas is unavailable as the same is not under KE's control. KE remains in continuous engagements with SSGC for resolution of this matter and is also working on alternative options.

1.3.2. Energy Payments

Energy cost includes

- Fuel cost (including Indigenous Natural Gas & RLNG),
- Variable O&M local & Variable O&M foreign which are detailed in above sections multiplied by degradation factor of relevant year.

The Energy Price shall be calculated using the Reference Fuel Cost Component during the year as follows:

Fuel	NEO for the month	Fuel	Variable O&M local	Variable O&M Foreign	Total Variable O&M	Output Degradation factor	Variable O&M after Degradation factor	EPP per unit	Energy payment
	A	b	c	d	e=c+d	f	g=exf	h=b+g	i=axh
	kWh	PKR / kWh	PKR / kWh	PKR / kWh	PKR / kWh	Factor	PKR / kWh	PKR / kWh	PKR
Natural Gas – Combined cycle	Units	$FCCIG_{(Rev)(adj)}$	Var. Local. $O\&M_{(Rev)}$	Var. Foreign. $O\&M_{(Rev)}$	Calculated	Relevant factor	Calculated	Calculated	Calculated
Natural Gas – Simple	Units	$FCCIG\text{-}SC_{(Rev)(adj)}$	Var. Local. $O\&M_{(Rev)}$	Var. Foreign. $O\&M_{(Rev)}$	Calculated	Relevant factor	Calculated	Calculated	Calculated
RLNG – Combined cycle	Units	$FCCRLNG_{(Rev)(adj)}$	Var. Local. $O\&M_{(Rev)}$	Var. Foreign. $O\&M_{(Rev)}$	Calculated	Relevant factor	Calculated	Calculated	Calculated
RLNG – Simple	Units	$FCCRLNG\text{-}SC_{(Rev)(adj)}$	Var. Local. $O\&M_{(Rev)}$	Var. Foreign. $O\&M_{(Rev)}$	Calculated	Relevant factor	Calculated	Calculated	Calculated
Total	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated

1.4. O&M Sharing Mechanism

KE is proposing to share the savings in O&M, if any, in proportion of 60:40 for Consumers: KE, which shall be calculated at completion of Overhaul cycle.

Overhaul cycle shall be completed when

- Major inspections of all Engine(s) are completed at every 60,000 hours; and
- Major overhaul of ST is completed at every 40,000 hours.

At completion of Overhaul cycle, any savings in O&M shall be shared in 60:40 for Consumers: KE, where is in case of Loss, it shall be carried forward to future years to set off with expenses of future years.

For the purpose of calculation of sharing of O&M savings/ (loss) at the completion of each major overhaul cycle, O&M expenses (O&M Expenses as per Profit & Loss Account & Addition to CWIP) as per the audited financial statements shall be used. .

An illustration of sharing mechanism for one cycle is given in **KTGEPS - Annexure N**. Same shall be applicable for next major overhaul cycles till the end of plant life.

1.5. Other items

Items generally covered under PPA

Unlike previous MYT, KE has proposed Tariff structure in line with IPPs. In case of IPPs, certain modalities / charges are governed under the Power Purchase Agreement, which have

been included in the petition. However, detailed modalities and other remaining terms will be agreed in a "Service Level Agreement" for which KE has prepared and Annexed a Head of Terms (please refer, **KTGEPS – Annexure O**). Full scope SLA will be prepared and submitted for NEPRA's approval based on Tariff determination.

Alternate Supplier of RLNG

In case of any additional requirements on account of arranging RLNG through an Alternative Supplier as detailed in **Section 1.2.1 - Plant Capacity and Heat Rate** above, KE will submit details of the proposal separately to NEPRA for approval. Post approval of the Authority, KE will file a one-time adjustment for reference tariff components, based on allowed investment, Net capacity and heat rate impacts.

Costs pursuant to Unbundling in future

KE is an integrated utility and therefore there are certain synergies in common costs. In future, if there is any legal unbundling, KE will file for a onetime adjustment for additional costs pursuant to that.

Costs pursuant to Force Majeure Events

Costs related to a Force Majeure Events are allowed to IPPs and accordingly KE also request those to be passed through in Tariff. Details and modalities of force majeure events will be included under the SLA, pursuant to the Terms of Agreements as explained in **KTGEPS – Annexure O**, in line with agreements of other IPPs.

1.6. Summary of Base Tariff FY 2024 & Indexation Mechanism

In view of the foregoing and considering the significant changes in tariff structure, following component wise indexation mechanism is being requested to ensure recovery of prudent costs critical to ensure quality of service.

Tariff Components	RLNG PKR / kWh	Indexation Mechanism	Reference Rates
Energy cost Fuel cost	29.83	• Indexation with fuel price. • Impact of allowed part load and degradation factor (monthly)	• Net HHV RLNG price of PKR 3,301 / MMBtu
Variable O&M – local	0.04	• Indexed with Pak CPI (Quarterly)	• CPI of 158.48 for FY 2022 average
Variable O&M – Foreign	1.37	• Indexed with US CPI and USD to PKR exchange rate (Quarterly)	• US CPI of 282.03 for FY 22 average • Exchange rate of PKR 206 / USD
Energy cost subtotal	31.25		
Capacity cost Fixed O&M – local	0.40	• Indexed with Pak CPI (Quarterly)	• CPI of 158.48 for FY 2022 average
Fixed O&M – Foreign	0.03	• Indexed with US CPI and USD to PKR exchange rate (Quarterly)	• US CPI of 282.03 for FY 22 average • Exchange rate of PKR 206 / USD
Insurance	0.25	• Indexed with USD to PKR exchange rate – quarterly • Annual actualization based on capping of 1% of EPC cost (in USD terms)	• Exchange rate of PKR 206 / USD as of FY22
Working Capital	0.47	• Indexed with KIBOR (Quarterly) and change in fuel prices.	• KIBOR of 15.16% as of FY22
RoRB - Cost of Debt Local	0.54	• Indexed with KIBOR (Quarterly) • Recalculated based on RAB changes due to addition of specific project approved by NEPRA	• KIBOR of 15.16% as of FY22
RoRB - Cost of Equity	0.50	• Indexed with USD to PKR exchange rate • Recalculated based on RAB changes due to addition of specific project approved by NEPRA	• Exchange rate of PKR 206 / USD as of FY22
Depreciation	0.28	• Recalculated based on RAB changes due to addition of specific project approved by NEPRA	
Capacity cost subtotal	2.48		
Total Base Tariff – FY 2024	33.73		
Levelized tariff	33.20		
Energy cost Fuel cost – Simple cycle	32.43	• Indexation with fuel price • Impact of allowed part load and degradation factor (monthly)	• Net HHV RLNG price of PKR 3,301 / MMBtu
Fuel cost – Ind gas - CC	7.75	• Indexation with fuel price • Impact of allowed part load and degradation factor (monthly)	• Net HHV Ind Gas price of PKR 857 / MMBTU
Fuel cost – Ind gas - OC	8.42	• Indexation with fuel price • Impact of allowed part load and degradation factor (monthly)	• Net HHV Ind Gas price of PKR 857 / MMBTU

Please refer following tariff tables for year wise tariffs.

K-Electric Limited
Generation Plants Tariff Petition
KTGEPS
Tariff table - FY 2024 and onwards

Gas Fuel - RLNG

Gross Capacity	95.5	MW		Exchange rate	206	PKR / USD
Net Capacity	92.1	MW		KIBOR	15.16%	%
Units at full capacity	806.4	GWh		LIBOR	2.29%	%

		Energy Purchase Price (PKR / kWh)				Capacity Purchase Price PKR / kW / hour at 87.81% Plant factor											
Year	FY	Fuel cost CCGT RLNG	Variable O&M - local	Variable O&M - Foreign	EPP	Fixed O&M - local	Fixed O&M - Foreign	Insurance	RoRB - Cost of debt - local	RoRB - Cost of debt - foreign	RoRB - Cost of Equity	Depreciation	Working capital	CPP	Total tariff PKR / kWh	Total tariff Cents / kWh	CPP PKR / kW / month
		a	b	c	d = a + b + c	e	f	g	h	i	j	k	l	m = sum e to l	n = d + m	o = n / 206	p
1	2024	29.83	0.04	1.37	31.25	0.40	0.03	0.25	0.54	-	0.50	0.28	0.47	2.48	33.73	16.37	1,811
2	2025	29.83	0.04	1.37	31.25	0.40	0.03	0.25	0.51	-	0.47	0.28	0.47	2.41	33.66	16.34	1,762
3	2026	29.83	0.04	1.37	31.25	0.40	0.03	0.25	0.48	-	0.44	0.28	0.47	2.35	33.59	16.31	1,714
4	2027	29.83	0.04	1.37	31.25	0.40	0.03	0.25	0.44	-	0.41	0.28	0.47	2.28	33.53	16.28	1,665
5	2028	29.83	0.04	1.37	31.25	0.40	0.03	0.25	0.41	-	0.37	0.28	0.47	2.21	33.46	16.24	1,616
6	2029	29.83	0.04	1.37	31.25	0.40	0.03	0.25	0.37	-	0.34	0.28	0.47	2.15	33.39	16.21	1,567
7	2030	29.83	0.04	1.37	31.25	0.40	0.03	0.25	0.34	-	0.31	0.28	0.47	2.08	33.33	16.18	1,519
8	2031	29.83	0.04	1.37	31.25	0.40	0.03	0.25	0.30	-	0.28	0.28	0.47	2.01	33.26	16.15	1,470
9	2032	29.83	0.04	1.37	31.25	0.40	0.03	0.25	0.27	-	0.25	0.28	0.47	1.95	33.19	16.11	1,421
10	2033	29.83	0.04	1.37	31.25	0.40	0.03	0.25	0.23	-	0.21	0.28	0.47	1.88	33.13	16.08	1,372
11	2034	29.83	0.04	1.37	31.25	0.40	0.03	0.25	0.20	-	0.18	0.28	0.47	1.81	33.06	16.05	1,323
12	2035	29.83	0.04	1.37	31.25	0.40	0.03	0.25	0.16	-	0.15	0.28	0.47	1.75	32.99	16.02	1,275
13	2036	29.83	0.04	1.37	31.25	0.40	0.03	0.25	0.13	-	0.12	0.28	0.47	1.68	32.93	15.98	1,226
14	2037	29.83	0.04	1.37	31.25	0.40	0.03	0.25	0.09	-	0.09	0.28	0.47	1.61	32.86	15.95	1,177
15	2038	29.83	0.04	1.37	31.25	0.40	0.03	0.25	0.06	-	0.05	0.28	0.47	1.55	32.79	15.92	1,128
16	2039	29.83	0.04	1.37	31.25	0.40	0.03	0.25	0.02	-	0.02	0.28	0.47	1.48	32.73	15.89	1,079
	2040	29.83	0.04	1.37	31.25	0.40	0.03	0.25	0.02	-	0.02	0.28	0.47	1.47	32.71	15.88	1,071
Average tariff		29.83	0.04	1.37	31.25	0.40	0.03	0.25	0.27	-	0.25	0.28	0.47	1.95	33.20	16.11	1,423

PKR 33.2 / kWh

US Cents 16.11 / kWh

Fuel cost component -

RLNG - Simple cycle	32.43
Indigenous Gas - combined cycle	7.75
Indigenous Gas - Simple cycle	8.42

K-ELECTRIC LIMITED

KTGEPS - Annexures

List of Annexures

Annexure	Description
KTGEPS – Annexure A (i)	Major Activities Performed for Improving Performance of the Plant
KTGEPS – Annexure A (ii)	Safety procedures
KTGEPS – Annexure A (iii)	Projects details
KTGEPS – Annexure A (iv)	Minimum Loading
KTGEPS – Annexure A (v)	Fire protection system
KTGEPS – Annexure A (vi)	Plant layout
KTGEPS – Annexure A (vii)	Details of Major Equipment
KTGEPS – Annexure B (i)	Sample bill for April (Indigenous Natural Gas / RLNG)
KTGEPS – Annexure B (ii)	Sample calculation for Indigenous Natural Gas / RLNG
KTGEPS – Annexure C (i)	Part load Adjustment Factor table - Gas - CC
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KTGEPS – Annexure E (i)	Degradation table -Net Heat rate HHV (Gas) - CC
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KTGEPS – Annexure F	O&M Break up (levelized)
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KTGEPS – Annexure H	RAB Movement
KTGEPS – Annexure I (i)	Calculation of indexed RoE
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KTGEPS – Annexure K	Output Adjustment due to Ambient temperature
KTGEPS – Annexure L	Capacity payment sample calculation
KTGEPS – Annexure M	Outage Schedule and plant factor
KTGEPS – Annexure N	Sharing Mechanism
KTGEPS – Annexure O	Head of Terms

KTGEPS – Annexure A (i)

Major Activities Performed for improving performance of the plant

- Modifications in electrical and mechanical BOPs to enhance reliability of plant.

Engine	Type of Major Overhaul	Dates
E11	30K	12-Apr-16
E12	30K	28-Feb-16
E13	30K	31-Mar-17
E14	30K	24-Jul-15
E15	30K	29-Jul-16
E16	30K	15-Apr-16
E17	30K	27-Jan-16
E18	30K	26-May-16
E21	30K	30-Jun-15
E22	30K	10-Jun-15
E23	30K	28-Jan-15
E24	30K	6-Apr-15
E25	30K	24-Feb-15
E26	30K	9-Dec-14
E27	30K	12-Mar-15
E28	30K	17-Jan-15
E31	30K	20-Dec-16
E32	30K	28-Apr-15
E33	30K	10-Jun-17
E34	30K	19-Sep-15
E35	30K	12-Dec-15
E36	30K	14-Jul-15
E37	30K	23-Sep-15
E38	30K	26-Jun-15
E41	30K	15-Oct-15
E42	30K	19-Jan-16
E43	30K	9-Feb-16
E44	30K	26-Sep-16
E45	30K	7-Jan-16
E46	30K	23-Jun-16
E47	30K	31-Oct-15
E48	30K	30-Nov-15
E21	60K	9-Nov-19

Engine	Type of Major Overhaul	Dates
E24	60K	13-Aug-20
E25	60K	6-Sep-20
E41	60K	23-Aug-20
E45	60K	3-Aug-20
E26	60K	21-Feb-21
E47	60K	25-Feb-21
E27	60K	3-Apr-21
E22	60K	27-Apr-21
E23	60K	29-Apr-21
E28	60K	8-Apr-21

KTGEPS – Annexure A (ii)

Safety procedures

S. No	Document Name
1	Integrated Organization Structure for Safety Procedure
2	Hazard Identification and Risk Assessment
3	Environment Aspect and their Impacts
4	Setting HSEQ Objectives and Targets
5	HSEQ Laws and Regulations
6	HSEQ Responsibilities and Accountabilities
7	HSEQ Trainings, Awareness and Competence
8	Control of Documents and Records
9	Communication and Consultations
10	Emergency Preparedness and Response
11	Calibration of Measuring and Monitoring Devices
12	Measurement and Monitoring of HSEQ System
13	Evaluation of Compliance
14	Internal Audit
15	Change Management
16	Incident Investigation Procedure
17	Risk and Opportunity Management
18	Context of Organization and Change Management
19	Personal Protective Equipment
20	Competence, Training and Awareness
21	Permit to Work Procedure
22	Lock Out / Tag Out Procedure
23	Safety Induction
24	Hazardous Substances Management
25	Compressed Gas Cylinders Handling and Storage
26	Working at Height and Scaffolding
27	Manual Handling
28	Oxyacetylene Welding Procedure
29	Noise Management
30	Waste Management
31	Hot Work Safety
32	Toolbox Talk Procedure
33	Confined Space Safety
34	Ionization Radiation for Non-Destructive Testing
35	Use of Self-Contained Breathing Apparatus (SCBA)
36	Animal Infestation Procedure
37	Indoor Air Quality
38	Environmental incident reporting procedure
39	Resource conservation procedure
40	Ladder Procedure

KTGEPS – Annexure A (iii)

Project Details

Plant Reference Condition

Reference Conditions at the Plant Site are:

1. Ambient Air Temperature = Tra = 30 deg. C
2. Total Barometric Pressure = p_T = 1013.2 mbar
3. Relative Humidity = 60%
4. Power Factor = 0.85 (Lagging)
5. System Frequency = 50 Hz
6. Fuel Supply Temperature = 25 deg C
7. Gas Fuel (LHV) = 34,200 Kj/Kg

Plant Configuration

Technology	Combine Cycle Power Plant
Type of fuel	Indigenous Natural Gas/RLNG.
Equipment	Indigenous Natural Gas Reciprocating 4-stroke engines and steam turbine
Units	32 engines + 32 HRSG + 1 steam turbine
Output	107.312 MW ISO Installed
Make	Gas Engines – GE Jenbacher, Steam Turbine – NG Allen
Model	Gas Engines – JGS 620 GS-NL, Steam Turbine – UK MC-800

Plant Characteristics

Gross Capacity – MW (RSC)	95.513
Auxiliary Consumption	3.462 MW
Net Plant capacity	92.05 MW
Net Plant efficiency (LHV)	41.867%
Generation voltage	11 kV
Grid voltage	132 kV
Frequency	50 Hz
Power factor	Lead 0.98 for Engines and 0.95 for ST / Lag 0.80 for all Engines and ST
Ramp up rate of generators	"16 KW/Sec (Open Cycle) 0.33 MW/min (Cold run-Up for ST) 0.5 MW/min (Warm run-up for ST) 0.666 MW/min (Hot run-up for ST)"
Time required to synchronization to grid at full load	3 Hours & 53 Minutes for CC operation, when Boilers hot

Frequency Limits

The generators are capable of maintaining constant output for system frequency range of 50 Hz +/- 3% in accordance with the requirements.

Voltage Limits

The plant is capable to operate continuously within the voltage range of 132/11 kV +/- 10%.

Noise

The noise level is less than 75 dB(A) which fall within the EPA prescribed.

Water Resources

The power plant is designed on a subsoil water source treated through Reverse Osmosis plant. To meet additional water requirements, KDA water tankers are used.

KTGEPS – Annexure A (iv)

Minimum loading details

NEPRA Query:

- Reasons as well as supporting data (OEM) regarding minimum loading of KGTPS.

KE Response:

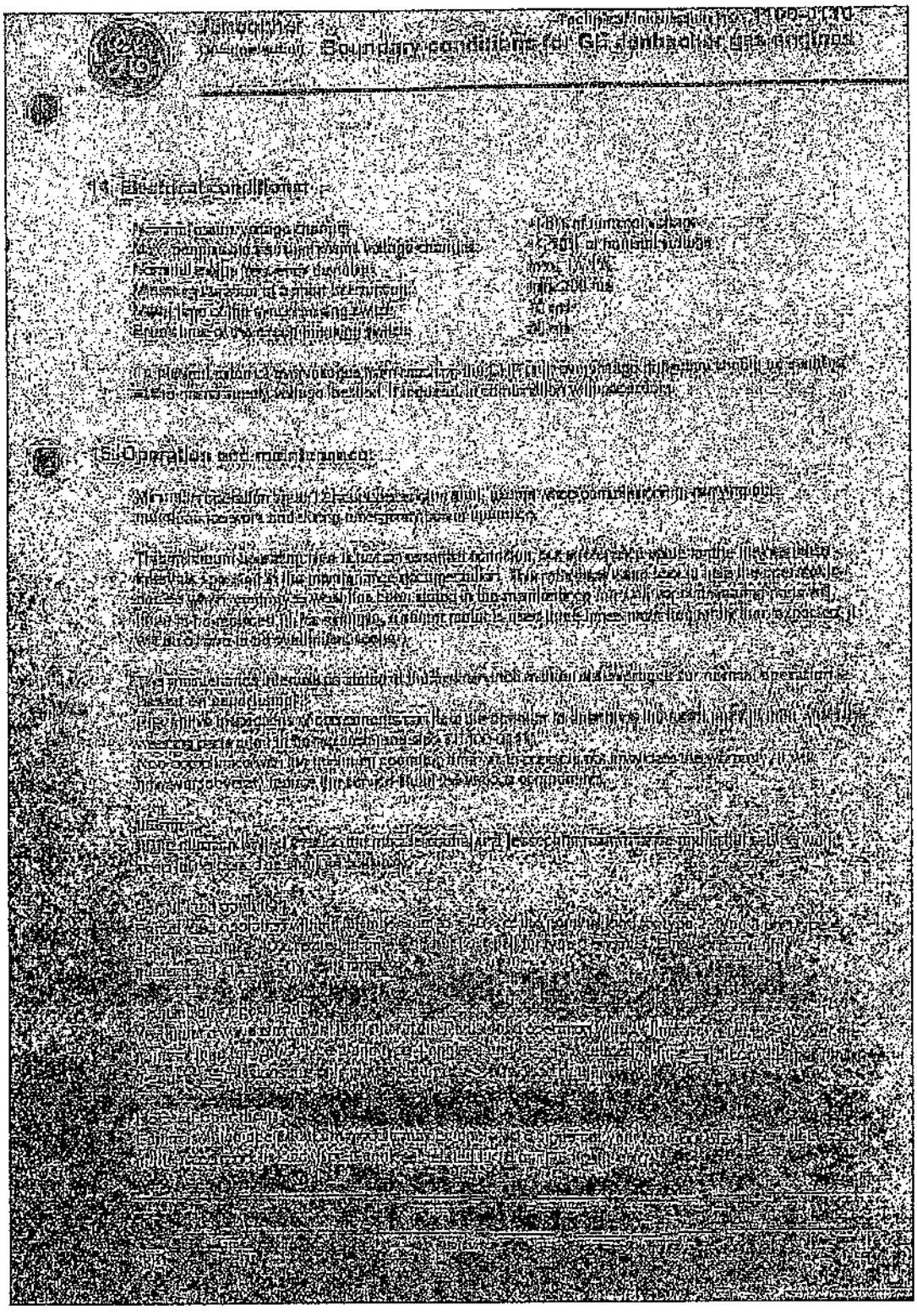
Reference Document: Technical Instruction 1100-0110 (Boundary Conditions for GE Jenbacher Gas Engines) , Page 11 (attached)

As per OEM, Plant should always aim for full load operation which is also necessary for combine cycle Operation, if needed for any specific reasons, engine can run on partial load of > 40% of the full load. However, emissions are only guaranteed with > 50% load.

Note: Partial loading badly impacts Plant's combine cycle operation, efficiency, and After-Turbo Temperature of engine (which may increase to trip limit).

Syed Amir Ali
Operations Head KGTPS

Zeeshan Mumtaz
Plant Head KGTPS



KTGEPS – Annexure A (v)

Fire Protection System

Fire Protection System has following main measures:

1. **Fire area, fire escape and evacuation passage**

   Plant wide Emergency "Emergency Evacuation Map" at the entrance and other conspicuous locations to warn and update the entrants of the buildings about the route to be taken to assembly point, in case of any emergency.

   Also, every building has been provided with the adequate number of emergency evacuations passageways (exit doors) which are always kept healthy and unobstructed to be easily accessible during any emergency.

2. **Evacuation Channels**

   Plant has dedicated emergency warning (siren, buddy system, walkie-talkie, hot lines) system, while actions from every employee are clearly documented in the plant Emergency Response Procedure on what to do when they hear the alarm / observe an emergency situation.

   Moreover, dedicated Fire Wardens are assigned against individual buildings who ensure (in case of any emergency) the complete evacuation of the workers in the dedicated building.

   Plant has also dedicated assembly point, where every individual has to report after hearing the emergency siren and then a robust headcount management system is followed.

   In case of any off-site evacuation need (due to any injury), dedicated emergency vehicle (ambulance) is also available at plant, to support prompt evacuation of injured individual to the nearest medical facility.

3. **Fire-fighting system and fire extinguisher**

   Internationally accepted (i.e. NFPA) and advanced firefighting & fire protection systems are available at plant (including fire hydrant network, water deluge system, foam suppression system). Adequate number of fire extinguishers have also been installed across the plant premises (indoor as well as outdoor) and different training sessions are imparted among the team for its operation throughout the year.

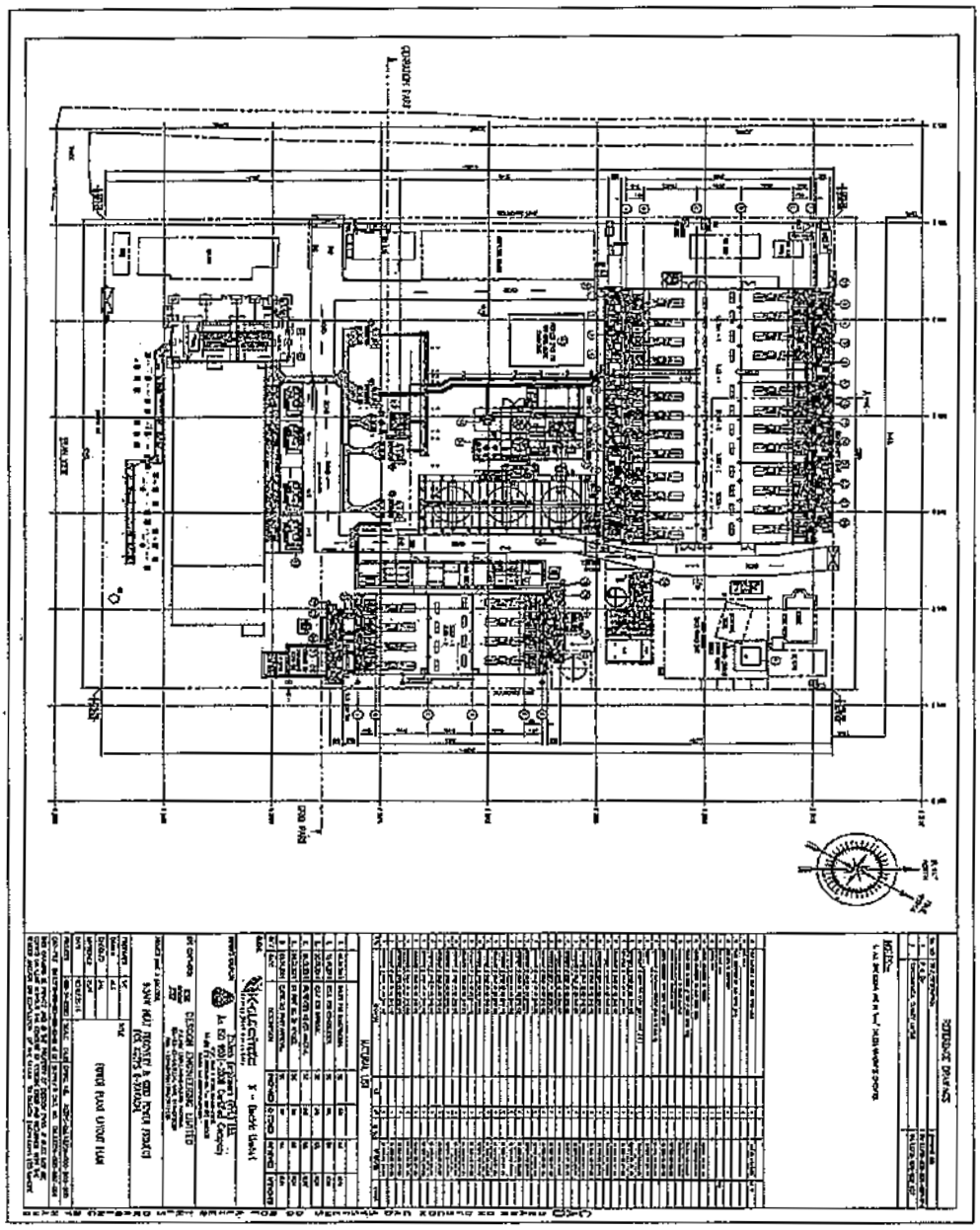
4. **Fire pump and alarm monitoring**

   Plant has a dedicated fire water network (covering whole plant premises), along with NFPA compliant fire pumps and water storage facility (supporting ample time of firefighting).

   Early detection of the fire is given paramount importance which ensures that fire is detected at the incipient stage. These (smoke detectors) are widespread across the plant and integrated with plant fire siren system. Multiple manual call points are also installed across the plant for actuation of the fire siren, upon observing any fire emergency.

KTGEPS – Annexure A (vi)

Plant Layout



KTGEPS – Annexure A (vii)

Details of Major Equipment

Gas Engines

Description	Parameters
Manufacturer, country	GE Jenbacher
Model/Type	J 620 GS-E01
Year of Manufacture	2009
Speed (RPM)	1500
Site Rating Gross /Net	2739 kWh
Air Filtration, Type	Forced Draught Pressurized Cabin Filter Type
Turbo Charger Make & Model	MAN PBS NR20/SJ
Exhaust Bypass Stack available	Yes
Starting System	Cranking DC motor with batteries backup
Control System	Diane XT Controllers
Engine Cooling System	Closed System Radiators
Specific Fuel Consumption	0.280 Standard Cu. Meter
Safety Protection Systems	Diane PLC in built safety interlocking and hardwire fail-safe loop
Type of Fire Protection - Detection - Suppression	1. Fire Detection system via smoke sensing initiates engine trip and cuts off air intake/exhaust. 2.Gas detection system initiates engine trip and engine hall ventilation on fuel gas detection. 3. Adequate Portable Fire Extinguishers (DCP & CO_2) are available in Engine Halls

Gas Engine Alternators

Description	E11, E42 Alternators	Alternators (Remaining)
Manufacturer, Country	AVK, Romania	AVK, Germany
Year of Manufacture	2016	2009
Type/Model	DIG 142 e/4	
Rating MVA/MW	4.45/3.56	
Voltage/Frequency/Power Factor	11000V/50Hz/0.80	
Speed	1500	
Insulation Class	F	
Excitation Type	Brushless Excitation /AVR	
Protection	OC/SC, EF, UV, UF, OV, OF, df/dt, RP, LOE, NC, Differential	
Efficiency	97% @ .8 PF, 97.6 @ 1.0PF	
Cooling -Stator winding -Stator Core -Rotor	Forced Air	
Type of Fire Protection - Exciter - Generator	Smoke Detection - Portable Fire Extinguishers (DCP/CO_2) available at site	

Steam Turbine

Description	Parameters
Manufacturer	NG Allen
Year	2014
Model	MC-800
Serial Number	415534
Type	Low Reaction
Stages	9
Rating, ISO & Site	10,000 KW
Speed (RPM)	6532
Casing	OEM Provided
HP Steam pressure	17 barg
HP Steam temperature	355 Deg. Celsius
HP Steam Flow	52 TPH
LP Exhaust Flows	Not Applicable
LP Steam inlet pressure	Not Applicable
LP Steam inlet temperature	Not Applicable
Control System, Make & Type	Allen Bradley PLC
Type & Specs of Lube Oil	ISO VG68
Type & Specs of Control Oil	ISO VG68
Type of Fire Protection	- Heat detection and water deluge system. - Beam Detection System - Portable Fire Extinguishers (DCP/CO_2) available at site

Steam Turbine Alternators

Description	Parameters
Manufacturer	Indar
Year of Manufacture	2014
Model	LSA-900-X/4
Serial Number	4010000892
Rating MVA/MW	12.875
Voltage	11000
Speed	1500
Frequency	50
Power Factor	0.8
Insulation Class	H
Protection	POC, -ve seq, GOC, Phase diff, High set overcurrent, UV, OV, Phase reversal, UF/OF, LOE, RP, ROCOF, inadvertent energization.
Cooling Medium	Water-Air
Excitation Type	Brushless / AVR
Efficiency	97.3% @ 0.8 PF, 98.1 @1.0 PF
Cooling	TEAWC (Total enclosed Air Water cooled, IC81W)
Type of Fire Protection - Exciter - Generator	Heat Detection System and Manual Suppression System - Portable Fire Extinguishers (DCP/CO_2) available at site

Section Transformers

Description	Parameters			
	Section 1	Section 2	Section 3	Section 4
Manufacturer	Hitachi	Hitachi	Hitachi	Hitachi
Country of Origin	Japan	Japan	Japan	Japan
Year of Manufacturing	1978	1976	1976	1976
International Standard of Manufacture	IEC 76-1967	IEC 76-1967	IEC 76-1967	IEC 76-1967
Rating	22 MVA /30 MVA	22 MVA /30 MVA	22 MVA /30 MVA	22 MVA /30 MVA
HV/LV	132/11.5 KV	132/11.5 KV	132/11.5 KV	132/11.5 KV
Tap	5	5	5	5
Cooling	ONAN/ONAF	ONAN/ONAF	ONAN/ONAF	ONAN/ONAF
Separation	YES	YES	YES	YES

Description	Parameters			
	Section 1	Section 2	Section 3	Section 4
Deluge Fire Protection	YES	YES	YES	YES
Dissolved Gas Monitoring	YES (not online)	YES (not online)	YES (not online)	YES (not online)
Fire Separation	NA	Firewall	Firewall	NA
Frequency	50HZ	50HZ	50HZ	50HZ
Oil Capacity	13524 Kg	13524 Kg	13524 Kg	13524 Kg
Containment, Oil Drain Pit, type & size	Yes	Yes	Yes	Yes
Type of - Fire Detection - Suppression	Heat Detectors & Deluge System	Heat Detectors & Deluge System	Heat Detectors & Deluge System	Heat Detectors & Deluge System

ST Transformer

Description	Parameter
Manufacturer	PEL
Country of Origin	Pakistan
Year	2015
International Standard of Manufacture	IEC 60076
Type	TMNO 15500/145
Serial Number	PEL-HV1150012
Rating	15.5 MVA
HV/LV Voltage	132/11 KV
Tap	5
Cooling	ONAN
Separation	YES
Deluge Fire Protection	YES
Dissolved Gas Monitoring	YES (not online)
Fire Separation	Firewall
Frequency	50Hz
Oil Capacity	10,074Kg
Containment, Oil Drain Pit, type & size	Secondary Oil Containment Pit, 798.3 cubic ft, 22605 L capacity
Type of --Fire Detection --Suppression	Heat Detectors & Deluge System

Auxiliary Transformers

Description	Parameters			
	Sec 1 Aux	Sec 2 Aux	Sec 3 Aux	Sec 4 Aux
Manufacturer	Siemens	Siemens	Siemens	Siemens
Year	2009	2009	2009	2009
International Standard	IEC 60076	IEC 60076	IEC 60076	IEC 60076
Serial Numbers	20900426	20900429	20900431	20900430
Rating	2 (MVA)	2 (MVA)	2 (MVA)	2 (MVA)
Voltage/Frequency	11000/400V / 50Hz	11000/400V / 50Hz	11000/400V / 50Hz	11000/400V / 50Hz
Tap	6	6	6	6
Cooling	ONAN	ONAN	ONAN	ONAN
Oil Capacity	1250 KG	1250 Kg	1250 Kg	1250 Kg
Containment, Oil Drain Pit, *type & size*	Yes	Yes	Yes	Yes
Type of --Fire Detection --Suppression	Yes	Yes	Yes	Yes

Auxiliary Transformer ST

Description	Parameters
Manufacturer	PEL
Year	2014
International Standard	IEC 60076
Serial Numbers	342635
Rating	2 (MVA)
Voltage/Frequency	11000/415 V / 50Hz
Tap	5
Cooling	ONAN
Oil Capacity	1290 kg
Containment, Oil Drain Pit, type & size	Yes
Type of --Fire Detection --Suppression	Yes

Emergency Diesel Engine

Description	Unit	Parameter
Type	-	Four stroke Diesel Engine
Model	-	TAD-1242 GE
Engine Output	kW	398
Number of cylinders	-	6
Bore	mm	131
Stroke	mm	150
Cylinder configuration	-	In-line
Rotation direction	-	Counterclockwise
Max. Cylinder pressure	bar	Not Available
Speed	rpm	1500
Mean effective pressure	bar	Not Available
Weight	T	1.455

Waste Heat Recovery Steam Generator (32 WHRSG)

Parameter	WHRSG
Manufacturer	Descon
Country of Manufacture	Pakistan
Year	2014
Type/Model	Water tube
Heat source	Exhaust gases
HP Steam pressure	17.0 barg
HP Steam temperature	350 deg C
HP Steam flow	1.7 t/h

KTGEPS – Annexure B (i)

RLNG Sample Bills April 2020

Sui Southern Gas Company Limited
SSGC Block 14, Sir Shah Suleman Road, Gulshan-e-Iqbal, Karachi 75300 www.ssgc.com.pk

KESC KORANGI TOWN GAS TURBINE (KTGT)
K-Electric Limited
Plot No. 1,
Sector-19 Korangi Industrial Area, NC 376 Deh Pat Tappo Landhi

SSGC General Sales Tax Number 02-04-9026-001-19

Billing Group: (A-I1/0108985 /12)

For emergencies and complaints please call 1199

SERVICE WITH A SMILE
Contact your Neighborhood Customer Facilitation Centre at: SIR SHAH SULEMAN ROAD, GULSHAN-E-IQBAL, NEAR CIVIC CENTER, TEL: 99021041

ACCOUNT INFORMATION

Customer Number:	4655415095 (6)
Billing Month	April 2020
Tariff/Customer Class	IND
GST/NTN Number:	1200271600728

Issue Date: 04 May 2020

ACCOUNT SUMMARY AS OF

Previous Balance (Rs.)	Current Charges (Rs)	Payable Within Due Date (Rs.)	Late Payment Surcharge (Rs)	Payment After Due Date (Rs.)	Due Date
	68,903,496	68,903,496	1,033,552	69,937,049	06 May 2020

MONTHLY CONSUMPTION

METER INFORMATION

METER No.	CURRENT DATE	CURRENT READING	PREVIOUS DATE	PREVIOUS READING	MEASURED QTY (SCM)
25300069	30 Apr 2020		01 Apr 2020		1,106,952

SMS CODE	GCV (BTU/SCF)	MMBTU	No. OF DAYS	PRESSURE	TEMP
	947.379998	37,289.860759		1	1

BILL & PAYMENT HISTORY

Month	Bill Amount (Rs.)	Payment Date	Amount (Rs.)

BILL CALCULATION

Tariff $ = 165.23
Tariff Rs. 1579.3

COMPUTATION OF CURRENT GAS CHARGES

SLAB	CMs	MMBTU	RATE/ MMBTU (Rs.)	AMOUNT (Rs.)

GID CESS

IMPORTANT MESSAGES

CURRENT CHARGES (RS)

Gas Charges	58,891,877
Meter Rent	
General Sales Tax	10,011,619
Withholding Tax @ 4%	
Other Charges	
Less: Provisional Bill Corrections	
Adjustments - Debit	
Adjustments - Credit	

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Sui Southern Gas Company Limited
Block 14, Sir Shah Suleman Road, Gulshan-e-Iqbal, Karachi 75300
SSGC www.ssgc.com.pk

M/S KESC KORANGI TOWN GAS TURBINE (KTGT)
K-Electric Limited
Plot No. 1,

Customer Number	Total Amount Due	Due Date	After Due Date
4655415095 (6)	68,903,496	06 May 2020	69,937,049

Sui Southern Gas Company Limited
SSGC Block 14, Sir Shah Suleman Road, Gulshan-e-Iqbal, Karachi 75300 www.ssgc.com.pk

SSGC General Sales Tax Number 02-04-9028-001-19

KESC KORANGI TOWN GAS TURBINE (KTGT)
K-Electric Limited
Plot No. 1,
Sector-19 Korangi Industrial Area NC976 Deh Tai Tappa Landhi

Billing Group: (A-I1/0108995 /12)

For emergencies and complaints please call **1199**

SERVICE WITH A SMILE
Contact your Neighborhood Customer Facilitation Center at:
SIR SHAH SULEMAN ROAD GULSHAN-E-IQBAL NEAR CIVIC CENTER. TEL: 99021041

ACCOUNT INFORMATION

Customer Number:	6322910000 (1)
Billing Month	April 2020
Tariff/Customer Class	IND
GST/NTN Number:	1200271600728

Issue Date: 03 May 2020

ACCOUNT SUMMARY AS OF

Previous Balance (Rs.)	Current Charges (Rs.)	Payable Within Due Date (Rs.)	Late Payment Surcharge (Rs.)	Payment After Due Date (Rs.)	Due Date
	158,539,019	158,539,019	2,378,085	160,917,105	06 May 2020

MONTHLY CONSUMPTION

METER INFORMATION

METER No.	CURRENT DATE	CURRENT READING	PREVIOUS DATE	PREVIOUS READING	MEASURED QTY (SCM)
16128823	30 Apr 2020		01 Apr 2020		2,551,571

SMS CODE	GCV (BTU/SCF)	MMBTU	No. OF DAYS	PRESSURE	TEMP
	947.379998	85,799.680515		1	1

BILL & PAYMENT HISTORY

Month	Bill Amount (Rs.)	Payment Date	Amount (Rs.)

BILL CALCULATION

Tariff $ = 165.23
Tariff Rs. 1579.3

COMPUTATION OF CURRENT GAS CHARGES

SLAB	CMs	MMBTU	RATE/ MMBTU (Rs.)	AMOUNT (Rs.)

GID CESS

IMPORTANT MESSAGES

CURRENT CHARGES (Rs.)

Gas Charges	135,503,435
Meter Rent	
General Sales Tax	23,035,584
Withholding Tax @ 4%	
Other Charges	
Less: Provisional/Bill Corrections	
Adjustments - Debit	
Adjustments - Credit	

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Gulshan-e-Iqbal, Karachi 75300
SSGC www.ssgc.com.pk

M/S KESC KORANGI TOWN GAS TURBINE (KTGT)
K-Electric Limited
Plot No. 1,

Customer Number	Total Amount Due	Due Date	After Due Date
6322910000 ()	158,539,019	06 May 2020	160,917,105

Indigenous Sample Bills April 2020

Sui Southern Gas Company Limited
SSGC Block 14, Sir Shah Suleman Road, Gulshan-e-Iqbal, Karachi 75300 www.ssgc.com.pk

SSGC General Sales Tax Number 02-04-9028-001-19

KESC KORANGI TOWN GAS TURBINE (KTGT)
K-Electric Limited
Plot No 1,
Sector 19 Korangi Industrial Area, NC376 Deh Tal Tabbo (Landhi)

Billing Group: (A-11/0108985 /09)

For emergencies and complaints please call
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SERVICE WITH A SMILE
Contact your Neighborhood Customer Facilitation Center at:
SIR SHAH SULEMAN ROAD, GULSHAN-E-IQBAL, NEAR CIVIC CENTER. TEL: 99021041

ACCOUNT INFORMATION

Customer Number:	7903464064 (3)
Billing Month	Apr- 2020
Tariff/Customer Class	IND -
GST/NTN Number:	1200271600728

Issue Date: 04-May 2020

ACCOUNT SUMMARY AS OF:

Previous Balance (Rs.)	Current Charges (Rs.)	Payable Within Due Date (Rs.)	Late Payment Surcharge (Rs.)	Payment After Due Date (Rs.)	Due Date
130,137,699	37,343	130,175,041		130,175,041	19 May 2020

MONTHLY CONSUMPTION

METER INFORMATION

METER NO.	CURRENT DATE	CURRENT READING	PREVIOUS DATE	PREVIOUS READING	MEASURED QTY (SCM)
15844632	30-Apr-2020	8845460	31-Mar-2020	8849460	0
RUNG VOL	30-Apr-2020		31-Mar-2020		0 -

SMS CODE	GCV (BTU/SCF)	MMBTU	No. OF MONTHS	PRESSURE	TEMPERATURE
	947.375998	.0	01	1	1

BILL PAYMENT HISTORY

Month	Bill Amount (Rs.)	Payment Date	Amount (Rs.)

BILL CALCULATION

ACTUAL BILL CONSUMPTIVE

COMPUTATION OF CURRENT GAS CHARGES

SLAB	CMs	MMBTU	RATE/ MMBTU (Rs.)	AMOUNT (Rs.)

IMPORTANT MESSAGES

CURRENT CHARGES (Rs.)

Gas Charges	29,417
Meter Rent	2,500
General Sales Tax	5,426
Withholding Tax @ 4%	
Other Charges	
Less: Provisional Bill Corrections	
Adjustments - Debit	
Adjustments - Credit	

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Gulshan-e-Iqbal, Karachi 75300
SSGC www.ssgc.com.pk

M/S KESC KORANGI TOWN GAS TURBINE (KTGT)
K-Electric Limited
Plot No. 1,

Customer Number	Total Amount Due	Due Date	After Due Date
7903464064 (3)	130,175,041	19 May 2020	130,175,041

Sui Southern Gas Company Limited
SSGC Block 14, Sir Shah Suleman Road, Gulshan-e-Iqbal, Karachi 75300 www.ssgc.com.pk

SSGC General Sales Tax Number 02-04-9028-001-19

KESC KORANGI TOWN GAS TURBINE (KTGT)
K-Electric Limited
Plot No. 1,
Sector-19 Korangi Industrial Area, NC376 Deh Fal Tappo Landhi

Billing Group: (A41/0109985 /69)

For emergencies and complaints please call **1199**

SERVICE WITH A SMILE
Contact your Neighborhood Customer Facilitation Centre at: SIR SHAH SULEMAN ROAD GULSHAN-E-IQBAL, NEAR CIVIC CENTER, TEL: 9902101

ACCOUNT INFORMATION

Customer Number:	6322910000 [1]
Billing Month	Apr-2020
Tariff/Customer Class	IND
GST/NTN Number:	1200271600728

Issue Date: 04-May-2020

ACCOUNT SUMMARY AS OF

Previous Balance (Rs.)	Current Charges (Rs.)	Payable Within Due Date (Rs.)	Late Payment Surcharge (Rs.)	Payment After Due Date (Rs.)	Due Date
4,210,074,339	187,805,488	4,397,879,827		4,397,879,827	19 May 2020

MONTHLY CONSUMPTION

METER INFORMATION

METER No.	CURRENT DATE	CURRENT READING	PREVIOUS DATE	PREVIOUS READING	MEASURED QTY [SCM]
16128823	30-Apr-2020	12107310	31-Mar-2020	3762655	8344645
RUIG VOL	30-Apr-2010		31-Mar-2020		2551571-

SMS CODE	GCV (BTU/SCF)	MMBTU	No. OF MONTHS	PRESSURE	TEMPERATURE
	947.379999	194,799.164279	01	1	1

BILL & PAYMENT HISTORY

Month	Bill Amount (Rs.)	Payment Date	Amount (Rs.)

BILL CALCULATION

ACTUAL BILL CONSUMPTIVE

COMPUTATION OF CURRENT GAS CHARGES

SLAB	CMs	MMBTU	RATE/ MMBTU (Rs.)	AMOUNT (Rs.)

IMPORTANT MESSAGES

CURRENT CHARGES (Rs.)

Gas Charges	160,514,511
Meter Rent	3,000
General Sales Tax	27,287,977
Withholding Tax @ 4%	
Other Charges	
Less. Provisional/Bill Corrections	
Adjustments - Debit	
Adjustments - Credit	

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SSGC www.ssgc.com.pk

M/S KESC KORANGI TOWN GAS TURBINE (KTGT)
K-Electric Limited
Plot No. 1,

Customer Number	Total Amount Due	Due Date	After Due Date
6322910000 (1)	4,397,879,827	19 May 2020	4,397,879,827

Sui Southern Gas Company Limited

SSGC Block 14, Sir Shah Suleman Road, Gulshan-e-Iqbal, Karachi 75300 www.ssgc.com.pk

SSGC General Sales Tax Number 02-04-9028-001-19

KESC KORANGI TOWN GAS TURBINE (KTGT)
K-Electric Limited
Plot No.1,
Sector-19 Korangi Industrial Area, NC376 Pehlwan Goth Landhi

Billing Group: (A41/0108985 /09)

For emergencies and complaints please call **1199**

SERVICE WITH A SMILE
Contact your Neighborhood Customer Facilitation Center at:
SIR SHAH SULEMAN ROAD
GULSHAN-E-IQBAL
NEAR CIVIC CENTER. TEL
99021041

ACCOUNT INFORMATION

Customer Number:	4655415095 (6)
Billing Month	Apr-2020
Tariff/Customer Class	IND
GST/NTN Number:	1200271600728

Issue Date: 04-May 2020

ACCOUNT SUMMARY AS OF

Previous Balance (Rs.)	Current Charges (Rs.)	Payable Within Due Date (Rs.)	Late Payment Surcharge (Rs.)	Payment After Due Date (Rs.)	Due Date
1,833,681,273	81,573,103	1,915,254,376		1,915,254,376	19 May 2020

MONTHLY CONSUMPTION

METER INFORMATION

METER No.	CURRENT DATE	CURRENT READING	PREVIOUS DATE	PREVIOUS READING	MEASURED QTY (SCM)
15300069	30-Apr-2020	69792356	31-Mar-2020	65167232	3625124
BLLG VOL	30-Apr-2020		31-Mar-2020		1108352-

SMS CODE	GCV (BTU/SCF)	MMBTU	No. OF MONTHS	PRESSURE	TEMPERATURE
	947.379591	84,609.346034	01	1	1

BILL & PAYMENT HISTORY

Month	Bill Amount (Rs.)	Payment Date	Amount (Rs.)

BILL CALCULATION

ACTUAL BILL CONSUMPTIVE

COMPUTATION OF CURRENT GAS CHARGES

SLAB	CMs	MMBTU	RATE/ MMBTU (Rs.)	AMOUNT (Rs.)

IMPORTANT MESSAGES

CURRENT CHARGES (Rs.)

Gas Charges	69,718,101
Meter Rent	2,500
General Sales Tax	11,852,502
Withholding Tax @ 4%	
Other Charges	
Less Provisional Bill Corrections	
Adjustments - Debit	
Adjustments - Credit	

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Block 14, Sir Shah Suleman Road
Gulshan-e-Iqbal, Karachi 75300
SSGC www.ssgc.com.pk

M/S KESC KORANGI TOWN GAS TURBINE (KTGT)
K-Electric Limited
Plot No. 1,

Customer Number	Total Amount Due	Due Date	After Due Date
4655415095 (6)	1,915,254,376	19 May 2020	1,915,254,376

K-ELECTRIC LIMITED

KTGEPS – Annexure B (ii)

Description	Unit	Legend	SSGC Meter# 16128823	SSGC Meter # 15300069	SSGC Meter# 16844632	Total
Current month reading	SCM	A	12,107,310	69,792,356	8,849,480	90,749,146
Previous month reading	SCM	B	3,762,665	66,167,232	8,849,480	78,779,377
Total Consumption	SCM	C = A – B	8,344,645	3,625,124	-	11,969,769
RLNG Consumption	SCM	D	2,551,571	1,108,952		3,660,523
Indigenous Natural Gas consumption	SCM	E = C – D	5,793,074	2,516,172	-	8,309,246
Conversion factor (from SCM to SCF)	SCF/SCM	F	35	35	35	35
NG conversion from SCM to SCF	SCF	G = E x F	205,618,827	89,308,774	-	294,927,601
RLNG conversion from SCM to SCF	SCF	H = D x F	90,565,223	39,361,039	-	129,926,261
Gross Heating Value (GCV)	BTU/SCF	I	947	947	947	947
NG MMBTUs	MMBTU	J = G x I / 10^6	194,799	84,609	-	279,409
RLNG MMBTUs	MMBTU	K = H x I / 10^6	85,800	37,290	-	123,090
Total MMBTUs	MMBTU	L = J + K	280,599	121,899	-	402,498
Generation on Gas	MWH	M	32,159	13,971	-	46,129
Generation on RLNG	MWH	N = K / L x M	9,833	4,274	-	14,107
Generation on NG	MWH	O = M – N	22,325	9,697	-	32,022

KTGEPS – Annexure C (i)

Part load Adjustment Factor table – CC

Net Heat Rate	Plant Load Percentage (%)
1.00000	100.00%
1.00059	96.90%
1.00110	93.80%
1.00164	90.60%
1.00231	87.50%
1.00300	84.40%
1.00378	81.30%
1.00465	78.10%
1.00564	75.00%[5]
1.00704	71.90%
1.00898	68.80%
1.01089	65.60%
1.01311	62.50%
1.01566	59.40%
1.01858	56.30%
1.02188	53.10%
1.02536	50.00%[6]

[5] 3 Sections (24 Engines)

[6] 2 Sections (16 Engines): minimum number of engines required for combined cycle operations

KTGEPS – Annexure C (ii)

Part load Adjustment Factor table – OC

Net Heat Rate	Plant Load Percentage
1.00000	100.00%
1.000019	96.90%
1.000039	93.80%
1.000061	90.60%
1.000084	87.50%
1.000109	84.40%
1.000136	81.30%
1.000165	78.10%
1.000196	75.00%[7]
1.000230	71.90%
1.000268	68.80%
1.000309	65.60%
1.000353	62.50%
1.000403	59.40%
1.000458	56.30%
1.000520	53.10%
1.000589	50.00%[8]
1.000668	46.90%
1.000758	43.80%
1.000861	40.60%
1.000982	37.50%
1.001125	34.40%
1.001297	31.30%
1.001507	28.10%
1.001770	25.00%[9]
1.002107	21.90%
1.002558	18.80%
1.003190	15.60%
1.004139	12.50%
1.005724	9.40%

[7] 3 Sections (24 Engines)

[8] 2 Sections (16 Engines)

[9] 1 Section (8 Engines)

K-Electric Limited
Generation Plants Tariff Petition
KTGEPS
Annexure D - Part Load Adjustment Example

Partial Load Sample Calculation of a DAY

KTGEPS

Time	Date	Net Dependable Capacity MW a	Forced Outage MW b	Planned Outage MW c	Forced Derated MW d	Planned Derated MW e	Available Capacity (post planned and forced outages) MW f=a-b-c-d-e	Hourly Net Load MW (from energy meters) MW g	Ambient Temp, °C h	Ambient Temp. Correction i	Adjusted Actual Capacity j=f/i	Load Factor k=g/j	Efficiency correction based on Partial Load Calculation l	Net Heat Rate m=(l*Baseload Net HR)	mmbtus n=m*g/1000
1:00:00 AM	1-Jul	92	0	0	0	0	92	85	30	1.0000000000	92	92%	1.0013	9050	769
2:00:00 AM	1-Jul	92	0	0	0	0	92	56	35	1.0005730000	92	61%	1.0145	9169	513
3:00:00 AM	1-Jul	92	0	0	0	0	92	80	35	1.0005730000	92	87%	1.0024	9060	726
4:00:00 AM	1-Jul	92	0	0	0	0	92	79	35	1.0005730000	92	86%	1.0027	9063	714
5:00:00 AM	1-Jul	92	0	0	0	0	92	82	35	1.0005730000	92	89%	1.0020	9056	742
6:00:00 AM	1-Jul	92	0	0	0	0	92	72	12	0.9935798000	92	78%	1.0047	9081	651
7:00:00 AM	1-Jul	92	0	0	0	0	92	54	35	1.0005730000	92	59%	1.0160	9182	499
8:00:00 AM	1-Jul	92	0	0	0	0	92	54	44	1.0725160000	86	63%	1.0125	9151	497
9:00:00 AM	1-Jul	92	0	0	0	0	92	48	35	1.0005730000	92	52%	1.0226	9242	446
10:00:00 AM	1-Jul	92	0	0	0	0	92	49	35	1.0005730000	92	53%	1.0218	9235	452
11:00:00 AM	1-Jul	92	0	0	0	0	92	43	35	1.0005730000	92	47%	1.0025	9060	392
12:00:00 PM	1-Jul	92	0	0	0	0	92	41	35	1.0005730000	92	44%	1.0015	9052	369
1:00:00 PM	1-Jul	92	0	0	0	0	92	39	35	1.0005730000	92	43%	1.0016	9053	354
2:00:00 PM	1-Jul	92	0	0	0	0	92	39	35	1.0005730000	92	42%	1.0016	9053	351
3:00:00 PM	1-Jul	92	0	0	0	0	92	47	35	1.0005730000	92	51%	1.0238	9254	437
4:00:00 PM	1-Jul	92	0	0	0	0	92	45	35	1.0005730000	92	49%	1.0196	9215	418
5:00:00 PM	1-Jul	92	0	0	0	0	92	55	35	1.0005730000	92	59%	1.0157	9180	502
6:00:00 PM	1-Jul	92	0	0	0	0	92	55	35	1.0005730000	92	59%	1.0157	9180	502
7:00:00 PM	1-Jul	92	0	0	0	0	92	55	35	1.0005730000	92	59%	1.0157	9180	502
8:00:00 PM	1-Jul	92	0	0	0	0	92	55	35	1.0005730000	92	59%	1.0157	9180	502
9:00:00 PM	1-Jul	92	0	0	0	0	92	55	35	1.0005730000	92	59%	1.0157	9180	502
10:00:00 PM	1-Jul	92	0	0	0	0	92	55	35	1.0005730000	92	59%	1.0157	9180	502
11:00:00 PM	1-Jul	92	0	0	0	0	92	55	35	1.0005730000	92	59%	1.0157	9180	502
12:00:00 AM	1-Jul	92	0	0	0	0	92	53	35	1.0005730000	92	57%	1.0177	9198	484
Total								1349							12,329
Benchmark Heat Rate (Total mmbtus/Total MWs)														9136.95	
Adjustment Factor (Benchmark Heat Rate/ Net Heat Rate)														1.011	

Reference		
Load	Net Eff	Net HR
92	37.753%	9038

KTGEPS – Annexure E (i) (Gas)

Degradation table -Net Heat rate HHV

NET Heat Rate Degradation Factor - HHV

FY	Gas Engine (Simple Cycle)						Combined Cycle (100% LF)		
	Permanent	Recoverable	Total	Efficiency		Correction Factor	Efficiency		Correction Factor
				Tested	Revised		Tested	Revised	
20*	0.76%	1.10%	1.86%	34.73%	34.73%	1.0000	37.75%	37.75%	1.0000
20	0.81%	1.33%	2.14%	34.73%	34.63%	1.0027	37.75%	37.66%	1.0025
21	0.87%	1.97%	2.84%	34.73%	34.39%	1.0097	37.75%	37.42%	1.0090
22	0.88%	0.40%	1.29%	34.73%	34.93%	0.9942	37.75%	37.96%	0.9947
23	0.98%	1.17%	2.15%	34.73%	34.63%	1.0029	37.75%	37.64%	1.0029
24	1.09%	1.37%	2.46%	34.73%	34.52%	1.0060	37.75%	37.53%	1.0059
25	1.19%	1.22%	2.41%	34.73%	34.54%	1.0055	37.75%	37.54%	1.0056
26	1.29%	0.47%	1.76%	34.73%	34.76%	0.9990	37.75%	37.77%	0.9997
27	1.39%	1.24%	2.63%	34.73%	34.46%	1.0077	37.75%	37.45%	1.0081
28	1.50%	1.45%	2.95%	34.73%	34.35%	1.0109	37.75%	37.33%	1.0114
29	1.60%	1.28%	2.88%	34.73%	34.38%	1.0102	37.75%	37.35%	1.0108
30	1.70%	0.54%	2.24%	34.73%	34.60%	1.0038	37.75%	37.61%	1.0038
31	1.81%	0.72%	2.52%	34.73%	34.50%	1.0066	37.75%	37.50%	1.0066
32	1.91%	1.54%	3.45%	34.73%	34.19%	1.0159	37.75%	37.17%	1.0156
33	2.01%	1.39%	3.41%	34.73%	34.20%	1.0154	37.75%	37.18%	1.0154
34	2.11%	0.61%	2.72%	34.73%	34.43%	1.0086	37.75%	37.41%	1.0091
35	2.22%	0.80%	3.02%	34.73%	34.33%	1.0116	37.75%	37.30%	1.0121
36	2.32%	1.62%	3.94%	34.73%	34.02%	1.0208	37.75%	36.96%	1.0214
37	2.42%	1.51%	3.93%	34.73%	34.02%	1.0207	37.75%	36.96%	1.0216
38	2.52%	0.67%	3.19%	34.73%	34.27%	1.0133	37.75%	37.21%	1.0145
39	2.63%	0.88%	3.51%	34.73%	34.17%	1.0165	37.75%	37.09%	1.0179

* 3rd party Heat Rate Test conducted in July-2019
FY 18 - 22 : As per actual Operating Hours
FY 23-39 : As per 87.81% Utilization

KTGEPS – Annexure E (ii) (Gas – applicable for Combined cycle)

Degradation table – Net Output (Gas)

NET Output Degradation Factor

FY	Total Degradation Combined Cycle	Tested Combined Cycle Output (MW)	Revised Combined Cycle Output (MW)	Correction Factor
20*	0.01%	92.05	92.05	1.0000
20	0.01%	92.05	92.05	1.0000
21	0.02%	92.05	92.04	1.0001
22	0.02%	92.05	92.04	1.0001
23	0.02%	92.05	92.04	1.0001
24	0.03%	92.05	92.03	1.0002
25	0.04%	92.05	92.02	1.0003
26	0.04%	92.05	92.02	1.0003
27	0.05%	92.05	92.01	1.0004
28	0.06%	92.05	92.00	1.0005
29	0.07%	92.05	92.00	1.0006
30	0.03%	92.05	92.03	1.0002
31	0.03%	92.05	92.03	1.0002
32	0.04%	92.05	92.02	1.0003
33	0.05%	92.05	92.01	1.0004
34	0.06%	92.05	92.01	1.0005
35	0.06%	92.05	92.00	1.0005
36	0.07%	92.05	92.00	1.0006
37	0.07%	92.05	91.99	1.0006
38	0.08%	92.05	91.99	1.0007
39	0.09%	92.05	91.98	1.0008

* 3rd party Heat Rate Test conducted in July-2019

FY 18 - 22 : As per actual Operating Hours

FY 23-39 : As per 87.81% Utilization

KTGEPS – Annexure F

O&M break up

KTGEPS O&M Levelized per year

PKR million

Major Activities	Fixed		Variable		Total
	Foreign	local	Foreign	local	
Plant O&M Cost – excluding MSA	21.89	93.11	497.08	29.82	641.91
Overhead Cost	-	192.65	-	0.93	193.58
MSA	-	-	473.15	-	473.15
Total	21.89	285.76	970.23	30.75	1,308.64

K-Electric Limited
Generation Plants Tariff Petition
KTGEPS
Annexure H - RAB Movement

Description	Legend	Unit	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031	FY 2032	FY 2033	FY 2034
RoRB movement																			
Assets without revaluation																			
Opening		PKR Mn		9,348	9,348	9,348	9,348	9,348	9,348	9,348	9,348	9,348	9,348	9,348	9,348	9,348	9,348	9,348	9,348
Capitalization		PKR Mn		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Disposal		PKR Mn		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Closing	a	PKR Mn	9,348	9,348	9,348	9,348	9,348	9,348	9,348	9,348	9,348	9,348	9,348	9,348	9,348	9,348	9,348	9,348	9,348
Accumulated Depreciation																			
Opening		PKR Mn		6,127	6,326	6,526	6,725	6,924	7,123	7,322	7,521	7,721	7,920	8,119	8,318	8,517	8,717	8,916	9,115
Depreciation for the year		PKR Mn		199	199	199	199	199	199	199	199	199	199	199	199	199	199	199	199
Depreciation - Disposal		PKR Mn		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Closing	b	PKR Mn	6,127	6,326	6,526	6,725	6,924	7,123	7,322	7,521	7,721	7,920	8,119	8,318	8,517	8,717	8,916	9,115	9,314
Net Book Value - Operating Assets only	c = a + b	PKR Mn	3,221	3,021	2,822	2,623	2,424	2,225	2,026	1,826	1,627	1,428	1,229	1,030	831	631	432	233	34
Capital Work in Progress																			
Opening		PKR Mn		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Capex		PKR Mn		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Transfer to Fixed Assets		PKR Mn		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Closing	d	PKR Mn	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Net RAB	e = c + b	PKR Mn	3,221	3,021	2,822	2,623	2,424	2,225	2,026	1,826	1,627	1,428	1,229	1,030	831	631	432	233	34
Average RAB - PKR	f = average of e	PKR Mn		3,121	2,922	2,723	2,524	2,324	2,125	1,926	1,727	1,528	1,328	1,129	930	731	532	333	133
RoRB break up																			
Equity Portion	g	%		30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Debt Portion	h	%		70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%
Local Component	i	%		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Foreign Component	j	%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
KIBOR	k	%		15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%	15.16%
Spread on KIBOR	l	%		2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%
Local Borrowing rate	m = k + l	%		17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%	17.66%
LIBOR	n	%		2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%
Hedge	o	%		15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%
Spread	p	%		4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Foreign borrowing Rate	q = n + o + p	%		22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%
Indexed Return on Foreign Equity	r	%		37.98%	37.98%	37.98%	37.98%	37.98%	37.98%	37.98%	37.98%	37.98%	37.98%	37.98%	37.98%	37.98%	37.98%	37.98%	37.98%
RoRB and Depreciation amounts																			
Cost of Debt - Local	s	PKR Mn		385	361	337	312	287	263	238	213	189	164	140	115	90	66	41	16
Cost of Debt - Foreign	t	PKR Mn		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cost of Equity	u	PKR Mn		355	333	310	288	265	242	219	197	174	151	129	106	83	61	38	15
Depreciation	v	PKR Mn		199	199	199	199	199	199	199	199	199	199	199	199	199	199	199	199
Calculation of Tariff components																			
Gas - CC																			
Net Capacity	w	MW		92.051	92.051	92.051	92.051	92.051	92.051	92.051	92.051	92.051	92.051	92.051	92.051	92.051	92.051	92.051	92.051
Plant factor	x	%		87.8%	87.8%	87.8%	87.8%	87.8%	87.8%	87.8%	87.8%	87.8%	87.8%	87.8%	87.8%	87.8%	87.8%	87.8%	87.8%
Net Capacity units at Plant factor	y = w x 24 x 365 x (x/1000)	GWh		708	708	708	708	708	708	708	708	708	708	708	708	708	708	708	120
Components																			
Cost of Debt - Local	z = s / y	PKR / kWh		0.5449	0.5101	0.4754	0.4406	0.4058	0.3710	0.3363	0.3015	0.2667	0.2319	0.1972	0.1624	0.1276	0.0928	0.0581	0.0233
Cost of Debt - Foreign	aa = t / y	PKR / kWh		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cost of Equity	ab = u / y	PKR / kWh		0.5023	0.4702	0.4382	0.4061	0.3741	0.3420	0.3100	0.2779	0.2458	0.2138	0.1817	0.1497	0.1176	0.0856	0.0535	0.0215
Depreciation	ac = v / y	PKR / kWh		0.2813	0.2813	0.2813	0.2813	0.2813	0.2813	0.2813	0.2813	0.2813	0.2813	0.2813	0.2813	0.2813	0.2813	0.2813	0.2813

K-Electric Limited
Generation Plants Tariff Petition
KTGEPS
Annexure I (i) - Calculation of Indexed RoE

					Actualized				Forecasted	
Average Exchange rates	PKR / USD	104.82	104.81	110.01	136.17	158.38	160.21	178.08	206.00	206.00
RAB amount - Generation	PKR mn	5,862	5,826	5,538	5,094	4,897	4,885	3,947	3,221	3,221
Additions, net of Depreciation & Disposals during the year	PKR mn		(36)	(289)	(444)	(197)	(12)	(937)	(727)	-

Year wise indexation based on exchange rates (a)

FY 2016	%		-0.01%	4.95%	29.91%	51.10%	52.84%	68.84%	96.53%	96.53%
FY 2017	%			4.96%	29.92%	51.11%	52.86%	69.86%	96.55%	96.55%
FY 2018	%				23.78%	48.97%	45.63%	61.83%	87.26%	87.26%
FY 2019	%					16.31%	17.65%	30.74%	51.28%	51.28%
FY 2020	%						1.16%	12.41%	30.07%	30.07%
FY 2021	%							11.12%	28.58%	28.58%
FY 2022	%								15.71%	15.71%
FY 2023	%									0.00%

Calculated with reference to exchange rate of a relavant year vs exchange rate of base year for example 16.31% in FY 2019 calculated as PKR 158.38 / USD divided by PKR 136.17 / USD

Year wise break up of RAB

FY 2016	PKR mn	5,862	5,862	5,862	5,862	5,862	5,862	5,862	5,862	5,862
FY 2017	PKR mn		(36)	(36)	(36)	(36)	(36)	(36)	(36)	(36)
FY 2018	PKR mn			(289)	(289)	(289)	(289)	(289)	(289)	(289)
FY 2019	PKR mn				(444)	(444)	(444)	(444)	(444)	(444)
FY 2020	PKR mn					(197)	(197)	(197)	(197)	(197)
FY 2021	PKR mn						(12)	(12)	(12)	(12)
FY 2022	PKR mn							(937)	(937)	(937)
FY 2023	PKR mn								(727)	(727)
Total RAB	PKR mn	5,862	5,826	5,538	5,094	4,897	4,885	3,947	3,221	3,221

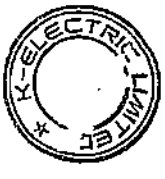
Weightage of RAB (b)

FY 2016	PKR mn	100%	101%	106%	115%	120%	120%	149%	182%	182%
FY 2017	PKR mn	-	-1%	-1%	-1%	-1%	-1%	-1%	-1%	-1%
FY 2018	PKR mn	-	-	-5%	-6%	-6%	-6%	-7%	-9%	-9%
FY 2019	PKR mn	-	-	-	-9%	-9%	-9%	-11%	-14%	-14%
FY 2020	PKR mn	-	-	-	-	-4%	-4%	-5%	-6%	-6%
FY 2021	PKR mn	-	-	-	-	-	0%	0%	0%	0%
FY 2022	PKR mn	-	-	-	-	-	-	-24%	-29%	-29%
FY 2023	PKR mn	-	-	-	-	-	-	-	-23%	-23%
Total	PKR mn	100%	100%	100%	100%	100%	100%	100%	100%	100%

Year wise indexation - considering RAB weightage [c = (a x b)]

FY 2016	%		0.0%	5.2%	34.4%	61.2%	63.4%	103.7%	175.7%	175.7%
FY 2017	%		-	0.0%	-0.2%	-0.4%	-0.4%	-0.6%	-1.1%	-1.1%
FY 2018	%		-	-	-1.3%	-2.6%	-2.7%	-4.5%	-7.8%	-7.8%
FY 2019	%		-	-	-	-1.5%	-1.6%	-3.5%	-7.1%	-7.1%
FY 2020	%		-	-	-	-	0.0%	-0.6%	-1.8%	-1.8%
FY 2021	%		-	-	-	-	-	0.0%	-0.1%	-0.1%
FY 2022	%		-	-	-	-	-	-	-4.6%	-4.6%
FY 2023	%		-	-	-	-	-	-	-	-
Total Indexation	%		0.0%	5.2%	32.9%	56.7%	58.7%	94.5%	153.2%	153.2%

RoE - USD based (d)	%	15.0%
Indexation (e)	%	153.2%
RoE - Indexed at PKR 206 / USD[f = d x (1 + e)]	%	37.98%



K-Electric Limited
Generation Plants Tariff Petition
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Annexure I (ii) - Illustration for RoE Indexation

Indexation for the quarter	Q1 - FY 2024
Date of indexation	July 3, 2023

Description	Unit	Legend	Gas
Reference RoRB Cost of Equity component for FY 2024	PKR / kWh	a	0.5023
TT & OD selling rate of USD as notified by National bank of Pakistan at June 30, 2022	PKR / USD	b	250
Reference exchange rate	PKR / USD	c	206.00
Indexed RoRB Cost of Equity component for FY 2024	PKR / kWh	d = a x b / c	0.6096

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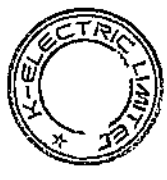
Annexure J - Calculation of Working Capital

	Fuel cost on receivable cycle - RLNG	Unit	Legend	FY2024
	KIBOR	%	a	15.16%
	Spread	%	b	2.00%
	Total	%	c = a + b	17.16%
1	Fuel cost receivable cycle			
	Receipt - days	days	d	30
	Payment - days	days	e	7
	Net days	days	f = d - e	23
	RLNG bill			
	Net capacity	MW	g	92
	Load factor	%	h	88%
	Units for 365 days	GWh	i = g x h 24 x 365 / 10^3	708
	Allowed Heat Rate for the Quarter	btu / kWh	j	9,038
	Reference price	PKR / MMBtu	k	3,301
	Amount for 365 days	PKR / kWh	l = i x j x k / 10^6	21,123
	Amount for outstanding days	PKR Mn	m = f x l / 365	1,331
	With sales tax	PKR Mn	n = m x (1 + 17%)	1,557
	Cost of working capital	PKR Mn	o = c x n	267
2	Cost of SBLC			
	Daily gas	MMBTu	p = g x j x 1,000 / 10^6	19,967
	60 days	MMBTu	q = p x 60	1,198,024
	Amount of 60 days	PKR Mn	r = k x q / 10^6	3,954
	Actual SBCL given	PKR Mn	r1	432
	Lower of 60 days or Actual	PKR Mn	r2 = lower of r & r1	432
	SBLC cost	%	s	0.50%
	Cost of SBLC	PKR Mn	t = r2 x s	2
3	Cost of Fuel Inventory		Not Applicable	
4	Cost of other Inventory			
	Inventory amount	PKR Mn	u	380
	Cost	PKR Mn	v = u x c	65
	Total cost of working capital	**PKR Mn**	**w = o + t + v**	**335**
	Net Capacity units at Plant factor			
	Gas - CC	GWh	x	708
	Gas - CC	PKR / kWh	z = w / x	0.4726



KTGEPS – Annexure K

Output adjustment in Temperature (Combined Cycle)

Ambient Temp. C°	Correction Factor (CF)	Combined Cycle Load (MW)
10	0.998422	92.19649
11	0.998501	92.1892
12	0.998580	92.18192
13	0.998659	92.17463
14	0.998738	92.16735
15	0.998817	92.16007
16	0.998895	92.15279
17	0.998974	92.14551
18	0.999053	92.13824
19	0.999132	92.13096
20	0.999211	92.12369
21	0.999290	92.11641
22	0.999369	92.10914
23	0.999448	92.10187
24	0.999527	92.0946
25	0.999606	92.08733
26	0.999684	92.08006
27	0.999763	92.07279
28	0.999842	92.06553
29	0.999921	92.05826
30	1.000000	92.051
31	1.000115	92.04045
32	1.000229	92.02991
33	1.000344	92.01936
34	1.000458	92.00882
35	1.000573	91.99828
36	1.000914	91.96692
37	1.001256	91.93557
38	1.001597	91.90425
39	1.001938	91.87295
40	1.002279	91.84167
41	1.010723	91.0744
42	1.031321	89.25546
43	1.051918	87.50774

Output adjustment in Temperature (Open Cycle)

Temp Correction Open Cycle – KTGTPS		
Ambient Temp. C°	Correction Factor (CF)	Simple Cycle Load MW
10	0.999589	84.55975
11	0.999610	84.55802
12	0.999630	84.55628
13	0.999651	84.55454
14	0.999671	84.5528
15	0.999692	84.55106
16	0.999712	84.54932
17	0.999733	84.54759
18	0.999753	84.54585
19	0.999774	84.54411
20	0.999795	84.54237
21	0.999815	84.54064
22	0.999836	84.5389
23	0.999856	84.53716
24	0.999877	84.53542
25	0.999897	84.53369
26	0.999918	84.53195
27	0.999938	84.53021
28	0.999959	84.52847
29	0.999979	84.52674
30	1.000000	84.525
31	1.000029	84.52253
32	1.000058	84.52006
33	1.000088	84.5176
34	1.000117	84.51513
35	1.000146	84.51266
36	1.000183	84.50951
37	1.000221	84.50635
38	1.000258	84.5032
39	1.000295	84.50005
40	1.000333	84.4969
41	1.008971	83.7735
42	1.030510	82.02251
43	1.052049	80.34322

K-Electric Limited
Generation Plants Tariff Petition
KTGEPS
Annexure L – Capacity Sample Calculation

Capacity Payment Sample Calculation

KTGEPS

Time	Date	Net Dependable Capacity MW	Forced Outage MW	Planned Outage MW	Forced Derated MW	Planned Derated MW	Available Capacity (Post planned and forced outages) MW	Ambient Temp. °C	Ambient Temp. Correction	Adjusted available Capacity due to Temp	Impact of Temp. Oc	Available Capacity MW	Capacity Tariff Rs/kWh	Capacity Payment Pkr - Mn
		a	b	c	d	e	f = a-b-c-d-e	g	h	i = f/h	j = f-i	k = i	l	m = k*l/1000
1:00:00 AM	1-Jul	92	22	0	0	0	70	30	1.0000	70	0	70	1.99	0.1398
2:00:00 AM	1-Jul	92	0	0	0	0	92	35	1.0006	92	0	92	1.99	0.1834
3:00:00 AM	1-Jul	92	0	0	0	0	92	35	1.0006	92	0	92	1.99	0.1834
4:00:00 AM	1-Jul	92	0	0	0	0	92	35	1.0006	92	0	92	1.99	0.1834
5:00:00 AM	1-Jul	92	0	0	0	0	92	35	1.0006	92	0	92	1.99	0.1834
6:00:00 AM	1-Jul	92	0	92	0	0	0	12	0.9984	0	0	0	1.99	0.0000
7:00:00 AM	1-Jul	92	0	0	0	0	92	35	1.0006	92	0	92	1.99	0.1834
8:00:00 AM	1-Jul	92	0	0	0	0	92	44	1.0725	86	6	92	1.99	0.1834
9:00:00 AM	1-Jul	92	0	0	0	0	92	35	1.0006	92	0	92	1.99	0.1834
10:00:00 AM	1-Jul	92	0	0	0	0	92	35	1.0006	92	0	92	1.99	0.1834
11:00:00 AM	1-Jul	92	0	0	0	0	92	35	1.0006	92	0	92	1.99	0.1834
12:00:00 PM	1-Jul	92	0	0	0	0	92	35	1.0006	92	0	92	1.99	0.1834
1:00:00 PM	1-Jul	92	0	0	0	0	92	35	1.0006	92	0	92	1.99	0.1834
2:00:00 PM	1-Jul	92	0	0	0	0	92	35	1.0006	92	0	92	1.99	0.1834
3:00:00 PM	1-Jul	92	0	0	0	0	92	35	1.0006	92	0	92	1.99	0.1834
4:00:00 PM	1-Jul	92	0	0	0	0	92	35	1.0006	92	0	92	1.99	0.1834
5:00:00 PM	1-Jul	92	0	0	0	0	92	35	1.0006	92	0	92	1.99	0.1834
6:00:00 PM	1-Jul	92	0	0	0	0	92	35	1.0006	92	0	92	1.99	0.1834
7:00:00 PM	1-Jul	92	0	0	0	0	92	35	1.0006	92	0	92	1.99	0.1834
8:00:00 PM	1-Jul	92	0	0	0	0	92	35	1.0006	92	0	92	1.99	0.1834
9:00:00 PM	1-Jul	92	0	0	0	0	92	35	1.0006	92	0	92	1.99	0.1834
10:00:00 PM	1-Jul	92	0	0	0	0	92	35	1.0006	92	0	92	1.99	0.1834
11:00:00 PM	1-Jul	92	0	0	0	0	92	35	1.0006	92	0	92	1.99	0.1834
12:00:00 AM	1-Jul	92	0	0	0	0	92	35	1.0006	92	0	92	1.99	0.1834
Total												2095	1.99	4.1752

K-ELECTRIC LIMITED

K-Electric Limited
Generation Plants Tariff Petition
KTGEPS
Annexure M - Outage schedule and Plant factor

Description	Formula	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35	FY36	FY37	FY38	FY39	FY40	Total
Hours	a	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	408
Days	b	366	365	365	365	366	365	365	365	366	365	365	365	366	365	365	365	62	5,906
Days - Cumulative for 32 engines	b(i) = b x 32	11,712	11,680	11,680	11,680	11,712	11,680	11,680	11,680	11,712	11,680	11,680	11,680	11,712	11,680	11,680	11,680	1,984	188,992
Hours in a year	c = a x b	8,784	8,760	8,760	8,760	8,784	8,760	8,760	8,760	8,784	8,760	8,760	8,760	8,784	8,760	8,760	8,760	1,488	141,744
1 Annual outages																			
Gross Capacity - MW																			
32 Engines	d	87.8	87.8	87.8	87.8	87.8	87.8	87.8	87.8	87.8	87.8	87.8	87.8	87.8	87.8	87.8	87.8	87.8	87.8
ST		7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7
Plant		95.5	95.5	95.5	95.5	95.5	95.5	95.5	95.5	95.5	95.5	95.5	95.5	95.5	95.5	95.5	95.5	95.5	95.5
Scheduled outage days - Note																			
32 Engines (21.5 per Engine)	e	688.5	688.5	688.5	688.5	688.5	688.5	688.5	688.5	688.5	688.5	688.5	688.5	688.5	688.5	688.5	688.5	161.5	11,177.3
ST		21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	4.0	348.2
Forced outage days - Note																			
32 Engines (15 per Engine)	f	480.0	480.0	480.0	480.0	480.0	480.0	480.0	480.0	480.0	480.0	480.0	480.0	480.0	480.0	480.0	480.0	82.0	7,762.0
ST		15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	3.0	243.0
Total Annual outage days																			
32 Engines	g = e + f	1,168.5	1,168.5	1,168.5	1,168.5	1,168.5	1,168.5	1,168.5	1,168.5	1,168.5	1,168.5	1,168.5	1,168.5	1,168.5	1,168.5	1,168.5	1,168.5	243.5	18,939.3
ST		36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	7.0	591.2
Plant		1,205.0	1,205.0	1,205.0	1,205.0	1,205.0	1,205.0	1,205.0	1,205.0	1,205.0	1,205.0	1,205.0	1,205.0	1,205.0	1,205.0	1,205.0	1,205.0	250.5	19,530.5
Total Annual outage %																			
32 Engines	h = g / b(i)	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	12.3%	10.0%
ST	h = g / b	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	11.3%	10.0%
Plant	i = w. average g / d	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	12.2%	10.0%
Annual Availability %	j = 100% - i	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	87.8%	90.0%
2 Overhauls																			
Cumulative hours																			
32 Engines		76,575	84,267	91,959	99,652	107,365	115,057	122,749	130,441	138,154	145,847	153,539	161,231	168,944	176,636	184,328	192,021	193,327	
ST		32,016	39,709	47,401	55,093	62,806	70,498	78,190	85,883	93,596	101,288	108,980	116,672	124,385	132,078	139,770	147,462	148,769	

Description	Unit	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35	FY36	FY37	FY38	FY39	FY40	Total
Overhauls																			
32 Engines		60K (7 Engines) , 30K (01 Engine)	60K (9 Engines) , 30K (02 Engines) + MV Switchgear Major Maintenance - Sections	60K (2 Engines) , 30K (4 Engines) + Control System Upgradation - Section	60K (2 Engines) , 30K (7 Engines)	60K (1 Engine) , 30K (11 Engines)	30K (5 Engines) + Control System Upgradation - Section	60K (1 Engine) , 30K (2 Engines)	60K (10 Engines) , 30K (3 Engines) + Control System Upgradation - Section	60K (3 Engines)	60K (13 Engines)	60K (2 Engines) , 30K (1 Engine)	60K (3 Engines) , 30K (10 Engines)	30K (6 Engines)	30K (10 Engines) + MV Switchgear Major Maintenance - Sections	30K (1 Engine)	30K (3 Engines)		
ST		Outage Days equivalent to 60K,30K (EPDH)	Steam Turbine Major Inspection + Outage Days equivalent to 60K,30K (EPDH)	Outage Days equivalent to 60K,30K (EPDH)	Outage Days equivalent to 60K,30K (EPDH)	Outage Days equivalent to 60K,30K (EPDH)	Steam Turbine Major Inspection + Outage Days equivalent to 30K (EPDH)	Outage Days equivalent to 60K,30K (EPDH)	Outage Days equivalent to 60K,30K (EPDH)	Outage Days equivalent to 60K (EPDH)	Outage Days equivalent to 60K (EPDH)	Steam Turbine Major Inspection + Outage Days equivalent to 60K,30K (EPDH)	Outage Days equivalent to 60K,30K (EPDH)	Outage Days equivalent to 30K (EPDH)	Outage Days equivalent to 30K (EPDH)	Outage Days equivalent to 30K (EPDH)	Steam Turbine Major Inspection + Outage Days equivalent to 30K (EPDH)		

*Overhauls are included based on Operating hours. Accordingly, these events will occur when respective operating hours will be achieved

Overhaul - days																			
32 Engines	k	305	410	180	255	315	125	90	475	120	520	105	370	150	250	25	50	-	3,745
ST		10	48	6	8	10	39	3	15	4	16	38	12	5	8	1	37	-	257
Plant		315	458	186	263	325	164	93	490	124	536	143	382	155	258	26	87	-	4,002
Overhaul - %																			
32 Engines	l = k / b (i)	2.6%	3.5%	1.5%	2.2%	2.7%	1.1%	0.8%	4.1%	1.0%	4.5%	0.9%	3.2%	1.3%	2.1%	0.2%	0.4%	-	2.0%
ST	l = k / b	0.03	0.13	1.5%	0.02	0.03	0.11	0.01	4.1%	0.01	0.04	0.10	0.03	1.3%	0.02	0.00	10.0%	-	4.4%
Plant	m = w, average k / d	2.6%	4.3%	1.5%	2.2%	2.7%	1.8%	0.8%	4.1%	1.0%	4.5%	1.7%	3.2%	1.3%	2.1%	0.2%	1.2%	-	2.2%

3 Annual outages + Overhaul

Outage days - Annual + Overhaul																			
32 Engines	n = g + k	1,473	1,578	1,348	1,423	1,488	1,293	1,258	1,643	1,288	1,688	1,273	1,538	1,318	1,418	1,193	1,218	244	22,684
ST		46	84	42	44	46	75	39	51	40	53	75	48	41	44	37	73	7	848
Plant		1,520	1,663	1,391	1,468	1,530	1,369	1,298	1,695	1,329	1,741	1,348	1,587	1,360	1,463	1,231	1,292	251	23,282
Outage % - Annual + Overhaul																			
32 Engines	o = n / b	12.6%	13.5%	11.5%	12.2%	12.7%	11.1%	10.8%	14.1%	11.0%	14.5%	10.9%	13.2%	11.3%	12.1%	10.2%	10.4%	12.3%	12.0%
ST		12.6%	23.1%	11.5%	12.2%	12.7%	20.7%	10.8%	14.1%	11.0%	14.5%	20.5%	13.2%	11.3%	12.1%	10.2%	20.0%	13.3%	14.4%
Plant	p = n / b w average	12.6%	14.3%	11.5%	12.2%	12.7%	11.8%	10.8%	14.1%	11.0%	14.5%	11.7%	13.2%	11.3%	12.1%	10.2%	11.2%	12.2%	12.2%
Availability	q = 100% - p	87.42%	85.71%	88.45%	87.81%	87.33%	88.15%	89.23%	85.93%	89.00%	85.54%	88.32%	86.83%	88.74%	87.86%	89.78%	88.80%	87.81%	87.81%

Note: Days mentioned for Engines are cumulative for 32 Engines

K-Electric Limited
Generation Plants Tariff Petition
KTGEPS
Annexure N - O&M Sharing Mechanism

Description		Unit				
Hours	a	no.	24	24	24	24
Days	b	no.	365	365	365	365
Hours in a year	c = a x b	no.	8,760	8,760	8,760	8,760

Overhauls

Shall be replaced with Actual occurrence

32 Engines	60K (11 Engines) + 30K (01 Engine)	60K (19 Engines) + 20K (01 Engine)	20K (02 Engines)	60K (01 Engine) + 20K (29 Engines)
Steam Turbine	Major Inspection + Reducing Gear Box Inspection + Generator Maintenance M3	Minor Inspection	Minor Inspection	Minor Inspection

Overhauls are included based on factored fired hours. Accordingly, these events will occur when respective factored fired hours will be achieved

O&M components - Gas Combined cycle

Description		Unit				
Tariff components [Shall be replaced with actual quarterly indexed tariff components]						
Variable - local	d	PKR / kWh	0.0357	0.0580	0.0382	0.0421
Variable - Foreign	e	PKR / kWh	1.3788	1.9374	1.2220	1.3776
Fixed - local	f	PKR / kWh	0.5166	0.4468	0.4078	0.3868
Fixed - Foreign	g	PKR / kWh	0.0465	0.0579	0.0847	0.0118
Net Capacity	h	MW	92.1	92.1	92.1	92.1
Availability factor [Shall be replaced with Actual]	i	%	87.4%	85.7%	88.5%	87.8%
Available capacity	j = h x i x c / 1000	GWh	704.9	691.2	713.3	708.1
Dispatch factor [Shall be replaced with Actual]	j1	%	100%	100%	100%	100%
Units sent out	k = i x j1	GWh	704.9	691.2	713.3	708.1
Recovery in tariff						
Variable - local	l = d x k	PKR mn	25	40	27	30
Variable - Foreign	m = e x k	PKR mn	972	1,339	872	975
Fixed - local	n = f x j	PKR mn	366	310	291	274
Fixed - Foreign	o = g x j	PKR mn	33	40	60	8
Total	p	PKR mn	1,395	1,729	1,250	1,287
Cost [Shall be replaced with actual cost incurred]						
O&M expenses as per Financial statements		PKR mn	1,150	1,500	1,189	1,432
Addition to CWIP as per Financial statements		PKR mn	980	480	480	880
Total	q	PKR mn	2,130	1,980	1,669	2,312
Over / (Under) Recovery	r = p - q	PKR mn	(735)	(231)	(419)	(1,025)
Over / (Under) Recovery - Movement						
Opening	s	PKR mn	-	(735)	(965)	(1,384)
Addition	t = r	PKR mn	(735)	(231)	(419)	(1,025)
Closing	u	PKR mn	(735)	(965)	(1,384)	(2,409)

Sharing Timeline - based on occurrence on Overhaul of last component in One cycle for 32 Engines and 1 ST, and at the end of life - Note			Sharing on completion of MOH of ST
Over / (Under Recovery)	v = u	PKR mn	(2,409)
In case of (Under recovery) - carry forward	w = if v < 0	PKR mn	(2,409)
In case of Over recovery - sharing	x = if v > 0	PKR mn	-
- Consumer - 60%	y = X x 60%	PKR mn	-
- KE - 40%	z = X x 40%	PKR mn	-

Sharing of consumer to be credited in next invoice.

One Overhaul cycle shall include one:
- One 60k for each engine
- One 30k for each engine
- One Major Inspection for each ST after every 40k operating hours
- One Minor Inspection for each ST after every 8k operating hours

In case of First overhaul cycle, 60k for one engine has already been incurred before FY 2024

KTGEPS – Annexure O

Head of Terms

POWER PURCHASE AGREEMENT

TERM SHEET

This Term Sheet dated xxx (the "Date of Signing") is a summary of the principal and indicative terms for inclusion in the Power Purchase Agreement (the "PPA") to be entered into between XX Generating Station (Plant) which is part of KE's generation fleet, and Transmission/Load Dispatch Center (LDC) of KE (individually a "Party" and together the "Parties") in relation to the sale and purchase of electrical energy. The terms and conditions contained in this non-binding term sheet are indicative and non-binding in nature. Any such obligation or agreement will be created only by the execution of a definitive power purchase agreement (the "PPA") by Seller and Buyer (as defined below, and collectively the "Parties"), the provisions of which, if so executed, will supersede this Term Sheet and all other agreements, if any, related to this document and the proposed transaction.

Sr #	Terms	Description
1)	Seller	KTGEPS
2)	Buyer	Load Dispatch Center (LDC) / Supply
3)	Purpose of PPA	The Plant shall sell all electrical energy generated by it to the Buyer based on the dispatch instructions issued by Buyer and the fuel available with Seller to meet such dispatch in line with the agreed availability plan between buyer and seller
4)	Plant	[.] *Description of plant to be added*
5)	Product	The **"Product"** to be delivered and sold by Seller and received and purchased by Buyer consists of: (a) all energy, or Buyer's applicable portion, expressed in MWh, generated by the Plant and delivered to the delivery point/interconnection point (**"Delivered Energy"**) b) all other plant output including capacity and ancillary services c) Black start facility, if applicable
6)	Term	The term of the PPA shall be effective on the **Effective Date** (to be defined in the PPA) and shall terminate XX Contract Years or the expiry of the regulatory license of the Plant, whichever is earlier, following the Effective Date ("Term"). **"Contract Year"** means each consecutive 12-month period during the Term that commences on the first day of July following the Effective Date, and every July 1st thereafter. The first Contract Year shall be a partial year, commencing on the Effective Date.
7)	Contract Capacity	The Contract Capacity shall be XX MW (net, at reference condition)
8)	Sale and Purchase of Energy and Capacity	Buyer shall have exclusive right of energy and capacity of the Plant. Subject to terms of PPA, The Seller shall: (i) Make available to the Buyer the Declared Available Capacity up to the Contract Capacity (ii) Deliver and sell to Buyer at the interconnection point, the dispatched net electrical output Subject to the terms of PPA, the Buyer shall, in accordance with NEPRA approved tariff: (i) Pay Declared Available Capacity (Take or Pay mechanism) (ii) Pay for the dispatched and delivered net electrical output

Sr #	Terms	Description
9)	Metering	Buyer's share of the Delivered Energy shall be measured using electric metering devices. The Metering System shall be in place prior to the delivery of net electrical output to the interconnection point. Seller shall maintain and Buyer shall inspect such electric metering devices In accordance with the agreed terms and conditions between buyer and seller and approved by NEPRA.
10)	Billing	The PPA shall contain provisions pursuant to which Seller shall send Buyer monthly invoices in form and method determined by the Parties, showing the amount due to the Seller for the relevant month, specifying MWs supplied, all billing parameters, rates and factors and all other data relevant to the calculation of payments.
11)	Net Heat Rate	The Plant shall perform at a Net Heat Rate (NHR) of XXXX as witnessed and/or approved by NEPRA. Necessary Corrections shall be applicable on part load operations.
12)	Annual Operational Plan	At the beginning of each Year, the Plant shall submit to the Buyer, its Annual Operational Plan, which shall include but not be limited to the following: - Planned Outage Schedule - Maintenance Outage Schedule - Forced Outages Allowance - Annual Availability - Minimum Dispatch requirements as per technical limits - Fuel allocation as available from the Fuel Supplier Upon receipt of the Plants' Annual Operational Plan, the Buyer shall review and provide timely feedback on the operational plan based on the following: - The Year's demand forecast - Economic Merit Order Projection (tentative) to be provided to the seller - System constraints including planned outages in the network if any, to be provided to the Seller. - Annual Dispatch Plan (tentative) - to be provided to the Seller annually. Upon review of the Plant's Annual Operational Plan, both Parties shall mutually agree to the final plan for the upcoming contract year
13)	Plant Availability and Dispatch	Seller shall achieve availability of no less than XX%, The Plant shall be responsible for the availability of the Complex for Dispatch by the Buyer. Upon receipt of a notice of Dispatch from the Buyer, the Seller shall generate and deliver the Net Electrical Output at the Interconnection Point in accordance with the technical limits as per grid code and all applicable standards/prudent practices. The Seller shall give prompt notice to the Buyer regarding any changes to availability of the Complex caused by events such as: (i) Force Majeure Event; (ii) Scheduled Outage; (iii) Forced Outage; (iv) Partial Forced Outage; and (v) Any other event which causes alteration in availability

Sr #	Terms	Description
14)	Operation and Maintenance Costs	Seller will bear all costs and expenses for Operations and Maintenance of the Plant and any other costs up to the delivery /interconnection point for the performance of Seller's obligations under the PPA (collectively, the "Seller Costs"). Any ancillary services costs to be excluded from the Seller Costs shall be discussed in the PPA.
15)	Others	The PPA will also include, among other things, the following covenants, terms, and/or conditions: • Seller will insure operate, maintain, manage, replace, repair, study, test, and otherwise use the Plant up to its battery limits in accordance with (i) Seller's obligations in the PPA, and the OEM Manual(s), (ii) Prudent electrical and utility practices, and (iii) all applicable laws (including environmental laws), consents, and governmental approvals, including all applicable standards and guidelines adopted from time to time by governmental authorities • Seller will schedule and perform required maintenance according to the PPA • Seller will insure against all insurable risks with coverage in an amount not less than full replacement cost and on terms specified in the PPA.
16)	Fuel Supply	The Seller shall make its best efforts for the availability and allocation of Main fuel to the Gen Station to maintain guaranteed availability and to meet dispatch notifications.
17)	Start-ups and Minimum Load	The Seller shall make technical references available to the Buyer concerning the required times for Start-Ups and minimum complex/machine loading
18)	Billing	Relevant Payment Terms for Energy shall be 30 days. The Buyer shall pay the Seller the Capacity Payments for the available capacity for each month (70% in advance and 30% immediately after month end) and energy payments for dispatched and delivered net electrical output for the relevant month.
19)	Liquidated Damages	To be discussed between the Parties
20)	Force Majeure	Force Majeure Events and the obligations, duties, compensation, and recourse available to each Party during such events including but not limited to **PPFME** (Pakistan Political Events that occur inside or directly involve Pakistan) and **CLFME** (any Change in Law to the extent of Force Majeure Event) shall be negotiated and finalized in the PPA. The PPA will also include a termination right for extended force majeure that impacts Party's ability to perform under the contract.
21)	Events of Default	The PPA will include standard events of default, as appropriate.
22)	Termination	The PPA will include standard terms for Termination. However, Parties agree that there shall not be any Termination for Convenience in the PPA.
23)	Dispute Resolution	In the event of any disputes between the Parties, the Parties shall seek to resolve the same in the following order: 1. Through mutual discussion involving Steering Committee 2. If the dispute in question is not resolved through mutual discussions, then senior management of KE shall resolve the disputes. Other terms & conditions for settlement of disputes shall be mutually agreed between the Parties

Sr #	Terms	Description
25)	Indemnification	Seller shall indemnify Buyer against any damages (unless resulting from Buyer's gross negligence or willful misconduct). Buyer shall indemnify Seller against any damages (unless resulting from Seller's gross negligence or willful misconduct).
26)	Governing Law	Laws of Pakistan
27)	Confidentiality	Each Party shall be required to keep the terms and provisions, of the PPA and this Term Sheet, confidential and prohibited from disclosing such terms to any third party, subject to certain limited exceptions specified in the PPA.

K-Electric Limited

IC Report on O&M cost evaluation – Korangi Town Gas Engine Power Station ("KTGEPS") Plant

30 November 2022

Consortium of Independent Consultant

OMS

EY

Building a better working world

Reliance Restricted

Chief Financial Officer
K-Electric Limited
KE House, 39-B
Sunset Boulevard, D.H.A. Phase 2
Karachi, Pakistan

Project Power – IC Report on O&M cost evaluation of KTGEPS **30 November 2022**

Dear Sir

In accordance with your instructions, we have performed the work set out in our Purchase Order (No: 7500048189) dated 29 March 2022 (the "Engagement Agreement") in connection with the evaluation of forecast of operations and maintenance cost of owned power generation plants prepared by K-Electric Limited ("KE" or the "Client" or "you"), as part of seeking stand-alone tariff for each power plant under IPP mode from National Electric Power Regulatory Authority ("NEPRA") ("the Project" or "Project Power" or the "Transaction").

Purpose of our report and restrictions on its use

This engagement is of due diligence in nature and accordingly this due diligence report ("Report") on Korangi Town Gas Engine Power Station ("KTGEPS") has been prepared by consortium comprising OMS (Private) Limited ("OMS" or "Technical cum lead consultant") and EY Ford Rhodes ("EY" or "Financial Consultant") (hereinafter jointly referred as "Independent Consultant" or "IC", "We" or "Our") based on their respective technical and commercial analysis performed in accordance with the scope agreed vide Engagement Agreement. The supplementary analysis performed by IC during the course of this engagement has been compiled and submitted to KE separately.

This Report has been prepared on the specific instructions of KE, solely for the purpose of the Transaction and should not be used or relied upon for any other purpose. This Report (or any portion or summary of it) may not be quoted, referred to or shown to any other parties except as provided in the Engagement Agreement.

We accept no responsibility or liability to any person other than to KE, or to such party to whom we have agreed in writing to accept our responsibility in respect of this Report, and accordingly if such other persons choose to rely upon any of the contents of this Report they do so at their own risk.

Nature and scope of the services and limitations

The nature and scope of the services, including the basis and limitations, are detailed in the Engagement Agreement.

Whilst each part of our Report addresses different aspects of our work, the entire Report together with Appendices should be read for a full understanding of our findings and advice.

"Banner headlines" used in this Report are intended only to act as an introduction to the page concerned and should be read in conjunction with rest of the page. They are not intended to represent any recommendation, conclusion or finding.

Our work was completed on 30 November 2022. Therefore, our Report does not take account of events or circumstances arising after that date and we have no responsibility to update the Report for such events or circumstances.

This Report has been finalized based on the data, explanations and feedback provided by the Client during the course of engagement.

Nature and scope of the services and limitations (cont'd)

IC highlights that our Report do not include any recommendation to you on your future course of action. Any decision to proceed with tariff petition may entail consideration of several factors, some of which IC may not be aware of. The evaluation of these factors or advising you on any business decision does not form part of scope of our work of this Report. You should therefore consider the appropriateness of the Report in light of your own objectives and financial situation.

While EY has performed a review of the Operations and Maintenance ("O&M") cost model, we have not assessed the contents of the model i.e. the financial statements or roll-forward for their appropriateness for financial reporting (as per applicable framework) or taxation authorities. Further, as summarized in section 2 of the Report, our review is based on the data and agreements / quotations of the respective power plants made available to IC during the course of the engagement. Reasonableness of O&M costs has been performed by OMS in detail based on substantial review of relevant supporting documents, wherever available. Additionally, we perform our work in the capacity of IC and have not assessed any agreements for their authenticity / legality from a legal and tax perspective.

IC has reported broadly on matters, which Consortium members have noted and which appear significant to us for the purpose of technical and commercial due diligence. In addition, please note that:

a) Our work in connection with this engagement is of a different nature to that of an audit or a review of information, as those terms are understood in applicable international auditing standards. Consequently, we give no assurance on such information.

b) Our scope of work was limited to the review and analysis of information made available to EY by the management of KE, physical site visit and discussions with key management personnel of KE.

c) We have relied on the information provided during the course of engagement and have assumed the genuineness of all the documents and the signatures thereon as if they were originals and also assumed that the scanned or soft copies conform to the original.

d) Transactions, data and events which were not recorded and which were not disclosed to us may not have been identified during our due diligence.

Detailed findings of technical due diligence performed by OMS have been placed in the appendices to this Report with summary findings and considerations highlighted in different sections of the Report.

The contents of our Report have been reviewed by KE management, who have confirmed to us their factual accuracy. Further, feedback provided on the draft Report has been duly addressed, wherever deemed appropriate.

We appreciate the co-operation extended by the KE team during the course of this engagement. Please do not hesitate to contact us if you have any questions about this engagement or if we may be of any further assistance.

Yours faithfully,

For and on behalf of OMS (Private) Limited (Technical cum lead consultant)

Abu Adil (Senior General Manager)

For and on behalf of EY Ford Rhodes (Financial consultant)

Rana Nadeem Idrees (Partner)

Table of contents

1 Key considerations

Key considerations

Key consideration	Commentary	Findings / Recommendation	Pg. no.
Plant operating profile and availability / utilization factor assumption	▸ Under an integrated MYT regime, KE had a consolidated O&M tariff component based on projected operating profile and load factor of its plants. ▸ Since, KE is planning to seek standalone O&M cost tariff for each plant, including KTGEPS, therefore, Management has assumed projected plant availability / utilization factor of 87.81% (i.e. the maximum achievable average availability / utilization factor during remaining plant life). ▸ Aforementioned assumption of projected plant utilization to match projected plant availability has been kept aligned with other IPPs, for the sake of tariff petition. ▸ KTGEPS configuration includes 32 × Gas Engines, 32 × HRSG & 01 × ST. ▸ Since NEPRA has determined the performance of complex through 3rd party test i.e., Gross Capacity: 95.51 MW, Net Output: 92.05 MW, Net Efficiency (HHV): 37.75% and auxiliary consumption of 3.462 MW (3.62%), therefore, it is implied that the same shall stand accepted as such..	▸ Major cost events and the variable cost annual spend profile during the requested tariff control period has been assessed keeping in view forecast availability/utilization. ▸ Since variable costs, including event based costs, are claimed based on actual utilization of the plant, risk of claiming any extra cost for lower actual utilization is negligible. ▸ The availability/utilization/load factor assumed by KE is reflective of the brownfield nature of the plant and expected maintenance requirements over its remaining useful life.	n.a.
Methodology applied for preparing O&M tariff	▸ KE intends to submit its petition for each of its owned power generation plant under IPP mode. ▸ Previously, NEPRA has considered the Revex component of O&M cost for the immediately preceding year (reference year) and accordingly determined the O&M tariff component. In this particular case, KE is submitting its petition in advance for tariff period commencing from FY24 in the current fiscal year. Therefore, for the purpose of O&M cost estimation, FY22 audited numbers have been used.	▸ KE would need to assess its readiness to address any additional information required during tariff determination process. ▸ The findings of this Report are also expected to provide comfort around O&M cost estimation of KE, during the tariff determination process.	n.a.

Key considerations

Key consideration	Commentary	Findings / Recommendation	Pg. no.

Reclassification of expenses between foreign and local components and other adjustments	▸ The adjustments mainly reflect the impact of:
	  ▸ update of exchange rate assumption by KE from PKR 185 to PKR 206 in case of foreign components of VOM and FOM costs (i.e. with a cumulative increase of PKR 1.58b in VOM foreign and PKR 0.04b in FOM foreign).
	  ▸ reclassification/revisit of costs suggested by IC in local and foreign components of VOM and FOM.
	▸ These adjustments translated into a net cumulative reduction of PKR 3.3b in FOM and a net cumulative increase of PKR 1.3b in VOM over the requested tariff control period. Consequently, average per kWh VOM cost increased by PKR 0.1127 and average per kWh FOM cost decreased by PKR 0.2896.
		▸ KE has evaluated and concurred with the identified adjustments of IC and accordingly reflected those in its adjusted average tariff computation.
		▸ The adjusted average tariff has been included in the later sections of this Report.
			27

Basis used for estimating O&M costs	▸ Basis of estimations can be summarized in three broad categories:
	  ▸ Linked to latest available POs/quotations;
	  ▸ Management estimate/past experience; and
	  ▸ Based on FY22 values and SAP history.
	▸ IC has substantiated the reasonableness of assumptions on sample basis (covering ~85.2% of value) through checking of POs, quotations, SAP history, underlying agreements and / other relevant data / basis considered by the Management.
		▸ Estimation basis used by the management were found reasonable / consistent with the historical benchmarks, underlying agreements and / or historical basis.
		▸ As highlighted above, some re-classification adjustments (between local / foreign and variable / fixed components) and cost reductions were identified by IC. These have been agreed with KE and accordingly have been addressed in the adjusted average tariff computation of KE, shown in later sections of this Report.
			26

Key considerations

Key consideration	Commentary	Findings / Recommendation	Pg. no.
Benchmarking of O&M costs (Gas operations) PKR/kWh KTGEPS: 1.8482 SNPCL: 1.8841	▸ Any reference of similar technology with same configuration of combined cycle mode could not be found in Pakistan, however, the closest benchmark with respect to gas engines in combined cycle mode i.e., Sindh Nooriabad Power Company Limited ("SNPCL") was considered for tariff benchmarking. ▸ In terms of total reference average O&M component of tariff, as shown in the adjacent column, total KTGEPS O&M cost tariff is less than that of SNPCL. ▸ Fixed cost ratio in KTGEPS is less than benchmark by 9.35%. This is compensated by higher VOM cost ratio in KGTEPS by 9.35% as compared to the benchmark. ▸ Foreign cost component of KTGEPS is 75.8%, as compared to SNPCL, where the foreign cost component is 43.8%. **Enabling cost benchmarking:** ▸ Due to lack of publicly available data about benchmark projects, enabling costs were analyzed at overall FOM level and were found reasonable.	▸ Overall KTGEPS O&M cost tariff is lower as compared to the benchmark power plant, despite having 53 major maintenance events (i.e. 60K major maintenance events during remaining life of plant until FY39).	31

O&M cost indexations	▸ KTGEPS average tariff is expected to be indexed as follows:
	  ▸ Local costs: Pak CPI Quarterly
	  ▸ Foreign costs: US CPI and Exchange rate Quarterly variation
		▸ The requested indexations are aligned with benchmark projects and recent determinations by NEPRA for other thermal power projects.	32

Key considerations

Key consideration	Commentary	Findings / Recommendation	Pg. no.
Unbundling consideration	▸ KTGEPS plant is currently operating under the umbrella of overall KE system. Accordingly, cost structure may change going forward, in case Management decides to unbundle the utility into distinct business segments.	▸ KE is suggested to seek adequate openers (e.g. those related to the recovery of legitimate incremental O&M costs that may arise in future due to potential unbundling of the utility) in its tariff petition.	n.a.
Other commercial considerations	▸ Since KE is using an in-house model for O&M operations, opportunity of embedding certain costs and risks (as part of third-party O&M contractor scope) with performance guarantee mechanism and indirect reflection in fixed or variable O&M charge is not available to KE. Consequently, such costs and risks are being parked with/borne by KE instead of a third party and hence bear a cost recovery challenge. However, KE does not envisage any cost increase due to continuation of an in-house operating model.	▸ KE, in consultation with its legal team, should consider reiterating the legitimate cost recovery principal enshrined within the prevalent tariff regulatory framework while finalizing and framing request for the O&M cost components of the tariff.	n.a.

2 Project background and scope of work

KE has hired consortium of OMS and EY for the independent evaluation of projected O&M costs for KTGEPS

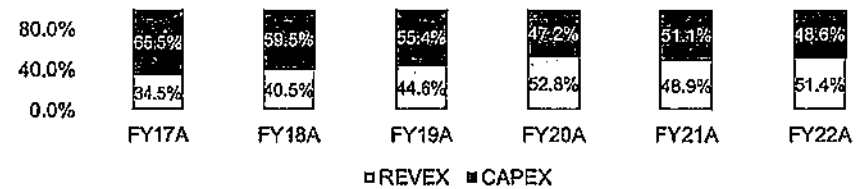
Background

- K-Electric Limited ("KE") is the only vertically integrated power utility of Pakistan.
- KE carries out operations and maintenance of its power generation plants, including major overhauls, under service contracts with OEMs and/or in-house (with or without vendors support), as applicable.
- KE's existing integrated-Multi Year Tariff ("MYT") period is due to expire on 30 June 2023.
- As part of its preparatory work for next MYT petition, KE has internally decided to opt out of MYT for generation component of its business and is in the process of applying separate generation tariff for the following owned power generation plants, covering their remaining useful economic lives as tariff control period:
  - Bin Qasim Power Station – I ("BQPS I")
  - Bin Qasim Power Station – II ("BQPS II")
  - Bin Qasim Power Station – III ("BQPS III")
  - S.I.T.E Gas Engine Power Station ("SGEPS")
  - Korangi Town Gas Engine Power Station ("KTGEPS")
  - Korangi Combined Cycle Power Plant ("KCCPP")
- KE has prepared an O&M cost forecast for each of these power plants for the purpose of tariff petioning. For this purpose, O&M costs have been derived keeping in view historical and forecast revenue expenditure ("REVEX") and capital expenditure ("CAPEX") for each plant.
- KE hired a consortium comprising OMS (Private) Limited ("Technical cum lead consultant") and EY ("Financial Consultant") (hereinafter together referred to as "Independent Consultant" or "IC") for the independent evaluation of the aforesaid projected O&M costs.

O&M costs related to generation segment are reflected in audited financial statements as expenses incurred in generation and additions to CWIP – generation segment

Historical generation O&M cost – KE system

Figures in PKRm		FY17A	FY18A	FY19A	FY20A	FY21A	FY22A
REVEX	A	4,751	4,695	5,195	5,054	5,322	4,770
CAPEX	B	9,003	6,877	6,429	4,521	5,656	4,505
Total		13,754	11,572	11,624	9,575	10,978	9,275



Reconciliation with audited financial statements

Figures in PKRm	FY17A	FY18A	FY19A	FY20A	FY21A	FY22A
O&M expenditure	4,751	4,695	5,195	5,054	5,322	4,770
Add: Depreciation & Amortization	7,648	9,061	9,878	11,729	11,436	11,657
O&M expenditure total	**12,399**	**13,756**	**15,073**	**16,783**	**16,758**	**16,427**
O&M expenditure support cost	1,089	920	1,138	986	1,223	1,273
Add: Depreciation & Amortization support dept	43	55	68	82	85	212
O&M expenditure total	**1,132**	**974.56**	**1,206**	**1,068**	**1,308**	**1,485**
Expenses incurred in generation as per AFS	**13,531**	**14,731**	**16,279**	**17,851**	**18,066**	**17,912**

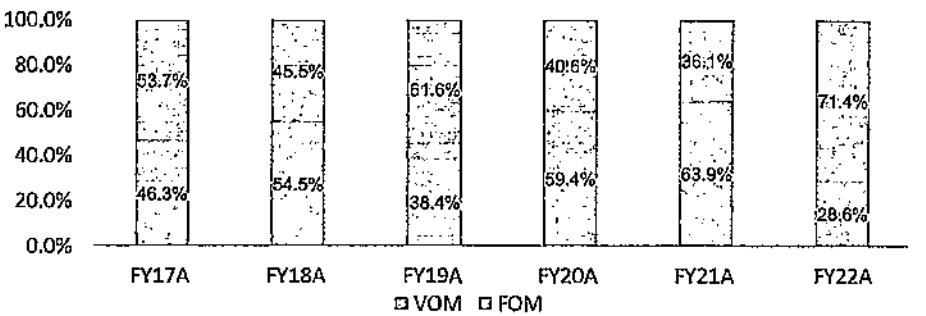
Figures in PKRm	FY17A	FY18A	FY19A	FY20A	FY21A	FY22A
Generation – Plant and machinery additions	7,509	6,385	6,857	4,234	5,059	4,162
Generation – Others	1,494	492	-428	287	597	343
Sub-total	**9,003**	**6,877**	**6,429**	**4,521**	**5,656**	**4,505**
Add: BQPS III Project Cost	0	30	14	16,625	45,372	21,819
CWIP additions as per AFS	**9,003**	**6,907**	**6,443**	**21,146**	**51,028**	**26,324**

Source: Management data and KE Annual Reports

Snapshot of historical O&M cost of KTGEPS (figures in PKR million)

Financial year	FY17A	FY18A	FY19A	FY20A	FY21A	FY22A
REVEX	466	491	517	471	528	380
CAPEX	387	241	115	346	545	169
Total O&M	853	732	633	817	1,073	549

Source: Management data



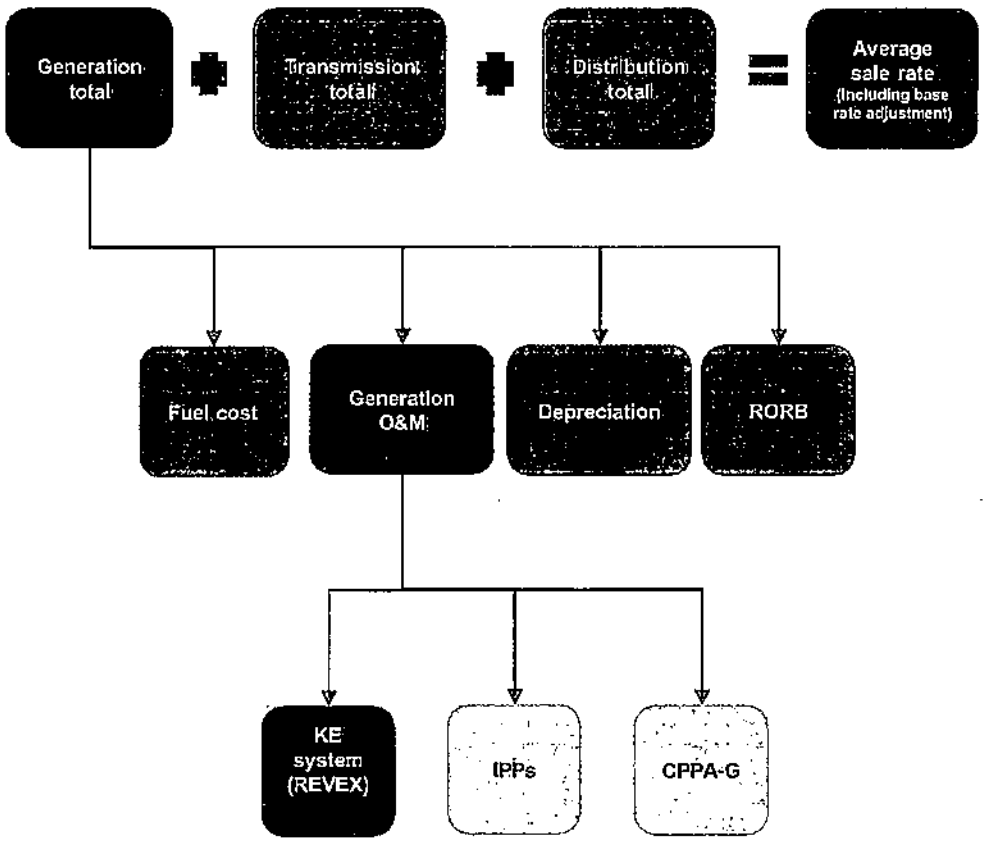
Breakdown of KTGEPS O&M cost in variable and fixed components

Financial year	FY17A	FY18A	FY19A	FY20A	FY21A	FY22A
Variable O&M local	48	54	31	45	10	31
Variable O&M foreign	347	345	212	440	676	126
Sub-total variable O&M	395	399	243	485	686	157
Fixed O&M local	312	331	385	329	387	351
Fixed O&M foreign	146	2	5	3	0	41
Sub-total fixed O&M	458	333	390	332	387	392
Total	853	732	633	817	1,073	549

- Per management, since existing MYT does not bifurcate O&M into variable and fixed costs and accordingly, therefore costs are being maintained in the form of REVEX and CAPEX only. According to the Management, for the purposes of comparison with the proposed O&M bifurcation into fixed and variable cost going forward, historical O&M costs have been bifurcated based on assumptions similar to that of projected O&M costs.

Composition and comparability limitations of existing MYT

Current Integrated Multi-Year Tariff structure determined by NEPRA



- KE's current Multi Year Tariff is an Integrated MYT which includes costs and returns for all three segments i.e. Generation (all plants), Transmission and Distribution based on Regulatory Asset Base (RAB).
- While the underlying costs for three segments are defined in the current MYT determination, certain components such as base rate component and working capital component are not bifurcated segment wise.
- Similarly, plant wise tariff bifurcation in case of generation segment is not available within the MYT.
- Current MYT includes below components:
  - Fuel cost based on allowed benchmarks (indexed value for the month of June 2022 was PKR 21.72/kWh*);
  - RoRB and Depreciation components which cover for Returns on Regulatory Asset base (indexed value for the month of June 2022 was PKR 1.13/kWh* for generation); and
  - Operation and maintenance costs for generation, that are covered through:
    - O&M component allowed for Revex expenses (indexed value for the month of June 2022 was PKR 0.59/kWh*); and
    - Capital nature expenses allowed as investments and included in Regulatory Asset Base
- As explained above, base rate and working capital components are given on Company level, which include coverage for Generation segment as well.
- Accordingly, MYT in its current form is not comparable with the O&M cost tariff being requested under IPP mode.

Source: Management data

* Tariff values based on total units sold basis

Scope of work of IC

Scope of work	Responsibility	
	OMS (Lead cum Technical Consultant)	EY (Financial Consultant)
Comment on the historical and projected operating profile of plant	✓	
Review and evaluate grouping of O&M activities under fixed and variable components	✓	✓
Review bifurcation of expenses in foreign and local components	✓	✓
Review and evaluate completeness of O&M costs	✓	
Review and evaluate assumptions used for projecting O&M costs	✓	✓
Evaluate enabling / associated cost loading over O&M cost component of isolated plant	✓	✓
Identify gaps in costing and provide estimates to fill those gaps	✓	
Benchmarking of O&M costs against those of comparable projects	✓	✓
Consider inventory in hand and consider its periodic depletion till end of term	✓	

3 Technical specifications of the plant

Key technical specification and plant configuration of KTGEPS

- Korangi Town Gas Engines Power Station ("KTGEPS") is located at Plot 1/19, Sector 10, Korangi Town Industrial Area of Karachi.
- KTGEPS is connected to K-Electric 132KV transmission system and is the part of the overall fleet of generating stations owned by K-Electric.
- The 32 engines are configured in four (4) sections (8 engines in each section) and the same configuration has been followed for 32 HRSG units. Each of the four sections is connected to 132kV GIS via 11/132kV 30MVA step-up transformer. Similarly, steam turbine is connected to 132kV GIS via 11/132kV 15.5MVA step-up transformer.
- Plant can be operated both in simple cycle and combined cycle as well. The fuel for the plant is natural gas which is supplied by the Sui Southern Gas Company Ltd. (SSGC)
- KTGEPS is sub-divided into 04 Sections.
- Section-I contains Engine (1~8): achieved COD on August 22, 2009
- Section-II contains Engine (9~16): achieved COD on September 16, 2009
- Section-III contains Engine (17~24): achieved COD on December 12, 2009
- Section-IV contains Engine (25~32): achieved COD on December 20, 2009
- Steam Turbine (unit # 33): completed Reliability Run Test (RRT) on March 01, 2016.
- NEPRA issued Generation License # GL/04/2002 to K-Electric on November 18, 2002 and subsequent modifications time to time for distinctly placed six power generation stations. The latest GL modification approved on February 19, 2021 i.e., NEPRA/R/LAG-05/8872-76 to the Company in accordance with the prevailing regulatory regime & project useful life is determined as 30 years for Engines & 25 Years for Steam Turbine from (COD).
- It has been in operation for the last 13 years and is supposed to enter its final year of operations by 2039.

Category	Description
Technology	Combined cycle power plant
Configuration	32 Engines + 32 HRSG +1ST
Type of fuel	Natural Gas
Equipment	Gas Engines & Steam Turbines
Units	32 x 3.041 MW Gas Engines, 1 x 10.0 MW Steam turbines
Capacity	107.312 MW ISO Installed
Make	Gas Engines – GE JENBACHER, Steam Turbine – NG ALLEN, UK
Model	Gas Engine – JGS 620 E-Series , Steam Turbine – MC-800

Plant past performance and heat rate

Last 6-year performance

Performance Indicator	FY17	FY18	FY19	FY20	FY21	FY22
Availability (%)[1]	88.12	88.45	90.44	88.46	84.40	96.74
Reliability (%) [2]	94.79	96.16	96.84	99.34	97.84	99.33

Heat rate test results

Description	Values
Gross Capacity – MW (RSC)	95.513
Auxiliary – MW	3.462
Net Capacity – MW	92.05
Net Heat Rate LHV Basis (BTU/kWh)	8,150
Net Efficiency LHV Basis	41.87%
Auxiliary (Gross Load)	3.62%
Gross Heat rate LHV Basis (BTU/kWh)	7,855
Gross Efficiency LHV Basis	43.44%
Net Heat Rate HHV Basis (BTU/kWh)	9,038
Net Efficiency HHV Basis	37.75%
Gross Heat rate HHV Basis (BTU/kWh)	8,710
Gross Efficiency HHV Basis	39.17%

1. Availability % = Available Capacity / Gross Dependable Capacity
2. Reliability = (Period Hours – Forced Outage Hours) / Period Hours

Engine maintenance strategies for KTGEPS

Engine RHRS	Maintenance type	Maintenance
1000 RHRS	1K	Borescope, Spark Plug Re-Gapping and sealing ring replacement, (For J-Type Plug), Greasing of Actuator Linkage Rod
2000 RHRS	2K	Valve Take-Up, Spark Plug Replacement, Cylinder Tappet Adjustment, tightening of all Rocker Arm Bolts, Main Gas Street and Prechamber Gas Filter, Air Filter Replacement
6000 RHRS	6K	2K Work Scope & PCGVs replacement
10000 RHRS	10K	2K Work Scope, Replacement of Spark Plug O-rings Replacement of Sleeves upon inspection, Replacement of Pre-combustion chamber, Turbocharger Replacement, Intercooler Core and Flame arrestor cleaning, Turbo bypass Valve Gasket replacement and Turbo bypass servicing
20000 RHRS	20K	2K Work Scope, Replacement of Spark Plug O-rings, Replacement of Sleeves upon inspection, Replacement of Pre-combustion chamber, Turbocharger Replacement, Intercooler Core and Flame arrestor cleaning, Turbo bypass Valve Gasket replacement and Turbo bypass servicing, Vibration Damper Replacement
30000 RHRS	30K	2K Work Scope, Replacement of Spark Plug O-rings, Replacement of Sleeves upon inspection, Replacement of Pre-combustion chamber, Turbocharger Replacement, Intercooler Core and Flame arrestor cleaning, Turbo bypass Valve Gasket replacement and Turbo bypass servicing, Throttle Bush replacement, Cylinder Liner Replacement, Piston Replacement, Connecting Rod replacement, Cylinder Heads overhauling
60000 RHRS	60K	2K Work Scope, Replacement of Spark Plug O-rings, Replacement of Sleeves upon inspection, Replacement of Pre-combustion chamber, Turbocharger Replacement, Intercooler Core and Flame arrestor cleaning, Turbo bypass Valve Gasket replacement and Turbo bypass servicing, Throttle Bush replacement, Vibration Damper Replacement, Cylinder Liner Replacement, Piston Replacement, Connecting Rod replacement, Cylinder Heads Replacement, Block/Crank shaft inspection & Machining (whichever applicable)

Planned maintenance summary of major equipment

Planned outages

Year	Planned Outages Description	Total Outage Hours (Engine-based)
2016	E11 30K RH Maintenance	432
2016	E12 30K RH Maintenance	744
2016	E15 30K RH Maintenance	696
2016	E16 30K RH Maintenance	528
2016	E18 30K RH Maintenance	504
2016	E31 30K RH Maintenance	792
2016	E43 30K RH Maintenance	696
2016	E44 30K RH Maintenance	840
2016	E46 30K RH Maintenance	744
2017	E13 30K RH Maintenance	768
2017	E33 30K RH Maintenance	840
2017	BT4 for shifting on new GIS	2,421
2018	BT-3 Dismantling and refurb installation	3,365
2021	BT4 Replacement and testing	3,146
2021	BT2 Replacement and testing	1,189

Year	Planned Outages Description	Total Outage Hours (Engine-based)
2022	BT1 Refurbished Transformer replacement	2,552
2019	E21 60K RH Major Maintenance	936
2020	E24 60K RH Major Maintenance	5,352
2020	E25 60K RH Major Maintenance	5,688
2020	E41 60K RH Major Maintenance	5,352
2020	E45 60K RH Major Maintenance	5,112
2020	E26 60K RH Major Maintenance	3,960
2020	E47 60K RH Major Maintenance	4,104
2020	E27 60K RH Major Maintenance	4,440
2020	E22 60K RH Major Maintenance	4,896
2020	E23 60K RH Major Maintenance	4,944
2020	E28 60K RH Major Maintenance	4,560

KTGEPS unit wise accumulated operating hours

Accumulated hours until 30 June 2022

Unit No.	Accumulated Hours
Engine No. 1 (E11)	61717.00
Engine No. 2 (E12)	64566.00
Engine No. 3 (E13)	57781.00
Engine No. 4 (E14)	61991.00
Engine No. 5 (E15)	55892.00
Engine No. 6 (E16)	62611.00
Engine No. 7 (E17)	61528.00
Engine No. 8 (E18)	62033.00
Engine No. 9 (E21)	67940.00
Engine No. 10 (E22)	63155.00
Engine No. 11 (E23)	61880.00
Engine No. 12 (E24)	65186.64
Engine No. 13 (E25)	63745.00
Engine No. 14 (E26)	65071.00
Engine No. 15 (E27)	64148.00
Engine No. 16 (E28)	63498.00
Engine No. 17 (E31)	58444.00
Engine No. 18 (E32)	60442.00
Engine No. 19 (E33)	47813.00
Engine No. 20 (E34)	58697.00
Engine No. 21 E(35)	61368.00
Engine No. 22 E(36)	56257.00
Engine No. 23 E(37)	57343.00
Engine No. 24 E(38)	54146.00

KTGEPS unit wise accumulated operating hours

Accumulated hours until 30 June 2022	
Unit No.	Accumulated Hours
Engine No. 25 (E41)	62519.00
Engine No. 26 (E42)	64006.00
Engine No. 27 (E43)	63205.00
Engine No. 28 (E44)	62010.00
Engine No. 29 (E45)	65131.00
Engine No. 30 (E46)	58861.00
Engine No. 31 (E47)	64215.00
Engine No. 32 (E48)	60228.00
ST Unit No. 33	16611.00

Engines projected planned maintenance summary (FY24 – FY39)

S/No.	Gas engine	Engine #	Maintenance type	Maintenance year	Outage days per engine
1	60K Maintenance	11,14,15,16,17,36,38	Major	FY-24	40
2	60K Maintenance	18,31,32,33,35,43,44,46,48	Major	FY25	40
3	60K Maintenance	12,42	Major	FY-26	40
4	60K Maintenance	13,34	Major	FY27	40
5	60K Maintenance	37	Major	FY28	40
6	60K Maintenance	21	Major	FY30	40
7	60K Maintenance	22,23,24,25,26,27,28,41,45,47	Major	FY31	40
8	60K Maintenance	15,36,38	Major	FY-32	40
9	60K Maintenance	11,14,16,17,18,31,32,33,35,43,44,46,48	Major	FY33	40
10	60K Maintenance	12,42	Major	FY34	40
11	60K Maintenance	13,34,37	Major	FY35	40
12	30K Maintenance	37	Minor	FY24	25
13	30K Maintenance	13,34	Minor	FY25	25
14	30K Maintenance	21,24,25,45	Minor	FY26	25
15	30K Maintenance	22,23,26,27,28,41,47	Minor	FY27	25
16	30K Maintenance	11,14,15,16,17,18,32,35,36,38,48	Minor	FY28	25
17	30K Maintenance	31,33,43,44,46	Minor	FY29	25
18	30K Maintenance	12,42	Minor	FY30	25
19	30K Maintenance	13,34,37	Minor	FY31	25
20	30K Maintenance	21	Minor	FY34	25
21	30K Maintenance	22,23,24,25,26,27,28,41,45,47	Minor	FY35	25
22	30K Maintenance	11,14,15,16,36,38	Minor	FY36	25
23	30K Maintenance	17,18,31,32,33,35,43,44,46,48	Minor	FY37	25
24	30K Maintenance	42	Minor	FY38	25
25	30K Maintenance	34,37	Minor	FY39	25

Steam Turbine Projected Planned Maintenance Summary (FY24 - FY39)

S/No.	Steam turbine	Maintenance type	Maintenance year	Outage days
1	Steam Turbine 40K Maintenance	Major	FY-25	35
2	Steam Turbine 40K Maintenance	Major	FY-29	35
3	Steam Turbine 40K Maintenance	Major	FY-34	35
4	Steam Turbine 40K Maintenance	Major	FY-39	35
5	Steam Turbine 8K Maintenance	Minor	FY-26	14
6	Steam Turbine 8K Maintenance	Minor	FY-27	14
7	Steam Turbine 8K Maintenance	Minor	FY-28	14
8	Steam Turbine 8K Maintenance	Minor	FY-30	14
9	Steam Turbine 8K Maintenance	Minor	FY-32	14
10	Steam Turbine 8K Maintenance	Minor	FY-33	14
11	Steam Turbine 8K Maintenance	Minor	FY -35	14
12	Steam Turbine 8K Maintenance	Minor	FY -36	14
13	Steam Turbine 8K Maintenance	Minor	FY -37	14
14	Steam Turbine - RGB 80K Maintenance	Major	FY-25	7
15	Steam Turbine - RGB 80K Maintenance	Major	FY-34	7

Strategic spares and inventory available in the warehouse

Strategic spares and inventory available in the warehouse built up as of 30 June 2022 is as follow:

S. No	Department	No of Items	Amount in PKR
1	Mechanical	60	125,557,212
2	Electrical and I&C (E&I)	42	60,534,411
3	REVEX / Other Consumables	2,477	355,518,100
	Total	**2,580**	**541,609,723**

- In KTGEPS project cost, certain level of capital spares for plant equipment and its auxiliaries were provided by EPC.
- ST strategic spares are maintained as per outage requirement i.e., 8K (Minor) & 40K (Major) etc.
- Other auxiliary system spares and routine maintenance spares of Engine, ST, HRSG & BOP are maintained according to their requirements. minimum / maximum quantities of these spares are defined in SAP and reordered accordingly.
- Consumables are managed under REVEX which majorly comprise of lube oil, air intake filters and BOP equipment spares.
- Total inventory given in the inventory list is carried at **PKR 541,609,723** which requires regular replenishment for smooth O&M of plant during its remaining useful life.

Key findings

Overall spares availability and inventory management was found reasonable to ensure the plant availability / maintenance requirement.

4 Adjusted O&M cost and average tariff

Key assumptions

Key assumptions

- As per generation license, precise commercial operations end date for KTGEPS is 19 August 2039. However, for the sake of simplicity, KE has projected the O&M costs for period FY24 – FY39 ("KTGEPS PP"). The impact of additional period rounded to the nearest month has been illustrated on the following slides for ease of reference and understanding.
- Availability / utilization factor varies throughout the years as follows:

FY	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
Factor	87.4%	85.7%	88.5%	87.8%	87.3%	88.2%	89.2%	85.9%	89.0%	85.5%	88.3%	86.8%	88.7%	87.9%	89.8%	88.8%

- The average utilization/load factor is reflective of the brownfield nature of the plant and expected maintenance requirements over its remaining useful life.
- Average availability during FY17 – FY22 was 89.43%, whereas, average availability assumed during FY24 – FY39 works out to be 87.81%, keeping in view the anticipated maintenance requirements for the plant
- Foreign currencies other than USD are first converted to equivalent USD based on their respective exchange rate parity with USD (assumed 1.05, 1.21, 0.15, 0.01, and 1.0 for EUR, GBP, CNY, JPY and USD respectively). Subsequently, USD based values are converted to equivalent PKR using prevailing PKR to USD conversion rate of 206.0, as per 30th June 2022 (as per NBP).
- The projected O&M costs originally estimated by the management of KE was based on PKR to USD exchange rate of 185. Towards the finalization of IC work, this assumption has been updated to PKR 206 for each USD. Accordingly, the adjusted reference tariff is also reflective of exchange rate assumption update.

Adjusted reference cumulative O&M cost (un-indexed) during FY24 – FY39 is PKR 19.7b (excluding enabling)

Adjusted O&M cost (FY24 – FY39) (excluding enabling cost)	Summary of identified adjustments reflected in the adjusted O&M cost
Total O&M cost | PKR 19.7b	Total O&M cost: PKR - 2.0b A: PKR - 3.62b | B: PKR +1.62b
Variable | PKR 16.0b (81.5%)	Total VOM cost: PKR + 1.3b A: PKR - 0.31b | B: PKR +1.58b
Local PKR 0.5b (3.1%)	Local: PKR - 1.05b A: PKR - 1.05b
Foreign PKR 15.6b (96.9%)	Foreign: PKR + 2.4b A: PKR + 0.74b B: + 1.58b
Fixed | PKR 3.6b (18.5%)	Total FOM cost: PKR - 3.3b A: PKR - 3.32b | B: PKR +0.04b
Local PKR 3.3b (90.4%)	Local: PKR -1.91b A: PKR - 1.91b
Foreign PKR 0.4b (9.6%)	Foreign: PKR - 1.37b A: PKR - 1.41b B: + 0.04b

After considering additional period (2 months) until expiry of the generation license, the aggregate increase in the total O&M cost (excluding enabling cost) is PKR 208.6 million.

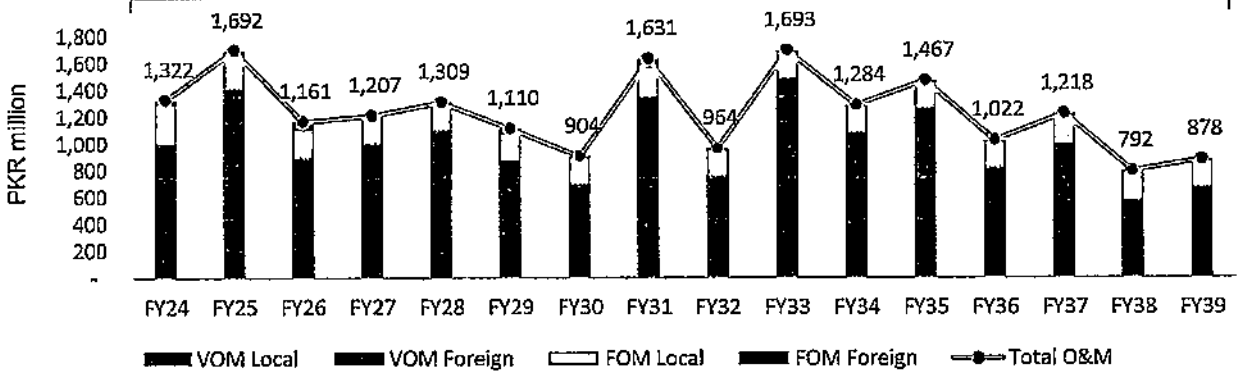
Source: Management data

Legend: **Cost reduction** **Cost increase** **A: Estimated cumulative adjustments identified by IC** **B: Estimated exchange rate update impact**

Adjusted total O&M costs mix and trend (Excluding enabling)

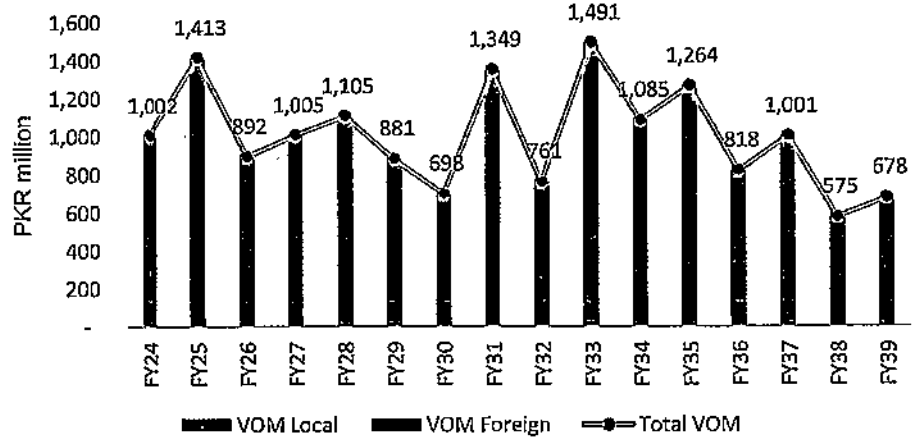
Total adjusted reference O&M cost (un-indexed)

Average availability / utilization: 87.81%

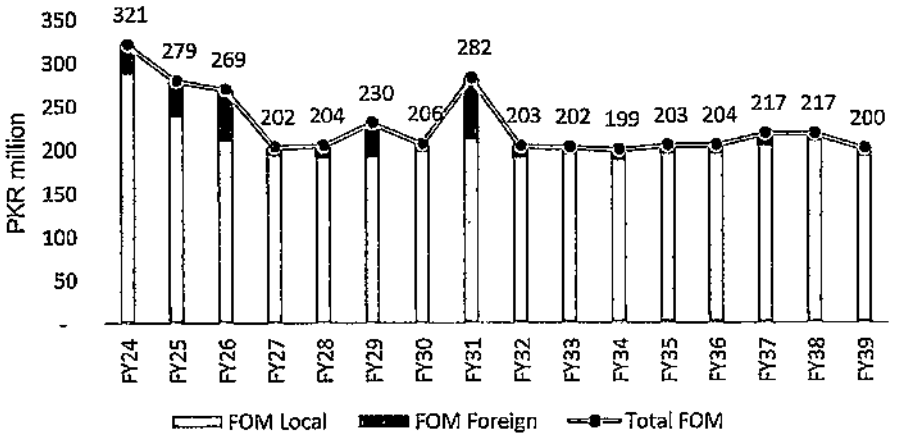


Historical analysis (FY 17 – 22)	
Average availability (%)	89.4
Average utilization (%)	38.0
Average annual total O&M (PKR million)	706.7

Total adjusted reference VOM cost (un-indexed)



Total adjusted reference FOM cost (un-indexed)



Computation of tariff based on projected plant availability for both FOM and VOM components

Load factor used:

FY	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
Factor	87.4%	85.7%	88.5%	87.8%	87.3%	88.2%	89.2%	85.9%	89.0%	85.5%	88.3%	86.8%	88.7%	87.9%	89.8%	88.8%

Year	Variable O&M			Fixed O&M			Total
	Local	Foreign	Total	Local	Foreign	Total	
FY24	0.0359	1.3849	**1.4207**	0.4084	0.0467	**0.4551**	**1.8758**
FY25	0.0594	1.9847	**2.0441**	0.3445	0.0593	**0.4038**	**2.4479**
FY26	0.0379	1.2130	**1.2510**	0.2929	0.0841	**0.3770**	**1.6280**
FY27	0.0421	1.3775	**1.4196**	0.2737	0.0118	**0.2854**	**1.7051**
FY28	0.0464	1.5225	**1.5688**	0.2708	0.0186	**0.2894**	**1.8582**
FY29	0.0489	1.1899	**1.2388**	0.2694	0.0537	**0.3231**	**1.5619**
FY30	0.0348	0.9352	**0.9700**	0.2747	0.0116	**0.2863**	**1.2563**
FY31	0.0450	1.9018	**1.9468**	0.3045	0.1021	**0.4067**	**2.3534**
FY32	0.0350	1.0250	**1.0601**	0.2662	0.0169	**0.2831**	**1.3431**
FY33	0.0601	2.1007	**2.1609**	0.2816	0.0112	**0.2928**	**2.4537**
FY34	0.0484	1.4748	**1.5232**	0.2633	0.0158	**0.2791**	**1.8023**
FY35	0.0425	1.7624	**1.8049**	0.2789	0.0117	**0.2906**	**2.0955**
FY36	0.0323	1.1111	**1.1433**	0.2726	0.0123	**0.2850**	**1.4283**
FY37	0.0507	1.3622	**1.4129**	0.2870	0.0196	**0.3066**	**1.7195**
FY38	0.0336	0.7607	**0.7942**	0.2893	0.0107	**0.3000**	**1.0942**
FY39	0.0434	0.9032	**0.9466**	0.2680	0.0113	**0.2793**	**1.2259**
Weighted average	0.0434	1.3703	**1.4137**	0.2902	0.0309	0.3211	**1.7348**
Add: Enabling charge (for details, please see next page)				0.1134	-	**0.1134**	**0.1134**
Total tariff	0.0434	1.3703	**1.4137**	0.4036	0.0309	0.4345	**1.8482**

Since KE is a vertically integrated power utility and carry a unique position due to brown field nature of its power plants with entity level consumption, it intends to follow a billing regime for capacity payment based on available (net of outage allowances) basis. Accordingly, in order to recover projected fixed costs, Management has computed capacity part at respective availability/utilization factor across all power plants of KE. In terms of total fixed cost recovery on an annual basis, KE's proposed Fixed cost component is expected to be indifferent from tariff computation being practiced under Take or Pay regime for other IPPs .

Weighted average tariff including additional 62 days:

FY24 - 40	**0.0434**	**1.3703**	**1.4137**	**0.4036**	**0.0309**	**0.4345**	**1.8482**

Since KE operates as VIU company, it has a central enabling/support function serving all three business segments of the business. Central costs are allocated to each business segment (generation, transmission and distribution)

Allocation of enabling charge to O&M tariff

Average Enabling cost (per annum)	Average tariff component (per kWh)
PKR 80.3m	**PKR 0.1134**

Source: Management data

- Per Management, enabling costs represent costs apportioned to KTGEPS by departments, such as Human Resource Management, Information Technology, Marcom, Business Development (including IPP department), Security, Corporate Affairs, CFO Office and CEO Office etc., for provision of shared services to KTGEPS.
- It has been assumed by the Management that aforementioned costs will be directly incurred by the respective departments and subsequently a re-allocation will be made to the generation, transmission and distribution segments, using re-allocation basis provided by the respective departments (generally based on their own assessment of time spent or relevance of cost between generation, transmission and distribution segments).
- Ultimately, projected cost assigned to generation segment is spread between six plants based on the numbers of unit sent out.
- Such costs are generally covered as part of the administrative costs claim in the fixed O&M local component of the tariff allowed to IPPs.

Key findings

In the absence of visibility on the cost break-up of benchmark power plant i.e. SNPCL, IC is not in a position to benchmark enabling cost allocation to KTGEPS. Accordingly, these have been analyzed on total FOM basis, and were found reasonable.

Overall O&M tariff of KTGEPS is less as compared to the benchmark power plant

Tariff components	KTGEPS		SNPCL[1]	
	PKR / kWh	%share	PKR / kWh	%share
Variable O&M – Local	0.0434	2.3%	0.4387	23.28%
Variable O&M – Foreign	1.3703	74.1%	0.8264	43.86%
Sub-total	**1.4137**	**76.5%**	**1.2651**	**67.15%**
Fixed O&M – Local	0.4036	21.8%	0.6190	32.85%
Fixed O&M – Foreign	0.0309	1.7%	0.0000	0.00%
Sub-total	**0.4345**	**23.5%**	**0.6190**	**32.85%**
Total O&M tariff	**1.8482**	**100.0%**	**1.8841**	**100.0%**

Key technical specifications	KTGEPS	SNPCL
Net capacity (MW)	92.05 MW	2 X 50 MW
Efficiency (net at HHV)	37.75%	41.64%
Fuel	Natural Gas	Natural Gas
Engines type	GE Jenbacher JGS 620 GS-NL Gas Engine	Wartsila 20V 34 SG Gas Engine
Plant configuration	32 Engines + 32 HRSG +1ST	2 × (5 Engines + 5 HRSGs +1 ST)
Generation license period	30 years	25 Years
Average availability / utilization factor for tariff benchmarking	87.81% [2]	87.81% [1]

Key findings

Any reference of similar technology with same configuration of combined cycle mode could not be found in Pakistan, however, the closest benchmark with respect to gas engines in combined cycle mode i.e., SNPCL was considered for tariff benchmarking.

Overall KTGEPS O&M cost tariff is less as compared to the benchmark power plant, due to lower number of 60K major maintenance events (i.e. 53 activities during remaining life of plant until FY39).

Cost mix alignment:

Fixed cost ratio in KTGEPS is less than benchmark by 9.35%. This is compensated by higher VOM cost ratio in KGTEPS by 9.35% as compared to the benchmark.

Foreign cost component of KTGEPS is 75.8%, as compared to SNPCL, where the foreign cost component is 43.8%.

Enabling cost benchmarking:

Enabling costs when analyzed at overall FOM level are found reasonable.

Source: Management data and NEPRA website

[1] Revised indexed tariff for April to June 2022 quarter adjusted for PKR to USD exchange rate of 206 and latest available CPI of June 2020 (i.e. 269.27 as per NEPRA determinations), adjusted for CPI of 8.9% (FY21) and 9.0% (FY22) respectively. Further, fixed O&M components have been grossed up at 87.81% (representing average projected availability of KTGEPS).

[2] Average availability takes into consideration the annual availability of 90% (covering annual scheduled outage & forced outage allowance) along with the impact of periodic major / minor overhauls of engines / ST in line with outages allowance given to IPPs under applicable Power Policies

Indexations being requested by KTGEPS are aligned with recent determinations of NEPRA for thermal power plants

Indexation	KTGEPS	SNPCL
Variable O&M – Local	Indexed with Pak CPI (Quarterly)	Indexed with Pak CPI (Quarterly)
Variable O&M – Foreign	Indexed with US CPI and USD to PKR exchange rate (Quarterly)	Indexed with US CPI and USD to PKR exchange rate (Quarterly)
Fixed O&M – Local	Indexed with Pak CPI (Quarterly)	Indexed with Pak CPI (Quarterly)
Fixed O&M – Foreign	Indexed with US CPI and USD to PKR exchange rate (Quarterly)	Not applicable

5 Abbreviations

Abbreviations

Periods

Historical period	FY17 and FY22
Budgeted period	FY23
Forecast period	FY24 – FY39

Abbreviations

BQPS I	Bin Qasim Power Station – I
BQPS II	Bin Qasim Power Station – II
BQPS III	Bin Qasim Power Station – III
CAPEX	Capital Expenditure
CEO	Chief Executive Officer
CFO	Chief Financial Officer
COD	Commercial Operations Date
Consortium	OMS (Private) Limited & EY
EY	EY Ford Rhodes
Financial consultant	EY
FOM	Fixed Operations & Maintenance
FY	Financial Year
GTD	Generation, Transmission and Distribution
HHV	High Heating Value
I&C	Instrumentation and Controls
IC	Independent Consultant
IE	Independent Engineer
IPP	Independent Power Producer
KCCPP	Korangi Combined Cycle Power Plant
KE	K-Electric Limited
KTGEPS	Korangi Town Gas Engine Power Station
KTGEPS PP	FY24-FY39
KV	Kilovolt
kWH	Kilowatt Hour
LHV	Lower Heating Value
MSA	Material Stream Agreement
MW	Megawatt
MYT	Multi-Year Tariff
NEPRA	National Electric Power Regulatory Authority
O&M	Operations and Maintenance
Pak CPI	Pakistan Consumer Price Index
PKR	Pakistani Rupee

Abbreviations

PKRm	PKR millions
POs	Purchase Orders
REVEX	Revenue Expenditure
RLNG	Regassified Liquefied Natural Gas
RSC	Rotor Side Converter
SGEPS	S.I.T.E Gas Engine Power Station
SNPCL	Sindh Nooriabad Power Company Limited
ST	Steam Turbine
Technical cum lead consultant	OMS (Private) Limited
US CPI	United States Consumer Price Index
USD	United States Dollar
VOM	Variable Operation & Maintenance

K-ELECTRIC
Energy That Moves Life

Section E

Site Gas Engine Power Station – (SGEPS)

Table of Contents - SGEPS

1. Site Gas Engine Power Station - SGEPS

This section covers details of Site Gas Engine Power Station Plant (referred as "SGEPS") and tariff being requested.

1.1. Introduction to the plant – SGEPS

SGEPS is a 107.312 MW combined cycle power plant (ISO Capacity) situated at S.I.T.E Industrial area of Karachi. It is part of the overall fleet of generating stations owned by KE.

Principal Features

1. The Power Plant is situated at S.I.T.E Industrial area of Karachi
2. The plant comprises of 32 Gas Engines of 3.041 MW each and 01 ST of 10.00 MW (ISO Capacity)
3. Gas engines started its commercial operations from June 2009 to August 2009 (Units 1 – 32)
4. Subsequently, Steam turbine completed Reliability Run Test (RRT) on July 31, 2016.
5. KE was granted Generation License (GL/04/2002) on November 18, 2002 and has been modified from time to time to account for additions / deletions of power plants to / from KE's generation fleet.
6. In August 2013, NEPRA issued Modification IV to the Generation License no. GL/04/2002 to the Company in accordance with the prevailing regulatory regime, adding SGEPS in the fleet.

Technical Capability

The installed generation capacity of SGEPS currently stands at 107.312 MW (Gross ISO) with Gross capacity of 96.19 MW[1] (Corrected at RSC) dedicated power into the K-Electric system

The prime movers for the power plant were manufactured at the Jenbacher production facilities in Austria known for manufacturing of natural gas engines. The JGS 620 GS-N.L series of engines installed at the power plant are well designed, reliable and economical in operation. For combined cycle operation Steam Turbine make NG-Allen and 32 WHRSG make Descon have been installed to enhance plant capacity and efficiency.

The plant was built by Orient Energy Systems ("OES"). The Plant O&M is being maintained by K-Electric Limited (KE). KE has a Material Stream Agreement (MSA) with OES whereby OES supply parts for Gas Engines running hour based maintenance/overhauls.

Summary of Plant Performance Since Commissioning

The Key Factors

The key factors of the plant performance since commissioning are summarized as follows:

[1] As per Generation license

Fiscal Year	Total Energy Supplied (Gross) (GWh)	Average Plant Availability (%)[2]
*FY-13	156	100%
*FY-14	113	78%
FY-15	160	92%
FY-16	382	96%
FY-17	384	93%
FY-18	498	93%
FY-19	368	57%
FY-20	414	98%
FY-21	227	97%
FY-22	110	99%

Modifications & Improvements

The upkeep of the plant and equipment has always been the priority, which has made it possible for the Company to provide power to K-Electric's ("KE") users as per demand.

For details of last Major Overhaul, please refer table given in **SGEPS - Annexure A (i)**.

Operation Summary

The power generated by the plant is transmitted through KE grid stations which are supplying power to Karachi city's major industrial and commercial customers. It is for this reason that it has always been the aim of KE to keep the plant in best shape in order to offer the maximum availability all year round.

Health & Safety

The facility has been operational since beginning without any major incident complying Quality, Health, Process Safety and Environment related standards. It is achieved through good O&M practices and having skilled plant operations team. The plant premises has a first aid facility backed up by a 24/7 ambulance.

The Company has well established Process Safety Procedures covering:

- Hazard Identification & Risk Assessment
- Emergency Response Plan
- Permit to Work Procedure
- Compressed Gas Cylinders Handling and Storage

Safety Procedures and Certifications

SGEPS has acquired following ISO certifications,

1. Occupational Health & Safety Management System – ISO 45001:2015
2. Environmental Management System – ISO 14001:2015
3. Quality Management System – ISO 9001:2015

[2] Average Plant Availability = Available Capacity / (Gross Dependable Capacity)
[3] Prior to FY-15 Section outages (i.e., when 8 engines are out) have been used to calculate Station's available capacity

4. Energy Management System (EnMS) – ISO 50001:2018
5. Asset Management System (AMS) – ISO 55001:2014

For list of HSEQ Safety Procedures: please refer **SGEPS - Annexure A (ii)**.

Project Details

For project details including site details, plant reference conditions & plant machinery details, please refer **SGEPS – Annexure A (iii).**

Fuel Source

SGEPS plant use indigenous natural gas as a fuel at plant site for generation which is supplied through pipeline by SSGC to SGEPS, while Gas Engines also operate on RLNG fuel supplied through SSGC pipeline. Citing shortage of Indigenous gas, SSGC has included RLNG in supply since April 2018, however, it is supplied from the same pipeline.

Plant requires minimum gas pressure of 2 bars, however, often has to face Gas pressure issues, for which SSGC gives reason that the plant is located at tail end and pressure issues are faced due to area dynamics.

In order to cope with the issue of shortage of gas / gas pressure, KE is in continuous engagements with SSGC and discussions on draft Gas Supply Agreements (GSA) are also on going.

Further, KE is also considering alternate suppliers of gas / RLNG and in this regard, once a feasible option is identified, KE would request for NEPRA's approval for the supplier along with a modification in tariff, if required.

Moreover, agreement with RLNG/ Gas supplier may involve Take or Pay arrangements, for which KE will be required to ensure regular payments for Fuel Charges as per the Gas Supply Agreements regardless of plant operations. Accordingly, KE requests the Authority to allow these costs as pass through in the proposed tariff. Alternatively, the Authority may allow KE to consider the plant as a must run under the Economic Merit Order (EMO) to the extent of Take or Pay Gas arrangements.

Cooling System

Engines cooling water is closed circuit which is cooled through air cooled radiators installed on each engine. Dedicated cooling towers are also available to cater hot ambient conditions.

Air cooled condenser (ACC) is used as condenser for Steam turbine operation to dissipate heat & condense steam turbine exhaust to maintain rated vacuum level inside turbine exhaust system for Steam turbine operation. Further, ST Lube Oil and Generator cooling is being done through separate cooling water modules

Minimum Loading

Minimum loading of each engine is 1.3695 MW (Gross) based on GE's recommendations. Please refer **SGEPS – Annexure A (iv)** for reference document.

Fire Protection System

The plant has a state-of-the-art Fire Protection System details of which are given in refer **SGEPS – Annexure A (v)**

Spares & Inventories

In order to ensure reliability of the plant and to avoid down time, the Company maintains an inventory of worth **PKR 407 million** as of June 2022.

Plant Layout

For plant layout, please refer **SGEPS – Annexure A (vi).**

Details of Major Equipment

For details of Major Equipment, please refer **SGEPS – Annexure A (vii)**

Remaining Useful Life

The plant has been in operation since 2009 with a remaining licensed useful life ending on August 2039.

Factored Fired Hours operated for each gas engine is given in the table below:

Gas Engines	Hours Operated as of 30th June, 2022
11	26,955
12	49,329
13	48,792
14	50,795
15	50,184
16	51,478
17	49,714
18	50,231
21	46,330
22	46,682
23	46,958
24	47,863
25	47,663
26	48,998
27	48,622
28	45,558
31	53,096
32	53,352
33	53,828
34	53,897
35	52,415
36	49,803
37	46,608
38	48,498
41	49,365
42	49,513
43	49,241
44	48,157
45	49,624
46	49,9,90

Gas Engines	Hours Operated as of 30th June, 2022
47	49,750
48	49,182
Average	48,827

Plant Capacity and Heat Rate

Heat rate and capacity test was conducted for the plant by Independent Engineer in July 2019, based on which Heat rate was determined for the Current MYT 2017 – 2023 and plant capacity was updated in the Generation License.

Test results at base load were as follows:

Description	SGEPS
Gross Capacity – MW (RSC)	96.191
Auxiliary – MW	3.464
Net Capacity – MW (RSC)	92.727
Auxiliary %	3.60%
Net Heat Rate LHV Basis – btu / kWh	8179.522
Net Efficiency LHV Basis	41.716%
Gross Heat rate LHV Basis	7884.970
Gross Efficiency LHV Basis	43.274%
Net Heat Rate HHV Basis – btu / kWh	9063.865
Net Efficiency HHV Basis	37.646%
Gross Heat rate HHV Basis	8737.468
Gross Efficiency HHV Basis	39.052%

Accordingly, Net capacity & Heat rate (Combined cycle) for the purpose of Tariff petition has been taken from Generation license which is based on tests conducted in 2019 as per IE's heat rate test reports.

Further, capacity & Heat rate at Open cycle were also conducted by IE, based on which values are given in the table below:

Category	Gas fuel	
	Combined cycle	Open cycle
Gross De rated capacity – MW	96.191	87.884
Auxiliary consumption – MW	3.464	2.883
Net Capacity – MW	92.727	85.001
Auxiliary consumption %	3.60%	3.28%
Net HHV heat rate – btu / kWh	9063.865	9889.086

1.2. Tariff Mechanism

This section explains in detail the tariff mechanism of SGEPS to ensure cost reflective tariffs including component wise indexation so that all prudent costs of the plant are adequately recovered.

KE is requesting a two-part tariff, in line with IPPs i.e. Energy payments and Capacity payments on a Take-or-pay mechanism where Capacity payment shall be made for the Available Capacity and Energy payments for the Net Electrical Output.

Available capacity has been calculated considering annual availability of 90% and additional outage allowance in the year in which Overhaul is occurring. Accordingly, based on expected incurrence of Overhauls, levelized availability of 87.64% has been calculated and has been used as Plant factor for Variable O&M and Capacity components, so that Capacity components cover the impact of outages. Details of Outages and billing mechanism have been further discussed in detail in Section 1.3.1

For indexation purposes, following Indexation factors are proposed to be used sources of which given in the table below:

Indexation Factors	Sources
Local Inflation (CPI)	Pakistan Bureau of Statistics (PBS)
Foreign Inflation (US CPI)	US Bureau of Labor Statistics
Exchange rates (USD)	National Bank of Pakistan
KIBOR	State Bank of Pakistan
LIBOR / SOFR	Intercontinental Exchange /Federal Reserve Bank of New York

1.2.1. Fuel Cost

This component represents the cost of fuel for the Net Electrical Output (NEO) produced by the plant at the allowed efficiency levels and shall be indexed for any fuel price variations.

Net Electrical Output: The net electrical energy expressed in kWh that is generated by the Complex (or any Unit) and delivered to the Interconnection Point as measured by the Metering system.

Fuel price

SGEPS operates on Gas (Indigenous Natural Gas / RLNG supplied by SSGC through the same line. NEO is currently recorded through meters at 132KV bus bar and is bifurcated between Indigenous Natural Gas / RLNG as per mechanism explained below

Indigenous Natural Gas / RLNG – Mechanism of billing, pricing, and bifurcation

Prices for Indigenous Natural Gas and RLNG shall be calculated based on OGRA's notification. Prices of Indigenous Natural Gas are notified in PKR / mmbtu, whereas Prices of RLNG are notified by OGRA in USD / mmbtu which are then translated into PKR / mmbtu by SSGC using the daily average exchange rates issued by National bank for the month. Accordingly, SSGC mentions the rate in PKR / mmbtu on the bills.

Considering prices of Indigenous Natural Gas and RLNG are notified in per mmbtu, calorific value is not required for price conversion.

SSGC supplies gas to KE through single pipeline based on available gas quantity and billing is done based on Indigenous Natural Gas and RLNG (Distribution tariff) based on proportion of Indigenous Natural Gas & RLNG supplied to KE (determined by SSGC based on RLNG imports).

(Sample bills for the month of April 2020 are enclosed as **SGEPS - Annexure B (i)**)

Units Generated by the plant are recorded through Energy Meters at the plant and then are bifurcated in Indigenous Natural Gas and RLNG based on proportion of Indigenous Natural Gas and RLNG in MMBTUs. MMBTUs for Indigenous Natural Gas and RLNG are calculated using consumption appearing in SCF on bills and actual calorific value (btu / scf) appearing on the bills (Sample calculation enclosed as **SGEPS - Annexure B (ii)**)

Gas Infrastructure Development Cess (GIDC)

Currently the matter of GIDC is sub-judice and no amount is passed onto the consumers. Subsequently, if any GIDC is paid (pertaining to prior periods) based on court verdict, the same will be included in fuel price PKR / mmbtu.

RLNG from any Dedicated Line / Alternate Supplier

In future, if RLNG is procured from any dedicated line / alternate supplier, the same will be measured through separate meters and energy will be bifurcated in supply from any dedicated line / alternate supplier based on actual MMBTUs, accordingly, to apply separate prices as per respective pricing mechanism.

Mechanism of Part load adjustment factor

For SGEPS, Net HHV Heat rate of 9063.865 btu / kWh at base load on Combined cycle, was established based on IE's test with part load heat rate also given at 75% load.

Considering separate tariff requests for each plant, central economic dispatch plan going forward as explained in **section 5** and the part load adjustment mechanism followed for IPPs, KE is proposing monthly part load adjustment based on actual operations for a month and part load adjustment factor given in the table as per the part load curve in **SGEPS - Annexure C (i) to C(ii)** for Combined cycle and open cycle operations, respectively. This mechanism of adjustment based on actual part load factor will also be consistent with other IPPs.

Part load adjustment will be based on hourly data for energy generated on plant and available capacity based on which part loading % for each hour will be determined. Part load factor for each hour will be calculated based on part load % and part load factors given in Part load table for Gas fuel (given in **SGEPS - Annexure C (i) to C(ii)**). Accordingly, a weighted average part load factor for the month will be calculated which shall be denominated as PL_{Gas} (Sample calculation for a day enclosed as **SGEPS - Annexure D.)**

Degradation factor

Reference values of heat rate and capacity combined cycle & Open cycle) are based on test conducted in 2019 and KE would request NEPRA to adjust the heat rate and output for each year based on degradation table as provided in **SGEPS - Annexure E(i) and E(ii)** which is based on degradation curve given in IE's report.

Simple cycle operations

Although SGEPS is generally run on combined cycle operations, however, in case if Steam Turbine is on outage and the outage is within the allowed outage allowance, as detailed in section *Outage Allowance* and the plant is required to operate to fulfill demand based on Economic Merit Order on pricing of simple cycle operations, KE should be allowed the fuel cost at simple cycle operations.

Further, plant must be operated on simple cycle during startups when engine is synchronized, and ST is under start up. Accordingly, KE requests that fuel cost on units produced during that period shall also be allowed on simple cycle whereas Startup costs should be reduced by fuel cost claimed on units produced during start up as these will be claimed under Fuel cost.

Cost of simple cycle operations is requested to be allowed if plant is operated due to dispatch based on EMO Ranking on pricing of simple cycle operations. However, for allowing cost of simple cycle operations during startups, EMO ranking of combined cycle shall be relevant considering the intended use.

Heat rates for both open and combined cycle are given under *Plant capacity and heat rate* above. KE requests that part load and degradation adjustment factor shall be applied on simple cycle in the same manner as for combined cycle, based on Part load and degradation curve.

Energy generated on simple cycle mode will be separately recorded through logs for application of simple cycle heat rate.

Summary of assumptions used for reference tariff

Description	Indigenous Natural Gas		RLNG	
	Combined cycle	Simple cycle	Combined cycle	Simple cycle
Net HHV heat rate - btu / kWh	9,064	9,889	9,064	9,889
Fuel price PKR / mmbtu	857	857	3300.8	3300.8
Fuel Component PKR / kWh	7.77	8.47	29.92	32.64
RLNG price				
Fuel Price PKR / mmbtu			3300.8	3300.8

Indexation formula

The fuel cost component of tariff shall be adjusted on account of fuel price variation as per the following mechanism:

Indigenous Natural Gas

$FCCIG_{(Rev)}$	=	$FCCIG_{(Ref)} \times PIG_{(Rev)} / PIG_{(Ref)}$
Where:		
$FCCIG_{(Rev)}$	=	The revised fuel cost component on Indigenous Natural Gas in PKR / kWh
$FCCIG_{(Ref)}$	=	The reference fuel cost component of **PKR 7.77 / kWh** on Indigenous natural gas for Combined cycle and **PKR 8.47 / kWh** on Simple cycle
$PIG_{(Rev)}$	=	The revised net HHV Indigenous Natural Gas price notified by the OGRA in PKR / MMBTU
$PIG_{(Ref)}$	=	The reference net HHV Indigenous Natural Gas price of **PKR 857 / MMBtu**

RLNG

$FCCRLNG_{(Rev)}$	=	$FCCRLNG_{(Ref)} \times PRLNG_{(Rev)} / PRLNG_{(Ref)}$
Where:		
$FCCRLNG_{(Rev)}$	=	The revised fuel cost component on RLNG in PKR / kWh
$FCCRLNG_{(Ref)}$	=	The reference fuel cost component of **PKR 29.92 / kWh** on RLNG for combined cycle and **PKR 32.64 / kWh** on Simple cycle
$PRLNG_{(Rev)}$	=	The revised net HHV RLNG price notified by the OGRA in USD / MMBTU multiplied by exchange rate appearing on SSGC bills
$PRLNG_{(Ref)}$	=	The reference net HHV RLNG price of **PKR 3,300.8 / MMBtu**

The calculated $FCCIG_{(Rev)}$ and $FCCRLNG_{(Rev)}$ shall be adjusted with weighted average part load factor for the month based on calculation as explained in *Mechanism of Part load Adjustment Factor* and degradation factor under section *Degradation Factor*.

Fuel cost components

$FCCIG_{(Rev)(adj)}$	=	$FCCIG_{(Rev)} \times PL_{Gas} \times D_y$
$FCCIG\text{-}SC_{(Rev)(adj)}$	=	$FCCIG\text{-}SC_{(Rev)} \times PL_{Gas} \times D_y$
$FCCRLNG_{(Rev)(adj)}$	=	$FCCRLNG_{(Rev)} \times PL_{Gas} \times D_y$
$FCCRLNG\text{-}SC_{(Rev)(adj)}$	=	$FCCRLNG\text{-}SC_{(Rev)} \times PL_{Gas} \times D_y$
Where;		
SC	=	Simple cycle
PL_{Gas}	=	Weighted average Part load factor for the month for Gas operations as calculated on mechanism explained under section *"Mechanism of Part load Adjustment factor"* for combined cycle and simple cycle operations, respectively
D_y	=	Degradation factor for the year based on degradation table given in **SGEPS - Annexure E (i)**

1.2.2. O&M Expenses

Under the existing MYT structure, capital expenditure for maintenance of plant is allowed as investment plan and becomes part of Regulatory Asset base, whereas revenue expenses are allowed as part of O&M expenses.

However, as explained above, KE is proposing a tariff for remaining life of generation plant with structure in line with IPPs where both capex and revex nature of expenditures are allowed through Fixed and Variable O&M. This will help to have better visibility and align the tariff structure with CTBCM requirement and industry practice.

Accordingly, proposed O&M expenses are bifurcated in Variable and Fixed, and then further bifurcated in Foreign and local, based on nature of expenses for applying relevant indexations.

Bifurcation of O&M is as follows:

Variable O&M local

The Variable O&M Local represents plant maintenance costs consisting of both parts and services which are procured in local currency by the Company. Being variable in nature, these costs are linked to plants' operating hours and incurred on some specific machine operating hours intervals.

For tariff calculation purposes, KE has calculated levelized Variable O&M Local keeping in view costs of FY 2022 and based on projected Variable O&M local for the remaining useful life of the plant, including maintenance expenses being incurred at regular intervals of hours recommended by OEM, which shall be indexed with Pak CPI at the start of each quarter.

Accordingly, levelized variable O&M cost per year **PKR 39 million per year** translating into **PKR 0.05 / kWh** at reference CPI of **158.48** average as of FY 2022 which shall be indexed with Pak CPI at the start of each quarter.

Variable O&M local (levelized)

Category	Amount – PKR million	Units at plant factor - GWh	O&M Per unit – PKR / kWh
Variable O&M Local	38.56	711.87	0.0542

Indexation formula:

Var. Local. $O\&M_{(Rev)}$	=	Var. Local $O\&M_{(Ref)}$ x $CPI_{(Rev)}$ / $CPI_{(Ref)}$
Where;		
Var. Local. $O\&M_{(Rev)}$	=	Revised Variable O&M local Component of Tariff
Var. Local $O\&M_{(Ref)}$	=	Reference Variable O&M local Component of Tariff
$CPI_{(Rev)}$	=	Revised CPI – notified by Pakistan Bureau of Statistics latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
$CPI_{(Ref)}$	=	Reference CPI of **158.48** average for FY 2022

Variable O&M Foreign

The Variable O&M Foreign is for imported Gas Engine & Steam Turbine capital spare parts, electrical spares and technical services required. Further, KE has a Material Stream Agreement (MSA) with OES whereby OES parts for Gas Engines running hour based maintenance/overhauls and services (where applicable).

For tariff calculation purposes, KE has calculated levelized Variable O&M Foreign keeping in view costs of FY 2022 and based on projected Variable O&M Foreign for the remaining useful life of the plant, including maintenance expenses being incurred at regular intervals of hours recommended by OEM which shall be indexed with US CPI and exchange rates at the start of each quarter.

Accordingly, levelized variable O&M Foreign component cost per year is estimated at **PKR 1,016 million** per year translating into **PKR 1.43 / kWh** at reference USD CPI of **282.03** and exchange rate of **PKR 206 / USD as of FY 2022**, based on projected expenses which shall be indexed based on US CPI and exchange rates at the start of each quarter.

Variable O&M Foreign (levelized)

Category	Amount – PKR million	Units at plant factor - GWh	O&M Per unit – PKR / kWh
Variable O&M Foreign	1,015.95	711.87	1.4272

Indexation formula:

Var. Foreign. O&M$_{(Rev)}$	=	Var. Foreign O&M$_{(Ref)}$ x USCPI$_{(Rev)}$ / USCPI$_{(Ref)}$ x ER$_{(Rev)}$ / ER$_{(Ref)}$
Where;		
Var. Foreign. O&M$_{(Rev)}$	=	Revised Variable O&M Foreign Component of Tariff
Var. Foreign O&M$_{(Ref)}$	=	Reference Variable O&M Foreign Component of Tariff
USCPI$_{(Rev)}$	=	The revised US CPI (All Urban Consumers) notified by US Bureau of Labor Statistics latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
USCPI$_{(Ref)}$	=	The reference US CPI of **282.03 average** for FY 2022
ER$_{(Rev)}$	=	The Revised TT & OD selling rate of USD as notified by National bank latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
ER$_{(Ref)}$	=	The reference exchange rate of **PKR 206.00 / USD** as of FY2022

Fixed O&M local

Fixed costs are incurred to ensure plant's availability irrespective of its operations. This component includes both plant maintenance expenses and necessary allied costs of salaries and wages, third party services, transport etc.

For tariff calculation purposes, KE has calculated levelized Fixed O&M Local considering FY 22 costs and based on the projected Fixed O&M local for the remaining useful life of the plant which shall be indexed with Pak CPI at the start of each quarter.

Accordingly, levelized Fixed O&M local component cost per year is estimated at **PKR 268 million** per year translating into **PKR 0.38 / kW/h (based on units at plant factor)** at reference Pak CPI of **158.48** (Average FY 22) based on projected expenses which shall be indeed based on Pak CPI at the start of each quarter.

Fixed O&M local (levelized)

Category	Amount – PKR million	Units at plant factor – GWh	O&M Per unit – PKR / kWh
Fixed O&M Local	268.27	711.87	0.3768

Indexation formula:

Fix. Local. O&M$_{(Rev)}$	=	Fix. Local O&M$_{(Ref)}$ x CPI$_{(Rev)}$ / CPI$_{(Ref)}$
Where;		
Fix. Local. O&M$_{(Rev)}$	=	Revised Fixed O&M local Component of Tariff
Fix. Local O&M$_{(Ref)}$	=	Reference Fixed O&M local Component of Tariff
CPI$_{(Rev)}$	=	Revised CPI notified by Pakistan Bureau of Statistics latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
CPI$_{(Ref)}$	=	Reference CPI of **158.48 average as of FY 2022**

Fixed O&M Foreign

Fixed costs are incurred to ensure plant's availability irrespective of its operations. These costs are critical to ensure availability and continued operations of the plant, major activities include Control System Upgradation, Radiator Motor Replacement, GIS Overhauling (GE/Alstom F-35), GIS Battery Bank Replacement etc.

For tariff calculation purpose, KE has calculated Fixed cost foreign based on FY 2022 costs and projected Fixed cost foreign which shall be indexed to US CPI and exchange rates at the start of each quarter.

Accordingly, levelized Fixed O&M foreign component cost per year is estimated at **PKR 38 million** per year translating into **PKR 0.05 / kW/h** at reference US CPI of **282.03** average FY 2022 and exchange rate of **PKR 206 / USD** as of FY 2022 based on projected expenses which shall be indexed based on USD CPI and exchange rate at the start of each quarter.

Fixed O&M Foreign (levelized)

Category	Amount – PKR million	Units at plant factor – GWh	O&M Per unit – PKR / kWh
Fixed O&M Foreign	38.22	711.87	0.0537

Indexation formula:

$Fix.\ Foreign.\ O\&M_{(Rev)}$	=	$Fix.\ Foreign\ O\&M_{(Ref)} \times USCPI_{(Rev)} / USCPI_{(Ref)} \times ER_{(Rev)} / ER_{(Ref)}$
Where;		
Fix, Foreign. $O\&M_{(Rev)}$	=	Revised Fixed O&M Foreign Component of Tariff
Fix. Foreign $O\&M_{(Ref)}$	=	Reference Fixed O&M Foreign Component of Tariff
$USCPI_{(Rev)}$	=	The revised US CPI (All Urban Consumers) notified by US Bureau of Labor Statistics latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
$USCPI_{(Ref)}$	=	The reference US CPI of **282.03 average** FY 2022
$ER_{(Rev)}$	=	The Revised TT & OD selling rate of USD as notified by National bank latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
$ER_{(Ref)}$	=	The reference exchange rate of **PKR 206 / USD** as of FY 2022

For breakup of O&M (levelized), please refer **SGEPS - Annexure F**

O&M costs both Variable & Fixed (local / foreign) have been validated and benchmarked by Independent Consultant, report of which is enclosed as **SGEPS – Annexure G.**

1.2.3. Insurance

KE requests an insurance premium up to 1% of EPC cost consistent with the insurance cost allowed to IPPs that shall be adjusted annually as per actual subject to maximum limit of 1% of EPC.

Insurance cost based on EPC cost

EPC Cost	USD 73.28 Mn
1% of EPC cost	USD 0.7328 Mn
Reference exchange rate	PKR 206 / USD
1% of EPC Cost	PKR 150.95 Mn
Ins(Ref) Gas at 87.64% plant factor	PKR 0.2120 / kWh

Insurance component shall be adjusted with actual cost at start of the year

$Ins_{(Ref)(adj)}$	=	$Ins_{(Ref)} \times P_{(Act)} / P_{(Ref)}$
Where;		
$Ins_{(Ref)(adj)}$	=	Adjusted Reference Insurance Component of Tariff
$Ins_{(Ref)}$	=	Reference Insurance Component of Tariff
$P_{(Ref)}$	=	Reference Premium USD 0.7328 million
$P_{(Act.)}$	=	Actual Premium in USD or USD 0.7328 million (1% of EPC cost) whichever is lower

Further, insurance component shall be adjusted quarterly based on below formula

$Ins_{(Rev)}$	=	$Ins_{(Ref)(adj)} \times ER_{(Rev)} / ER_{(Ref)}$
Where;		
$Ins_{(Ref)(adj)}$	=	Adjusted reference Insurance component of Tariff
$ER_{(Rev)}$	=	The Revised TT & OD selling rate of USD as notified by National bank latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
$ER_{(Ref)}$	=	The reference exchange rate of **PKR 206 / USD** as of FY2022

1.2.4. Return on Regulatory Asset Base and Depreciation

Regulatory Asset Base

Regulatory Asset Base shall comprise of written down value of plant excluding surplus on revaluation and including Intangibles (mainly software used for regulated business) and CWIP at start of control period, which will be depreciated each year based on remaining useful life of the plant.

Regulatory asset base based on current structure at the end of FY 2023 will be locked and used as a basis for proposed MYT and further additions to RAB shall only be based on any project-based addition / modification to the plant subject to NEPRA's approval for which a onetime request will be submitted for adjustment in tariff components.

With regard to RAB, KE has projected RAB as of FY 2023 at **PKR 4,504 million** and accordingly, requests NEPRA to actualize the same at the start of the next term i.e. July 2023 based on audited financial statements.

RAB movement is enclosed as **SGEPS - Annexure H**. Once RAB at end of FY 2023 will be finalized post audit of financial statements, KE will file **SGEPS - Annexure H** with updated opening RAB.

Return

Return shall be calculated based on Return on Equity, cost of debt and Debt to Equity ratio

Debt Equity ratio

Debt to equity ratio is proposed to be 70:30 as allowed in current MYT subject to discussion in section 3.2.

Cost of Debt

Like existing MYT, cost of debt for local component will be calculated based on 3 month KIBOR plus a spread of 2.5% and cost of debt for foreign component is calculated based on 3 month LIBOR, spread 4.5% and hedging cost based on difference of 3 month KIBOR and 3 month LIBOR plus a hedging cost spread.

Accordingly, cost of debt has been calculated using reference 3 month KIBOR of **15.16%** as of FY22 reference 3 month LIBOR of **2.29%** as of FY22.

Further, KE proposes KIBOR, LIBOR / SOFR and hedging cost to be indexed at the start of each quarter going forward based on actual.

Local to Foreign debt ratio

Considering no foreign debt is currently drawn for SGEPS, Debt has been taken at local for cost of debt.

Accordingly, Return on Regulatory Asset Base – Cost of Debt (RoRBCoD comes out to **PKR 0.76 / kWh**, at 87.64% plant factor for FY 2023. For year wise tariff components, please refer Tariff table.

RoRB – Local component of Cost of debt

$RoRBCoD\ Local_{(Rev)}$	=	$RoRBCoD\ Local_{(Ref)}$ for relevant year x $CoD\ Local_{(Rev)}$ / $CoD\ Local_{(Ref)}$
Where;		
$RoRBCoD\ Local_{(Rev)}$	=	Revised Local RoRB cost of debt component of tariff
$RoRBCoD_{(Ref)}$	=	Reference Local RoRB cost of debt component of tariff
$CoD\ Local_{(Rev)}$	=	$KIBOR_{(Rev)}$ + 2.5%
$CoD\ Local_{(Ref)}$	=	$KIBOR_{(Ref)}$ + 2.5%
$KIBOR_{(Rev)}$	=	The revised 3-month KIBOR as published by State Bank of Pakistan latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
$KIBOR_{(Ref)}$	=	The reference 3-month KIBOR of 15.16% as of FY22

Cost of Equity

Keeping in view currently allowed returns, return on equity of USD based 15% is proposed that shall be indexed based on changes in USD to PKR exchange rate at the start of each quarter.

For the purpose of Exchange rate indexation, indexation with reference to FY 2016 has been calculated considering weightage of RAB each year till FY 2023 in line with mechanism used by NEPRA in the current MYT. Accordingly, reference indexed cost of equity has been calculated using reference current exchange rate of **PKR 206 / USD**. Accordingly, KE requests the Authority to consider the actual average exchange rate of FY23 at the time of actualization of RAB at FY23 as mentioned in **"Regulatory Asset Base"** section above. Please refer calculation in **SGEPS - Annexure I (i).**

Accordingly, Return on Regulatory Asset Base (RoRBCoE) comes out to **PKR 0.62 / kWh at 87.64 %** plant factor for FY 2024 considering USD RoE of **15%** and indexed RoE of **33.72%**

at exchange rate of PKR 206 / USD. For year wise tariff components, please refer Tariff table.

Indexation formula is given below. Further, an illustration for RoE indexation is given in **SGEPS - Annexure I (ii).**

RoRB – Component of Cost of Equity

$RoRBCoE_{(Rev)}$	=	$RoRBCoE_{(Ref)}$ for relevant year x $ER_{(Rev)}$ / $ER_{(Ref)}$
Where;		
$RoRBCoE_{(Rev)}$	=	Revised RoRB cost of equity component of tariff
$RoRBCoE_{(Ref)}$	=	Reference RoRB cost of equity component of tariff
$ER_{(Rev)}$	=	The Revised TT & OD selling rate of USD as notified by National bank of Pakistan latest available at the start of each quarter i.e. 1st July, 1st October, 1st Jan, and 1st April.
$ER_{(Ref)}$	=	The Reference exchange rate of **PKR 206 / USD as of FY22**

Depreciation

Depreciation shall be calculated as straight line based on written down value of RAB at the end of FY 2023 (Current control period) and remaining useful life at the end of Control period.

Accordingly, Depreciation component comes out to **PKR 0.39 / kWh** for FY 2024. For year wise tariff components, please refer Tariff table.

1.2.5. Cost of Working Capital

KE requests NEPRA for working capital mechanism based on below formula, consistent with IPPs.

Legend	Working Capital Components
A	Cost of Stores & spares inventory
B	Cost of Fuel inventory (not applicable)
C	Cost of Fuel in Receivable cycle based on 30 days receipt period and 7 days payment period on RLNG fuel with 17% sales tax – based on 87.64% plant factor, to be actualized every quarter.
D	Cost of SBLC (currently included based on SBLC given to SSGC allocated to KTGEPS plant, will be updated in future in case of any new agreement)

Working capital component has been calculated for the control period based on current movement of balances year on year and reference KIBOR of 15.16% plus a short term spread 2%.

Cost of working capital shall be indexed with actual KIBOR and change in fuel prices, on a **quarterly basis.** Further, reference component shall be updated in future through a request in case of any change in circumstances.

Based on above, working capital component comes out to **PKR 0.48 / kWh for FY 2024. For year wise tariff components, please refer Tariff table.**

Working Capital requirement shall be indexed through updating the template enclosed in **SGEPS - Annexure J** at each quarter including update in SBLC cost pursuant to any changes / addition in the arrangement(s).

1.2.6. Pass through items

Similar to the current MYT and as allowed to IPPs, KE proposes the following items to be allowed as pass-through costs in the new MYT.

Corporate tax and WWPF / WWF

Currently, KE is an integrated entity therefore Corporate tax and WPPF / WWF on overall company level is a pass through item within MYT.

Considering that legal structure will remain same, KE is proposing that Corporate tax and WPPF / WWF shall be passed through to consumers in Supply Tariff.

However, going forward, in case of any change in legal structure whereby a Corporate tax and WWF / WPPF is separately levied on Generation plant, same shall be passed through as done in case of IPPs.

Unrecovered cost of Current MYT

Any unrecovered cost of Current MYT shall be pass through in tariff.

Startup Charges

Startup : Any startup of a Gas Unit that is necessary for a station to comply with the Dispatch requirements / Instructions and that results in the synchronization with the grid system.

Consistent with industry practice, KE requests the Authority to allow start up charges, as defined below.

In any month in a Financial year, KE shall be allowed to claim "Start-Up charges" based on Reference start up charges indexed with relevant indices, including fuel prices and electricity tariff as requested below.

"Start-Up Charge" shall consist of two components and is calculated as follows:

Start-Up Charge = MDI Charge + Reference Unit Start-Up Charges.

a) **MDI Charge:** The MDI charge shall be based on maximum demand recorded during the relevant month at startup and shall be calculated based on the then applicable MDI rate in Rs/kW, from time to time,

b) **Reference Unit Start-Up Charge:** This cost will cover the consumables, fuel and equivalent operating hours consumed for the start-ups.

The Start-Up Charges for each Start-Up shall be calculated as follows:

SC_M	=	$MDIR_x \times N1 + ((SCPI_{Ref} \times SCFadjust_{PI}) + (SCFC_{Ref} \times SCFadjust_{FC})) \times N2$
Where:		
SC_M	=	The Start Up Charges during the Month M
$MDIR_x$	=	Total fixed charges for the month due to Distributing segment during the relevant month (based on MDI for the month and MDI charge) divided by the total number of Start Ups performed during the month.
N1	=	The number of Start-ups to be claimed, unless any shutdowns claimed during the relevant month in which case this will be considered as zero.
N2	=	The number of Start-ups to be claimed
$SC_{(Ref)}$	=	The Reference Start-Up Charge as given below. Consists of the following two components:
$SCPI_{Ref}$	=	The Reference Start-Up Charge for the Power Import from Transmission System during GT Startup till Synchronization.
$SCFadjust_{PI}$	=	The Startup Charges Adjustment Factor for the hour h for the Import of Power from Transmission Network as per following formula: **$SCFadjust_{PI}$ = $WAVCT\text{-}B4_{(Rev)}$ / $WAVCT\text{-}B4_{(Ref)}$** where: **$WACT\text{-}B4_{(Rev)}$** = Weighted Average of the latest notified variable consumer tariff for the Industrial Consumer Category (B-4b) based on a weightage of 4:20 for Peak & Off-Peak Rates respectively. **$WACT\text{-}B4_{(Ref)}$** = Weighted Average of the reference notified variable consumer tariff for the Industrial Consumer Category (B-4b) based on a weightage of 4:20 for Peak & Off-Peak Rates (i.e. Rs. 30.33 per kWh & Rs. 24.43 per kWh) respectively **(i.e. Rs. 25.41 per kWh)**
$SCFC_{Ref}$	=	The Reference Start-Up Charge for the Fuel Consumed during GT Startup till Synchronization including ST Synchronization, if applicable.
$SCFadjust_{FC}$	=	The Startup Charges Adjustment Factor for the hour h for the consumption of fuel as per the following formula:

		For Gas[3] – $SCFadjust_{FC} = FCCG_{Rev} / FCCG_{Ref}$ For HSD – $SCFadjust_{FC} = FCCHSD_{Rev} / FCCHSD_{Ref}$

TYPE OF START (Gas) – Note	Reference 1 Section StartUp Charges	Reference Half Complex StartUp Charges (16 Engines x ST)	Reference 3 Sections Start-Up Charges (24 Engines x ST)	Reference Complex Start-Up Charges (32 Engines x ST)
	PKR million			
Hot Start: Total Cost	0.01	3.10	4.64	6.18
Recovery based on Simple Cycle	-	(3.07)	(4.60)	(6.13)
Net Claim	0.01	0.03	0.04	0.05
Warm Start: Total Cost	0.01	4.18	6.27	8.35
Recovery based on Simple Cycle	-	(4.15)	(6.23)	(8.30)
Net Claim	0.01	0.03	0.04	0.05
Cold Start: Total Cost	0.04	5.53	8.28	11.03
Recovery based on Simple Cycle	-	(5.42)	(8.13)	(10.84)
Net Claim	0.04	0.11	0.15	0.19

Note: Furthermore, recovery on units sent to grid has been based on simple cycle tariff, to be allowed separately for NEO.

Shutdown Cost

Shutdown: Any shutdown of a Gas Unit that is necessary for a station to comply with the Dispatch requirements / Instructions and/or technical limits of machines which results in the de synchronization with the grid system.

KE requests the Authority to allow shutdown charges, as defined below.

In any month, KE shall be allowed to claim "Shutdown charges" based on Reference Shutdown charges indexed with relevant indices, including fuel prices and electricity tariff as requested below.

"Shutdown Charge" shall consist of two components and is calculated as follows:

Shutdown Charge = MDI Charge+ Reference Unit Shutdown Charges.

a) **MDI Charge:** The MDI charge shall be based on maximum demand recorded during the relevant month at shutdown and shall be calculated based on the then applicable MDI rate in Rs/kW, from time to time,

b) **Reference Unit Shutdown Charge**: This cost will cover the consumables, fuel and equivalent operating hours consumed for the shutdown.

[3] Proportion of Indigenous Gas & RLNG in both Reference & Revised FCCG will be calculated based on the actual mix of Indigenous Gas & RLNG used as appearing in SSGC Bills for the relevant month in which Startup Cost is being claimed whereas Reference and Revised Fuel Cost Component will be calculated as per Section 1.2.1 above.
Furthermore, in case Gas is made available through Dedicated Line/ Alternate Supplier as discussed in Section 1.2.1 above, then separate costs will be calculated and submitted to the Authority for approval.

The Shutdown Charges for each Shutdown shall be calculated as follows:

SHC_M	=	$MDIR_x \times N_1 + ((SHCPI_{Ref} \times SHCFadjust_{PI}) + ((SHCFC_{Ref} \times SHCFadjust_{FC})) \times N_2$
Where:		
SHC_M	=	The Shutdown Charges during the Month M
$MDIR_x$	=	Total fixed charges for the month due to Distributing segment during the relevant month (based on MDI for the month and MDI charge) divided by the total number of Shutdowns performed during the month.
N1	=	The number of Shutdowns to be claimed, unless any startups claimed during the relevant month in which case this will be considered as zero.
N2	=	The number of Shutdowns to be claimed
$SHC_{(Ref)}$	=	The Reference Shutdown Charge as given below. Consists of the following two components:
$SHCPI_{Ref}$	=	The Reference Shutdown Charge for the Power Import from Transmission System till GT & ST are in Standby mode.
$SHCFadjust_{PI}$	=	The Shutdown Charges Adjustment Factor for the hour h for the Import of Power from Transmission Network as per following formula: **$SHCFadjust_{PI}$ = WAVCT-$B4_{(Rev)}$ / WAVCT-$B4_{(Ref)}$** where: **WACT-$B4_{(Rev)}$** = Weighted Average of the latest notified variable consumer tariff for the Industrial Consumer Category (B-4b) based on a weightage of 4:20 for Peak & Off-Peak Rates respectively. **WACT-$B4_{(Ref)}$** = Weighted Average of the reference notified variable consumer tariff for the Industrial Consumer Category (B-4b) based on a weightage of 4:20 for Peak & Off-Peak Rates (i.e. Rs. 30.33 per kWh & Rs. 24.43 per kWh) respectively **(i.e. Rs. 25.41 per kWh)**
$SHCFC_{Ref}$	=	The Reference Shutdown Charge for the Fuel Consumed during GT & ST (if applicable) De-Synchronization till Flame-Off.
$SHCFadjust_{FC}$	=	The Shutdown Charges Adjustment Factor for the hour h for the consumption of fuel as per the following formula: For Gas[4] – $SHCFadjust_{FC} = FCCG_{Rev} / FCCG_{Ref}$ For HSD – $SHCFadjust_{FC} = FCCHSD_{Rev} / FCCHSD_{Ref}$

Type of Shutdown	Reference Single Section Shutdown Charges	Reference Half Complex Shutdown Charges (16 EnginesxST)	Reference 3 Sections Shutdown Charges(24 EnginesxST)	Reference Complex Shutdown Charges (32EnginessxST)
	PKR million			
Gas	0.01	0.02	0.03	0.04

Costs pursuant to Import of Power during Non-Operational Hours

Costs of Import of Power for the period when plant is stand-by but not in operation, in accordance with EMO is requested to be passed through in Tariff.

[4] Proportion of Indigenous Gas & RLNG in both Reference & Revised FCCG will be calculated based on the actual mix of Indigenous Gas & RLNG used as appearing in SSGC Bills for the relevant month in which Shutdown Cost is being claimed whereas Reference and Revised Fuel Cost Component will be calculated as per Section 1.2.1 above.
Furthermore, in case Gas is made available through Dedicated Line/ Alternate Supplier as discussed in Section 1.2.1 above, then separate costs will be calculated and submitted to the Authority for approval.

The Power Import Charges for each month shall be based on actual amount billed by the Supply business based on Import readings recorded, including monthly MDI / Fixed Charges paid to Supply Business for fixed capacity dedicated for plant startup operations. Amount billed shall be reduced by any MDI Charges recovered under Startup & Shutdown Costs as per mechanism explained in this petition.

1.3. Billing Mechanism

Billing shall be based on a Take-or-pay mechanism where Capacity payment shall be paid for the Available Capacity and Energy payments for the Net Electrical Output.

Available capacity for a month shall be based on hourly Annual Dependable Capacity after considering outages in each year.

Annual Dependable Capacity shall be based on ADC Test to be carried out at start of each year, to be carried out by Plant team and results of which shall be submitted to NEPRA.

NEO will be based on energy recorded through meters as explained in above sections.

1.3.1. Capacity Payments

Capacity cost includes Fixed O&M local, Fixed O&M foreign, Insurance, Working capital, RoRB – cost of debt, RoRB – cost of equity and Depreciation which are detailed in above sections. Capacity payment shall be made on a monthly basis as per formula detailed below:

Monthly Capacity Payment

CapacityPayment	=	**$CapacityPrice \times AvailCap_m \times DO_y$**
Where:		
CapacityPayment	=	the Capacity Payment, in Rupee, paid for a Month;
$AvailCap_m$	=	Aggregate Available capacity, in kWh, for the month based on Hourly Available capacity
CapacityPrice	=	(Fixed O&M local + Fixed O&M foreign, working capital + RoRB – cost of debt + RoRB – cost of equity + insurance) for the relevant month after indexations as explained above.
DO_y	=	the output degradation factor, as given in **SGEPS - Annexure E (ii)** for Combined cycle, for the relevant year. Output degradation is not relevant for Open cycle.

Outages

Plant will maintain Annual Availability of 90% with considering annual outages of 10%. In addition, in case of periodic overhauls, following outage days shall be allowed;

- **21.5 Days (516 hours)** of Maintenance outages Per Engine & ST,
- **15 Days (360 hours)** of forced outages Per Engine & ST

Further, Additional outages will be required for Overhauls as below:

- Engine 60,000 Operating Hours Maintenance - in which case the Company shall be entitled to **an additional Forty (40) days** of Maintenance Outage periods.
- Engine 30,000 Operating Hours Maintenance - in which case the Company shall be entitled to **an additional Twenty Five (25) days** of Maintenance Outage periods.
- ST Major Inspection at 40,000 operating hours interval in which case the Company shall be entitled to **an additional Thirty Five (35) days** of Maintenance Outage periods.

These overhauls will be required when plant will reach the required Operating hours. Based on annual availability of 90% and expected occurrence of Overhauls, Levelized Plant factor has been calculated as 87.64%. **Please refer SGEPS - Annexure M**

The plant will be considered as available when plant is standby including periods when gas is unavailable as the same is not under KE's control. KE remains in continuous engagements with SSGC for resolution of this matter and is also working on alternative options.

1.3.2. Energy Payments

Energy cost includes:

- Fuel cost (including Indigenous Natural Gas & RLNG),
- Variable O&M local & Variable O&M foreign which are detailed in above sections multiplied by degradation factor of relevant year.

The Energy Price shall be calculated using the Reference Fuel Cost Component during the year as follows:

Fuel	NEO for the month	Fuel	Variable O&M local	Variable O&M Foreign	Total Variable O&M	Output Degradation factor	Variable O&M after Degradation factor	EPP per unit	Energy payment
	A	b	c	d	e = c + d	f	g = e x f	h = b + g	i = a x h
	kWh	PKR / kWh	PKR / kWh	PKR / kWh	PKR / kWh	Factor	PKR / kWh	PKR / kWh	PKR
Natural Gas – Combined cycle	Units	$FCCIG_{(Rev)(adj)}$	Var. Local. $O\&M_{(Rev)}$	Var. Foreign. $O\&M_{(Rev)}$	Calculated	Relevant factor	Calculated	Calculated	Calculated
Natural Gas – Simple	Units	$FCCIG\text{-}SC_{(Rev)(adj)}$	Var. Local. $O\&M_{(Rev)}$	Var. Foreign. $O\&M_{(Rev)}$	Calculated	Relevant factor	Calculated	Calculated	Calculated
RLNG – Combined cycle	Units	$FCCRLNG_{(Rev)(adj)}$	Var. Local. $O\&M_{(Rev)}$	Var. Foreign. $O\&M_{(Rev)}$	Calculated	Relevant factor	Calculated	Calculated	Calculated
RLNG – Simple	Units	$FCCRLNG\text{-}SC_{(Rev)(adj)}$	Var. Local. $O\&M_{(Rev)}$	Var. Foreign. $O\&M_{(Rev)}$	Calculated	Relevant factor	Calculated	Calculated	Calculated
Total	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated

1.4. O&M Sharing Mechanism

KE is proposing to share the savings in O&M, if any, in proportion of 60:40 for Consumers: KE, which shall be calculated at completion of Overhaul cycle.

- Overhaul cycle shall be completed when Major inspections of all Engines are completed at every 60,000 hours; and
- Major overhaul of ST is completed at every 5 years.

At completion of Overhaul cycle, any savings in O&M shall be shared in 60:40 for Consumers: KE, where is in case of Loss, it shall be carried forward to future years to set off with expenses of future years.

For the purpose of calculation of sharing of O&M savings/ (loss) at the completion of each major overhaul cycle, O&M expenses (O&M Expenses as per Profit & Loss Account & Addition to CWIP) as per the audited financial statements shall be used.

An illustration of sharing mechanism for one cycle is given in **SGEPS - Annexure N**. Same shall be applicable for next overhaul cycles till the end of plant life.

1.5. Other items

Items generally covered under PPA

Unlike previous MYT, KE has proposed Tariff structure in line with IPPs. In case of IPPs, certain modalities / charges are governed under the Power Purchase Agreement, which have been included in the petition. However, detailed modalities and other remaining terms will be agreed in a "Service Level Agreement" for which KE has prepared and Annexed a Head of Terms (please refer, **SGEPS – Annexure O**). Full scope SLA will be prepared and submitted for NEPRA's approval based on Tariff determination.

Costs pursuant to Unbundling in future

KE is an integrated utility and therefore there are certain synergies in common costs. In future, if there is any legal unbundling, KE will file for a onetime adjustment for additional costs pursuant to that.

Alternate Supplier of RLNG

In case of any additional requirements on account of arranging RLNG through an Alternative Supplier as detailed in **Section 1.2.1 - Plant Capacity and Heat Rate** above, KE will submit details of the proposal separately to NEPRA for approval. Post approval of the Authority, KE will file a one-time adjustment for reference tariff components, based on allowed investment, Net capacity and heat rate impacts.

Costs pursuant to Force Majeure Events

Costs related to a Force Majeure Events are allowed to IPPs and accordingly KE also request those to be passed through in Tariff. Details and modalities of force majeure events will be included under the SLA, pursuant to the Terms of Agreements as explained in **SGEPS – Annexure O**, in line with agreements of other IPPs.

1.6. Summary of Base Tariff FY 2024 & Indexation Mechanism

In view of the foregoing and considering the significant changes in tariff structure, following component wise indexation mechanism is being requested to ensure recovery of prudent costs critical to ensure quality of service.

Tariff Components	RLNG PKR / kWh	Indexation Mechanism	Reference Rates
Energy cost Fuel cost	29.92	• Indexation with fuel price. • Impact of allowed part load and degradation factor (monthly)	• Net HHV RLNG price of PKR 3,300.82 / MMBtu
Variable O&M – local	0.05	• Indexed with Pak CPI (Quarterly)	• CPI of 158.48 for FY 2022 average
Variable O&M - Foreign	1.43	• Indexed with US CPI and USD to PKR exchange rate (Quarterly)	• US CPI of 282.03 for FY 22 average • Exchange rate of PKR 206 / USD
Energy cost subtotal	**31.40**		
Capacity cost Fixed O&M - local	0.38	• Indexed with Pak CPI (Quarterly)	• CPI of 158.48 for FY 2022 average
Fixed O&M - Foreign	0.05	• Indexed with US CPI and USD to PKR exchange rate (Quarterly)	• US CPI of 282.03 for FY 22 average • Exchange rate of PKR 206 / USD
Insurance	0.21	• Indexed with USD to PKR exchange rate – quarterly • Annual actualization based on capping of 1% of EPC cost (in USD terms)	• Exchange rate of PKR 206 / USD as of FY22
Working Capital	0.48	• Indexed with KIBOR (Quarterly) and change in fuel prices.	• KIBOR of 15.16% as of FY22
RoRB - Cost of Debt Local	0.76	• Indexed with KIBOR (Quarterly) • Recalculated based on RAB changes due to addition of specific project approved by NEPRA	• KIBOR of 15.16% as of FY22
RoRB - Cost of Equity	0.62	• Indexed with USD to PKR exchange rate • Recalculated based on RAB changes due to addition of specific project approved by NEPRA	• Exchange rate of PKR 206 / USD as of FY22
Depreciation	0.39	• Recalculated based on RAB changes due to addition of specific project approved by NEPRA	
Capacity cost subtotal	**2.89**		
Total Base Tariff – FY 2024	**34.29**		
Levelized tariff	**33.59**		
Energy cost Fuel cost – Simple cycle	32.64	• Indexation with fuel price • Impact of allowed part load and degradation factor (monthly)	• Net HHV RLNG price of PKR 3,300.82 / MMBtu
Fuel cost – Ind gas - CC	7.77	• Indexation with fuel price • Impact of allowed part load and degradation factor (monthly)	• Net HHV Ind Gas price of PKR 857 / MMBTU
Fuel cost – Ind gas - OC	8.47	• Indexation with fuel price • Impact of allowed part load and degradation factor (monthly)	• Net HHV Ind Gas price of PKR 857 / MMBTU

Please refer following tariff tables for year wise tariffs.

K-Electric Limited
Generation Plants Tariff Petition
SGEPS
Tariff table - FY 2024 and onwards

Gas Fuel - RLNG

Gross Capacity	96.2	MW	Exchange rate	206	PKR / USD
Net Capacity	92.7	MW	KIBOR	15.16%	%
Units at full capacity	812.3	GWh	LIBOR	2.29%	%

		Energy Purchase Price (PKR / kWh)				Capacity Purchase Price PKR / kW / Hour at 87.64% Plant factor											
Year	FY	Fuel cost - FCC RLNG	Variable O&M - local	Variable O&M - Foreign	EPP	Fixed O&M - local	Fixed O&M - Foreign	Insurance	RoRB - Cost of debt - local	RoRB - Cost of debt - foreign	RoRB - Cost of Equity	Depreciation	Working capital	CPP	Total tariff - PKR / kWh	Total tariff - Cents / kWh	CPP - PKR / kW / month
		a	b	c	d=a+b+c	e	f	g	h	i	j	k	l	m=sum(e:l)	n=d+m	o=n/206	p
1	2024	29.92	0.05	1.43	31.40	0.38	0.05	0.21	0.76	-	0.62	0.39	0.48	2.89	34.29	16.65	2,111
2	2025	29.92	0.05	1.43	31.40	0.38	0.05	0.21	0.71	-	0.58	0.39	0.48	2.80	34.20	16.60	2,047
3	2026	29.92	0.05	1.43	31.40	0.38	0.05	0.21	0.66	-	0.54	0.39	0.48	2.72	34.12	16.56	1,983
4	2027	29.92	0.05	1.43	31.40	0.38	0.05	0.21	0.61	-	0.50	0.39	0.48	2.63	34.03	16.52	1,918
5	2028	29.92	0.05	1.43	31.40	0.38	0.05	0.21	0.56	-	0.46	0.39	0.48	2.54	33.94	16.48	1,854
6	2029	29.92	0.05	1.43	31.40	0.38	0.05	0.21	0.52	-	0.42	0.39	0.48	2.45	33.85	16.43	1,790
7	2030	29.92	0.05	1.43	31.40	0.38	0.05	0.21	0.47	-	0.38	0.39	0.48	2.36	33.76	16.39	1,726
8	2031	29.92	0.05	1.43	31.40	0.38	0.05	0.21	0.42	-	0.34	0.39	0.48	2.28	33.68	16.35	1,662
9	2032	29.92	0.05	1.43	31.40	0.38	0.05	0.21	0.37	-	0.30	0.39	0.48	2.19	33.59	16.30	1,597
10	2033	29.92	0.05	1.43	31.40	0.38	0.05	0.21	0.32	-	0.26	0.39	0.48	2.10	33.50	16.26	1,533
11	2034	29.92	0.05	1.43	31.40	0.38	0.05	0.21	0.27	-	0.22	0.39	0.48	2.01	33.41	16.22	1,469
12	2035	29.92	0.05	1.43	31.40	0.38	0.05	0.21	0.23	-	0.18	0.39	0.48	1.92	33.32	16.18	1,405
13	2036	29.92	0.05	1.43	31.40	0.38	0.05	0.21	0.18	-	0.15	0.39	0.48	1.84	33.24	16.13	1,341
14	2037	29.92	0.05	1.43	31.40	0.38	0.05	0.21	0.13	-	0.11	0.39	0.48	1.75	33.15	16.09	1,276
15	2038	29.92	0.05	1.43	31.40	0.38	0.05	0.21	0.08	-	0.07	0.39	0.48	1.66	33.06	16.05	1,212
16	2039	29.92	0.05	1.43	31.40	0.38	0.05	0.21	0.03	-	0.03	0.39	0.48	1.57	32.97	16.01	1,148
17	2040	29.92	0.05	1.43	31.40	0.38	0.05	0.21	0.02	-	0.02	0.39	0.48	1.56	32.96	16.00	1,137
Average tariff		29.92	0.05	1.43	31.40	0.38	0.05	0.21	0.37	-	0.31	0.39	0.48	2.19	33.59	16.31	1,600

PKR 33.59 / kWh **US Cents 16.31 / kWh**

Fuel cost component -

RLNG - Simple cycle	32.64
Indigenous Gas - combined cycle	7.77
Indigenous Gas - Simple cycle	8.47

K-ELECTRIC LIMITED

SGEPS - Annexures

List of Annexures

Annexure	Description
SGEPS – Annexure A (i)	Major Activities Performed for Improving Performance of the Plant
SGEPS – Annexure A (ii)	Safety procedures
SGEPS – Annexure A (iii)	Projects details
SGEPS – Annexure A (iv)	Minimum Loading
SGEPS – Annexure A (v)	Fire protection system
SGEPS – Annexure A (vi)	Plant layout
SGEPS – Annexure A (vii)	Details of Major Equipment
SGEPS – Annexure B (i)	Sample bill for April (Indigenous Natural Gas / RLNG)
SGEPS – Annexure B (ii)	Sample calculation for Indigenous Natural Gas / RLNG
SGEPS – Annexure C (i)	Part load Adjustment Factor table - Gas - CC
SGEPS – Annexure C (ii)	Part load Adjustment Factor table - Gas - OC
SGEPS – Annexure D	Sample calculation for weighted average part load factor - Gas
SGEPS – Annexure E (i)	Degradation table -Net Heat rate HHV (Gas) – CC & OC
SGEPS – Annexure E (ii)	Degradation table -Net Output (gas) CC
SGEPS – Annexure F	O&M Break up (levelized)
SGEPS – Annexure G	Consultant Report (Separate document)
SGEPS – Annexure H	RAB Movement
SGEPS – Annexure I (i)	Calculation of indexed RoE
SGEPS – Annexure I (ii)	RoE indexation illustration
SGEPS – Annexure J	Calculation of cost of working capital
SGEPS – Annexure K	Output adjustment due to Amb. temperature
SGEPS – Annexure L	Capacity sample calculation
SGEPS – Annexure M	Outage Schedule and plant factor
SGEPS – Annexure N	O&M Sharing Mechanism
SGEPS – Annexure O	Head of Terms

SGEPS – Annexure (i)

Details of Last Major Activities Performed for improving performance of the plant

Engine	Type of Major Overhaul	Dates
E12	30K	08-Aug-18
E13	30K	23-Apr-18
E14	30K	25-Nov-17
E15	30K	18-Dec-18
E16	30K	07-Apr-17
E17	30K	09-Jul-17
E18	30K	06-Sep-17
E21	30K	31-May-18
E22	30K	11-May-18
E23	30K	05-Apr-18
E24	30K	09-Aug-17
E25	30K	05-Jun-17
E26	30K	17-Mar-17
E27	30K	19-Apr-17
E28	30K	23-Jul-18
E31	30K	4-May-17
E32	30K	14-Dec-16
E33	30K	30-Mar-17
E34	30K	08-Mar-17
E35	30K	16-May-17
E36	30K	28-Sep-17
E37	30K	27-Apr-18
E38	30K	29-Mar-18
E41	30K	29-Aug-19
E42	30K	18-Jan-19
E43	30K	28-Feb-19
E44	30K	31-Aug-18
E45	30K	04-Mar-19
E46	30K	12-Feb-19
E47	30K	18-Jan-19
E48	30K	21-Mar-19

SGEPS – Annexure A (ii)

Safety procedures

S. No.	Document Name
1	B-Level HSEQ Committee Procedure
2	Hazard Identification & Risk Assessment
3	Environmental Aspect Impact Procedure
4	Setting HSEQ Objectives and Targets
5	Legal Requirement Procedure
6	HSEQ Responsibilities
7	Training, Awareness and Competence
8	Communication and Consultation
9	Control of Documents and Records
10	Emergency Response Plan
11	Calibration and Measurement
12	Measurement and Monitoring of HSE System
13	Internal Audit
14	Management Review Procedure
15	Evaluation of Compliance
16	Safety Induction
17	Contractor's Safety Evaluation
18	Context of Organization and Change Management
19	Non-Conformance, Corrective and Preventive Action
20	Incident Reporting, Investigation & Analysis Procedure
21	PPE's Procedure
22	Chemical Handling Procedure
23	Manual Handling Procedure
24	Forklift Operating Procedure
25	Permit to Work Procedure
26	Asbestos Management Procedure
27	Waste Management Procedure
28	Hazard Substance Procedure
29	Spill Contingency Plan
30	Fire Safety Procedure
31	Sf6 Management
32	Working at Height Procedure
33	Ladder Procedure
34	Fire Extinguisher Checking & Maintenance
35	Fire Hydrant Operating System
36	Animal Infestation
37	Environmental Incident Reporting Procedure
38	Resource Conservation Procedure
39	Water Hydrant Checking & Maintenance
40	Excavation Work
41	Covid-19 Pandemic Management
42	Indoor Air Quality Monitoring Procedure

S. No.	Document Name
43	Toolbox Talk Procedure
44	Use & Maintenance of SCBA & ELSA
45	Vehicle & Transport Facility Management

SGEPS – Annexure A (iii)

Project Details

Plant Reference Condition

Reference Conditions at the Plant Site are:

1. Ambient Air Temperature = Tra = 30 deg. C
2. Total Barometric Pressure = p_T = 1013.2 mbar
3. Relative Humidity = 60%
4. Power Factor = 0.85 (Lagging)
5. System Frequency = 50 Hz
6. Fuel Supply Temperature = 25 deg C
7. Co-mingled Gas Contract Fuel (LHV) = 34,200 Kj/Kg

Plant Configuration

Technology	Combine Cycle Power Plant
Type of fuel	Indigenous Natural Gas/RLNG
Equipment	Indigenous Natural Gas Reciprocating 4-stroke engines and steam turbine
Units	32 engines + 32 HRSG + 1 steam turbine
Output	107.312 MW ISO Installed
Make	Gas Engines - GE Jenbacher, Steam Turbine – NG Allen
Model	Gas Engines – JGS 620 GS-NL, Steam Turbine – UK MC-800

Plant Characteristics

Gross Capacity – MW (RSC)	96.191 MW
Auxiliary Consumption	3.464 MW
Net Plant capacity	92.727MW
Net Plant efficiency (LHV)	41.716%
Generation voltage	11 kV
Grid voltage	132 kV
Frequency	50 Hz
Power factor	Lead 0.98 for Engines and 0.95 for ST / Lag 0.80 for all Engines and ST
Ramp up rate of generators	"16 KW/Sec (Open Cycle) 0.33 MW/min (Cold Run-Up for ST) 0.5 MW/min (Warm run-up for ST) 0.666 MW/min(Hot run-up for ST)"
Time required to synchronization to grid at full load	3 Hours & 53 Minutes for CC operation, when Boilers hot

Frequency Limits

The generators are capable of maintaining constant output for system frequency range of 50 Hz +/- 3% in accordance with the requirements.

Voltage Limits

The plant is capable to operate continuously within the voltage range of 132/11 kV +/- 10%.

Noise

The noise level is less than 75 dB(A) which fall within the EPA prescribed environmental limits.

Water Resources

The power plant is designed on a subsoil water source treated through Reverse Osmosis plant. To meet additional water requirements, KDA water tankers are used.

SGEPS – Annexure A (iv)

Minimum loading details

Boundary conditions for GE Jenbacher gas engines

14. Electrical conditions

15. Operation and maintenance

K-ELECTRIC LIMITED

SGEPS – Annexure A (v)

Fire Protection System

Fire Protection System has following main measures:

1. **Fire area, fire escape and evacuation passage**

   Plant wide Emergency "Emergency Evacuation Map" at the entrance and other conspicuous locations to warn and update the entrants of the buildings about the route to be taken to assembly point, in case of any emergency.

   Also, every building has been provided with the adequate number of emergency evacuations passageways (exit doors) which are always kept healthy and unobstructed to be easily accessible through the year.

2. **Evacuation Channels**

   Plant has dedicated emergency warning (siren, buddy system, walkie-talkie, hot lines) system, while actions from every employee are clearly documented in the plant Emergency Response Procedure on what to do when they hear the alarm / observe an emergency situation.

   Moreover, dedicated Fire Wardens are assigned against individual buildings who ensure (in case of any emergency) the complete evacuation of the workers in the dedicated building.

   Plant has also dedicated assembly point, where every individual has to report after hearing the emergency siren and then a robust headcount management system is followed.

   In case of any off-site evacuation need (due to any injury), dedicated emergency vehicle (ambulance) is also available at plant to support prompt evacuation of injured individual to the nearest medical facility.

3. **Fire-fighting system and fire extinguisher**

   Internationally accepted (i.e. NFPA) and advanced firefighting & fire protection systems are available at plant (including fire hydrant network, water deluge system, foam suppression system).

   Adequate number of fire extinguishers have also been installed across the plant premises (indoor a well as outdoor) and different training sessions are imparted among the team for its operation throughout.

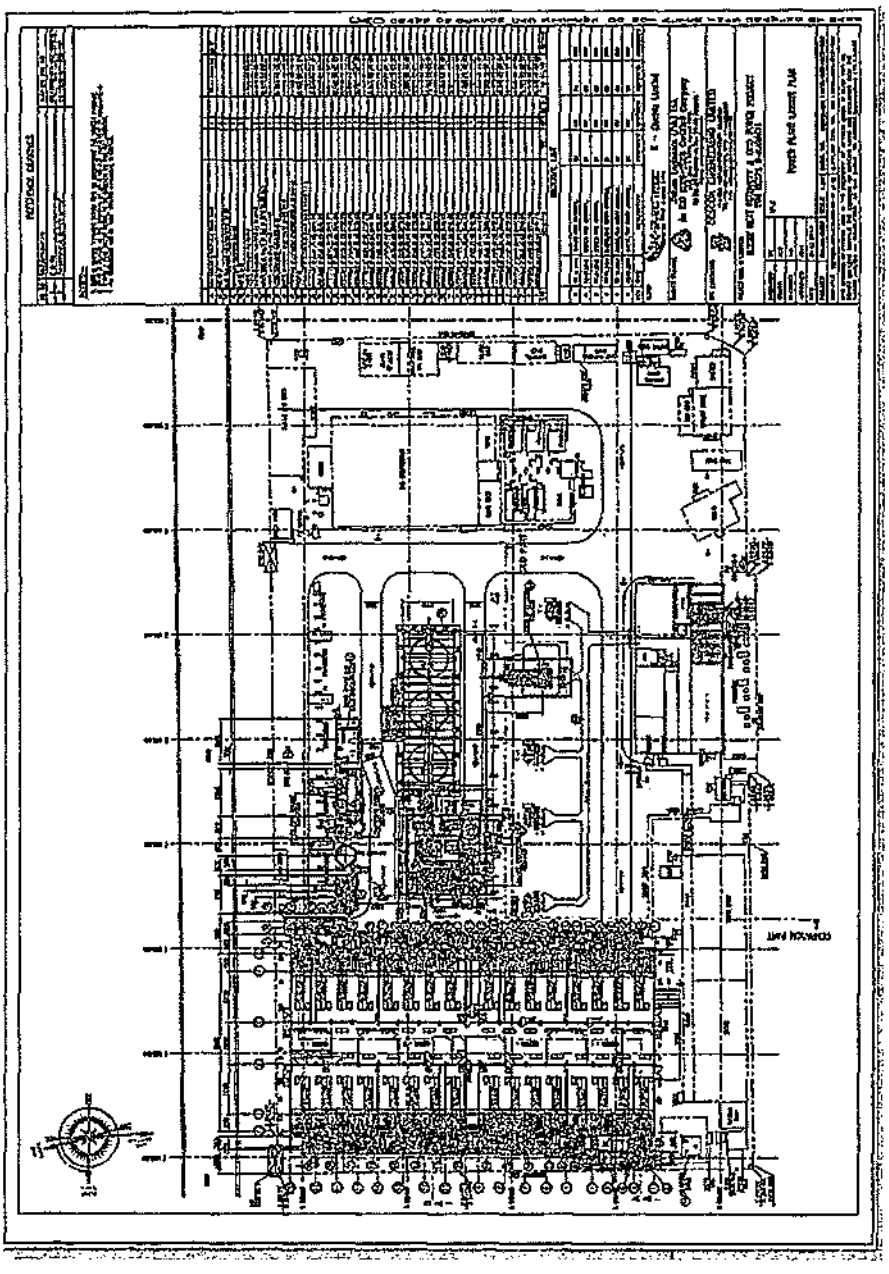
4. **Fire pump and alarm monitoring**

   Plant has a dedicated fire water network (covering whole plant premises), along with NFPA compliant fire pumps and water storage facility (supporting ample time of firefighting). during any emergency.

   Early detection of the fire is given paramount importance which ensures that fire is detected at the incipient stage. These (smoke detectors) are widespread across the plant and integrated with plant fire siren system. Multiple manual call points are also installed across the plant for actuation of the fire siren, upon observing any fire emergency.

SGEPS – Annexure A (vi)

Plant Layout



SGEPS – Annexure A (vii)

Details of Major Equipment

Gas Engines

Description	Parameters
Manufacturer, country	GE Jenbacher
Model/Type	J 620 GS-E01
Year of Manufacture	2009
Speed (RPM)	1500
Site Rating Gross /Net	2739 kWh
Air Filtration, Type	Forced Draught Pressurized Cabin Filter Type
Turbo Charger , Make & Model	MAN PBS NR20/SJ
Exhaust Bypass Stack available	Yes
Starting System	Cranking DC motor with batteries backup
Control System	Diane XT Controllers
Engine Cooling System	Closed System Radiators
Specific Fuel Consumption	0.280 Standard Cu. Meter
Safety Protection Systems	Diane PLC in built safety interlocking and hardwire fail-safe loop
Type of Fire Protection —Detection —Suppression	1. Fire Detection system via smoke sensing initiates engine trip and cuts off air intake/exhaust. 2.Gas detection system initiates engine trip and engine hall ventilation on fuel gas detection. 3. Adequate Portable Fire Extinguishers (DCP & CO2) are available in Engine Halls

Gas Engine Alternators

Description	Engine No. 37, 38 Alternators	Alternators
Manufacturer, Country	AVK, Romania	AVK, Germany
Year of Manufacture	2016	2009
Type/Model	DIG 142 e/4	
Rating MVA/MW	4.45/3.56	
Voltage/Frequency/Power Factor	11000V/50Hz/0.80	
Speed	1500	
Insulation Class	F	
Excitation Type	Brushless Excitation /AVR	
Protection	OC/SC, EF, UV, UF, OV, OF, df/dt, RP, LOE, NC, Differential	
Efficiency	97% @ .8 PF, 97.6 @ 1.0PF	
Cooling -Stator winding -Stator Core -Rotor	Forced Air	
Type of Fire Protection -- Exciter -- Generator	Smoke Detection - Portable Fire Extinguishers (DCP/CO2) available at site	

Steam Turbine

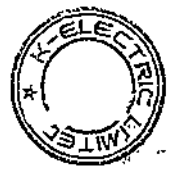
Description	Parameters
Manufacturer	NG Allen
Year	2014
Model	MC-800
Serial Number	415534
Type	Low Reaction
Stages	9
Rating, ISO & Site	10,000 KW
Speed (RPM)	6532
Casing	OEM Provided
HP Steam pressure	17 barg
HP Steam temperature	355 Deg. Celsius
HP Steam Flow	52 TPH
LP Exhaust Flows	Not Applicable
LP Steam inlet pressure	Not Applicable
LP Steam inlet temperature	Not Applicable
Control System, Make & Type	Allen Bradley PLC
Type & Specs of Lube Oil	ISO VG68
Type & Specs of Control Oil	ISO VG68
Type of Fire Protection	- Heat detection and water deluge system. - Beam Detection System - Portable Fire Extinguishers (DCP/CO2) available at site

Steam Turbine Alternator

Description	Parameters
Manufacturer	Indar
Year of Manufacture	2014
Model	LSA-900-X/4
Serial Number	4010000891
Rating MVA/MW	12.875 MVA
Voltage	11000 V
Speed	1500
Frequency	50 Hz
Power Factor	0.8
Insulation Class	H
Protection	POC, -ve seq, GOC, Phase diff, High set overcurrent, UV, OV, Phase reversal, UF/OF, LOE, RP, ROCOF, inadvertent energization.
Cooling Medium	Water-Air
Excitation Type	Brushless / AVR
Efficiency	97.3% @ 0.8 pf , 98.1% @ 1 pf
Cooling	TEAWC (Total enclosed Air Water cooled, IC81W)
Type of Fire Protection --Exciter -- Generator	Heat Detection System and Manual Suppression System Portable Fire Extinguishers (DCP/CO2) available at site

Section Transformers

Description	Parameters			
	Section 1	Section 2	Section 3	Section 4
Manufacturer	Siemens	Hitachi	Siemens	Hitachi
Country of Origin	Pakistan	Japan	Pakistan	Japan
Year of Manufacturing	2007	1978	1991	1978
International Standard of Manufacture	IEC-60076	IEC-60076	IEC-60076	IEC-60076
Serial Number	10700004	732228-2	204899	732225-2
Rating	22 MVA /30 MVA	22 MVA /30 MVA	30 MVA	22 MVA /30 MVA
HV/LV	132/11.5 KV	132/11.5 KV	132/11 KV	132/11.5 KV
Tap	5	5	25	5
Cooling	ONAN/ONAF	ONAN/ONAF	ONAN	ONAN/ONAF
Separation	Yes	Yes	Yes	Yes
Deluge Fire Protection	Yes	Yes	Yes	Yes
Dissolved Gas Monitoring	Yes (not online)	Yes (not online)	Yes (not online)	Yes (not online)
Fire Separation	Not Applicable	Not Applicable	Not Applicable	Firewall
Oil Capacity	16281 Kg	13524 Kg	18112 Kg	13524 Kg
Containment, Oil Drain Pit, type & size	Containment Pit Available (25,500L)	Containment Pit Available (25,500L)	Containment Pit Available (25,500L)	Containment Pit Available (25,500L)
Type of --Fire Detection --Suppression	Heat Detectors & Deluge System	Heat Detectors & Deluge System	Heat Detectors & Deluge System	Heat Detectors & Deluge System



Steam Turbine Transformer

Description	Parameters
Manufacturer	PEL
Country of Origin	Pakistan
Year	2015
International Standard of Manufacture	IEC 60076
Type	TMNC 15500/145
Serial Number	PEL-HV 1150013
Rating	15.5 MVA
HV/LV Voltage	132/11 KV
Tap	5
Cooling	ONAN
Separation	Yes
Deluge Fire Protection	Yes
Dissolved Gas Monitoring	Yes (not online)
Fire Separation	Not Applicable
Oil Capacity	10,074Kg
Containment, Oil Drain Pit, type & size	Containment Pit Available (19,200L)
Type of --Fire Detection --Suppression	Heat Detectors & Deluge System

Auxiliary Transformers

Description	Parameters			
	Sec 1 Aux	Sec 2 Aux	Sec 3 Aux	Sec 4 Aux
Manufacturer	Siemens	Siemens	Siemens	Siemens
Year	2009	2009	2009	2009
International Standard	IEC 60076	IEC 60076	IEC 60076	IEC 60076
Serial Numbers	20900424	20900425	20900427	20900428
Rating	2 (MVA)	2 (MVA)	2 (MVA)	2 (MVA)
Voltage/Frequency	11000/400V / 50Hz	11000/400V / 50Hz	11000/400V / 50Hz	11000/400V / 50Hz
Tap	6	6	6	6
Cooling	ONAN	ONAN	ONAN	ONAN
Oil Capacity	1250 kg	1250 kg	1250 kg	1250 kg
Containment, Oil Drain Pit, type& size	Yes	Yes	Yes	Yes
Type of --Fire Suppression	Portable set of fire extinguishers at location.	Portable set of fire extinguishers at location.	Portable set of fire extinguishers at location.	Portable set of fire extinguishers at location.

Auxiliary Transformers ST

Description	Parameters
Manufacturer	PEL
Year	2014
International Standard	IEC 60076
Serial Numbers	342634
Rating	2 (MVA)
Voltage/Frequency	11000/415 V, 50Hz
Tap	5
Cooling	ONAN
Oil Capacity	1290 kg
Containment, Oil Drain Pit, type & size	Yes
Type of –Fire Suppression	Portable set of Fire Extinguishers and mobile trolley.

Emergency Diesel Engine

Description	Unit	Parameter
Type	-	Four stroke Diesel Engine
Model	-	C15
Engine Output	kW	417
Number of cylinders	-	06 cylinders
Bore	mm	137
Stroke	mm	172
Cylinder configuration	-	In- line six cylinder
Rotation direction	-	Counterclockwise
Max. Cylinder pressure	bar	Not Available
Speed	rpm	1500
Mean effective pressure	bar	Not Available
Weight	T	4

Waste Heat Recovery Steam Generator (32 WHRSG)

Parameter	WHRSG
Manufacturer	Descon
Country of Manufacture	Pakistan
Year	2014
Type/Model	Water tube
Heat source	Exhaust gases
HP Steam pressure	17.0 barg

SGEPS – Annexure B (i)

RLNG Sample Bills April 2020

Sui Southern Gas Company Limited
SSGC Block 14, Sir Shah Suleman Road, Gulshan-e-Iqbal, Karachi 75300 www.ssgc.com.pk
SSGC General Sales Tax Number 02-04-9020-001-19

KESC SITE GAS TURBINE POWER STATION - 2
K-Electric Limited
Plot No. F-255,
Site Area (Site Gas Turbine Power Station)

Billing Group: [A-B/0188585 /32]

For emergencies and complaints please call 1199

ACCOUNT INFORMATION

Customer Number:	5999978254 (9)
Billing Month:	April 2020
Tariff/Customer Class:	IND
GST/NTN Number:	1200271600728

Issue Date: 30 May 2020

ACCOUNT SUMMARY AS OF

Previous Balance (Rs.)	Current Charges (Rs.)	Payable Within Due Date (Rs.)	Late Payment Surcharge (Rs.)	Payment After Due Date (Rs.)	Due Date
	110,602,065	110,602,065	1,659,031	112,261,096	06 May 2020

MONTHLY CONSUMPTION

METER INFORMATION

METER NO.	CURRENT DATE	CURRENT READING	PREVIOUS DATE	PREVIOUS READING	MEASURED QTY (SCM)
16392837	30 Apr 2020		01 Apr 2020		1,593,045

GAS CODE	GCV (BTU/SCF)	MMBTU	NO. OF DAYS	PRESSURE	TEMP
	.99646	59,856.605836		1	1

BILL & PAYMENT HISTORY

Month	Bill Amount (Rs.)	Payment Date	Amount (Rs.)

BILL CALCULATION

Tariff $ = 165.23

Tariff Rs: 1579.3

COMPUTATION OF CURRENT GAS CHARGES

SLAB	CM	MMBTU	RATE/ MMBTU (Rs.)	AMOUNT (Rs.)

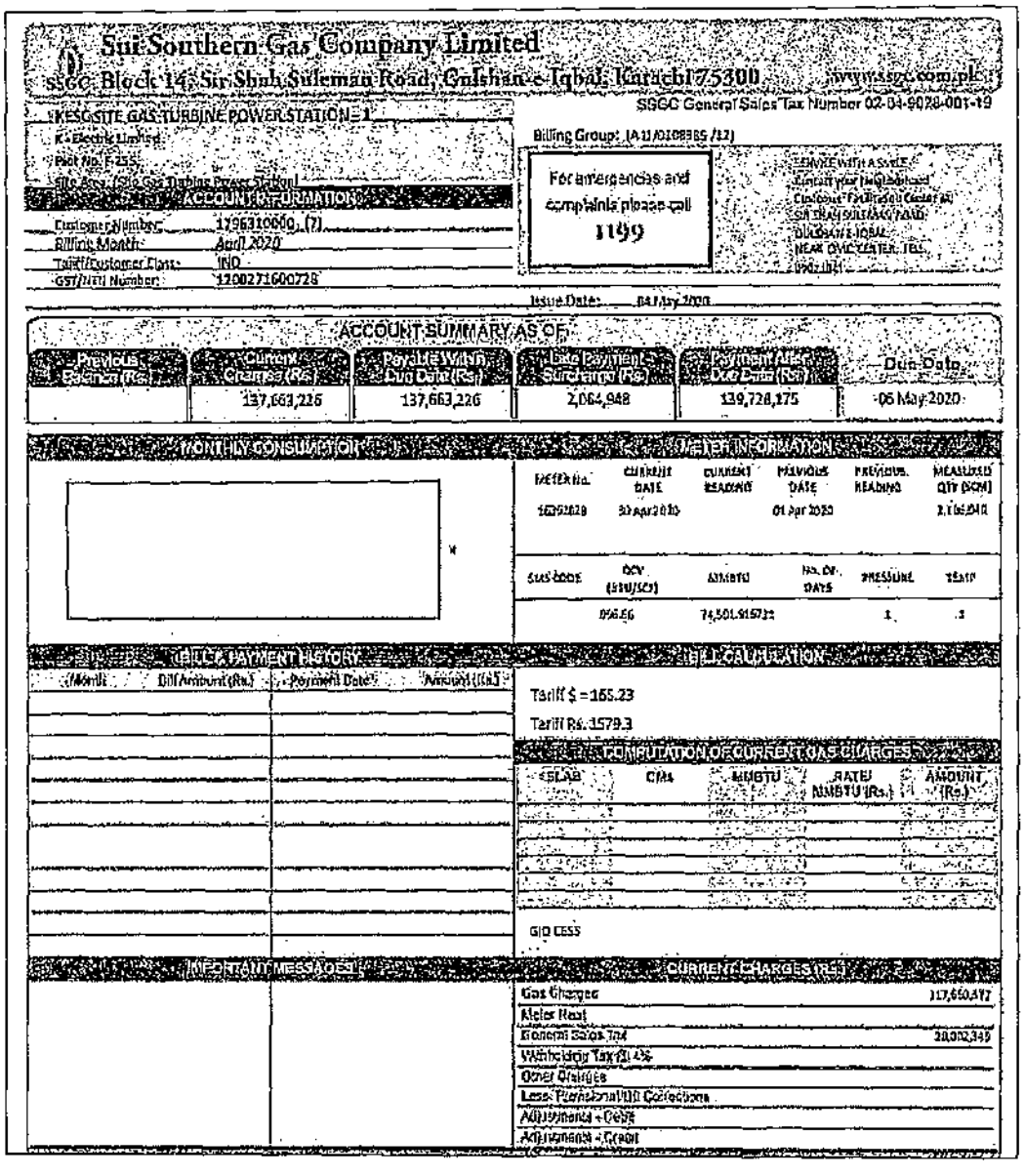
GID CESS

IMPORTANT MESSAGES

CURRENT CHARGES (Rs.)

Gas Charges	94,531,680
Meter Rent	
General Sales Tax	16,070,385
Withholding Tax @ 4%	
Other Charges	
Less: Provisional Bill Correction	
Adjustments - Debit	
Adjustments - Credit	

K-ELECTRIC LIMITED



Sui Southern Gas Company Limited

SSGC Block 14, Sir Shah Suleman Road, Gulshan-e-Iqbal, Karachi 75300 www.ssgc.com.pk

SSGC General Sales Tax Number 02-04-9020-001-19

KESC SITE GAS TURBINE POWER STATION-1

K-Electric Limited

Plot No. F-255,

Site Area, Site Gas Turbine Power Station

ACCOUNT INFORMATION

Customer Number: 1296310660 (7)

Billing Month: April 2020

Tariff/Customer Class: IND

GST/NTN Number: 1200271600728

Billing Group: (A1)/0108385 /12)

For emergencies and complaints please call 1199

Issue Date: 04 May 2020

ACCOUNT SUMMARY AS OF

Previous Balance (Rs.)	Current Charges (Rs.)	Payable Within Due Date (Rs.)	Late Payment Surcharge (Rs.)	Payable After Due Date (Rs.)	Due Date
	137,663,226	137,663,226	2,064,948	139,728,175	06 May 2020

MONTHLY CONSUMPTION

METER INFORMATION

Meter No.	Current Date	Current Reading	Previous Date	Previous Reading	Measured Qty (SCM)
16292628	30 Apr 2020		01 Apr 2020		2,156,240

Gas Code	GCV (BTU/SCF)	MMBTU	No. Of Days	Pressure	Temp
	956.66	74,501,915.22		1	1

BILL PAYMENT HISTORY

Month	Bill Amount (Rs.)	Payment Date	Amount (Rs.)

BILL CALCULATION

Tariff $ = 165.23

Tariff Rs. 1579.3

COMPUTATION OF CURRENT GAS CHARGES

SLAB	CMs	MMBTU	RATE MMBTU (Rs.)	AMOUNT (Rs.)

GID CESS

IMPORTANT MESSAGES

CURRENT CHARGES (Rs.)

Gas Charges	117,650,417
Meter Rent	
General Sales Tax	20,012,809
Witholding Tax @ 4%	
Other Charges	
Less: Provisional Bill Corrections	
Adjustments - Debit	
Adjustments - Credit	

Natural Sample Bills April 2020

Sui Southern Gas Company Limited

SSGC Block 14, Sir Shah Suleman Road, Gulshan-e-Iqbal, Karachi 75300 www.ssgc.com.pk

SSGC General Sales Tax Number 02-04-9028-001-19

KESC SITE GAS TURBINE POWER STATION-1
K-Electric Limited
Plot No. F/255,
Site Area, (Site Gas Turbine Power Station)

Billing Group: (A/11/0103985/09)

For emergencies and complaints please call
1199

SERVICE WITH A SMILE
Contact our Improvement
Customer Facilitation Counter
SIR SHAH SULEMAN ROAD
GULSHAN-E-IQBAL
NEAR CIVIC CENTER, TEL
9901601

ACCOUNT INFORMATION

Customer Number	1796310000 (7)
Billing Month	Apr-2020
Tariff/Customer Class	IND
GST/NTN Number	1200271600728

Issue Date: 04-May-2020

ACCOUNT SUMMARY AS OF

Previous Balance (Rs.)	Current Charges (Rs.)	Payable Within Due Date (Rs.)	Late Payment Surcharge (Rs.)	Payment After Due Date (Rs.)	Due Date
3,913,371,784	162,417,608	4,075,789,391		4,075,789,391	19 May 2020

MONTHLY CONSUMPTION

METER INFORMATION

METER No.	CURRENT DATE	CURRENT READING	PREVIOUS DATE	PREVIOUS READING	MEASURED QTY (SCM)
16297824	30-Apr-2020	76618415	31-Mar-2020	69750165	6868264
READ/CR.	30-Apr-2020		31-Mar-2020		2105040

SMS CODE	GCV (BTU/SCF)	MMBTU	No. OF MONTHS	PRESSURE	TEMPERATURE
	926.56	168,465.373507	01	1	1

BILL PAYMENT HISTORY

Month	Bill Amount (Rs.)	Payment Date	Amount (Rs.)

BILL CALCULATION

ACTUAL BILL CONSUMPTIVE

COMPUTATION OF CURRENT GAS CHARGES

SLAB	CMs	MMBTU	RATE/MMBTU (Rs.)	AMOUNT (Rs.)

IMPORTANT MESSAGES

CURRENT CHARGES (Rs.)

Gas Charges	138,815,468
Meter Rent	3,000
General Sales Tax	23,599,140
Withholding Tax @ 4%	
Other Charges	
Less: Provisional/Bill Corrections	
Adjustments - Debit	
Adjustments - Credit	

Sui Southern Gas Company Limited

SSGC, Block 14, Sir Shah Suleman Road, Gulshan-e-Iqbal, Karachi 75300 www.ssgc.com.pk

SSGC General Sales Tax Number 02-04-9028-001-19

KESC SITE GAS TURBINE POWER STATION - 2

K-Electric Limited,
Plot No. F-255,
Site Area (Site Gas Turbine Power Station)

Billing Group: [A-11/0109985 (09)]

For emergencies and complaints please call **1199**

SERVICE WITH A SMILE
Contact your Neighborhood Customer Facilitation Center at:
SIR SHAH SULEMAN ROAD GULSHAN-E-IQBAL NEAR CIVIC CENTER TEL 99021041

ACCOUNT INFORMATION

Customer Number	5999978254 (9)
Billing Month	Apr-2020
Tariff/Customer Class	IND
GST/NTN Number	1200271600728

Issue Date: 04-May-2020

ACCOUNT SUMMARY AS OF

Previous Balance (Rs.)	Current Charges (Rs.)	Payable Within Due Date (Rs.)	Late Payment Surcharge (Rs.)	Payment After Due Date (Rs.)	Due Date
3,087,461,141	330,486,317	3,217,947,458		3,217,947,458	19 May 2020

MONTHLY CONSUMPTION

METER INFORMATION

METER No.	CURRENT DATE	CURRENT READING	PREVIOUS DATE	PREVIOUS READING	MEASURED QTY (SCM)
16392881	30-Apr-2020	11522575	31-Mar-2020	5404566	5518013
RING VOL	30-Apr-2020		31-Mar-2020		1692045 -

SMS CODE	GCV (BTU/SCF)	MMBTU	No. OF MONTHS	PRESSURE	TEMPERATURE
	975.65	135,344.583524	01	1	1

BILL & PAYMENT HISTORY

Month	Bill Amount (Rs.)	Payment Date	Amount (Rs.)

BILL CALCULATION

ACTUAL BILL CONSUMPTIVE

COMPUTATION OF CURRENT GAS CHARGES

SLAB	CMs	MMBTU	RATE/ MMBTU (Rs.)	AMOUNT (RS.)

IMPORTANT MESSAGES

CURRENT CHARGES (Rs.)

Gas Charges	111,524,[illegible]
Meter Rent	2,500
General Sales Tax	18,950,550
Withholding Tax @ 4%	
Other Charges	
Less: Provisional/Bill Corrections	
Adjustments - Debit	
Adjustments - Credit	

K-ELECTRIC LIMITED

SGEPS – Annexure B (ii)

Description	Unit	Legend	Meter# 16392828	Meter# 16392831	Total
Current month reading	SCM	A	76,618,429	11,922,579	88,541,008
Previous month reading	SCM	B	69,750,165	6,404,566	76,154,731
Total Consumption	SCM	C = A - B	6,868,264	5,518,013	12,386,277
RLNG Consumption	SCM	D	2,106,040	1,692,045	3,798,085
Indigenous Natural Gas consumption	SCM	E = C - D	4,762,224	3,825,968	8,588,192
Conversion factor (from SCM to SCF)	SCF/SCM	F	35	35	35
NG conversion from SCM to SCF	SCF	G = E x F	169,029,934	135,798,551	304,828,485
RLNG conversion from SCM to SCF	SCF	H = D x F	74,751,587	60,057,287	134,808,874
Gross Heating Value (GCV)	BTU/SCF	I	997	997	997
NG MMBTUs	MMBTU	J = G x I / 10^6	168,465	135,345	303,810
RLNG MMBTUs	MMBTU	K = H x I / 10^6	74,502	59,857	134,359
Total MMBTUs	MMBTU	L = J + K	242,967	195,202	438,169
Generation on Gas	MWH	M	28,584	22,964	51,548
Generation on RLNG	MWH	N = K / L x M	8,765	7,042	15,806
Generation on NG	MWH	O = M - N	19,819	15,922	35,741

SGEPS – Annexure C (i)

Part load Adjustment Factor table – Gas - CC

Net Heat Rate	Plant Load Percentage
1.00000	100.00%
1.00027	96.90%
1.00045	93.80%
1.00059	90.60%
1.00072	87.50%
1.00090	84.40%
1.00116	81.30%
1.00155	78.10%
1.00209	75.00%[5]
1.00292	71.90%
1.00399	68.80%
1.00539	65.60%
1.00717	62.50%
1.00938	59.40%
1.01207	56.30%
1.01531	53.10%
1.01914	50.00%[6]

[5] 3 Sections (24 Engines)

[6] 2 Sections (16 Engines): Minimum number of engines required for combined cycle operation.

SGEPS II – Annexure C (ii)

Part load Adjustment Factor table – Gas - OC

Net Heat rate	Plant Load Percentage
1.000000	100.00%
1.000019	96.90%
1.000039	93.80%
1.000061	90.60%
1.000084	87.50%
1.000109	84.40%
1.000135	81.30%
1.000164	78.10%
1.000195	75.00%[7]
1.000229	71.90%
1.000266	68.80%
1.000307	65.60%
1.000352	62.50%
1.000401	59.40%
1.000456	56.30%
1.000517	53.10%
1.000586	50.00%[8]
1.000665	46.90%
1.000754	43.80%
1.000857	40.60%
1.000978	37.50%
1.001120	34.40%
1.001291	31.30%
1.001500	28.10%
1.001761	25.00%[9]
1.002097	21.90%
1.002546	18.80%
1.003174	15.60%
1.004119	12.50%
1.005697	9.40%

[7] 3 Sections (24 Engines)

[8] 2 Sections (16 Engines)

[9] 1 Section (8 Engines)

K-Electric Limited
Generation Plants Tariff Petition
SGEPS
Annexure D – Part Load Adjustment Example

Partial Load Sample Calculation of a DAY

SGEPS

Time	Date	Net Dependable Capacity MW	Forced Outage MW	Planned Outage MW	Forced Derated MW	Planned Derated MW	Available Capacity (post planned and forced outages) MW (a)	Hourly Net Load MW (from energy meters) MW	Ambient Temp. °C	Ambient Temp. Correction	Adjusted Actual Capacity MW (b)	Load Factor Load%	Efficiency correction based on Partial Load Calculation	Net HR (Baseload HR)	mmBtu mmBtu
1:00:00 AM	1-Jul	92	0	0	0	0	92	85	30	1.0000000000	92	92%	1.0006	9069.65	771
2:00:00 AM	1-Jul	92	0	0	0	0	92	56	35	1.0005775023	92	61%	1.0118	9170.42	513
3:00:00 AM	1-Jul	92	0	0	0	0	92	80	35	1.0005775023	92	87%	1.0011	9073.57	728
4:00:00 AM	1-Jul	92	0	0	0	0	92	79	35	1.0005775023	92	86%	1.0012	9074.72	715
5:00:00 AM	1-Jul	92	0	0	0	0	92	82	35	1.0005775023	92	89%	1.0009	9072.11	743
6:00:00 AM	1-Jul	92	0	0	0	0	92	72	12	0.9984231124	92	78%	1.0019	9080.63	651
7:00:00 AM	1-Jul	92	0	0	0	0	92	54	35	1.0005775023	92	59%	1.0130	9181.39	499
8:00:00 AM	1-Jul	92	0	0	0	0	92	96	44	1.0715213859	86	112%	1.0000	9063.87	870
9:00:00 AM	1-Jul	92	0	0	0	0	92	48	35	1.0005775023	92	52%	1.0174	9221.84	445
10:00:00 AM	1-Jul	92	0	0	0	0	92	49	35	1.0005775023	92	53%	1.0169	9217.44	451
11:00:00 AM	1-Jul	92	0	0	0	0	92	43	35	1.0005775023	92	47%	1.0000	9063.87	392
12:00:00 PM	1-Jul	92	0	0	0	0	92	41	35	1.0005775023	92	44%	1.0000	9063.87	369
1:00:00 PM	1-Jul	92	0	0	0	0	92	39	35	1.0005775023	92	43%	1.0000	9063.87	355
2:00:00 PM	1-Jul	92	0	0	0	0	92	39	35	1.0005775023	92	42%	1.0000	9063.87	352
3:00:00 PM	1-Jul	92	0	0	0	0	92	47	35	1.0005775023	92	51%	1.0182	9228.00	436
4:00:00 PM	1-Jul	92	0	0	0	0	92	45	35	1.0005775023	92	49%	1.0000	9063.87	411
5:00:00 PM	1-Jul	92	0	0	0	0	92	55	35	1.0005775023	92	59%	1.0127	9179.29	502
6:00:00 PM	1-Jul	92	0	0	0	0	92	55	35	1.0005775023	92	59%	1.0127	9179.29	502
7:00:00 PM	1-Jul	92	0	0	0	0	92	55	35	1.0005775023	92	59%	1.0127	9179.29	502
8:00:00 PM	1-Jul	92	0	0	0	0	92	55	35	1.0005775023	92	59%	1.0127	9179.29	502
9:00:00 PM	1-Jul	92	0	0	0	0	92	55	35	1.0005775023	92	59%	1.0127	9179.29	502
10:00:00 PM	1-Jul	92	0	0	0	0	92	55	35	1.0005775023	92	59%	1.0127	9179.29	502
11:00:00 PM	1-Jul	92	0	0	0	0	92	55	35	1.0005775023	92	59%	1.0127	9179.29	502
12:00:00 AM	1-Jul	92	0	0	0	0	92	53	35	1.0005775023	92	57%	1.0143	9193.15	484
Total								1391							12,698
														Benchmark Efficiency (Total mmbtu/Total MWs)	9128.76
														Adjustment Factor	1.0072

SGEPS – Annexure E (i) (Gas)
Degradation table -Net Heat rate HHV

Net Heat Rate Degradation Factor - HHV

FY	Gas Engine					Complex (100% LF)		Correction Factor
	Permanent	Recoverable	Total	Efficiency		Efficiency		
				Tested	Revised	Tested	Revised	
20*	0.60%	0.69%	1.29%	34.50%	34.50%	37.65%	37.65%	1.0000
20	0.67%	1.17%	1.83%	34.50%	34.32%	37.65%	37.46%	1.0050
21	0.70%	1.47%	2.17%	34.50%	34.20%	37.65%	37.34%	1.0081
22	0.72%	1.61%	2.33%	34.50%	34.15%	37.65%	37.29%	1.0096
23	0.82%	1.49%	2.31%	34.50%	34.16%	37.65%	37.28%	1.0097
24	0.92%	0.66%	1.58%	34.50%	34.40%	37.65%	37.53%	1.0030
25	1.03%	0.87%	1.90%	34.50%	34.30%	37.65%	37.42%	1.0060
26	1.13%	1.68%	2.81%	34.50%	33.99%	37.65%	37.09%	1.0150
27	1.23%	1.60%	2.83%	34.50%	33.98%	37.65%	37.08%	1.0153
28	1.33%	0.72%	2.05%	34.50%	34.24%	37.65%	37.35%	1.0080
29	1.44%	0.95%	2.38%	34.50%	34.13%	37.65%	37.22%	1.0113
30	1.53%	0.95%	2.48%	34.50%	34.10%	37.65%	37.22%	1.0114
31	1.64%	1.70%	3.34%	34.50%	33.81%	37.65%	36.92%	1.0197
32	1.74%	0.81%	2.55%	34.50%	34.08%	37.65%	37.19%	1.0124
33	1.85%	1.02%	2.87%	34.50%	33.97%	37.65%	37.07%	1.0156
34	1.94%	1.00%	2.94%	34.50%	33.94%	37.65%	37.03%	1.0165
35	2.05%	1.81%	3.86%	34.50%	33.64%	37.65%	36.71%	1.0256
36	2.15%	0.90%	3.05%	34.50%	33.91%	37.65%	36.98%	1.0179
37	2.26%	1.10%	3.36%	34.50%	33.81%	37.65%	36.87%	1.0212
38	2.35%	1.05%	3.40%	34.50%	33.79%	37.65%	36.84%	1.0219
39	2.46%	1.92%	4.38%	34.50%	33.47%	37.65%	36.48%	1.0318

* 3rd party Heat Rate Test conduted in July-2019
FY 18 - 22 : As per actual Operating Hours
FY 23-39 : As per 87.64% Utilization

SGEPS – Annexure E (ii) (Gas) applicable for Combined Cycle
Degradation table – Net Output (Gas)

Net Output Degradation Factor

FY	Total Degradation Combined Cycle	Tested Combined Cycle Output (MW)	Revised Combined Cycle Output (MW)	Correction Factor
20*	0.01%	92.73	92.73	1.0000
20	0.01%	92.73	92.73	1.0000
21	0.02%	92.73	92.72	1.0001
22	0.02%	92.73	92.72	1.0001
23	0.02%	92.73	92.71	1.0001
24	0.03%	92.73	92.71	1.0002
25	0.04%	92.73	92.70	1.0003
26	0.05%	92.73	92.69	1.0004
27	0.05%	92.73	92.69	1.0004
28	0.06%	92.73	92.68	1.0005
29	0.07%	92.73	92.68	1.0006
30	0.03%	92.73	92.71	1.0002
31	0.04%	92.73	92.70	1.0003
32	0.04%	92.73	92.70	1.0003
33	0.05%	92.73	92.69	1.0004
34	0.06%	92.73	92.68	1.0005
35	0.06%	92.73	92.68	1.0005
36	0.07%	92.73	92.67	1.0006
37	0.08%	92.73	92.66	1.0007
38	0.08%	92.73	92.66	1.0007
39	0.09%	92.73	92.65	1.0008

* 3rd party Heat Rate Test conduted in July-2019
FY 18 - 22 : As per actual Operating Hours
FY 23-39 : As per 87.64% Utilization

SGEPS – Annexure F

O&M break up

SGEPS O&M Levelized per year

PKR million

Major Activities	Fixed		Variable		Total
	Foreign	local	Foreign	local	
Plant O&M Cost – excluding LTSA	38.22	92.41	520.39	37.28	688.31
Overhead Cost	-	175.85	-	1.28	177.13
MSA	-	-	495.56	-	495.56
Total	38.22	268.26	1,015.95	38.56	1,361.00

K-Electric Limited
Generation Plants Tariff Petition
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Annexure IS - RAB Movement

Description	Code	Unit	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031	FY 2032	FY 2033	FY 2034	FY 2035	FY 2036	FY 2037	FY 2038	FY 2039	FY 2040
RoRB movement																				
Assets without revaluation																				
Opening		PKR Mn		9,972	9,972	9,972	9,972	9,972	9,972	9,972	9,972	9,972	9,972	9,972	9,972	9,972	9,972	9,972	9,972	9,972
Capitalization		PKR Mn		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Disposal		PKR Mn		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Closing	a	PKR Mn	9,972	9,972	9,972	9,972	9,972	9,972	9,972	9,972	9,972	9,972	9,972	9,972	9,972	9,972	9,972	9,972	9,972	9,972
Accumulated Depreciation																				
Opening		PKR Mn		5,468	5,747	6,025	6,304	6,583	6,861	7,140	7,418	7,697	7,975	8,254	8,532	8,811	9,089	9,368	9,646	9,925
Depreciation for the year		PKR Mn		279	279	279	279	279	279	279	279	279	279	279	279	279	279	279	279	47
Depreciation - Disposal		PKR Mn		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Closing	b	PKR Mn	5,468	5,747	6,025	6,304	6,583	6,861	7,140	7,418	7,697	7,975	8,254	8,532	8,811	9,089	9,368	9,646	9,925	9,972
Net Book Value - Operating Assets only	c = a + b	PKR Mn	4,504	4,225	3,947	3,668	3,390	3,111	2,833	2,554	2,276	1,997	1,718	1,440	1,161	883	604	326	47	-
Capital Work in Progress																				
Opening		PKR Mn		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Capex		PKR Mn		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Transfer to Fixed Assets		PKR Mn		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Closing	d	PKR Mn	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Net RAB	e = c + d	PKR Mn	4,504	4,225	3,947	3,668	3,390	3,111	2,833	2,554	2,276	1,997	1,718	1,440	1,161	883	604	326	47	-
Average RAB - PKR	f = average of a	PKR Mn		4,365	4,086	3,807	3,529	3,250	2,972	2,693	2,415	2,136	1,858	1,579	1,301	1,022	744	466	187	24
RoRB break up																				
Equity Portion	g	%		30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%
Debt Portion	h	%		70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%
Local Component	i	%		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Foreign Component	j	%		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
KIBOR	k	%		15.2%	15.2%	15.2%	15.2%	15.2%	15.2%	15.2%	15.2%	15.2%	15.2%	15.2%	15.2%	15.2%	15.2%	15.2%	15.2%	15.2%
Spread on KIBOR	l	%		2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
Cost of Debt - Local borrowing	m = k+l	%		17.7%	17.7%	17.7%	17.7%	17.7%	17.7%	17.7%	17.7%	17.7%	17.7%	17.7%	17.7%	17.7%	17.7%	17.7%	17.7%	17.7%
LIBOR	n	%		2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%
Hedge	o	%		15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%	15.37%
Spread	p	%		4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Cost of Debt - Foreign borrowing	q = n + o + p	%		22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%	22.16%
Indexed Return on Foreign Equity (Annexure - I (J))	r	%		33.72%	33.72%	33.72%	33.72%	33.72%	33.72%	33.72%	33.72%	33.72%	33.72%	33.72%	33.72%	33.72%	33.72%	33.72%	33.72%	33.72%
RoRB and Depreciation amounts																				
Cost of Debt - Local	s	PKR Mn		540	505	471	436	402	367	333	299	264	230	195	161	126	91	57	23	3
Cost of Debt - Foreign	t	PKR Mn		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cost of Equity	u	PKR Mn		442	413	385	357	329	301	272	244	216	188	160	132	103	75	47	19	2
Depreciation	v	PKR Mn		279	279	279	279	279	279	279	279	279	279	279	279	279	279	279	279	47
Calculation of Tariff components																				
Gas																				
Net Capacity	w	MW		92.727	92.727	92.727	92.727	92.727	92.727	92.727	92.727	92.727	92.727	92.727	92.727	92.727	92.727	92.727	92.727	92.727
Plant Factor	x	%		87.64%	87.6%	87.6%	87.6%	87.6%	87.6%	87.6%	87.6%	87.6%	87.6%	87.6%	87.6%	87.6%	87.6%	87.6%	87.6%	87.6%
Net Capacity units at Plant factor	y = w x 24 x 365 x (x/1000)	GWh		712	712	712	712	712	712	712	712	712	712	712	712	712	712	712	712	121
Tariff components on Gas																				
Cost of Debt - Local	z = s / y	PKR / kWh		0.7572	0.7096	0.6612	0.6120	0.5645	0.5161	0.4677	0.4191	0.3710	0.3226	0.2742	0.2259	0.1775	0.1291	0.0808	0.0324	0.0242
Cost of Debt - Foreign	aa = t / y	PKR / kWh		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cost of Equity	ab = u / y	PKR / kWh		0.6202	0.5806	0.5411	0.5015	0.4619	0.4223	0.3827	0.3431	0.3036	0.2640	0.2244	0.1848	0.1453	0.1057	0.0661	0.0265	0.0159
Depreciation	ac = v / y	PKR / kWh		0.3913	0.3913	0.3913	0.3913	0.3913	0.3913	0.3913	0.3913	0.3913	0.3913	0.3913	0.3913	0.3913	0.3913	0.3913	0.3913	0.3913

K-ELECTRIC LIMITED

K-Electric Limited
Generation Plants Tariff Petition
SGEPS
Annexure 1 (I) - Calculation of Indexed RoE

Particulars	Unit	FY 2015	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2023 - closing
		Actualized							Forecasted	
Average Exchange rates	PKR / USD	104.82	104.81	110.01	136.17	158.38	160.21	178.03	206.00	206.00
RAB amount - Generation	PKR mn	5,633	5,712	5,659	6,736	6,221	5,741	5,061	4,504	4,504
Additions, net of Depreciation & Disposals during the year	PKR mn		79	(53)	1,077	(515)	(479)	(681)	(557)	-

Year wise indexation based on exchange rates (a)

FY 2016	%		-0.01%	4.95%	29.91%	51.10%	52.84%	69.84%	96.53%	96.53%
FY 2017	%			4.96%	29.92%	51.11%	52.86%	69.86%	96.55%	96.55%
FY 2018	%				23.78%	42.97%	45.63%	61.83%	87.26%	87.26%
FY 2019	%					16.31%	17.69%	30.74%	51.28%	51.28%
FY 2020	%						1.16%	12.41%	30.07%	30.07%
FY 2021	%							11.12%	28.58%	28.58%
FY 2022	%								15.71%	15.71%
FY 2023	%									0.00%

Calculated with reference to exchange rate of a relevant year vs exchange rate of base year for example 16.31% in FY 2019 calculated as PKR 158.38 / USD divided by PKR 136.17 / USD

Year wise break up of RAB

FY 2016	PKR mn	5,633	5,633	5,633	5,633	5,633	5,633	5,633	5,633	5,633
FY 2017	PKR mn		79	79	79	79	79	79	79	79
FY 2018	PKR mn			(53)	(53)	(53)	(53)	(53)	(53)	(53)
FY 2019	PKR mn				1,077	1,077	1,077	1,077	1,077	1,077
FY 2020	PKR mn					(515)	(515)	(515)	(515)	(515)
FY 2021	PKR mn						(479)	(479)	(479)	(479)
FY 2022	PKR mn							(681)	(681)	(681)
FY 2023	PKR mn								(557)	(557)
Total RAB	PKR mn	5,633	5,712	5,659	6,736	6,221	5,741	5,061	4,504	4,504

Weightage of RAB (b)

FY 2016	PKR mn	100%	99%	100%	84%	91%	98%	111%	125%	125%
FY 2017	PKR mn	-	1%	1%	1%	1%	1%	2%	2%	2%
FY 2018	PKR mn	-	-	-1%	-1%	-1%	-1%	-1%	-1%	-1%
FY 2019	PKR mn	-	-	-	16%	17%	19%	21%	24%	24%
FY 2020	PKR mn	-	-	-	-	-8%	-8%	-10%	-11%	-11%
FY 2021	PKR mn	-	-	-	-	-	-8%	-9%	-11%	-11%
FY 2022	PKR mn	-	-	-	-	-	-	-13%	-15%	-15%
FY 2023	PKR mn	-	-	-	-	-	-	-	-12%	-12%
Total	PKR mn	100%	100%	100%	100%	100%	100%	100%	100%	100%

Year wise indexation - considering RAB weightage [c = (a x b)]

FY 2016	%		0.0%	4.9%	25.0%	46.3%	51.8%	77.7%	120.7%	120.7%
FY 2017	%		-	0.1%	0.4%	0.7%	0.7%	1.1%	1.7%	1.7%
FY 2018	%		-	-	-0.2%	-0.4%	-0.4%	-0.7%	-1.0%	-1.0%
FY 2019	%		-	-	-	2.8%	3.3%	6.5%	12.3%	12.3%
FY 2020	%		-	-	-	-	-0.1%	-1.3%	-3.4%	-3.4%
FY 2021	%		-	-	-	-	-	-1.1%	-3.0%	-3.0%
FY 2022	%		-	-	-	-	-	-	-2.4%	-2.4%
FY 2023	%		-	-	-	-	-	-	-	-
Total Indexation	%		0.0%	5.0%	25.2%	49.4%	55.4%	82.4%	124.8%	124.8%

RoE - USD based (d)	%	15.0%
Indexation (e)	%	124.8%
RoE - Indexed at PKR 206 / USD [f = d x (1 + e)]	%	33.72%

K-Electric Limited
Generation Plants Tariff Petition
SGEPS
Annexure I (ii) - Illustration for RoE Indexation

Indexation for the quarter	Q1 - FY 2024
Date of indexation	July 3, 2023

Description	Unit	Legend	Gas
Reference RoRB Cost of Equity component for FY 2024	PKR / kWh	a	0.6202
TT & OD selling rate of USD as notified by National bank of Pakistan at June 30, 2023	PKR / USD	b	250
Reference exchange rate	PKR / USD	c	206.00
Indexed RoRB Cost of Equity component for FY 2024	PKR / kWh	d = a x b / c	0.7527

K-Electric Limited
Generation Plants Tariff Petition
SGEPS
Annexure J - Calculation of Working Capital

Fuel cost on receivable cycle - RLNG	Unit	Legend	FY 2024
KIBOR	%	a	15.16%
Spread	%	b	2.00%
Total	%	c = a + b	17.16%
1 Fuel cost receivable cycle			
Receipt - days	days	d	30
Payment - days	days	e	7
Net days	days	f = d - e	23
RLNG bill			
Net capacity	MW	g	93
Load factor	%	h	87.64%
Units for 365 days	GWh	i = g x h 24 x 365 / 10^3	712
Allowed Heat Rate for the Quarter	btu / kWh	j	9,064
Reference price	PKR / MMBtu	k	3,301
Amount for 365 days	PKR / kWh	l = i x j x k / 10^6	21,298
Amount for outstanding days	PKR Mn	m = f x l / 365	1,342
With sales tax	PKR Mn	n = m x (1 + 17%)	1,570
Cost of working capital	PKR Mn	o = c x n	269
2 Cost of SBLC			
Daily gas	MMBTu	p = g x j x 1,000 / 10^6	20,171
60 days	MMBTu	q = p x 60	1,210,270
Amount of 60 days	PKR Mn	r = k x q / 10^6	3,995
Actual SBCL given	PKR Mn	r1	435
Lower of 60 days or Actual	PKR Mn	r2 = lower of r & r1	435
SBLC cost	%	s	0.50%
Cost of SBLC	PKR Mn	t = r2 x s	2
3 Cost of Fuel inventory		Not Applicable	
4 Cost of other inventory			
Inventory amount	PKR Mn	u	407
Cost	PKR Mn	v = u x c	70
Total cost of working capital	**PKR Mn**	**w = o + t + v**	341
Net Capacity units at Plant factor			
Gas - CC	GWh	x	712
Gas - CC	PKR / kWh	z = w / x	0.4797

SGEPS – Annexure K

Output adjustment in Temperature

SGEPS Simple Cycle CF		
Ambient Temp:	Ambient Temp: Correction	Adjusted Actual Capacity
10	0.9996	85.036
11	0.9996	85.034
12	0.9996	85.032
13	0.9997	85.031
14	0.9997	85.029
15	0.9997	85.027
16	0.9997	85.025
17	0.9997	85.024
18	0.9998	85.022
19	0.9998	85.020
20	0.9998	85.018
21	0.9998	85.017
22	0.9998	85.015
23	0.9999	85.013
24	0.9999	85.011
25	0.9999	85.010
26	0.9999	85.008
27	0.9999	85.006
28	1.0000	85.004
29	1.0000	85.003
30	1.0000	85.001
31	1.0000	84.999
32	1.0001	84.996
33	1.0001	84.994
34	1.0001	84.991
35	1.0001	84.989
36	1.0002	84.985
37	1.0002	84.982
38	1.0003	84.979
39	1.0003	84.976
40	1.0003	84.973
41	1.0090	84.245
42	1.0305	82.484
43	1.0520	80.796

SGEPS Combined Cycle CF		
Ambient Temp.	Ambient Temp. Correction	Adjusted Actual Capacity
10	0.9984	92.873
11	0.9985	92.866
12	0.9986	92.859
13	0.9987	92.851
14	0.9987	92.844
15	0.9988	92.837
16	0.9989	92.829
17	0.9990	92.822
18	0.9991	92.815
19	0.9991	92.807
20	0.9992	92.800
21	0.9993	92.793
22	0.9994	92.786
23	0.9994	92.778
24	0.9995	92.771
25	0.9996	92.764
26	0.9997	92.756
27	0.9998	92.749
28	0.9998	92.742
29	0.9999	92.734
30	1.0000	92.727
31	1.0001	92.716
32	1.0002	92.706
33	1.0003	92.695
34	1.0005	92.684
35	1.0006	92.673
36	1.0009	92.642
37	1.0013	92.610
38	1.0016	92.578
39	1.0019	92.547
40	1.0023	92.515
41	1.0107	91.742
42	1.0313	89.910
43	1.0519	88.150

K-Electric Limited
Generation Plants Tariff Petition
SGEPS
Annexure L - Capacity Sample Calculation

Capacity Payment Sample Calculation

SGTPS

Time	Date	Net Dependable Capacity MW a	Forced Outage MW b	Planned Outage MW c	Forced Derated MW d	Planned Derated MW e	Available Capacity (post planned and forced outages) MW f = a-b-c-d-e	Ambient Temp. oC g	Ambient Temp. Correction h	Adjusted available Capacity due to Temp. i = f / h	Impact of Temp. Oc j = f - i	Available Capacity MW k = i + j	Capacity Tariff Rs/kWh l	Capacity Payment PKR Mn m = k x l x 1000 / 10^6
1:00:00 AM	1-Jul	92	22	0	0	0	70	30	1.0000000000	70	0	70	2.19	0.1536
2:00:00 AM	1-Jul	92	0	0	0	0	92	35	1.0005775023	92	0	92	2.19	0.2018
3:00:00 AM	1-Jul	92	0	0	0	0	92	35	1.0005775023	92	0	92	2.19	0.2018
4:00:00 AM	1-Jul	92	0	92	0	0	0	35	1.0005775023	0	0	0	2.19	0.0000
5:00:00 AM	1-Jul	92	0	0	0	0	92	35	1.0005775023	92	0	92	2.19	0.2018
6:00:00 AM	1-Jul	92	0	0	0	0	92	12	0.9984231124	92	0	92	2.19	0.2018
7:00:00 AM	1-Jul	92	0	0	0	0	92	35	1.0005775023	92	0	92	2.19	0.2018
8:00:00 AM	1-Jul	92	0	0	0	0	92	44	1.0725213859	86	6	92	2.19	0.2018
9:00:00 AM	1-Jul	92	0	0	0	0	92	35	1.0005775023	92	0	92	2.19	0.2018
10:00:00 AM	1-Jul	92	0	0	0	0	92	35	1.0005775023	92	0	92	2.19	0.2018
11:00:00 AM	1-Jul	92	0	0	0	0	92	35	1.0005775023	92	0	92	2.19	0.2018
12:00:00 PM	1-Jul	92	0	5	0	0	87	35	1.0005775023	87	0	87	2.19	0.1909
1:00:00 PM	1-Jul	92	0	0	0	0	92	35	1.0005775023	92	0	92	2.19	0.2018
2:00:00 PM	1-Jul	92	0	0	0	0	92	35	1.0005775023	92	0	92	2.19	0.2018
3:00:00 PM	1-Jul	92	0	0	0	0	92	35	1.0005775023	92	0	92	2.19	0.2018
4:00:00 PM	1-Jul	92	0	0	0	0	92	35	1.0005775023	92	0	92	2.19	0.2018
5:00:00 PM	1-Jul	92	0	0	0	0	92	35	1.0005775023	92	0	92	2.19	0.2018
6:00:00 PM	1-Jul	92	0	0	0	0	92	35	1.0005775023	92	0	92	2.19	0.2018
7:00:00 PM	1-Jul	92	0	0	0	0	92	35	1.0005775023	92	0	92	2.19	0.2018
8:00:00 PM	1-Jul	92	0	0	0	0	92	35	1.0005775023	92	0	92	2.19	0.2018
9:00:00 PM	1-Jul	92	0	0	0	0	92	35	1.0005775023	92	0	92	2.19	0.2018
10:00:00 PM	1-Jul	92	0	0	0	0	92	35	1.0005775023	92	0	92	2.19	0.2018
11:00:00 PM	1-Jul	92	0	0	0	0	92	35	1.0005775023	92	0	92	2.19	0.2018
12:00:00 AM	1-Jul	92	0	0	0	0	92	35	1.0005775023	92	0	92	2.19	0.2018
Total												2090	2.19	4.5825

K-ELECTRIC LIMITED

K-Electric Limited
Generation Plants Tariff Petition
SGEPS
Annexure-M- Outage schedule and Plant factor

Description	Working	FY-24	FY-25	FY-26	FY-27	FY-28	FY-29	FY-30	FY-31	FY-32	FY-33	FY-34	FY-35	FY-36	FY-37	FY-38	FY-39	FY-40	Total
Hours	a	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	408
Days	b	366	365	365	365	366	365	365	365	366	365	365	365	366	365	365	365	62	5,906
Days - Cumulative for 32 engines	b(i) = b x 32	11,712	11,680	11,680	11,680	11,712	11,680	11,680	11,680	11,712	11,680	11,680	11,680	11,712	11,680	11,680	11,680	1,984	188,992
Hours in a year	c = a x b	8,784	8,760	8,760	8,760	8,784	8,760	8,760	8,760	8,784	8,760	8,760	8,760	8,784	8,760	8,760	8,760	1,488	141,744
1 Annual outages																			
Gross Capacity - MW																			
32 Engines	d	87.8	87.8	87.8	87.8	87.8	87.8	87.8	87.8	87.8	87.8	87.8	87.8	87.8	87.8	87.8	87.8	87.8	87.8
ST		8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3
Plant		96.2	96.2	96.2	96.2	96.2	96.2	96.2	96.2	96.2	96.2	96.2	96.2	96.2	96.2	96.2	96.2	96.2	96.2
Scheduled outage days																			
32 Engines (21.5 per Engine)	e	688.5	688.5	688.5	688.5	688.5	688.5	688.5	688.5	688.5	688.5	688.5	688.5	688.5	688.5	688.5	688.5	365	11,181.1
ST		21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	4.0	348.2
Forced outage days																			
32 Engines (15 per Engine)	f	480.0	480.0	480.0	480.0	480.0	480.0	480.0	480.0	480.0	480.0	480.0	480.0	480.0	480.0	480.0	480.0	82.0	7,762.0
ST		15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	3.0	243.0
Total Annual outage days																			
32 Engines	g=e+f	1,168.5	1,168.5	1,168.5	1,168.5	1,168.5	1,168.5	1,168.5	1,168.5	1,168.5	1,168.5	1,168.5	1,168.5	1,168.5	1,168.5	1,168.5	1,168.5	247.3	18,943.1
ST		36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	7.0	591.2
Plant		1,205.0	1,205.0	1,205.0	1,205.0	1,205.0	1,205.0	1,205.0	1,205.0	1,205.0	1,205.0	1,205.0	1,205.0	1,205.0	1,205.0	1,205.0	1,205.0	254.3	19,534.3
Total Annual outage %																			
32 Engines	h=g/bi	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	12.5%	10.0%
ST		10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	11.3%	10.0%
Plant	i=w. average g/d	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	12.4%	10.0%
Annual Availability %	j=100%-i	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	87.6%	90.0%
2 Overhauls																			
Cumulative hours																			
32 Engines		64,203	71,880	79,557	87,235	94,933	102,610	110,287	117,965	125,653	133,340	141,017	148,695	156,393	164,070	171,748	179,425	180,729	
ST		35,519	43,196	50,873	58,550	66,249	73,926	81,603	89,280	96,979	104,656	112,333	120,011	127,709	135,386	143,063	150,741	152,045	
Overhauls																			
32 Engines		60K (6 Engines) + 30K (01 Engine) + MV Switchgear Major Maintenance-Sections + One Section Control System Upgradation	60K (25 Engines) + One Section Control System Upgradation	One Section Control System Upgradation	One Section Control System Upgradation	60K (1 Engine) + 30K (9 Engines) + One Section Control System Upgradation	30K (22 Engines) + One Section Control System Upgradation	One Section Control System Upgradation	30K (01 Engine)	60K (22 Engines) + One Section Control System Upgradation	60K (9 Engines	Two Sections Control System Upgradation	60K (1 Engines) + Two Sections Control System Upgradation	30K (05 Engines) + + MV Switchgear Major Maintenance-Sections + Two Sections Control System Upgradation	30K (21 Engines)			
ST		Major Inspection + Outage Days equivalent to 60K,30K (EPDH)	Minor Inspection + Outage Days equivalent to 60K (EPDH)			Major Inspection + Outage Days equivalent to 60K,30K (EPDH)	Outage Days equivalent to 30K (EPDH)		Outage Days equivalent to 30K (EPDH)	Outage Days equivalent to 60K (EPDH)	Major Inspection + Outage Days equivalent to 60K (EPDH)		Outage Days equivalent to 60K (EPDH)	Outage Days equivalent to 30K (EPDH)	Outage Days equivalent to 30K (EPDH)	Major Inspection + Generator Maintenance M3		

*Overhauls are included based on operating hours. Accordingly, these events will occur when respective factored fired hours will be achieved

Overhaul - days																			
32 Engines	k	265	1,000	-	-	265	550	-	25	880	360	-	40	125	525	-	-	-	4,035
ST		43	31	-	-	43	17	-	1	28	46	-	1	4	16	35	-	-	266
Plant		308	1,031	-	-	308	567	-	26	908	406	-	41	129	541	35	-	-	4,301
Overhaul - %																			
32 Engines	l=k/b	2.3%	8.6%	0.0%	0.0%	2.3%	4.7%	0.0%	0.2%	7.5%	3.1%	0.0%	0.3%	1.1%	4.5%	0.0%	0.0%	-	2.1%
ST		0.12	0.09	0.0%	-	0.12	0.05	-	0.2%	0.08	0.13	-	0.00	1.1%	0.04	0.10	0.0%	-	4.5%
Plant	m=w. average k/b	3.1%	8.6%	0.0%	0.0%	3.1%	4.7%	0.0%	0.2%	7.5%	3.9%	0.0%	0.3%	1.1%	4.5%	0.8%	0.0%	-	2.3%
3 Annual outages + Overhaul																			
Outage days - Annual + Overhaul																			
32 Engines	n=g+k	1,433	2,168	1,168	1,168	1,433	1,718	1,168	1,193	2,048	1,528	1,168	1,208	1,293	1,693	1,168	1,168	247	22,978
ST		80	68	37	37	80	54	37	37	64	83	37	38	40	53	72	37	7	857
Plant		1,513	2,236	1,205	1,205	1,513	1,772	1,205	1,231	2,113	1,611	1,205	1,246	1,334	1,746	1,240	1,205	254	23,835
Outage % - Annual + Overhaul																			
32 Engines	o=n/b	12.2%	18.6%	10.0%	10.0%	12.2%	14.7%	10.0%	10.2%	17.5%	13.1%	10.0%	10.3%	11.0%	14.5%	10.0%	10.0%	12.5%	12.2%
ST		21.8%	18.6%	10.0%	10.0%	21.8%	14.7%	10.0%	10.2%	17.5%	22.7%	10.0%	10.3%	11.0%	14.5%	19.6%	10.0%	11.3%	14.5%
Plant	p=n/bw average	13.1%	18.6%	10.0%	10.0%	13.1%	14.7%	10.0%	10.2%	17.5%	13.9%	10.0%	10.3%	11.0%	14.5%	10.6%	10.0%	12.4%	12.4%
Availability	q=100%-p	86.93%	81.43%	90.00%	90.00%	86.93%	85.29%	90.00%	89.78%	82.51%	86.08%	90.00%	89.65%	88.99%	85.50%	89.16%	90.00%	87.64%	87.61%

Note: Days mentioned for Engines are cumulative for 32 Engines

K-Electric Limited
Generation Plants Tariff Petition
SGEPS
Annexure N - O&M Sharing Mechanism

Description	Reference	Units	FY-24	FY-25	FY-26	FY-27
Hours	a	no.	24	24	24	24
Days	b	no.	365	365	365	365
Hours in a year	c=a x b	no.	8,760	8,760	8,760	8,760

Overhauls

Shall be replaced with Actual occurrence

32 Engines	60K (11 Engines) + 30K (01 Engine)	60K (19 Engines) + 20K (01 Engine)	20K (02 Engines)	60K (01 Engine) + 20K (29 Engines)
Steam Turbine	Major Inspection + Reducing Gear Box Inspection + Generator Maintenance M3	Minor Inspection	Minor Inspection	Minor Inspection

**Overhauls are included based on factored fired hours. Accordingly, these events will occur when respective factored fired hours will be achieved*

O&M components - Gas Combined cycle

Tariff components
[Shall be replaced with actual quarterly indexed tariff components]

Variable - local	d	PKR / kWh	0.0545	0.0661	0.0484	0.0592
Variable - Foreign	e	PKR / kWh	1.5726	3.2259	0.7502	0.8937
Fixed - local	f	PKR / kWh	0.5584	0.3885	0.3516	0.3437
Fixed - Foreign	g	PKR / kWh	0.0422	0.0679	0.0606	0.0393
Net Capacity	h	MW	92.7	92.7	92.7	92.7
Availability factor [Shall be replaced with Actual]	i	%	86.9%	81.4%	90.0%	90.0%
Available capacity	j = h x i x c	GWh	706.1	661.5	731.0	731.0
Dispatch factor [Shall be replaced with Actual]	j1	%	100%	100%	100%	100%
Units sent out	k = i x j1	GWh	706	661	731	731
Recovery in tariff						
Variable - local	l = d x k	PKR mn	38	44	35	43
Variable - Foreign	m = e x k	PKR mn	1,110	2,134	548	653
Fixed - local	n = f x l	PKR mn	423	257	257	251
Fixed - Foreign	o = g x j	PKR mn	30	45	44	29
Total	p	PKR mn	1,601	2,480	885	977
Cost [Shall be replaced with actual cost incurred]						
O&M expenses as per Financial statements		PKR mn	1,931	1,887	1,847	1,932
Addition to CWIP as per Financial statements		PKR mn	1,021	1,041	931	1,054
Total	q	PKR mn	2,952	2,928	2,778	2,986
Over / (Under) Recovery	r = p - q	PKR mn	(1,351)	(449)	(1,893)	(2,010)
Over / (Under) Recovery - Movement						
Opening	s	PKR mn	-	(1,351)	(1,799)	(3,692)
Addition	t = r	PKR mn	(1,351)	(449)	(1,893)	(2,010)
Closing	u	PKR mn	(1,351)	(1,799)	(3,692)	(5,702)

Sharing Timeline - based on occurrence on Overhaul of last component in One cycle for 32 Engines and 1 ST, and at the end of life - Note			Sharing on completion of MOH of ST
Over / (Under Recovery)	v = u	PKR mn	(5,702)
In case of (Under recovery) - carry forward	w = If v < 0	PKR mn	(5,702)
In case of Over recovery - sharing	X = If v > 0	PKR mn	-
- Consumer - 60%	Y = X x 60%	PKR mn	-
- KE - 40%	z = X x 40%	PKR mn	-

Sharing of consumer to be credited in next invoice.

One Overhaul cycle shall include one:
- One 60k for each engine
- One 30k for each engine
- One Major inspection for each ST after every 40k operating hours
- One Minor inspection for each ST after every 8k operating hours

In case of First overhaul cycle, 60k for one engine has already been incurred before FY 2024

SGEPS – Annexure O

Head of Terms

POWER PURCHASE AGREEMENT

TERM SHEET

This Term Sheet dated xxx (the "Date of Signing") is a summary of the principal and indicative terms for inclusion in the Power Purchase Agreement (the "PPA") to be entered into between XX Generating Station (Plant) which is part of KE's generation fleet, and Transmission/Load Dispatch Center (LDC) of KE (individually a "Party" and together the "Parties") in relation to the sale and purchase of electrical energy. The terms and conditions contained in this non-binding term sheet are indicative and non-binding in nature. Any such obligation or agreement will be created only by the execution of a definitive power purchase agreement (the "PPA") by Seller and Buyer (as defined below, and collectively the "Parties"), the provisions of which, if so executed, will supersede this Term Sheet and all other agreements, if any, related to this document and the proposed transaction.

Sr #	Terms	Description
1)	Seller	SGEPS
2)	Buyer	Load Dispatch Center (LDC) / Supply
3)	Purpose of PPA	The Plant shall sell all electrical energy generated by it to the Buyer based on the dispatch instructions issued by Buyer and the fuel available with Seller to meet such dispatch in line with the agreed availability plan between buyer and seller
4)	Plant	[.] *Description of plant to be added*
5)	Product	The "**Product**" to be delivered and sold by Seller and received and purchased by Buyer consists of: (a) all energy, or Buyer's applicable portion, expressed in MWh, generated by the Plant and delivered to the delivery point/interconnection point ("**Delivered Energy**") b) all other plant output including capacity and ancillary services c) Black start facility, if applicable
6)	Term	The term of the PPA shall be effective on the **Effective Date** (to be defined in the PPA) and shall terminate XX Contract Years or the expiry of the regulatory license of the Plant, whichever is earlier, following the Effective Date ("**Term**"). "**Contract Year**" means each consecutive 12-month period during the Term that commences on the first day of July following the Effective Date, and every July 1st thereafter. The first Contract Year shall be a partial year, commencing on the Effective Date.
7)	Contract Capacity	The Contract Capacity shall be XX MW (net, at reference condition)
8)	Sale and Purchase of Energy and Capacity	Buyer shall have exclusive right of energy and capacity of the Plant. Subject to terms of PPA, The Seller shall: (i) Make available to the Buyer the Declared Available Capacity up to the Contract Capacity (ii) Deliver and sell to Buyer at the interconnection point, the dispatched net electrical output Subject to the terms of PPA, the Buyer shall, in accordance with NEPRA approved tariff: (i) Pay Declared Available Capacity (Take or Pay mechanism) (ii) Pay for the dispatched and delivered net electrical output

Sr #	Terms	Description
9)	Metering	Buyer's share of the Delivered Energy shall be measured using electric metering devices. The Metering System shall be in place prior to the delivery of net electrical output to the interconnection point. Seller shall maintain and Buyer shall inspect such electric metering devices In accordance with the agreed terms and conditions between buyer and seller and approved by NEPRA.
10)	Billing	The PPA shall contain provisions pursuant to which Seller shall send Buyer monthly invoices in form and method determined by the Parties, showing the amount due to the Seller for the relevant month, specifying MWs supplied, all billing parameters, rates and factors and all other data relevant to the calculation of payments.
11)	Net Heat Rate	The Plant shall perform at a Net Heat Rate (NHR) of XXXX as witnessed and/or approved by NEPRA. Necessary Corrections shall be applicable on part load operations.
12)	Annual Operational Plan	At the beginning of each Year, the Plant shall submit to the Buyer, its Annual Operational Plan, which shall include but not be limited to the following: - Planned Outage Schedule - Maintenance Outage Schedule - Forced Outages Allowance - Annual Availability - Minimum Dispatch requirements as per technical limits - Fuel allocation as available from the Fuel Supplier Upon receipt of the Plants' Annual Operational Plan, the Buyer shall review and provide timely feedback on the operational plan based on the following: - The Year's demand forecast - Economic Merit Order Projection (tentative) to be provided to the seller - System constraints including planned outages in the network if any, to be provided to the Seller. - Annual Dispatch Plan (tentative) - to be provided to the Seller annually. Upon review of the Plant's Annual Operational Plan, both Parties shall mutually agree to the final plan for the upcoming contract year
13)	Plant Availability and Dispatch	Seller shall achieve availability of no less than XX%, The Plant shall be responsible for the availability of the Complex for Dispatch by the Buyer. Upon receipt of a notice of Dispatch from the Buyer, the Seller shall generate and deliver the Net Electrical Output at the Interconnection Point in accordance with the technical limits as per grid code and all applicable standards/prudent practices. The Seller shall give prompt notice to the Buyer regarding any changes to availability of the Complex caused by events such as: (i) Force Majeure Event; (ii) Scheduled Outage; (iii) Forced Outage; (iv) Partial Forced Outage; and (v) Any other event which causes alteration in availability

Sr #	Terms	Description
14)	Operation and Maintenance Costs	Seller will bear all costs and expenses for Operations and Maintenance of the Plant and any other costs up to the delivery /interconnection point for the performance of Seller's obligations under the PPA (collectively, the "Seller Costs"). Any ancillary services costs to be excluded from the Seller Costs shall be discussed in the PPA.
15)	Others	The PPA will also include, among other things, the following covenants, terms, and/or conditions: • Seller will insure operate, maintain, manage, replace, repair, study, test, and otherwise use the Plant up to its battery limits in accordance with (i) Seller's obligations in the PPA, and the OEM Manual(s), (ii) Prudent electrical and utility practices, and (iii) all applicable laws (including environmental laws), consents, and governmental approvals, including all applicable standards and guidelines adopted from time to time by governmental authorities • Seller will schedule and perform required maintenance according to the PPA • Seller will insure against all insurable risks with coverage in an amount not less than full replacement cost and on terms specified in the PPA.
16)	Fuel Supply	The Seller shall make its best efforts for the availability and allocation of Main fuel to the Gen Station to maintain guaranteed availability and to meet dispatch notifications.
17)	Start-ups and Minimum Load	The Seller shall make technical references available to the Buyer concerning the required times for Start-Ups and minimum complex/machine loading
18)	Billing	Relevant Payment Terms for Energy shall be 30 days. The Buyer shall pay the Seller the Capacity Payments for the available capacity for each month (70% in advance and 30% immediately after month end) and energy payments for dispatched and delivered net electrical output for the relevant month.
19)	Liquidated Damages	To be discussed between the Parties
20)	Force Majeure	Force Majeure Events and the obligations, duties, compensation, and recourse available to each Party during such events including but not limited to **PPFME** (Pakistan Political Events that occur inside or directly involve Pakistan) and **CLFME** (any Change in Law to the extent of Force Majeure Event) shall be negotiated and finalized in the PPA. The PPA will also include a termination right for extended force majeure that impacts Party's ability to perform under the contract.
21)	Events of Default	The PPA will include standard events of default, as appropriate.
22)	Termination	The PPA will include standard terms for Termination. However, Parties agree that there shall not be any Termination for Convenience in the PPA.
23)	Dispute Resolution	In the event of any disputes between the Parties, the Parties shall seek to resolve the same in the following order: 1. Through mutual discussion involving Steering Committee 2. If the dispute in question is not resolved through mutual discussions, then senior management of KE shall resolve the disputes. Other terms & conditions for settlement of disputes shall be mutually agreed between the Parties

Sr. #	Terms	Description
25)	Indemnification	Seller shall indemnify Buyer against any damages (unless resulting from Buyer's gross negligence or willful misconduct). Buyer shall indemnify Seller against any damages (unless resulting from Seller's gross negligence or willful misconduct).
26)	Governing Law	Laws of Pakistan
27)	Confidentiality	Each Party shall be required to keep the terms and provisions, of the PPA and this Term Sheet, confidential and prohibited from disclosing such terms to any third party, subject to certain limited exceptions specified in the PPA.

K-Electric Limited

IC Report on O&M cost evaluation – S.I.T.E Gas Engine Power Station ("SGEPS") Plant

30 November 2022

Consortium of Independent Consultant

OMS

EY

Building a better working world

Reliance Restricted

Chief Financial Officer
K-Electric Limited
KE House, 39-B
Sunset Boulevard, D.H.A. Phase 2
Karachi, Pakistan

Project Power – IC Report on O&M cost evaluation of SGEPS **30 November 2022**

Dear Sir

In accordance with your instructions, we have performed the work set out in our Purchase Order (No: 7500048189) dated 29 March 2022 (the "Engagement Agreement") in connection with the evaluation of forecast of operations and maintenance cost of owned power generation plants prepared by K-Electric Limited ("KE" or the "Client" or "you"), as part of seeking stand-alone tariff for each power plant under IPP mode from National Electric Power Regulatory Authority ("NEPRA") ("the Project" or "Project Power" or the "Transaction").

Purpose of our report and restrictions on its use

This engagement is of due diligence in nature and accordingly this due diligence report ("Report") on S.I.T.E Gas Engine Power Station ("SGEPS") has been prepared by consortium comprising OMS (Private) Limited ("OMS" or "Technical cum lead consultant") and EY Ford Rhodes ("EY" or "Financial Consultant") (hereinafter jointly referred as "Independent Consultant" or "IC", "We" or "Our") based on their respective technical and commercial analysis performed in accordance with the scope agreed vide Engagement Agreement. The supplementary analysis performed by IC during the course of this engagement has been compiled and submitted to KE separately.

This Report has been prepared on the specific instructions of KE, solely for the purpose of the Transaction and should not be used or relied upon for any other purpose. This Report (or any portion or summary of it) may not be quoted, referred to or shown to any other parties except as provided in the Engagement Agreement.

We accept no responsibility or liability to any person other than to KE, or to such party to whom we have agreed in writing to accept our responsibility in respect of this Report, and accordingly if such other persons choose to rely upon any of the contents of this Report they do so at their own risk.

Nature and scope of the services and limitations

The nature and scope of the services, including the basis and limitations, are detailed in the Engagement Agreement.

Whilst each part of our Report addresses different aspects of our work, the entire Report together with Appendices should be read for a full understanding of our findings and advice.

"Banner headlines" used in this Report are intended only to act as an introduction to the page concerned and should be read in conjunction with rest of the page. They are not intended to represent any recommendation, conclusion or finding.

Our work was completed on 30 November 2022. Therefore, our Report does not take account of events or circumstances arising after that date and we have no responsibility to update the Report for such events or circumstances.

This Report has been finalized based on the data, explanations and feedback provided by the Client during the course of engagement.

Nature and scope of the services and limitations (cont'd)

IC highlights that our Report do not include any recommendation to you on your future course of action. Any decision to proceed with tariff petition may entail consideration of several factors, some of which IC may not be aware of. The evaluation of these factors or advising you on any business decision does not form part of scope of our work of this Report. You should therefore consider the appropriateness of the Report in light of your own objectives and financial situation.
While EY has performed a review of the Operations and Maintenance ("O&M") cost model, we have not assessed the contents of the model i.e. the financial statements or roll-forward for their appropriateness for financial reporting (as per applicable framework) or taxation authorities. Further, as summarized in section 2 of the Report, our review is based on the data and agreements / quotations of the respective power plants made available to IC during the course of the engagement. Reasonableness of O&M costs has been performed by OMS in detail based on substantial review of relevant supporting documents, wherever available. Additionally, we perform our work in the capacity of IC and have not assessed any agreements for their authenticity / legality from a legal and tax perspective.

IC has reported broadly on matters, which Consortium members have noted and which appear significant to us for the purpose of technical and commercial due diligence. In addition, please note that:

a) Our work in connection with this engagement is of a different nature to that of an audit or a review of information, as those terms are understood in applicable international auditing standards. Consequently, we give no assurance on such information.

b) Our scope of work was limited to the review and analysis of information made available to EY by the management of KE, physical site visit and discussions with key management personnel of KE.

c) We have relied on the information provided during the course of engagement and have assumed the genuineness of all the documents and the signatures thereon as if they were originals and also assumed that the scanned or soft copies conform to the original.

d) Transactions, data and events which were not recorded and which were not disclosed to us may not have been identified during our due diligence.

Detailed findings of technical due diligence performed by OMS have been placed in the appendices to this Report with summary findings and considerations highlighted in different sections of the Report.

The contents of our Report have been reviewed by KE management, who have confirmed to us their factual accuracy. Further, feedback provided on the draft Report has been duly addressed, wherever deemed appropriate.

We appreciate the co-operation extended by the KE team during the course of this engagement. Please do not hesitate to contact us if you have any questions about this engagement or if we may be of any further assistance.

Yours faithfully,

For and on behalf of OMS (Private) Limited (Technical cum lead consultant)

Abu Adil (Senior General Manager)

For and on behalf of EY Ford Rhodes (Financial consultant)

Rana Nadeem Idrees (Partner)

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1 Key considerations

Key considerations

Key consideration	Commentary	Findings / Recommendation	Pg. no.
Plant operating profile and availability / utilization factor assumption	▸ Under an integrated MYT regime, KE had a consolidated O&M tariff component based on projected operating profile and load factor of its plants. ▸ Since, KE is planning to seek standalone O&M cost tariff for each plant, including SGEPS, therefore, Management has assumed projected plant availability / utilization factor of 87.64% (i.e. the maximum achievable average availability / utilization factor during remaining plant life). ▸ Aforementioned assumption of projected plant utilization to match projected plant availability has been kept aligned with other IPPs, for the sake of tariff petition. ▸ SGEPS configuration includes 32 × Gas Engines, 32 HRSG and 01 × ST. ▸ Since NEPRA determined the performance of complex through 3rd party test i.e., Gross Capacity: 96.191 MW, Net Output: 92.73 MW, Net Efficiency (HHV): 37.65% and auxiliary consumption of 3.464 MW (3.60%), therefore, it is implied that the same shall stand accepted as such.	▸ Major cost events and the variable cost annual spend profile during the requested tariff control period has been assessed keeping in view forecast availability/utilization. ▸ Since variable costs, including event based costs, are claimed based on actual utilization of the plant, risk of claiming any extra cost for lower actual utilization is negligible. ▸ The availability/utilization/load factor assumed by KE is reflective of the brownfield nature of the plant and expected maintenance requirements over its remaining useful life.	n.a.
Methodology applied for preparing O&M tariff	▸ KE intends to submit its petition for each of its owned power generation plant under IPP mode. ▸ Previously, NEPRA has considered the Revex component of O&M cost for the immediately preceding year (reference year) and accordingly determined the O&M tariff component. In this particular case, KE is submitting its petition in advance for tariff period commencing from FY24 in the current fiscal year. Therefore, for the purpose of O&M cost estimation, FY22 audited numbers have been used.	▸ KE would need to assess its readiness to address any additional information required during tariff determination process. ▸ The findings of this Report are also expected to provide comfort around O&M cost estimation of KE, during the tariff determination process.	n.a.

Key considerations

Key consideration	Commentary	Findings / Recommendation	Pg. no.

Reclassification of expenses between foreign and local components and other adjustments	▸ The adjustments mainly reflect the impact of:
	  ▸ update of exchange rate assumption by KE from PKR 185 to PKR 206 in case of foreign components of VOM and FOM costs (i.e. with a cumulative increase of PKR 1.66b in VOM foreign and PKR 0.06b in FOM foreign).
	  ▸ reclassification/revisit of costs suggested by IC in local and foreign components of VOM and FOM.
	▸ These adjustments translated into a net cumulative reduction of PKR 2.2b in FOM and a net cumulative addition of PKR 0.5b in VOM over the requested tariff control period. Consequently, average per kWh VOM cost increased by PKR 0.0441 and average per kWh FOM cost decreased by PKR 0.1954.
		▸ KE has evaluated and concurred with the identified adjustments of IC and accordingly reflected those in its adjusted average tariff computation.
		▸ The adjusted average tariff has been included in the later sections of this Report.
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Basis used for estimating O&M costs	▸ Basis of estimations can be summarized in three broad categories:
	  ▸ Linked to latest available POs/quotations;
	  ▸ Management estimate/past experience; and
	  ▸ Based on FY22 values and SAP history.
	▸ IC has substantiated the reasonableness of assumptions on sample basis (covering ~91.3% of value) through checking of POs, quotations, SAP history, underlying agreements and / other relevant data / basis considered by the Management.
		▸ Estimation basis used by the management were found reasonable / consistent with the historical benchmarks, underlying agreements and / or historical basis.
		▸ As highlighted above, some re-classification adjustments (between local / foreign and variable / fixed components) and cost reductions were identified by IC. These have been agreed with KE and accordingly have been addressed in the adjusted average tariff computation of KE, shown in later sections of this Report.
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Key considerations

Key consideration	Commentary	Findings / Recommendation	Pg. no.
Benchmarking of O&M costs (Gas operations) PKR/kWh SGEPS: 1.9118 SNPCL: 1.8853	▸ Any reference of similar technology with same configuration of combined cycle mode could not be found in Pakistan, however, the closest benchmark with respect to gas engines in combined cycle mode i.e., Sindh Nooriabad Power Company Limited ("SNPCL") was considered for tariff benchmarking. ▸ In terms of total reference average O&M component of tariff, as shown in the adjacent column, total SGEPS O&M cost tariff is less than that of SNPCL. ▸ Fixed cost ratio in SGEPS is less than the benchmark by 10.4%. This is compensated by higher VOM cost ratio in SGEPS by 10.4% as compared to the benchmark. ▸ Foreign cost component of SGEPS is 77.5%, as compared to SNPCL, where the foreign cost component is 43.8%. **Enabling cost benchmarking:** ▸ Due to lack of publicly available data about benchmark projects, enabling costs were analyzed at overall FOM level and were found reasonable.	▸ Overall SGEPS O&M cost tariff is lower as compared to the benchmark power plant, despite having higher number of 60K major maintenance events (i.e. 64 activities during remaining life of plant until FY39).	31

O&M cost indexations	▸ SGEPS average tariff is expected to be indexed as follows:
	  ▸ Local costs: Pak CPI Quarterly
	  ▸ Foreign costs: US CPI and Exchange rate Quarterly variation
		▸ The requested indexations are aligned with benchmark projects and recent determinations by NEPRA for other thermal power projects.	32

Key considerations

Key consideration	Commentary	Findings / Recommendation	Pg. no.
Unbundling consideration	▸ SGEPS plant is currently operating under the umbrella of overall KE system. Accordingly, cost structure may change going forward, in case Management decides to unbundle the utility into distinct business segments.	▸ KE is suggested to seek adequate openers (e.g. those related to the recovery of legitimate incremental O&M costs that may arise in future due to potential unbundling of the utility) in its tariff petition.	n.a.
Other commercial considerations	▸ Since KE is using an in-house model for O&M operations, opportunity of embedding certain costs and risks (as part of third-party O&M contractor scope) with performance guarantee mechanism and indirect reflection in fixed or variable O&M charge is not available to KE. Consequently, such costs and risks are being parked with/borne by KE instead of a third party and hence bear a cost recovery challenge. However, KE does not envisage any cost increase due to continuation of an in-house operating model.	▸ KE, in consultation with its legal team, should consider reiterating the legitimate cost recovery principal enshrined within the prevalent tariff regulatory framework while finalizing and framing request for the O&M cost components of the tariff.	n.a.

2 Project background and scope of work

KE has hired consortium of OMS and EY for the independent evaluation of projected O&M costs for SGEPS

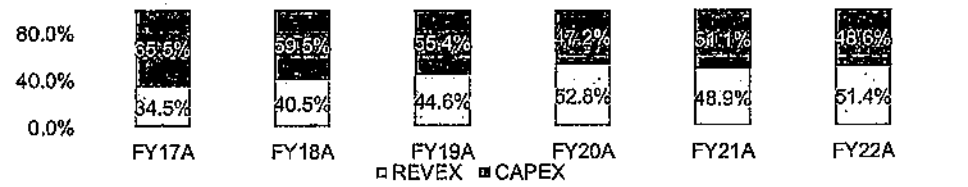
Background

- K-Electric Limited ("KE") is the only vertically integrated power utility of Pakistan.
- KE carries out operations and maintenance of its power generation plants, including major overhauls, under service contracts with OEMs and/or in-house (with or without vendors support), as applicable.
- KE's existing integrated-Multi Year Tariff ("MYT") period is due to expire on 30 June 2023.
- As part of its preparatory work for next MYT petition, KE has internally decided to opt out of MYT for generation component of its business and is in the process of applying separate generation tariff for the following owned power generation plants, covering their remaining useful economic lives as tariff control period:
  - Bin Qasim Power Station – I ("BQPS I")
  - Bin Qasim Power Station – II ("BQPS II")
  - Bin Qasim Power Station – III ("BQPS III")
  - S.I.T.E Gas Engine Power Station ("SGEPS")
  - Korangi Town Gas Engine Power Station ("KTGEPS")
  - Korangi Combined Cycle Power Plant ("KCCPP")
- KE has prepared an O&M cost forecast for each of these power plants for the purpose of tariff petioning. For this purpose, O&M costs have been derived keeping in view historical and forecast revenue expenditure ("REVEX") and capital expenditure ("CAPEX") for each plant.
- KE hired a consortium comprising OMS (Private) Limited ("Technical cum lead consultant") and EY ("Financial Consultant") (hereinafter together referred to as "Independent Consultant" or "IC") for the independent evaluation of the aforesaid projected O&M costs.

O&M costs related to generation segment are reflected in audited financial statements as expenses incurred in generation and additions to CWIP – generation segment

Historical generation O&M cost – KE system

Figures in PKRm		FY17A	FY18A	FY19A	FY20A	FY21A	FY22A
REVEX	A	4,751	4,695	5,195	5,054	5,322	4,770
CAPEX	B	9,003	6,877	6,429	4,521	5,656	4,505
Total		13,754	11,572	11,624	9,575	10,978	9,275



Reconciliation with audited financial statements

Figures in PKRm	FY17A	FY18A	FY19A	FY20A	FY21A	FY22A
O&M expenditure	4,751	4,695	5,195	5,054	5,322	4,770
Add: Depreciation & Amortization	7,648	9,061	9,878	11,729	11,436	11,657
O&M expenditure total	12,399	13,756	15,073	16,783	16,758	16,427
O&M expenditure support cost	1,089	920	1,138	986	1,223	1,273
Add: Depreciation & Amortization support dept	43	55	68	82	85	212
O&M expenditure total	1,132	974.56	1,206	1,068	1,308	1,485
Expenses incurred in generation as per AFS	13,531	14,731	16,279	17,851	18,066	17,912

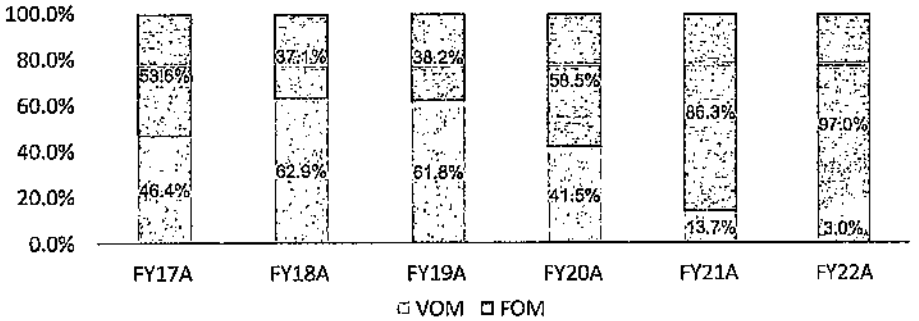
Figures in PKRm	FY17A	FY18A	FY19A	FY20A	FY21A	FY22A
Generation – Plant and machinery additions	7,509	6,385	6,857	4,234	5,059	4,162
Generation – Others	1,494	492	-428	287	597	343
Sub-total	9,003	6,877	6,429	4,521	5,656	4,505
Add: BQPS III Project Cost	0	30	14	16,625	45,372	21,819
CWIP additions as per AFS	9,003	6,907	6,443	21,146	51,028	26,324

Source: Management data and KE Annual Reports

Historical generation O&M cost – SGEPS

Figures in PKRm	FY17A	FY18A	FY19A	FY20A	FY21A	FY22A
REVEX	419	515	550	557	434	311
CAPEX	445	417	461	83	63	28
Total O&M	864	932	1,011	640	497	339

Source: Management data



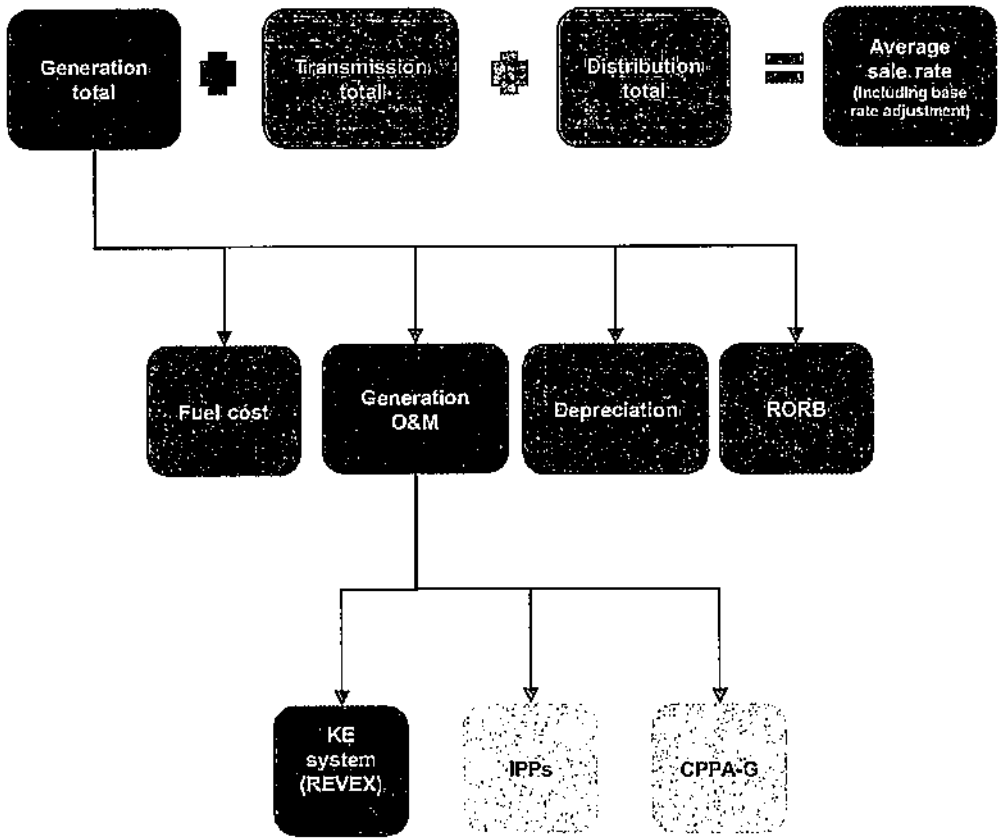
Estimated breakdown of historical SGEPS O&M cost

Financial year	FY17A	FY18A	FY19A	FY20A	FY21A	FY22A
Variable O&M local	14	53	32	10	8	7
Variable O&M foreign	387	533	593	256	60	3
Sub-total variable O&M	401	586	625	266	68	10
Fixed O&M local	294	315	370	355	383	308
Fixed O&M foreign	169	31	16	19	46	21
Sub-total fixed O&M	463	346	386	374	429	329
Total	864	932	1,011	640	497	339

- Per management, since existing MYT does not bifurcate O&M into variable and fixed costs and accordingly, therefore costs are being maintained in the form of REVEX and CAPEX only. According to the Management, for the purposes of comparison with the proposed O&M bifurcation into fixed and variable cost going forward, historical O&M costs have been bifurcated based on assumptions similar to that of projected O&M costs.

Composition and comparability limitations of existing MYT

Current Integrated Multi-Year Tariff structure determined by NEPRA



- KE's current Multi Year Tariff is an Integrated MYT which includes costs and returns for all three segments i.e. Generation (all plants), Transmission and Distribution based on Regulatory Asset Base (RAB).
- While the underlying costs for three segments are defined in the current MYT determination, certain components such as base rate component and working capital component are not bifurcated segment wise.
- Similarly, plant wise tariff bifurcation in case of generation segment is not available within the MYT.
- Current MYT includes below components:
  - Fuel cost based on allowed benchmarks (indexed value for the month of June 2022 was PKR 21.72/kWh*);
  - RoRB and Depreciation components which cover for Returns on Regulatory Asset base (indexed value for the month of June 2022 was PKR 1.13/kWh* for generation); and
  - Operation and maintenance costs for generation, that are covered through:
    - O&M component allowed for Revex expenses (indexed value for the month of June 2022 was PKR 0.59/kWh*); and
    - Capital nature expenses allowed as investments and included in Regulatory Asset Base
- As explained above, base rate and working capital components are given on Company level, which include coverage for Generation segment as well.
- Accordingly, MYT in its current form is not comparable with the O&M cost tariff being requested under IPP mode.

Source: Management data

* Tariff values based on total units sold basis

Scope of work of IC

Scope of work	Responsibility	
	OMS (Lead cum Technical Consultant)	EY (Financial Consultant)
Comment on the historical and projected operating profile of plant	✓	
Review and evaluate grouping of O&M activities under fixed and variable components	✓	✓
Review bifurcation of expenses in foreign and local components	✓	✓
Review and evaluate completeness of O&M costs	✓	
Review and evaluate assumptions used for projecting O&M costs	✓	✓
Evaluate enabling / associated cost loading over O&M cost component of isolated plant	✓	✓
Identify gaps in costing and provide estimates to fill those gaps	✓	
Benchmarking of O&M costs against those of comparable projects	✓	✓
Consider inventory in hand and consider its periodic depletion till end of term	✓	

3 Technical specifications of the plant

Key technical specification and plant configuration of SGEPS

SITE Gas Engine Power Station ("SGEPS")

- SITE Gas Engine Power Station ("SGEPS") is located at Sindh Industrial Trading Estate (SITE), Karachi.
- SGEPS is connected to K-Electric 132KV transmission system and is the part of the overall fleet of generating stations owned by K-Electric.
- The 32 engines are configured in four (4) sections (8 engines in each section) and the same configuration has been followed for 32 HRSG units. Each of the four sections is connected to 132kV GIS via 11/132kV 30MVA step-up transformer. Similarly, steam turbine is connected to 132kV GIS via 11/132kV 15.5MVA step-up transformer.
- Plant can be operated both in simple cycle and combined cycle as well. The fuel for the plant is natural gas & RLNG which is supplied by the Sui Southern Gas Company Ltd. (SSGC)
- SGEPS is sub-divided into 4 sections.
- Section-I contains Engine (1~8): achieved COD on June 23, 2009
- Section-II contains Engine (9~16): achieved COD on July 13, 2009
- Section-III contains Engine (17~24): achieved COD on August 21, 2009
- Section-IV contains Engine (25~32): achieved COD on August 21, 2009
- Steam Turbine (unit # 33): completed Reliability Run Test (RRT) on July 31, 2016
- NEPRA issued Generation License # GL/04/2002 to K-Electric on November 18, 2002 and subsequent modifications time to time for distinctly placed six power generation stations. The latest GL modification approved on February 19, 2021 i.e., NEPRA/R/LAG-05/8872-76 to the Company in accordance with the prevailing regulatory regime & project useful life is determined as 30 years for Engines & 25 Years for Steam Turbine from (COD).
- It has been in operation for the last 13 years and is supposed to enter its final year of operations by 2039.

Category	Description
Technology	Combined cycle power plant
Configuration	32 Engines + 32 HRSG +1ST
Type of fuel	Natural Gas
Equipment	Gas Engines & Steam Turbines
Units	32 x 3.041 MW Gas Engines, 1 x 10.0 MW Steam turbines
Capacity	107.312 MW ISO Installed
Make	Gas Engines – GE JENBACHER, Steam Turbine – NG ALLEN, UK
Model	Gas Engine – JGS 620 E-Series , Steam Turbine – MC-800

Plant past performance and heat rate

Last 6-year performance

Performance Indicator	FY17	FY18	FY19	FY20	FY21	FY22
Availability (%)[1]	93.18	92.58	57.42	97.94	97.12	98.58
Reliability (%)[2]	97.98	98.09	99.18	99.34	99.58	99.88

Heat rate test results

Description	Values
Gross Capacity – MW (RSC)	96.191
Auxiliary – MW	3.464
Net Capacity – MW	92.727
Net Heat Rate LHV Basis – Btu / kWh	8,179.522
Net Efficiency LHV Basis	41.716%
Auxiliary (Gross Load)	3.60%
Gross Heat rate LHV Basis – Btu / kWh	7,884.97
Gross Efficiency LHV Basis	43.274%
Net Heat Rate HHV Basis – Btu / kWh	9,063.865
Net Efficiency HHV Basis	37.646%
Gross Heat rate HHV Basis– Btu / kWh	8,737.468
Gross Efficiency HHV Basis	39.052%

1. Availability % = Available Capacity / Gross Dependable Capacity
2. Reliability = (Period Hours – Forced Outage Hours) / Period Hours

SGEPS engine maintenance strategy

Engine maintenance strategy

Engine RHRS	Maintenance type	Maintenance description
1000 RHRS	1K	Borescope, Spark Plug Re-Gapping and sealing ring replacement, (For J-Type Plug), Greasing of Actuator Linkage Rod
2000 RHRS	2K	Valve Take-Up, Spark Plug Replacement, Cylinder Tappet Adjustment, tightening of all Rocker Arm Bolts, Main Gas Street and Prechamber Gas Filter, Air Filter Replacement
6000 RHRS	6K	2K Work Scope & PCGVs replacement
10000 RHRS	10K	2K Work Scope, Replacement of Spark Plug O-rings Replacement of Sleeves upon inspection, Replacement of Pre-combustion chamber, Turbocharger Replacement, Intercooler Core and Flame arrestor cleaning, Turbo bypass Valve Gasket replacement and Turbo bypass servicing
20000 RHRS	20K	2K Work Scope, Replacement of Spark Plug O-rings, Replacement of Sleeves upon inspection, Replacement of Pre-combustion chamber, Turbocharger Replacement, Intercooler Core and Flame arrestor cleaning, Turbo bypass Valve Gasket replacement and Turbo bypass servicing, Vibration Damper Replacement
30000 RHRS	30K	2K Work Scope, Replacement of Spark Plug O-rings, Replacement of Sleeves upon inspection, Replacement of Pre-combustion chamber, Turbocharger Replacement, Intercooler Core and Flame arrestor cleaning, Turbo bypass Valve Gasket replacement and Turbo bypass servicing, Throttle Bush replacement, Cylinder Liner Replacement, Piston Replacement, Connecting Rod replacement, Cylinder Heads overhauling
60000 RHRS	60K	2K Work Scope, Replacement of Spark Plug O-rings, Replacement of Sleeves upon inspection, Replacement of Pre-combustion chamber, Turbocharger Replacement, Intercooler Core and Flame arrestor cleaning, Turbo bypass Valve Gasket replacement and Turbo bypass servicing, Throttle Bush replacement, Vibration Damper Replacement, Cylinder Liner Replacement, Piston Replacement, Connecting Rod replacement, Cylinder Heads Replacement, Block/Crank shaft inspection & Machining (whichever applicable)

Planned maintenance summary of major equipment

Planned outages

Year	Planned outages description	Total outage hours (Engine-based)
2018-2019	Stopped Due to GIS Replacement Activity under TP-1000 Project	114017.95
2016	Stopped Due to Transformer Lube Oil Report Out Of Range	5557.85
2020	Stopped Due to Main Gas Line Modification	3219.15
2019	Stopped Due to Transformer Replacement	1277.73
2016	30 MVA Transformer Oil Centrifuging	898.97
2020	Stopped Due to Block Transformer oil centrifuging activity	503.07
2016	E32 30K Maintenance	432
2017	E26 30K Maintenance	600
2017	E34 30K Maintenance	360
2017	E16 30K Maintenance	1032
2017	E33 30K Maintenance	408
2017	E27 30K Maintenance	816
2017	E31 30K Maintenance	720
2017	E35 30K Maintenance	744
2017	E25 30K Maintenance	792
2017	E17 30K Maintenance	1272
2017	E24 30K Maintenance	552
2017	E18 30K Maintenance	768
2017	E36 30K Maintenance	840
2017	E14 30K Maintenance	600
2018	E38 30K Maintenance	504
2018	E23 30K Maintenance	552

Year	Planned outages description	Total outage hours (Engine-based)
2018	E13 30K Maintenance	624
2018	E37 30K Maintenance	504
2018	E22 30K Maintenance	720
2018	E21 30K Maintenance	816
2018	E28 30K Maintenance	1056
2018	E12 30K Maintenance	672
2018	E44 30K Maintenance	840
2018	E15 30K Maintenance	864
2018	E42 30K Maintenance	1320
2018	E47 30K Maintenance	1152
2018	E46 30K Maintenance	1488
2018	E43 30K Maintenance	1584
2019	E48 30K Maintenance	1416
2019	E45 30K Maintenance	984
2019	E41 30K Maintenance	240

SGEPS unit wise accumulated operating hours

Accumulated hours until 30 June 2022

Unit No.	Accumulated hours
Engine No. 1 (E11)	26955.00
Engine No. 2 (E12)	49329.00
Engine No. 3 (E13)	48792.00
Engine No. 4 (E14)	50795.00
Engine No. 5 (E15)	50184.00
Engine No. 6 (E16)	51478.00
Engine No. 7 (E17)	49714.00
Engine No. 8 (E18)	50231.00
Engine No. 9 (E21)	46330.00
Engine No. 10 (E22)	46682.00
Engine No. 11 (E23)	46958.00
Engine No. 12 (E24)	47863.00
Engine No. 13 (E25)	47663.00
Engine No. 14 (E26)	48998.00
Engine No. 15 (E27)	48622.00
Engine No. 16 (E28)	45558.00
Engine No. 17 (E31)	53096.00
Engine No. 18 (E32)	53352.00
Engine No. 19 (E33)	53828.00
Engine No. 20 (E34)	53897.00
Engine No. 21 E(35)	52415.00
Engine No. 22 E(36)	49803.00
Engine No. 23 E(37)	46608.00
Engine No. 24 E(38)	48498.00

SGEPS unit wise accumulated operating hours

Accumulated hours until 30 June 2022	
Unit No.	Accumulated hours
Engine No. 25 (E41)	49365.00
Engine No. 26 (E42)	49513.00
Engine No. 27 (E43)	49241.00
Engine No. 28 (E44)	48157.00
Engine No. 29 (E45)	49624.00
Engine No. 30 (E46)	49990.00
Engine No. 31 (E47)	49750.00
Engine No. 32 (E48)	49182.00
ST Unit No. 33	20143.00

Engines projected planned maintenance summary (FY24 – FY39)

Engine's planned outage

S/No.	Gas Engine	Engine #	Maintenance Type	Maintenance Year	Outrage Days per Engine
1	60K Maintenance	16,31,32,33,34,35	Major	FY24	40
2	60K Maintenance	12,13,14,15,17,18,21,22,23,24,25,26,27,28,36,37,38,41, 42,43,44,45,46,47,48	Major	FY25	40
3	60K Maintenance	11	Major	FY28	40
4	60K Maintenance	12,13,14,15,16,17,18,26,27,31,32,33,34,35,36,41,42,43, 45,46,47,48	Major	FY32	40
5	60K Maintenance	21,22,23,24,25,28,37,38,44	Major	FY33	40
6	60K Maintenance	11	Major	FY35	40
7	30K Maintenance	11	Minor	FY24	25
8	30K Maintenance	14,15,16,18,31,32,33,34,35	Minor	FY28	25
9	30K Maintenance	12,13,17,21,22,23,24,25,26,27,28,36,37,38,41,42,43,44, 45,46,47,48	Minor	FY29	25
10	30K Maintenance	11	Minor	FY31	25
11	30K Maintenance	31,32,33,34,35	Minor	FY36	25
12	30K Maintenance	17,18,21,22,23,24,25,26,27,28,36,37,38,41,42,43,44,45, 46,47,48	Minor	FY37	25

Steam Turbine projected planned maintenance summary (FY24 – FY39)

Steam turbine planned outage				
S/No.	Steam Turbine	Maintenance type	Maintenance year	Outage days
1	Steam Turbine 40 K Maintenance	Major	FY24	35
2	Steam Turbine 40 K Maintenance	Major	FY28	35
3	Steam Turbine 40 K Maintenance	Major	FY33	35
4	Steam Turbine 40 K Maintenance	Major	FY38	35
5	Steam Turbine 8K Maintenance	Minor	FY25	14
6	Steam Turbine 8K Maintenance	Minor	FY26	14
7	Steam Turbine 8K Maintenance	Minor	FY27	14
8	Steam Turbine 8K Maintenance	Minor	FY29	14
9	Steam Turbine 8K Maintenance	Minor	FY31	14
10	Steam Turbine 8K Maintenance	Minor	FY32	14
11	Steam Turbine 8K Maintenance	Minor	FY34	14
12	Steam Turbine 8K Maintenance	Minor	FY35	14
13	Steam Turbine 8K Maintenance	Minor	FY36	14
14	Steam Turbine 8K Maintenance	Minor	FY39	14
15	Steam Turbine RGB 80K Maintenance	Major	FY24	7
16	Steam Turbine RGB 80K Maintenance	Major	FY33	7

Strategic spares and inventory available in the warehouse

Inventory management

- In SGEPS project cost, certain level of capital spares for plant equipment and its auxiliaries were provided by EPC Contractor.
- Engines strategic parts are maintained under Material Stream Agreement ("MSA") w.r.t. requirement of each scheduled outage i.e., 10k, 30k & 60k etc.
- ST strategic spares are maintained as per outage requirement i.e., 8K (Minor) & 40K (Major) etc.
- Other auxiliary system spares and routine maintenance spares of Engines, ST, HRSG & BOP are maintained according to their requirements.
- Minimum / maximum quantities of these spares are defined in SAP and reordered accordingly.
- Consumables are managed under REVEX which majorly comprise of lube oil, air intake filters and BOP equipment spares.
- Total inventory given in the inventory list is carried at **PKR 588,483,307** which requires regular replenishment for smooth O&M of plant during its remaining useful life.

Strategic spares and inventory available in the warehouse built up as of 30 June 2022

Sr. No.	Department	No of Items	Amount in PKR
1	Mechanical	51	84,456,440
2	Electrical	37	54,749,400
3	Instrument and control	29	44,409,934
4	REVEX / Other consumables	3,077	404,867,533
Total		**3,194**	**588,483,307**

Key findings

Overall spares availability and inventory management was found reasonable to ensure the plant availability / maintenance requirement.

Adjusted O&M cost and average tariff

Key assumptions

Key assumptions

- As per generation license, precise commercial operations end date for SGEPS is 19 August 2039. However, for the sake of simplicity, KE has projected the O&M costs for period FY24 – FY39 ("SGEPS PP"). The impact of additional period rounded to the nearest month has been illustrated on the following slides for ease of reference and understanding.
- Availability / utilization load factor varies throughout the years as follow:

FY	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
Factor	86.9%	81.4%	90.0%	90.0%	86.9%	85.3%	90.0%	89.8%	82.5%	86.1%	90.0%	89.7%	89.0%	85.5%	89.2%	90.0%

- The average utilization/load factor is reflective of the brownfield nature of the plant and expected maintenance requirements over its remaining useful life.
- Average availability during FY17 – FY22 was 89.47%, whereas, average availability assumed during FY24 – FY39 works out to be 87.64%, keeping in view the anticipated maintenance requirements for the plant
- Foreign currencies other than USD are first converted to equivalent USD based on their respective exchange rate parity with USD (assumed 1.05, 1.21, 0.15, 0.01, and 1.0 for EUR, GBP, CNY, JPY and USD respectively). Subsequently, USD based values are converted to equivalent PKR using prevailing PKR to USD conversion rate of 206.0, as per 30th June 2022 (as per NBP).
- The projected O&M costs originally estimated by the management of KE was based on PKR to USD exchange rate of 185. Towards the finalization of IC work, this assumption has been updated to PKR 206 for each USD. Accordingly, the adjusted reference tariff is also reflective of exchange rate assumption update.

Adjusted reference cumulative projected O&M cost (un-indexed) during FY24 – FY39 is PKR 20.5b (excluding enabling)

Adjusted O&M cost (FY24 – FY39) (excluding enabling cost)		Summary of identified adjustments reflected in the adjusted O&M cost	
Total O&M cost | PKR 20.5b		Total O&M cost: PKR - 1.72b ⇩ A: PKR - 3.44b | B: PKR +1.72b ⇧	
Variable | PKR 16.9b (82.4%)		Total VOM cost: PKR + 0.3b ⇧ ⇩A: PKR - 0.16b | B: PKR +1.66b ⇧	
Local PKR 0.6b (3.7%)	Foreign PKR 16.3b (96.3%)	Local: PKR - 1.42 ⇩ A: PKR - 1.42b ⇩	Foreign: PKR + 1.92b ⇧ A: PKR + 0.26b ⇧ B: + 1.66b ⇧
Fixed | PKR 3.6b (17.6%)		Total FOM cost: PKR - 2.23b ⇩ ⇩A: PKR - 2.29b | B: PKR +0.06b ⇧	
Local PKR 3.0b (83.1%)	Foreign PKR 0.6b (16.9%)	Local: PKR -1.80b ⇩ A: PKR - 1.80b ⇩	Foreign: PKR - 0.42b ⇩ A: PKR - 0.48b ⇩ B: + 0.06b ⇧

After considering additional period (2 months) until expiry of the generation license, the aggregate increase in the total O&M cost (excluding enabling cost) is PKR 217.5 million.

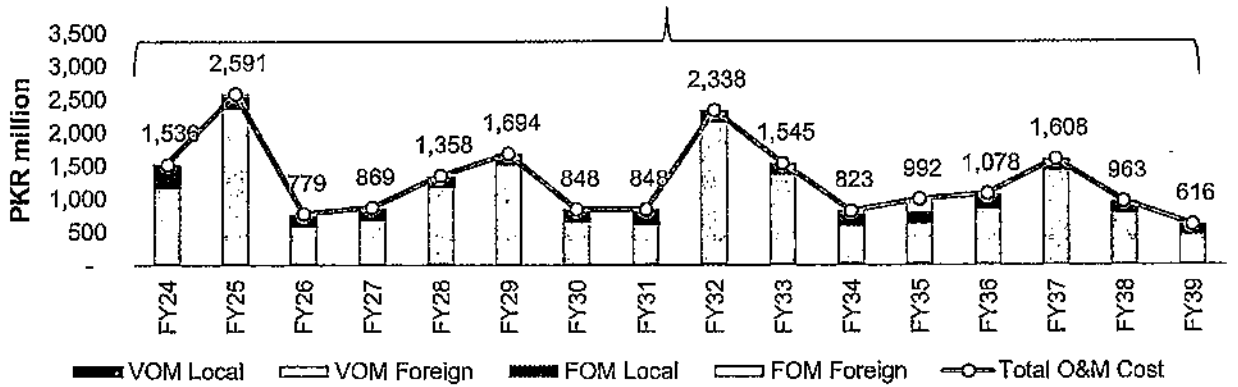
Source: Management data

Legend: Cost reduction ⇩ Cost Increase ⇧ A: Estimated cumulative adjustments identified by IC B: Estimated exchange rate update impact

Adjusted total O&M costs mix and trend (excluding enabling)

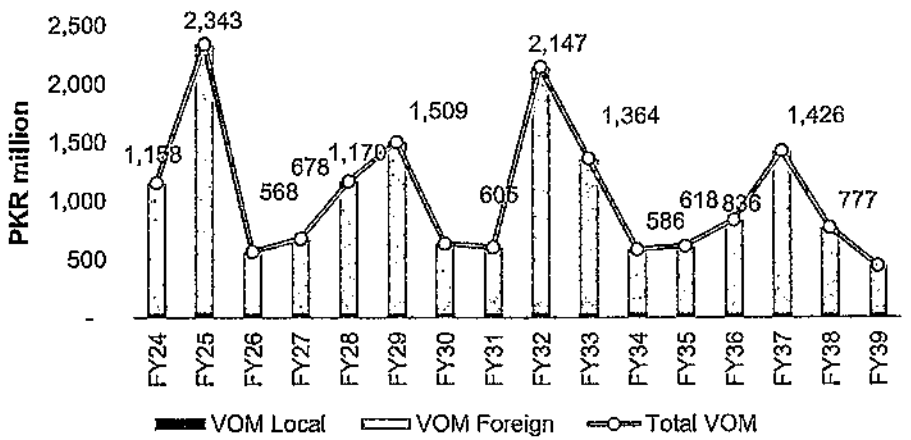
Total adjusted reference O&M cost (un-indexed)

Average availability / utilization: 87.64%

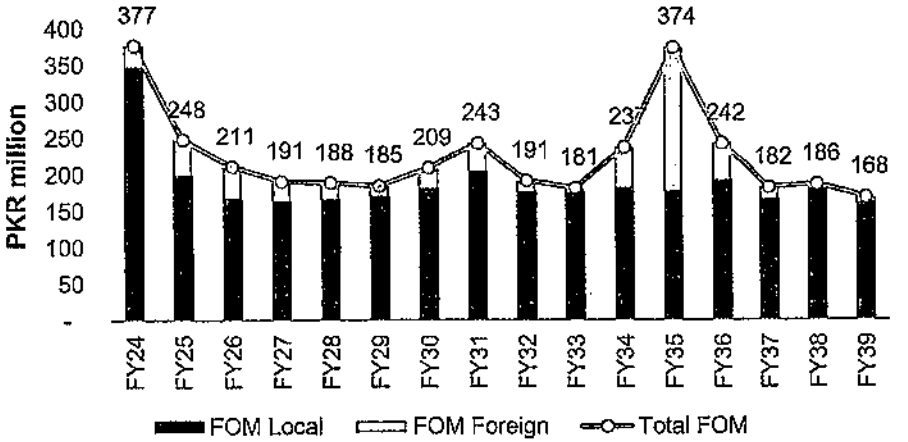


Historical analysis (FY 17 – 22)	
Average availability (%)	89.5
Average utilization (%)	39.5
Average annual total O&M (PKR million)	642.2

Total adjusted VOM cost (un-indexed)



Total adjusted FOM cost (un-indexed)



Computation of tariff based on projected plant availability for both FOM and VOM components

Plant availability / utilization factor used for both variable and fixed components:

FY	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
Factor	86.9%	81.4%	90.0%	90.0%	86.9%	85.3%	90.0%	89.8%	82.5%	86.1%	90.0%	89.7%	89.0%	85.5%	89.2%	90.0%

Year	Variable O&M			Fixed O&M			Total
	Local	Foreign	Total	Local	Foreign	Total	
FY24	0.0549	1.5854	**1.6403**	0.4917	0.0425	**0.5343**	**2.1745**
FY25	0.0712	3.4714	**3.5426**	0.3012	0.0730	**0.3742**	**3.9168**
FY26	0.0471	0.7306	**0.7777**	0.2291	0.0590	**0.2881**	**1.0658**
FY27	0.0577	0.8703	**0.9280**	0.2228	0.0383	**0.2611**	**1.1891**
FY28	0.0583	1.5984	**1.6567**	0.2345	0.0324	**0.2669**	**1.9236**
FY29	0.0488	2.1298	**2.1786**	0.2447	0.0221	**0.2669**	**2.4454**
FY30	0.0467	0.8275	**0.8742**	0.2472	0.0388	**0.2860**	**1.1602**
FY31	0.0529	0.7762	**0.8291**	0.2808	0.0525	**0.3333**	**1.1624**
FY32	0.0637	3.1403	**3.2039**	0.2618	0.0233	**0.2851**	**3.4890**
FY33	0.0567	1.8936	**1.9502**	0.2488	0.0104	**0.2592**	**2.2094**
FY34	0.0583	0.7428	**0.8011**	0.2480	0.0762	**0.3242**	**1.1253**
FY35	0.0516	0.7966	**0.8482**	0.2430	0.2705	**0.5134**	**1.3616**
FY36	0.0514	1.1052	**1.1566**	0.2646	0.0703	**0.3349**	**1.4915**
FY37	0.0507	2.0026	**2.0533**	0.2389	0.0227	**0.2617**	**2.3150**
FY38	0.0521	1.0201	**1.0722**	0.2473	0.0101	**0.2574**	**1.3296**
FY39	0.0470	0.5655	**0.6125**	0.2200	0.0104	**0.2304**	**0.8430**
Weighted average	0.0542	1.4271	1.4813	0.2636	0.0537	0.3173	**1.7985**
Add: Enabling cost (for details, see next page)				0.1133	-	**0.1133**	**0.1133**
Total tariff	0.0542	1.4271	1.4813	0.3768	0.0537	0.4305	**1.9118**

Since KE is a vertically integrated power utility and carry a unique position due to brown field nature of its power plants with entity level consumption, it intends to follow a billing regime for capacity payment based on available (net of outage allowances) basis. Accordingly, in order to recover projected fixed costs, Management has computed capacity part at respective availability/ utilization factor across all power plants of KE. In terms of total fixed cost recovery on an annual basis, KE's proposed Fixed cost component is expected to be indifferent from tariff computation being practiced under Take or Pay regime for other IPPs .

Weighted average tariff including additional 62 days:

FY24-40	**0.0542**	**1.4271**	**1.4813**	**0.3768**	**0.0537**	**0.4305**	**1.9118**

Since KE operates as VIU company, it has a central enabling/support function serving all three business segments of the business. Central costs are allocated to each business segment (generation, transmission and distribution)

Allocation of enabling charge to O&M tariff

Average enabling cost (per annum)	Average tariff component (per kWh)
PKR 80.6m	**PKR 0.1133**

Key findings

Due to the limitation of publicly available data about the benchmark project, enabling costs were analyzed at an overall FOM level for SGEPS with the benchmark project, and were found reasonable.

- Per Management, enabling costs represent costs apportioned to SGEPS by departments, such as Human Resource Management, Information Technology, Marcom, Business Development (including IPP department), Security, Corporate Affairs, CFO Office and CEO Office etc., for provision of shared services to SGEPS.
- The aforementioned costs are directly incurred by the respective departments and subsequently are re-allocated to the generation, transmission and distribution segments, using re-allocation basis provided by the respective departments (generally based on their own assessment of time spent or relevance of cost between generation, transmission and distribution segments).
- Ultimately, projected cost assigned to generation segment is spread between six plants based on the numbers of unit sent out.
- Such costs are generally covered as part of the administrative costs claim in the fixed O&M local component of the tariff allowed to IPPs.

Overall O&M tariff of SGEPS is lower as compared to the benchmark power plant

Tariff components	SGEPS		SNPCL	
	PKR / kWh	%share	PKR / kWh	%share
Variable O&M – Local	0.0542	2.8%	0.4387	23.27%
Variable O&M – Foreign	1.4271	74.6%	0.8264	43.83%
Sub-total	**1.4813**	**77.5%**	**1.2651**	**67.10%**
Fixed O&M – Local	0.3768	19.7%	0.6202	32.90%
Fixed O&M – Foreign	0.0537	2.8%	0.0000	0.00%
Sub-total	**0.4305**	**22.5%**	**0.6202**	**32.90%**
Total O&M tariff	**1.9118**	**100.0%**	**1.8853**	**100.0%**

Key technical specifications	SGEPS	SNPCL
Net capacity (MW)	92.73 MW	2 X 50 MW
Efficiency (net at HHV)	37.65%	41.64%
Fuel	RLNG/Natural Gas	Natural Gas
Engines type	GE Jenbacher JGS 620 GS-NL Gas Engine	Wartsila 20V 34 SG Gas Engine
Plant configuration	32 Engines + 32 HRSG +1ST	2 × (5 Engines + 5 HRSGs +1 ST)
Generation license period	30 years	25 Years
Average availability / utilization factor for tariff benchmarking	87.64% [2]	87.64% [1]

Key findings

Any reference of similar technology with same configuration of combined cycle mode could not be found in Pakistan, however, the closest benchmark with respect to gas engines in combined cycle mode i.e., SNPCL was considered for tariff benchmarking.

Overall SGEPS O&M cost tariff is lower as compared to the benchmark power plant, despite having higher number of 60K major maintenance events (i.e. 64 activities during remaining life of plant until FY39).

Cost mix alignment: Fixed cost ratio in SGEPS is less than the benchmark by 10.4%. This is compensated by higher VOM cost ratio in SGEPS by 10.4% as compared to the benchmark.

Foreign cost component of SGEPS is 77.5%, as compared to SNPCL, where the foreign cost component is 43.8%.

Enabling cost benchmarking: Enabling costs when analyzed at overall FOM level are found reasonable.

[1] Revised indexed tariff for April to June 2022 quarter adjusted for PKR to USD exchange rate of 206 and latest available CPI of June 2020 (i.e. 269.27 as per NEPRA determinations), adjusted for CPI of 8.9% (FY21) and 9.0% (FY22) respectively. Further, fixed O&M components have been grossed up at 87.6% (representing average projected availability of SGEPS).

[2] Average availability takes into consideration the annual availability of 90% (covering annual scheduled outage & forced outage allowance) along with the impact of periodic major / minor overhauls of engines / ST in line with outages allowance given to IPPs under applicable Power Policies.

Source: Management data and NEPRA website

Indexations being requested by SGEPS are aligned with recent determinations of NEPRA for thermal power plants

Indexation	SGEPS	SNPCL
Variable O&M – Local	Indexed with Pak CPI (Quarterly)	Indexed with Pak CPI (Quarterly)
Variable O&M – Foreign	Indexed with US CPI and USD to PKR exchange rate (Quarterly)	Indexed with US CPI and USD to PKR exchange rate (Quarterly)
Fixed O&M – Local	Indexed with Pak CPI (Quarterly)	Indexed with Pak CPI (Quarterly)
Fixed O&M – Foreign	Indexed with US CPI and USD to PKR exchange rate (Quarterly)	Not applicable

Source: Management data and NEPRA website

Abbreviations

Abbreviations

Periods

Historical period	FY17 and FY22
Budgeted period	FY23
Forecast period	FY24 – FY39

Abbreviation	
BQPS I	Bin Qasim Power Station – I
BQPS II	Bin Qasim Power Station – II
BQPS III	Bin Qasim Power Station – III
CAPEX	Capital Expenditure
CEO	Chief Executive Officer
CFO	Chief Financial Officer
COD	Commercial Operations Date
Consortium	OMS (Private) Limited & EY
Financial consultant	EY Ford Rhodes
FOM	Fixed Operations & Maintenance
FY	Financial Year
GTD	Generation, Transmission and Distribution
HHV	High Heating Value
I&C	Instrumentation and Controls
IC	Independent Consultant
IE	Independent Engineer
IPP	Independent Power Producer
KCCPP	Korangi Combined Cycle Power Plant
KE	K-electric
KTGEPS	Korangi Town Gas Engine Power Station
KV	Kilovolt
kWH	Kilowatt Hour
LHV	Lower Heating Value
MSA	Material Stream Agreement
MW	Megawatt
MYT	Multi-Year Tariff
NEPRA	National Electric Power Regulatory Authority
O&M	Operations and Maintenance
Pak CPI	Pakistan Consumer Price Index
PKR	Pakistani Rupee

Abbreviations

PKRm	PKR millions
POs	Purchase Orders
REVEX	Revenue Expenditure
RLNG	Regassified Liquefied Natural Gas
RSC	Rotor Side Converter
SGEPS	S.I.T.E Gas Engine Power Station
SGEPS PP	FY24-FY39
SNPCL	Sindh Nooriabad Power Company Limited
ST	Steam Turbine
Technical cum lead consultant	OMS (Private) Limited
US CPI	United States Consumer Price Index
USD	United States Dollar
VOM	Variable Operation & Maintenance