

National Electric Power Regulatory Authority Islamic Republic of Pakistan

Registrar

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Subject: Decision of the Authority in the matter of Motion for Leave for Review filed by CIHC Pak Power Company Limited against the Decision dated 19.12.2018 [Case No. NEPRA/TRF-434/CPPCL-2018]

Dear Sir,

Please find enclosed herewith the subject Decision of the Authority along with Annex-I & II (65 Pages) in Case No. NEPRA/TRF-434/CPPCL-2018.

2. The Decision is being intimated to the Federal Government for the purpose of notification in the official Gazette pursuant to Section 31(7) of the Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997.

3. The Order of the Authority alongwith Annex-I & II will be notified in the official Gazette.

Enclosure: <u>As above</u>

Storig (Syed Safeer Hussain)

Secretary Ministry of Energy (Power Division) 'A' Block, Pak Secretariat Islamabad

CC:

- 1. Secretary, Cabinet Division, Cabinet Secretariat, Islamabad.
- 2. Secretary, Ministry of Finance, 'Q' Block, Pak Secretariat, Islamabad.



DECISION OF THE AUTHORITY IN THE MATTER OF MOTION FOR LEAVE FOR REVIEW FILED BY CIHC PAK POWER COMPANY LIMITED AGAINST THE DECISION DATED 19TH DECEMBER 2018

1. BACKGROUND

- 1.1. CIHC Pak Power Company Limited (CPPCL or the Petitioner) is a company incorporated under the laws of Pakistan to establish 2x150MW coal fired power plant at Gwadar, on the Arabian Sea coast, in the Southwest part of Balochistan, Pakistan. The Project will be located within the jurisdiction of the GDA, near the Surbundar area and will require 207 acres of land, to be acquired from and through the Government of Balochistan (GoB).
- 1.2. CPPCL vide letter No. nil dated 12th January 2018 has submitted the Petition for approval of the reference generation Tariff for the subject 300MW (Gross) Coal fired power generation facility. Decision of the Authority in the matter was issued on 19th December 2018. Summary of the approved project cost is provided hereunder:

Description	Requested	Approved
EPC Cost	369.89	236.137
Custom Duties, Withholding and Sales Tax	40.11	7.985
Non EPC Costs	10.64	5.770
Land	5.00	4.727
Project Development Costs	21.03	7 730
Company and Sponsor Costs	26.84	7.750
Insurance during Construction	3.70	1.771
O&M Mobilization	6.49	2.361
Non-reimbursable Pre-Sync Fuel and Start-up Cost	3.44	2.738
CAPEX	487.14	269.219
SINOSURE Fee during construction	9.21	2.102
Financing Fees & Charges	13.12	4.308
Interest During Construction	32.90	17.139
Project Cost	542.37	292.769
EPC Cost/MW	1.23	0.79
Project Cost/MW	1.81	0.98



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1.3. Summary of the approved tariff is provided hereunder:

Description	Requested	Approved
Energy Charge (Rs./kWh):		
Fuel Cost Component	4.5196	4.6830
Variable O&M (foreign)	0.0662	0.0655
Variable O&M (Local)	0.0717	0.0709
Total	4.6574	4.8194
Capacity Charge (Rs./kW/hour):		
Fixed O&M (Local)	0.2203	0.0997
Fixed O&M (Foreign)	0.4276	0.1936
Cost of working capital	0.1483	0.1537
Insurance	0.1624	0.0718
SINOSURE Fee (Average) 1-13 Years	0.1144	0.0337
SINOSURE Fee (Average) 14-30 years	0.0357	-
ROE During Construction	0.1961	0 4205
Return on Equity	0.8095	0.4295
Debt servicing (1-13 years only)	2.1017	1.1224
Total CPP 1-13 years	4.1803	2.1043
Total CPP 14-30 years	2.0000	0.9482
Avg. Tariff 1-13 years @ 85% (Rs./kWh)	9.5754	7.2950
Avg. Tariff 14-30 years @ 85% (Rs./kWh)	7.0103	5.9349
Levelized tariff (Rs./kWh)	8.9182	6.9654
Levelized tariff (Cents/kWh)	8.4935	6.6337

2. Filing Of Review Petition

- 2.1. CPPCL being aggrieved from the decision of the Authority dated 19th December 2018 filed a Motion for Leave for Review vide letter dated 29th December 2018 (PUC). The Review Motion was filed in pursuant to Section 16(6) of the National Electric Power Regulatory Authority (Tariff Standards and Procedure) Rules, 1998.
- 2.2. The Authority admitted the Subject Review Motion on 15th January 2019.

3. Grounds Of Review Motion

3.1. Review has been sought on the basis of following grounds:

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a) Adjustment on Account of Engineering, Procurement & Construction (EPC) Cost;

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- b) Adjustment on Account of additional cost items within EPC scope;
- c) Adjustment on Account of Custom Duties, Withholding Tax and Sales Tax;
- d) Adjustment on Account of Non-EPC cost;
- e) Adjustment on Account of Project Development Costs and Company Sponsor Costs;
- f) Adjustment on Account of Insurance during Construction;
- g) Adjustment on Account of O&M Mobilization Cost;
- h) Adjustment on Account of Non-reimbursable fuel and start-up charges;
- i) Adjustment on Account of Sinosure Fee;
- j) Adjustment on Account of Financing Fees & Charges;
- k) Adjustment on Account of Auxiliary Consumption;
- l) Adjustment on Account of Thermal Efficiency;
- m) Adjustment on Account of O&M Costs;
- n) Adjustment on Account of Debt to Equity Ratio;
- o) Adjustment on Account of Return on Equity;
- p) Adjustment on Account of Fuel Cost Component;
- q) Adjustment on Account of Insurance during Operations; and
- r) Payment mechanism for Capacity Payments.

4. Comments From Stakeholders

- 4.1. In response to the notice of hearing, comments were received from the following stakeholders
 - Central Power Purchasing Agency (Guarantee) Limited (CPPA-G)
 - National Transmission & Despatch Company (NTDC)

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- 4.2. CPPA-G vide its letter No. CPPA-G/CTO/DGM/(CONV)/3199-201 dated 12th February 2019 submitted the following comments in the matter:
 - i. **Para-3-Adjustment on account of EPC Cost**: It is informed that recently the Authority has determined the COD stage tariff of Huaneng Shandong Ruyi (Pakistan) Energy Pvt Ltd (HSRPEL) on its COD which may be considered

comparison purposes. Moreover, for a bit precise comparison





Siddiqsons Energy Limited (SEL) may also be considered with details as below:

Component	Gwadar	SEL	HSRPEL
	(1x150MW)	(330 MW)	(2x660 MW)
EPC /	\$ 542.36 Mil	\$ 0.924	\$ 1321.751 Mil i.e
Capital	i.e.	Mil/MW	\$ 1.001 Mil/MW
Cost	\$ 1.808		
	Mil/MW		

The above tabulation reflects that the per MW cost of Gwadar project is still on the higher side as compared to SEL and HSRPEL. However, comparison of Gwadar with Jamshoro Power Company Ltd. (JPCL) is not appropriate as its tariff is not yet determined. Moreover, since HSRPEL tariff has got its finality, therefore, such comparison in all respects may be made with HSRPEL project.

- ii. **Para 4.2 & 4.2.1-Black Start Generator and Power During Construction:** Black Start Generator facility (approximately 14 MW) is a technical requirement of each power plant to meet its auxiliary consumption during system failure. However, NTDC is in a better position to comment on the requirement of Black Start facility to Gwadar project. It is also informed that the matter pertaining to power during construction relates to concerned DISCO for providing back-feed energization to power plant to meets its auxiliary consumption for smooth and reliable operation. Hence, their comments may please be sought in the matter.
- iii. **Para 8-Insurance during construction:** The Authority has determined insurance cost during construction for HSRPEL i.e 0.9 % of the 70% of the Capital Cost of the Company, which is based on actual cost of insurance borne by the Company. Therefore, the adjustment made by NEPRA by reducing the insurance from 1% of EPC cost to 0.7 % of the EPC cost is very prudent.
- iv. **Para 13-Adjustment on account of auxiliary consumption:** It is pertinent to mention here that the Authority vide its decision dated June 26, 2014 has





determined auxiliary consumption of 9 % of the total installed capacity for imported coal projects up to 220 MW capacity. It is also highlighted that following the COD of M/s HSRPEL, its auxiliary consumption has been revised to 5.79 % against the original allowed value of 8%. Hence, keeping in view the advancement in technology during the past 4-5 years, Authority is requested to consider HSRPEL tariff which has got its finality for such comparison in all respects.

- v. **Para 14-Adjustment on account of thermal efficiency:** It is informed that the Authority has determined minimum reference thermal efficiency of 37 % and 39 % for imported coal fired power projects up to 220 and 350 MW capacities respectively vide its decision dated June 26, 2014. However, the Authority has considered the thermal efficiency of 37.65 % for Gwadar project. Hence, keeping in view the advancement in technology during the past 4-5 years, Authority is in a better position to allow the thermal efficiency to CIHC project.
- vi. **Para 15-Adjustment on account of O&M Cost:** The total O&M Cost (fixed and variable) allowed to HSRPEL in one time adjusted tariff is Rs. 0.448/kWh on the basis of reference exchange rate of Rs. 104.594/US \$. So the claim of CIHC i.e Rs. 0.9/kWh on the basis of reference exchange rate of Rs. 105/US \$ is on a very high side even taking in to consideration the services cost prevailing at Gwadar.
- vii. **Para 19-Adjustment on account of insurance during operations:** NEPRA has allowed insurance cost on the basis of actual insurance cost incurred by HSRPEL with the maximum of 1% of 70 % of capital cost which is in line with insurance cost allowed to Gwadar i.e 0.7 % of capital cost. Hence, the same may be considered to keep homogeneity between the projects on similar technologies.
- viii. **Para 20-Payment Mechanism for Capacity Payments:** It is stated that construction of interconnection facility specifically fall within the purview of NTDC. Therefore, any comments on this Para may be sought from NTDC.
- 4.3. NTDC vide its letter No. GMPSP/CETP/TRP-300/1164-68 dated 14th February 2019 submitted the following comments in the matter:

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- NTDC has already issued data permission for Grid Interconnections Studies (GIS) of the subject power plant vide this office letter No. GMPP/CEMP/TRP-300/1748-52 dated 22-03-2018.
- NTDC received draft GIS report of aforementioned power plant vide M/s CIHC Pak Power Company Ltd letter No. CIHC /POCPEC/2018-112 dated 02-05-2018.
- iii. NTDC commented on the aforesaid draft GIS report vide this office letter No. GMPSP/CETP/TRP-300/2618-20 dated 07-05-2018 and asked to revise and submit the final interconnection study report in the light of above comments and further asked that the comments of QESCO on the subject interconnection study report should also be obtained.
- iv. However, yet the final GIS report has not been submitted to this office for approval and furthermore, QESCO has not provided any confirmation of the 132 kV development plan of Makran/Gwadar area and its interlinking with QESCO network as well as interconnection scheme of 300 MW Gwadar CFPP before the COD of subject Plant.

5. <u>Hearing</u>

- 5.1. The Authority decided to hold a hearing in the matter on 15th February 2019 in Pearl Continental Hotel Gawadar. Notices of hearing were issued on February 1, 2019 inviting comments from the stakeholders and to participate in the hearing. Copy of review motion was also made available on web.
- 5.2. The hearing was held as per schedule and was participated by the representatives from the Petitioner, Private Power and Infrastructure Board (PPIB), Quetta Electric Supply Company Limited (QESCO), Gawadar Development Authority (GDA), Gawadar Port Authority (GPA) and General Public.

6. <u>Consideration of the Views of the Petitioner, Analysis, Findings and Decision</u> <u>on Each of the Grounds</u>

6.1. After hearing the Petitioner and carefully going through the record, the analysis, findings and decision on each of the grounds is provided in the succeeding paragraphs.

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Adjustment on Account of Engineering, Procurement & Construction ("EPC") Cost

- 6.2. According to the Petitioner, the Authority has used EPC cost signed by Jamshoro coal-fired power project ("JPCL") as the benchmark for evaluating EPC cost of the Project, despite the company's contention that the two projects are not comparable. CPPCL requested the Authority through various documents in the past that JPCL is not comparable to the Project with the underlying factors for such incomparability reiterated below:
 - a) A 150 MW unit project cannot be compared to a 660 MW unit project as there is a significant escalation in terms of per MW costs for the former over latter. Documents to support this have already been submitted to the Authority.
 - b) It is necessary to respectfully direct NEPRA's attention to their own reference to CERC benchmark prices provided in Article 10.8 of the Impugned Order where the per MW difference of costs between a 500 MW and 660 MW unit is in the range of 25%. Such a difference in case of a 660 MW and 150 MW would be significantly higher than the 25% applicable in case of 660/500 MW comparison.
 - c) However, the Authority has adopted the escalation of a 220 MW unit over 660 MW unit available in Upfront Tariff 2014 of 6% in the Impugned Order as the relevant escalation over JPCL EPC cost for the Project. This escalation is clearly not justified based on the contrary evidence already submitted to the Authority and the reference to CERC provided by the Authority itself in the Impugned Order.
 - d) JPCL is located in developed area with readily available infrastructure and having access to relatively cheaper inputs, services and manpower. Differences on this account have been highlighted to Authority.
 - e) JPCL is an extension of existing generation facility benefiting from synergies and cost savings due to availability of existing site infrastructure.
 - f) JPCL is yet to file their tariff petition with the Authority nor has any information been made available to the Company to enable the Company to make an apple-to-apple comparison. This is of particular concern where majority of the costs related to civil works for the plant, residential colony etc. were parked in Non-EPC cost in the feasibility stage tariff petition by JPCL.
 - g) While determining the base cost for comparison purposes, the Authority has deducted from the EPC Cost of JPCL a capital cost of USD 62.04 million (USD

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0.047 million per MW) on account of railway siding as the same is not in the scope of work for the Gwadar Project. As per our information the length of the railway siding is around 1 km and allocating a cost of USD 62.04 million (PKR 8,985 million) is totally unjustified as such costs are typically in the USD 0.6 million per km. This arbitrary allocation based on untenable assumptions may kindly be revisited. The Petitioner also submitted that Indian Double Railway Track with Electrification, bridges, culverts, marshaling yards, tunnels, mountain cutting and signaling is not more than 20 Crores Indian Rupees (Reference <u>www.ircon.org</u> for per KM railway line costing). Hence US\$ 10.5 million is the cost of railway siding in this case. The wrong calculation of railway siding has reduced the Gwadar cost by US\$ 12 million.

- 6.3. The Petitioner further submitted that the Authority has ignored the fact that the EPC cost has been arrived at through a transparent and competitive bidding process following the NEPRA (Selection of Engineering, Procurement and Construction Contractor by Independent Power Procedures) Guidelines, 2017 where any bidder was free to participate in the process including the ones who provided bids for larger sized projects. In light of the above, the Petitioner requested that JPCL should not be used as a benchmark and the number arrived at through a transparent bidding process as per NEPRA Guidelines should be used to arrive at the EPC cost for the Project.
- 6.4. The Petitioner submitted that Clause 6 (2) of the EPC Guidelines provides reopeners for Hydropower Projects to be included in the RFPs and for other fuels and technology the prices in response to the RFP are required to be firm, nonnegotiable and without any re-openers. Furthermore, the company highlighted that the ECC decision dated May 23rd, 2007 wherein the GOP decided that NEPRA shall determine the tariff for the coal based power projects on firm EPC Cost without reopening such costs when it is arrived through competitive process duly signed by the IPP/EPC Contractor (ECC Decision). The ECC Decision explicitly states that the EPC Costs arrived through ICB are not subject to reopening of any of such costs. According to the Petitioner, in pursuance of the ECC Decision, NEPRA while determining the EPC Cost for Engro Energy Ltd (EEL) in their initial feasibility stage tariff reduced the EPC Cost by 18.3% against required cost in the initial determination on the ground that EEL had not submitted EPC Cost based on firm (non-reopenable) competitive price duly initialled/signed by the IPP/EPC Contractor. Subsequently, the same cost was restored while truing up tariff at commercial operations stage upon the submission of signed, non-reopenable EPC Contract arrived through competitive process. Furthermore,

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NEPRA has also accepted and determined EPC Cost arrived through competitive process in the cases of Atlas Power, Attock Gen and Nishat Power. In yet another precedent, NEPRA did not admit Sanjwal Solar (Pvt) Ltd (SSPL) petition on the ground that EPC Contract was not firm, openable and not signed or initialled as required under the ECC Decision.

- 6.5. The Petitioner requested that a similar non-discriminatory treatment should be given to and admissible for the CIHC Pak Power Project. Keeping in view that it is a CPEC "Prioritized Project" upon which whole commercial and industrial initiative at Gwadar Port is built. Cutting around 36% of EPC Cost arrived through competitive process in accordance with the NEPRA EPC Guidelines and cumulatively 46% of total project cost shall make the entire CPEC initiative in Gwadar area unfeasible.
- 6.6. According to the Petitioner, the EPC Cost comparison of supercritical technology and subcritical technology is out of context not only technically but also commercially. Furthermore, comparing a smaller unit of 150MW with bigger size unit of 660MW is not reasonable or justified. It is an established fact that the EPC Cost of subcritical unit is typically 30% higher than the supercritical unit, therefore comparison of Gwadar Power Project (300MW) with significantly larger size 1,320 MW Projects (Jamshoro, Sahiwal, Port Qasim) is not reasonable or justified rather it should be compared with Grange Power Plant (165 MW) Tariff in terms of operating and capital cost as determined by NEPRA. The Company further submitted that the switching between SBC and SC platforms only affects the cost of boiler, the steam generation system, and to lesser extent that of turbine. Remaining EPC cost components remain unaffected due to such switch. Therefore, only weightage of boiler cost in overall EPC cost and decrease in its cost on account of the change from SC to SBC needs to be factored in to calculate the new overall EPC cost. This fact can be confirmed from a report namely "New Coal-Fired Power Plant Performance and Cost Estimates" by Sargent & Lundy, a firm with 130+ years of power consulting history. As per Page 48 of the report, understandably so, all cost items of SBC, SC and ultra-supercritical ("USC") plants, for same project size remain the same apart from boiler cost and turbine cost. As per Page 48 of the report, for bituminous coal category, cost of a 400 MW SC plant has been provided at US\$ 1,044 million compared to that of a 400 MW SBC plant of US\$ 1,019 million, an escalation of 2.42%.
- 6.7. The Petitioner further submitted that in an article published on January 11, 2006 by Anthony J. Carrino, a senior power consultant with Dallas-based Solomon Associates, and Richard B. Jones, a Ph.D. and Director of Statistics and Risk

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Modelling for Solomon Associates, it was provided that capital cost of a new SC pulverized coal plant is typically around 1-3% higher than that of a new SBC pulverized coal plant.

- 6.8. The Petitioner also submitted that on Page 4 Exhibit ES-2 of a report namely "Cost and Performance Baseline for Fossil Energy Plants" published by U.S. Department of Energy, an agency of United States Government, in May 2007, total plant cost of pulverized coal SC plant is around 1.7% higher than total plant cost of pulverized coal SBC plant. Furthermore, in a presentation delivered to IMechE Greater Manchester Area (GMA) and Power Industries Division North West Centre (PIDNWC) on September 2nd, 2014, Dr Saravana Bavan Balakrishnan, a senior engineer in power generation, provided that EPC cost of SC option is around 2.9% higher than SBC option. In yet another report "Economic Benefits of the Introduction of Clean Coal Technology in the East Asia Summit Region" by Otaka and P. Han, on Page 29 it was provided that capital costs for SC plants are around 1.7% higher than capital costs of SBC plants.
- 6.9. The Petitioner further submitted that the Authority has compared different thermal projects for different benchmarks. CIHC has an opinion that the Authority is distracted itself by combining different benchmarks for one project. e.g. comparing with CMEC is not justifiable as the project is abandoned by the sponsor, similarly, Grange is still struggling with the financial close, while RLNG projects are in settled area and all are 1200MW capacity with any benchmark adjustment the price will work. Also Authority considered the upfront tariff in some benchmark, and not considered the EPC price of the same. As per company the main EPC Cost is 0.87 MUS\$ per MW (261.23 MUS\$) which is in equivalent to market norms for a smaller Coal Fired Power Plants. The company feels that the Authority has mixed the EPC cost with additional works required due to special nature of Gwadar Power plant.
- 6.10. According to the Petitioner, the Scaling Formula provided by CIHC Pak is based on the Energy Lab Documents and just an international guideline. But 6% adjustment by the Authority is not justifiable being admitted by the Authority no adjustment can be made due to variations in so many factors. CIHC suggests that an independent study for cost escalation shall require from a third party which can provide a guide lines to all stake holders. CIHC also suggests conducting this study from renowned construction supervision firms like Black & Veatch, Mat McDonalds, Horacio Carvalho or ACOM India or any other as per NEPRA requirements.





- 6.11. According to the Petitioner, it is unjustifiable as the engineering and design cost is independent of the size of Project and same is evident for different power project tariff determination. Moreover, Civil work cost is higher due to complex terrain and uneven foundation conditions, due to non-availability of local civil material, excessive transportation cost, etc. The engineering and design cost couldn't be scaled and compared under benchmarks system. For different size unit of power plant with the same fuel, almost they both have same design process, drawing workload is same and accordingly man-hours are almost same for big size and small size power project. Considering the more severe security situation than the east provinces, the site engineer service is more expensive, which will be result in significant difference of engineering and design cost. Moreover, another example is cooling water system which is more expensive for Gwadar as it has a seawater feeding channel instead of cooling tower for cooling purposes. The cooling tower is very cheap as compare to 1.4kM seawater channel for a 300MW power plant.
- 6.12. According to the Petitioner, NEPRA has ignored the facts that cost determined by CERC for 2 x 660 MW is 0.91 MUS\$/MW whilst the cost of JPCL is 0.66. Secondly, the cost difference between 2 x 660 and 2 x 500 MW is 0.5Million/MW or 6% difference on higher side. On the other side Authority has approved EPC cost for 220MW as 0.95 MUS\$/MW in upfront tariff. By combining all the above results, the EPC cost as determined by the Authority shall require to be revised.
- 6.13. The Petitioner also provided additional references and arguments during the proceedings. According to the Petitioner, following coal based power projects of similar capacity and technologies have successfully achieved financial closing around the World:

Projec Name	Date	Capacity	Location	Cost USD/kW
Kalselteng-2 CFPP	2017	200 MW	Indonesia	2000
PACO Power Plant	2016	2x150 MW	Panama	2210
Stanari TPP		1x300 MW	Bosnia and	1417
			Herzegovina	
Kalselteng-1 TPP	2016	2x100 MW	Indonesia	1263

6.14. The Petitioner forwarded various study reports with respect to equipment prices between various sizes. Reference is made by the company to Energy Sector Management Assistance Program (ESMAP) Technical Paper 122/09 captioned "Study of Equipment in Prices in the Power Sector" which provides detailed analysis of each cost items including equipment, material and labor for the coal power projects. As per the aforesaid study, the cost comparison between different MWs plant, in US, is as follows:





Coal fired steam plant (Sub-Critical)	300 MW Net	500 MW Net	800 MW Net
Cost - US\$/KW	2,730	2,290	1,960

- 6.15. Furthermore, it is mentioned by the Petitioner that Central Electricity Regulatory Commission of India's reference of benchmark capital cost for coal power plants for 500MW or above is not only unreasonable in terms of it's significantly larger size and supercritical technology but also Indian coal power market has its own dynamics. Primarily, all inputs associated with the projects are made available locally including but not limited to Capital Goods/Equipment including turbines, boilers and associated electromechanical equipment. Further, Indian Sponsors have the access of cheaper trained manpower, local financing, stronger currency/regulatory regime and various other variables associated with the coal power generation facility.
- 6.16. According to the Petitioner, in order to explain the cost relationship between per MW equipment cost between 150MW unit and the 660MW unit, based on a large number of engineering and implementation practical experience, professional research institutions in the power sector have collected and sorted out detailed information about the cost of the Main Components of the Power Plant, and compared them item wise and concluded that there is no linear relationship of cost, EPC cost or corresponding component cost and there is significant dispersion with major standard deviation between costs of 150MW unit and 660MW unit. Such data establishes that the EPC Cost of 150MW unit is approximate 1.6-1.8 times of 660MW unit based on the detailed tables showing that most cost component Scaling Relation is above 1.6. An accurate scale index will be difficult to conclude owing to different weights of project section costs for different projects.
- 6.17. As part of its earlier submissions the Petitioner submitted that various studies suggest a significant adjustment of the EPC cost due to unit/project size. Earlier, one of these studies has been provided by the company which shows adjustment of EPC price of any benchmark project for another potential project. As per earlier submissions of the petitioner, for detailed understanding of the scaling of EPC cost for different unit sizes, section 2 of US Department of Energy Report: "Capital Cost Scaling Methodology" published in January 2013 may be referred. As per company the aforesaid guidelines provides following formula for determining scaled cost:





6.18. The company computed scaled cost for one unit of Gwadar project while referring to JPCL's one unit cost and recommended an exponent of 0.53. The same is mentioned below:

Scaled Cost = 437.5 million $\times \left(\frac{150 \ MW}{660 \ MW}\right)^{0.53}$

- 6.19. According to the Petitioner, in the above working, average EPC price of Jamshoro of US\$ 437.5 million per unit (US\$ 0.66 million per MW) has been used to calculate scaled cost for 150 MW unit of the Project. The scaled cost as per above working works out to be US\$ 199.50 million for a 150 MW unit (US\$ 1.33 million per MW), which for the Project works out to be US\$ 399.00 million (199.50 x 2), an adjustment of approximately 100.64% (1.33/0.66-1). The company further submitted that the scaled price of US\$ 399.00 million was calculated using the formula provided above and is based on relevant exponents i.e. 0.53 extracted from the report and such calculation would essentially be an adjustment purely due to unit size.
- 6.20. As part of review petition submissions, the company submitted that Scaling down of an EPC cost through benchmarking is not the best approach to evaluate EPC cost of a smaller project particularly where the benchmark project is built on a different technology platform, different plant type, different elevation/location, and possibly different cooling technologies etc and scaling of EPC costs based on a single parameter, i.e. gross capacity is a one-dimensional and inappropriate approach. Gross capacity does not have a linear relationship with many EPC cost items (steam generation system, coal handling system, ash-handling system, feedwater system, cooling water system etc.), and has even weaker relationship with other EPC cost items (buildings and structures, site improvements, foundations etc.) for that matter. While the single-parameter approach can be used for high-level scaling, it is recommended that individual items/systems be scaled from the most similar references possible, particularly for cost drivers.
- 6.21. The company submitted that 150 MW units have been selected on the basis of peculiar site, endowment and energy market conditions. The industry's trend has been towards bigger and larger coal plants. Construction plans for power projects in various countries provided in a report by Institute of Energy Economics, Japan, in March 2011, suggests that small coal power plants particularly less than 300 MW were phased out back in 2011. The aforementioned points have been corroborated by Mott Macdonald, a global engineering, management and

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development consultancy with more than 100 years of history and Owner's Engineer to the Jamshoro Project.

- 6.22. However as per the Petitioner, since the Authority has requested the Company to provide a mechanism/supporting documents for benchmarking with a supercritical 660 MW project, the Company provided, for information purposes only, following information justifying the EPC cost of the Project as claimed in the Petition and reiterated in Review Motion, after accounting for sub-critical v/s super-critical platforms.
- 6.23. The company submitted that according to estimates provided by URS Washington Division on Page xiv Table ES3 of a report by Energy Sector Management Assistance Program ("ESMAP"), a global knowledge and technical assistance program administered by World Bank:
 - Cost of a US-based 800 MW SC coal-fired steam plant has been provided at US\$ 1.96 million per MW compared to cost of a US-based 300 MW SBC coal-fired steam plant of US\$ 2.73 million per MW, an escalation of 39.3%. Please note that this is a scaling of 800 MW to 300 MW (2.67x) in contrast to scaling of 4.4x for the instant case, 660 MW v/s 150 MW.
 - ii. Cost of an Indian 800 MW SC coal-fired steam plant has been provided at US\$ 1.29 million per MW compared to cost of an Indian 300 MW SBC coal-fired steam plant of US\$ 1.69 million per MW, an escalation of 31.0%. Please note that this is a scaling of 800 MW to 300 MW (2.67x) in contrast to scaling of 4.4x for the instant case, 660 MW v/s 150 MW.
 - iii. Cost of a Romanian800 MW SC coal-fired steam plant has been provided at US\$ 2.25 million per MW compared to cost of a Romanian300 MW SBC coal-fired steam plant of US\$ 2.92 million per MW, an escalation of 29.7%. Please note that this is a scaling of 800 MW to 300 MW (2.67x) in contrast to scaling of 4.4x for the instant case.
 - iv. An exponential rather than linear relationship of plant cost on a per MW basis can be referred to from Page 11 Figure 2.3 of the aforementioned report.
- 6.24. According to the Petitioner, on Page 48 Appendix B of Sargent & Lundy Report, within bituminous coal category, cost of a 900 MW SC plant has been provided at US\$ 3.262 million per MW compared to cost of a 400 MW SC coal-fired plant of US\$ 4.686 million per MW, an escalation of 43.7%. Please note that this is a scaling of 900 MW to 400 MW (2.25x) in contrast to scaling of 4.4x for the instant case.

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According to the Petitioner, National Energy Technology Laboratory ("NETL"), an agency of U.S. Department of Energy, in January 2013 went on to establish guidelines for scaling of capital costs ("Guidelines"), where they noted that scaling based on a single parameter may not be an appropriate approach to "accurately" capture the effect of different unit size. For instance, it would be more appropriate to scale cost of coal handling plant with coal feed rate than with power plant capacity. As per Section 1 (Page 11) of the Guidelines:

"The costs are scaled from a quote for a similar plant configuration by use of various equations that typically employ at least one process parameter (e.g., coal-feed rate, oxidant-feed rate, etc.) and often an exponent. The primary purpose of the exponent is to account for economies of scale (i.e. as equipment size gets larger, it gets progressively cheaper to add additional capacity)."

6.25. It is important to recognize here that the report talks about progressively cheaper price of larger units. Section 1.1 (Page 18) of the Guidelines also clarify that such scaling approach carries with it many limitations and care needs to be taken while using such approach for scaling of EPC costs.

"It is important to note that when scaling costs, the technologies must be as similar as possible. For instance, ff scaling a plant that fires Illinois No. 6, both the scaling exponents and the reference cost should be for a plant that fires Illinois No. 6. The same is true for the following specifications as well:

- Oxidant type (Air or Oxygen)
- Elevation/Location (International Standards Organization [ISO], North Dakota, Montana, etc.)
- Plant type (Sub-critical, supercritical, ultra-supercritical, etc.)
- Technology type (PC, IGCC, NGCC, etc.)
- Emissions control technologies (with/without CO2 capture, with/without flue gas desulfurization [FGD], etc.)

For many of the items provided in this report, the approach presented scales on a single parameter for a given account. In reality, some accounts, particularly some of the major equipment items, may be impacted by more than one parameter. For example, a line item may be scaled on one or more flows/outputs but should, in reality, be scaled on multiple flows/outputs and on both pressure and temperature, or thermal duty and delta temperature. While the single-parameter approach can be used for high-level scaling, it is

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recommended that individual items/systems be scaled from the most similar reference possible, particularly for the cost drivers.

There are limitations on the ranges that can accurately be addressed by the scaling approach. There can be step changes in pricing at certain equipment sizes that may not be captured by the scaling exponents. Care should be taken in applying the scaling factors when there is a large percentage difference between the scaling parameters. This is particularly true for the major equipment items. For example, it is known that the combustion turbine is an incremental cost and is specific to one level of performance.

The configuration also has a significant impact on costs. In addition to the base scaling, adjustments must be made for considerations such as number of trains for a particular system and equipment redundancy (i.e. $2 \times 100\%$ versus $3 \times 50\%$).

The plant location is another issue that must be kept in mind when scaling costs. Project location and labor basis can have a significant impact on overall project costs. An additional adjustment to the labor component may be required to reflect local wage rates, local labor productivity, and a union versus non-union environment.

It is imperative that the reader understand that even subtle differences in equipment specifications can result in significant cost impacts. Adjustments, often in the form of additions or deductions, must be incorporated to address these elements. These could include items such as unique site considerations (piles, access requirements, salt water environment), or specific equipment requirements (stack height, re-heat versus non re-heat, single pressure versus multiple pressure, turbine backpressure).

Finally, the cost basis date must be considered. Equipment, material, and labor costs may need to be escalated or de-escalated to adjust for the differences between the cost basis date for the scaled estimate and the reference estimate. Additionally, significant elapsed time between the reference cost date and the desired date for the scaled estimate could potentially encompass technology or approach changes for a specific item and/or system.

In general, the approach presented in this report is valid for high-level evaluation only. The accuracy of the factored estimate will be less than or equal to that for a reference estimate."

6.26. According to the Petitioner, Notwithstanding the above, NETL on Section 2 Page 22 of the Guidelines provided following formula for determining scaled cost (i.e. Gwadar EPC Cost) from a reference cost (Jamshoro EPC Cost), based on scaled parameter, reference parameter and exponent (please refer to Page 24 to Page 31 of Guidelines for exponent references).





6.27. The basic idea of NETL Guidelines works out to be that capital costs do not have linear relationship; the greater the exponent, the more linear the relationship is, vice versa. As per company, although not the most relevant, but Page 32 of a report by Organization for Economic Cooperation and Development's ("OECD Report") provides a similar mechanism as proposed by NETL referred to in Section 1.21 above, for scaling of cost of nuclear power plant across different unit sizes:

$$Cost (P1) = Cost (P0) \times (\frac{P1}{P0})^{n}$$

Where:

Cost (P1) = Cost of Power Plant for unit size P1

Cost (P0) = Cost of Power Plant for unit size P0

Package	Scaling factor (n)
Structures	0.2
NSSS	0.3
BOP	0.4
Turbine Plant	0.75
Electric Plant	0.37
Miscellaneous	0.2

n = scaling factor, in the range of **0.4 to 0.7** for the entire plant.

6.28. Page 33 of the OECD Report provides the following:

"It can be seen from Table 6 that, for a 350% increase in unit size from 300 MW to 1350 MW the total direct cost increases by about 151%, while the total indirect cost increases by only 52%. This conclusion is consistent with the expectation that as unit size increases, the savings arising from economy of scale are much higher for such costs as engineering design and construction services than equipment, material and construction labour costs."

6.29. Page 34 of the OECD Report provides the following:

"When two consecutive units of the same size are constructed on the same site, even more savings in overnight costs can be achieved. These savings in







overnight costs decreases with increase in unit sizes, however for example, in comparing the cost components in Table 7 with those in Table 6, while the overnight cost of a 2 × 1350 MWe plant is 171% higher than the single 1350 MWe unit, the overnight cost of a 2 × 300 MWe plant is 158% higher than the single 300 MWe unit."

6.30. Page 36 of the OECD Report provides the following:

"It can be seen from Table 8 that, for a 31% increases in unit size from 670 MWe to 881 MWe, the total direct cost increases by about 31%, while the total indirect cost increases by only 3%. It must be borne in mind that this comparison is between an existing design (CANDU 6) that has been commercially available since the early 1980s, with an advanced design (CANDU 9) that has incorporated the state-of-the-art design and construction features. Had the comparison been made using the traditional scaling factors, the savings would have been much higher.

When two consecutive units of the same size are constructed on the same site, even more savings in overnight costs can be achieved. The savings in overnight cost decreases with increase in unit sizes, however, consistent with the French experience. For example, in comparing the cost components in Table 9 with those in Table 8, while the direct cost of the 2 × 881 MWe CANDU 9plant is 175% higher than the single 881 MWe unit, the indirect cost of a 2 × 881 MWe CANDU plant is only 139% higher that the single 881 MWe unit. This trend is also consistent with that of the French experience."

6.31. According to the Petitioner, the scaling mechanism in Section 1.21 and Section 1.22 by NETL and OECD was yet again corroborated on Page 16 of a bulletin by George Woite, a member of Economic Studies Section, Division of Nuclear Power and Reactors, followed up by the following analysis:

> "The stringent licensing requirements which are currently applied affect small and medium power reactors more (in relative terms) than they do larger reactors (1000 MWe or more). Before 1976, the base cost of a 600 MWe nuclear unit was estimated to be about 26% less than that of a 1000 MWe unit (or, in other words, the cost in \$/kWe was estimated 23% higher for the 600 MWe unit). Since 1976, the base cost of a 600 MWe unit is estimated only about 20% less than that of a 1000 MWe unit, this means that the cost in\$/kWe is







estimated 33% higher for the 600 MWe unit. This is reflected in scaling models (see Table 3) which show smaller scaling exponents for the 1976/77 cost model than for the earlier one, indicating less variation of costs with unit size. Application of the 1976/77scaling model leads to a variation of costs with unit size as illustrated in Figure 2."

6.32. According to the Petitioner, based on exponent of 0.7, the most conservative assumption, applying the above formula for Gwadar Project based on Jamshoro Project would result in Gwadar base EPC cost of US\$ 310 million (US\$ 1.034 million per MW), an escalation of 55.97% over Jamshoro EPC cost of US\$ 875 million (US\$ 0.66 million per MW). The calculation is provided below:

US\$ 310 million = US\$ 875 million $\times (\frac{300 \text{ MW}}{1320 \text{ MW}})^{0.7}$

6.33. The company in its supplementary explanations dated May 9, 2019 submitted as follows:

"An improper scaling factor of 660MW and 150MW will make the project unviable. The project company has already submitted with the Authority, the monographic studies conducted by reputable institutes. The studies demonstrate approximately 1.55 times escalation in the cost due to unit size. One of the comments received by the Authority upon review of the most credible study for scaling methodology: "Capital Cost Scaling Methodology by U.S. Department of Energy" was that the mechanism cannot be used by the Authority since information related to relevant parameters for scaling are not available to them. The Company has requested North China Power Engineering Co. Ltd, which is one of the top 6 design institutes in China, to conduct detailed research of unit size cost adjustment from 660MW to 150MW. The document provided by them demonstrates an average 1.52 times escalation. We request the Authority to carry out an independent third-party study for cost escalation and scaling mechanism for different type of coal power plants under Authority's vigilance to arrive at fair and equitable resolution of the issue."

6.34. The above submissions of the Petitioner have been evaluated. Regarding the contention of the petitioner of not considering the bidding process by CIHC, the submissions of the Petitioner under this head have been thoroughly examined and noted that although CIHC had provided details about carrying out a competitive bidding for the EPC cost, however there was obvious disparity in the cost requested by CIHC and already available cost numbers prevailing in the sector.





Most of the interveners/commentators and other stake holders also highlighted that the costs requested by CIHC are on the higher side. Therefore the Authority could not ignore the need for rationalization of costs in spite of the request by CIHC that the costs are based on bidding. Inconsistencies in costs in the submissions of CIHC have also been noted. For instance capital cost per MW was indicated as US\$ 1.38 million in the feasibility report, US\$ 1.39 million as per License application and US\$ 1.62 million as per tariff petition. Accordingly, the costs were rationalized based on available information, data and benchmarks to determine tariff in a prudent manner.

- 6.35. On the issue that Gawadar coal project cannot be compared with that of JPCL coal project and that the concerns raised by the Petitioner about size, technology and site specific conditions are logical, it is to be noted that the JPCL project provides current market sentiments about capital costs which have to be kept in view while allowing capital cost for the instant project. The concerns of the Petitioner however, would be duly addressed by the Authority. The observations of the Petitioner about taking higher costs for JPCL railway siding have been noted. JPCL was asked vide letter dated March 8, 2019 to provide bifurcation of cost of railway siding and coal handling system. JPCL vide its letter dated March 12, 2019 submitted that railway siding account for US\$ 10.401 million. The same has accordingly been adjusted in the final approved EPC cost.
- 6.36. Regarding sub-critical vs. super critical technology issue, inconsistent arguments have been given by the Petitioner. Coal power plants on sub-critical technology have been in operation since decades and with technological improvements, supercritical technology is taking over with higher operational temperatures and pressures. A lot of literature and knowledge base are available to show that the power plants based on supercritical technology have higher costs on per MW basis than those based on subcritical technology.
- 6.37. In view of the above, the submissions of the Petitioners have been thoroughly examined. Per MW EPC cost of Indian coal fired power plants of different sizes are noted to be in the range of US\$ 0.675 ~ 0.90 million/MW. It is also noted that subcritical PCC boiler based Suratgarh thermal power station of India having size of 250 MW have the per MW capital cost of US\$ 0.87 million/ MW. Capital costs referred in international journal for two Indian coal fired power are noted in the following table. The references so examined, provide a general level of costs in India, however these costs may not be directly applied to EPC costs in Pakistan in general, as India itself manufactures major components of power plants, whereas Pakistan imports entire power plant components which push the costs upwards.





Capital Cost						
Description	IRs. Crore/MW	Year of COD	Exchange Rate	\$ Million/MW		
Goindwal Sahib TPP (2x270MW)	5.49	2014	62	0.89		
Rosa TPP Phase II (2x300 MW)	5.17	2012	53	0.98		

- 6.38. A report prepared by International Energy Agency (IEA) in year 2010 namely "Projected Costs of Generating Electricity" indicated per MW capital cost (supercritical power plant in China) around US\$ 0.602~0.670 million/MW. The report namely "Operating ratio and cost of coal power generation" prepared by IEA clean coal centre in year 2016 shows that the per MW capital cost for pulverized coal based power plants vary between US\$ 0.50 ~ 1 million/MW.
- 6.39. With reference to the issues of setting costs for different sizes of power plants, the Petitioner in its tariff Petition had provided reference to the scaling method (provided above) for estimating costs for different sizes of power plant relative to a reference project. The Authority however did not accept the exponent 0.53 proposed by the Petitioner and in the absence of reliable references reliance was made upon the information available in upfront coal tariff 2014. The Authority considers that additional information and credible international references have been provided as part of its review petition by the petitioner on using scaling approach to estimate the costs of projects having different sizes. Therefore the Authority has decided to take a comprehensive look on the scaling method and relevant information for determining costs for the Gwadar Project.
- 6.40. It is pertinent to mention that the scaling formula requires that the costs of the reference project are considered without any upfront adjustments which may otherwise be required for apple-to-apple comparison of the two projects. In the instant case, the Authority is fully aware of the fact that the Gwadar project presents certain unique challenges for the developers which may not be encountered in other areas in general and for JPCL coal fired units in particular. Therefore the Authority decided that in the first step the EPC cost of JPCL may be used to work out indicative cost for Gwadar. However to have final numbers, the indicative costs are adjusted for those components which require separate consideration for the Gwadar Project.
- 6.41. The petitioner as part of its review motion submissions, indicated the range of exponents from 0.4 to 0.7 that can be used for scaling purposes based on a study regarding "Reduction of Capital Costs of Nuclear Power Plants". The petitioner in its additional submissions dated May 14, 2019 has now proposed an

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exponent/coefficient 0.70 as the most conservative assumption that can be considered for Gwadar project, for scaling purposes, which results in an EPC cost of \$ 310 million compared to \$ 399 million in its earlier estimation.

6.42. While analysing the scaling mechanism, it is noted that the coefficient linked to nuclear power plants may not be appropriate and an exponent/coefficient for coalbased power plants should be used for calculations. In this respect, the MTS Journal volume 33, Issue 2, 2nd quarter 2017 by American Society of Appraisers provides capacity scaling method and it is stated that for coal-fired plants an exponent/coefficient 0.7201 may be used. Based on the same coefficient the EPC cost for Gwadar project while keeping JPCL's cost as a reference, has been calculated as follows:

US\$ 301.06 million = US\$ 875 million ×
$$(\frac{300 \text{ MW}}{1320 \text{ MW}})^{0.7201}$$

- 6.43. The scaled cost calculated above is required to be adjusted for the following three factors:
 - Adjustment due to use of subcritical boiler instead of supercritical technology;
 - Adjustment due to non-requirement of Railway Siding;
 - Adjustment due to the contractor's responsibilities as per EPC contract scope of JPCL coal fired units.
- 6.44. Regarding adjustment of sub-critical and supercritical technology, it is noted that there are various references available for comparison purposes. IEA Clean Coal Center in several of its reports has noted that the EPC cost for a supercritical unit may be up to 5% higher than a subcritical unit. However, the reference provided by the company i.e. "Economic Benefits of the Introduction of Clean Coal Technology in the East Asia Summit Region" is being considered for adjustment of EPC cost. By referring the report, the Petitioner has submitted that supercritical to subcritical EPC cost difference is 1.7%. The Petitioner has in fact provided the difference in EPC cost of ultra-supercritical to supercritical rather than supercritical to subcritical. The difference in EPC cost of supercritical to subcritical works out 6.1556% and the same has been used to adjust the scaled cost. The scaled EPC cost after adjusting for subcritical boiler works out US\$ 283.61 million (301.06/1.061556).



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- 6.45. The ratio of railway siding cost of US\$ 10.401 million to JPCL EPC cost works out 1.1887%. The scaled EPC cost for Gwadar project after adjustment on account of railway siding comes to US\$ 280.24 million.
- 6.46. Regarding adjustment due to the contractor's responsibilities as per EPC contract of JPCL, it may be noted that the EPC contract of JPCL clearly highlights the responsibilities of Contractor and the Employer. As per EPC contract of JPCL, the responsibility of arrangement of construction power, construction water, initial construction water, roads, site leveling, boundary wall, mosque, training simulator, anti-corrosion measures and other infrastructure etc. are on part of Contractor's responsibility. Since these components are claimed by the petitioner as separate items for Gwadar project, therefore the scaled cost is further required to be adjusted on account of these items. These items constitute around 9% of the EPC cost as claimed by the petitioner. Accordingly, the main EPC cost (excluding additional items discussed below) works out US\$ 255.01 million and the same is being approved.

Adjustment on Account of additional cost items within EPC scope;

6.47. According to the Petitioner, notwithstanding the below explanations, it is highlighted that the specific items in Section 4 below were not a part of the Company's Tariff Petition but were explanations to account for differences between a standard project and the instant case.

Black Start Generator:

- 6.48. According to the Petitioner, the Authority has disapproved black start generator cost of USD 10.8 million on the premise that power requirements in case of complete shutdown can be met through local grid. The Petitioner submitted following reasons for having black start facility:
 - The power house location is remote end of the system. Unlike others, the Project requires black start generator facility (approximately 14 MW) as the local grid is isolated, unreliable and erratic and in case of a shut-down, plant will be restarted through self-generated power failing which it will be at risk of penalties.
 - Considering the response rapidity and stability, a high speed diesel generator based black start solution has been recommended to meet the commitments required under the Power Purchase Agreement and Implementation agreement. The Petitioner further submitted that without





the black start solution, in case of a shutdown, it cannot guarantee availability of the plant.

- If QESCO/CPPAG shall take the responsibility for the loss of capacity payment and associated penalties under PPA during long outage of plant due to non-availability of NTDC/ QESCO network, CIHC shall accept the waiver of this cost.
- The entire supply capacity of local grid is limited to approximately 14 MW which is almost equivalent to the requirement for the Project, the unit starting surge current from the plant will significantly negatively impact the safety and reliability of local grid.
- The power house shall be connected with 2 x 132 kV Transmission lines passing through an environmentally and politically unstable area. Any high graded twister/ Storm or any sabotage activity on transmission line will keep the power plant and off-course the whole area under darkness. This may continue up till the restoration of the transmission lines which may go to weeks.
- As per NEPRA Grid Codes, OC8.2, & OC 8.3, where there is islanding may happen or chance of Islanding of network Black start generators are required.
- The Authority may further note that despite being located adjacent to one of the most developed cities of Pakistan (Karachi), 1,320 MW Port Qasim Electric Power Company were forced to shut down by the grid more than 10 times after COD.
- Furthermore the nearest 220kV Grid is Ghuzdar, which is approximately 600Km away from the Gwadar plant and connected through 2 x 132kV transmission Lines. Once the lines will be tripped, the Gwadar CFPP is difficult to connect back due to severe voltage issues and unstable grid. In view of the grid status of Gwadar, the Black start is essential.
- The Black Start Facilities are the norm in all power stations to meet the emergency nature of the system faults.
- 6.49. The requested black start facility consists of 8 DG sets of 1800 kW each. The Authority has decided to re-examine the issue in the light of additional submissions made by the Petitioner and feedback from other stakeholders. The

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size of the black start facility in any steam turbine based power plants may be equivalent to the auxiliary consumption of the single unit i.e. 8.98% of gross capacity (150 MW) in the instant case. The request of the Petitioner regarding the size of the black start facility is slightly on the higher side and requires to be 13.47 MW. The second unit can then be started from power provided by first unit during black start mode. However, the Authority agrees with the comments of CPPA that the Black Start Generator facility is a technical requirement to meet its auxiliary consumption during system failure and NTDC is the relevant entity to validate the requirement of Black Start facility for Gwadar project. Accordingly, the Authority has decided to allow the black start facility subject to the validation of the same by NTDC and reassessment of requested cost of US\$ 10.8 million, being on higher side.

- 6.50. In order to assess the reasonable cost, reliance has been made on the project cost of US\$ 0.747 million/MW in case of gas engines. The EPC cost, depending upon the scope of the EPC contract, usually comprises of 70~80% of the project cost. The EPC cost of gas engines thus worked out US\$ 0.5976 million/MW. While considering the ratio of regional benchmarks i.e. 0.8571 (for gas only and oil fired engines) and applying the same on US\$ 0.5976 million/MW, the EPC cost/MW for black start facility works out US\$ 0.5122 million/MW. Accordingly an amount of US\$ 6.9 million is being approved for the black start facility.
- 6.51. The approved cost shall be allowed only in case the Petitioner seek validation of the requirement of the black start facility from NTDC. In case NTDC do not validate the requirement of black start facility, the cost of US\$ 6.90 million shall be excluded from the project cost at the time of COD adjustment of tariff.

Construction Power:

6.52. According to the Petitioner, the construction power cost of USD 12.5 million has been disapproved on the premise that the power from local grid will be available to the project most of the time. According to the Petitioner, the Authority may kindly note that the Project site is served by a single, erratic 11 kV QESCO line. This power line terminus is not a reliable source for construction power based on general power supply situation in Gwadar town and adjoining areas. The erratic power supply could be just one of the many issues faced by Project. A typical 11 kV WAPDA/QESCO line may carry upto 5 MW, although WAPDA can tweak its 11 kV line to around upto 7 MW but at the serious risk of voltage drop and some other attendant problems. Therefore, it does not seem to be a sustainable and reliable option. The Project's peak requirement during construction phase is about

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7 MW and a consistent steady load at 5-6 MW, and the total construction power consumption is around 30 million kWh. The Project's technical team and the EPC contractor are of the considered opinion that the existing QESCO resource available in the Project area poses unacceptable risk and hence needs remedy. Therefore, it is proposed that EPC Contractor bring generators to meet the power requirement during construction. According to the Petitioner, the cost would include generator civil works, rental, maintenance, labour, fuel, installation, dismantling etc. of the generators. The fuel cost alone is expected to be in the range of PKR 33.0 per kWh (at December 2017 prices) as compared to a full tariff of PKR 13.20/kWh in case of projects being supplied construction power from the national grid. Hence, the incremental cost of construction power for the Project was estimated in the range USD 12.50 million.

Description	Average Consumption kWh/Day
Construction activities	25000
Officer Camp (estimated 30 rooms & allied facilities)	5300
Labor Camp (estimated 200 rooms & allied facilities)	7300
Site Offices	3500
Total Average consumption/day	41,100
Total requirement for two years (kWh)	30,003,000
Working Hours	8~10hrs/day
Equipment Cost including procurement, installation, civil works & operation & maintenance	US\$ 6.84 Million
Fuel Cost at Dec. 2017 prices @ Rs. 33/kWh	US\$ 9.43 Million

6.53. The company provided following breakup in support of its request:

6.54. NEPRA vide its letter dated March 8, 2019 addressed to CEO QESCO inquired that whether the local grid in the proposed site area shall be able to meet uninterrupted demand by the project company during construction phase keeping in view the demand and supply of power available in the Gwadar area? QESCO in its reply dated April 5, 2019 stated as "QESCO is getting electricity from Joki-Gor Iran for Makran region including Gwadar in isolation from National Grid. As obvious above, QESCO itself is fully dependent on Iran, so it is not possible to ensure un-interrupted supply during execution/installation of 300 MW coal power project Gwadar". In the absence of availability of National Grid, the limited

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available supply and the law & order situation in the area, the request of the Petitioner merit reconsideration.

6.55. As a part of additional submissions during the proceedings, the Petitioner provided the estimated breakup of the energy requirement during construction phase of 30 months for living & construction activities which is 40.32 GWh as against the earlier requested 30 GWh which was calculated on the basis of two years instead of 30 months construction period. On the basis of the Technical Evaluation, the Authority has decided to allow estimated energy consumption of 25 GWh as against the requested 30 GWh during construction phase. On the basis of current HSD price of Rs. 122.32/liter, the estimated cost for power during construction works out US\$ 8.80 million including rental and O&M cost and the same is being approved. In case the project consumes any energy supplied by QESCO during the construction phase, the proportionate amount (US\$ 8.80 million/25GWh*energy from QESCO) shall be subtracted from the recommended amount of US\$ 8.80 million. The Petitioner shall provide verifiable documentary evidence regarding consumption or otherwise of the energy from QESCO during construction phase which shall also be verified by QESCO for adjustment, if any, at the time of COD. The Petitioner shall also provide record of consumption of electricity during the construction phase and in case the consumption is less than the 25 GWh, adjustment of the cost shall also be made at the time of COD on the basis of verifiable documentary evidence.

Construction Water:

6.56. According to the Petitioner, while accepting the need for a desalination plant, the Authority has disallowed the rental, installation and dismantling of the desalination plant which may kindly be reconsidered. O&M cost alone is not sufficient to meet the cost of construction water. Furthermore, the Authority has allowed annual O&M cost of USD 0.34 million based on 5.69% of capital cost of desalination plant of USD 5.45 million, which based on 30-month construction period works out to be around USD 0.85 million. According to the Petitioner, the Authority may note that desalination plant is a highly corrosive equipment and requires extensive maintenance cost and fixing of the same based on 5.69% of capital cost plant to meet the water requirement during construction which shall include relevant civil works, plant rental, maintenance, operating cost, labour, chemicals, installation, dismantling etc. of the desalination plant, the cost for the same may kindly be approved by the Authority.





6.57. The Petitioner through email dated April 12, 2019 to NEPRA submitted following details in support of its claim:

			istruction	water	
no.	item	unit	qty	amount (USD)	Remarks
(1)	Total Price			4,700,433	
2	Equipment Price			1,112,612	
1	Desalination plant 2*15t/h	set	1	940,299	
2	Sea water pump and other Equipment	set	1	44 ,776	
3	Sea water pipeline	m	400	32,000	
4	2 years of spare parts	set	1	95,537	
3	Other Fee			3,587,821	
1	Construction Fee		1	1,204,401	Includes the seawater pool, the concrete foundation, the water supply pump room, the pipeline construction and construction of seaside pumping stations
2	Installation and Commissioning		1	689,819	
4	Operational and expendable materials		1	1,368,000	
5	Management Fee		1	203,500	
	10.1		1	122 100	

6.58. While analysing the above table it is noted that the petitioner has included the entire cost of desalination plant along with other allied accessories required during construction phase which is contrary to its earlier submissions wherein it was mentioned that the desalination plant during construction phase will be obtained on rental basis for temporary usage only. Therefore the claim of the entire equipment cost under this head separately is not justified. Furthermore, it may be noted that the cost under this head allowed by the Authority is based on regional benchmarks which is an average number and includes rental cost, monitoring cost, maintenance cost, labour cost, waste discharge cost, membrane cost, chemicals cost and cost related to electrical energy. Accordingly, the Authority has decided to maintain its earlier decision in the matter.

Residential Colony:

6.59. According to the Petitioner, the Authority has reduced the residential colony cost based on the construction cost of PKR 5,000 per sq. ft. as opposed to PKR 5,700 communicated by the Company. The Authority may appreciate that basic construction costs of PKR 5,000 per sq. ft. cannot be compared with the cost for

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developing a full-fledged housing colony which will need to accommodate all kinds of amenities for the personnel which shall reside at the Project site. Moreover, current construction cost estimates may not hold for during the development/construction period of 3-4 years and reasonable margin on the same needs to be considered. The company further submitted as part of review motion submissions that the cost not only included the construction cost but also the sewerage line cost, the roads in colony, the cost of electricity distribution, Street Lights, boundary wall, being a natural stream between power plant and colony , for security purposes and the water distribution system. Following breakup has been provided by the company in support of its claim:

Description	Rs./ft ²
Total Cost of civil works:	5700
Actual Cost of civil works	5000
Cost of Electricity	125
Cost of Road	325
Cost of Sewer	150
Cost of Water Lines	100

- 6.60. The company also referred LDA/RDA by-laws which state that the residential area cannot be more than 63% of total area and reaming shall be inform Parks, roads and civic facilities.
- 6.61. In the opinion of the Authority, the approved cost of US\$ 8.66 million for residential colony was based on established benchmarks. The Petitioner has not provided any new justification for its claim and the Authority has decided to maintain its earlier decision.

Anti-corrosion measures:

6.62. According to the Petitioner, The Authority has reduced anti-corrosion measures cost from USD 2.62 million to USD 1.30 million. The Project is located in a coastal area and needs to take into account anti-corrosive measures for its steel structure, foundation surface, enclosure material etc. Such measures include galvanizing, anti-corrosion coating and painting. The Petitioner requested the Authority to evaluate the cost objectively. The Petitioner provided following breakup of total cost of anti-corrosion measures:



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- a) Anti-corrosion paint for steel structure at USD 1.15 million, based on estimated weight of 14,400 MT and unit price of USD 80 per MT.
- b) Anti-corrosion coating for re-bars concrete foundation at USD 0.43 million, based on surface area of 85,000 m² and unit price of USD 5.05 per m².
- c) Anti-corrosion paint to boiler steel frame and other equipment, pipe, supporting and hanger gallery at USD 1.04 million, based on estimated weight of 11,000 MT and unit price of USD 95 per MT, considering the higher unit price of equipment coating.
- d) The H shape beam HEA300 measuring 12 x 12 x 12 has surface area of 6 ft² through 1 running ft length. The weight of this type of beam is 27.17 Kg/ft. Per ton surface area shall be 221 ft². The cost per ft² shall be calculated as 0.36 US\$/ft²
- 6.63. The new details and the cost breakup provided by the Petitioner has been considered. Gwadar area presents a hostile environment in terms of exposure to high moisture and sandy particulates, which require relatively high degree of protective measures. In the absence of any established benchmarks, the Authority has decided to allow the requested cost of \$2.62 million as maximum cap which shall be subject to adjustment as per actual at the time of COD. The Petitioner shall submit verifiable documentary evidence of the actual cost at the time of COD.

Incremental Material Cost:

6.64. According to the Petitioner, the Authority has disallowed any incremental material cost on the premise that intercity prices published by Monthly Bulletin of Statistics does not provide any difference in Gwadar and Karachi prices. Whereas the list price of the specific item such as cement and steel may be the same, we understand that such prices do not take into account the transportation and handling costs of such material from the source to the Project site. It is not reasonable to assume that a material from Karachi will have the same price in both Karachi and Gwadar. As an illustration, the Company had provided quotes from D.G. Khan Cement, the nearest plant to the Project site. Material rates from an engineering firm and cement companies have been provided to Authority, which demonstrate additional costs in the range 15-35%. Based on the above, it is requested that based on material cost of 30-35% of onshore cost of USD 120 million and incremental costs of around 30-35%, the costs explained by the Company may be allowed due to unavailability of these inputs at Gwadar and associated transportation costs.





6.65. The company further submitted as part of review motion submissions that the Authority has seriously ignored the quotes provided by CIHC from SECP &PEC registered firms having working experience on ground. The Monthly Bulletin of Statistics only gives the price of cement, but price of Crush, sand, gravel, soil, and asphalt is not given and it varies from site to site and according to distance as well as engineering specifications e.g. if engineering specs says Lawrencepur sand then nothing can replace it and further the Authority has totally ignored the cost of transportation in all aspects. The company through its email dated April 12, 2019 submitted following details in support of its claim:

No.	Item	Unit	Qty	Amount (US\$)	Remarks
1	Total Price			10,029,265	
2	Steel bar			1,359,086	
1	Reinforcement for steel bar	ton	10,021	1,145,257	From Gwadar market price data 105000 Rs/m3 on FEB,2019, with 93000 Rs/m3 from government price index of March, 2018
2	Others structural Steel bar for bridges	ton	1,871	213,829	From Gwadar market price data 105000 Rs/m3 on FEB,2019, with 93000 Rs/m3 from government price index of March, 2018
3	Cement	ton	40239	1,905,029	From Karachi market price data 11871 Rs/ton on DEC,2018, with 10500 Rs/ton from government price index of March, 2018 ;

Incremental Material Cost





					600 km transportation
					distance, each kilometer
					freight 6.0rupees per ton
4	Other Fee			6,765,150	
1	Sand		164214	2 270 816	100 km transportation
I	Sanu	m	104314	2,370,810	distance, each kilometer
 					freight 6.0 rupees per ton
					From Gwadar market price
					data 2120 Rs/m3 on
					FEB,2019, with 1296 Rs/m3
2	Gravel for	m ³	200329	3.403.685	from government price
-	aggregate			0,100,000	index of March, 2018
					100 km transportation
					distance, each kilometer
					freight 6.0 rupees per ton
					120 km transportation
3	Brick	m3	11280	139,227	distance, each kilometer
					freight 6.0 rupees per ton
					<u> </u>
					120 km transportation
4	Rubble stone block	m3	1172	14,466	distance, each kilometer
1					freight 6.0 rupees per ton
-	TA7 1		470	154.055	
5	Wood	m ³	478	156,955	From Karachi, 63,500Rs/m3
	Other materials				
6	numbered from	Theme	1	680.000	
D	purchased from	nem		000,000	
	surrounding area				



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- 6.66. NEPRA vide letter No. NEPRA/SAT-I/TRF-434/3980 dated 8th March 2019 requested Chairman Gawadar Development Authority (GDA) to apprise the Authority about the approximate incremental material and labour cost, if any, keeping in view your experience of construction activities carried out for development of Gawadar. In reply, the Superintending Engineering (Building) of GDA vide its letter dated May 3, 2019 submitted as "... Comparing the open market rates for construction material (cement, steel, bitumen etc.) from Karachi, the rates in Gwadar are approximately 15-20% higher. The labour rates are about 35-40% higher than Karachi ... ".
- 6.67. Based on the additional information by the Petitioner and GDA, the Authority has decided to re-examine as GDA is the more relevant body to comment on the onground conditions existing in Gwadar with respect to the construction activities. According to the submissions of GDA, an average incremental material cost of 17.5% may be expected at Gwadar over those at Karachi. Accordingly, the Authority has decided to allow US\$ 5.58 million on account of incremental material cost.

Incremental Labour Cost:

- 6.68. According to the Petitioner, the Authority has not accepted the Company's contention about incremental labour cost by using the intercity prices published by Monthly Bulletin of Statistics, which provide incremental prices prevailing Gwadar of 28.58% over Karachi. The Company genuinely doubts the reliability of the document as the quotes obtained by the Company from credible engineering firms show a premium of 140-165% over rates in Karachi, documentation in which regard has been provided to the Authority. The Authority may note that the above document, even if relevant, would be for unskilled or low skilled labour and not for services being offered by qualified local and international engineers. We would therefore appreciate that the Authority may revisit its findings in this regard as per the evidence provided by the Company.
- 6.69. The company through its email dated April 12, 2019 submitted following details in support of its claim:





	Incremental Labor/Manpower & Services Cost 0.009523					0.00952381			
N 0	Skilled Labor Mandays	Manmonths	Mandays	Gwadar Rate per day (PRK)	Rate in Karachi (PRK)	Difference (PRK)	Price in Karachi (USD)	Price in Gwadar (USD)	Total Diff (USD)
1	Electricians	1,050	32,025	4,813	1,450	3,363	442,250	1,467,813	1,025,563
2	Mech Fitter	1,730	52,765	4,813	1,450	3,363	728,660	2,418,396	1,689,736
3	Welders	745	22,723	6,750	2,100	4,650	454,450	1,460,732	1,006,282
4	Instrument Tech	630	19,215	5,625	1,800	3,825	329,400	1,029,375	699,975
5	Riggers	1,050	32,025	5,250	1,650	3,600	503,250	1,601,250	1,098,000
6	Semi Skilled Labor	5,300	161,650	3,750	1,250	2,500	1,924,405	5,773,214	3,848,810
7	Labor	7,500	228,750	3,125	950	2,175	2,069,643	6,808,036	4,738,393
8	Foreman	210	6,405	8,125	2,700	5,425	164,700	495,625	330,925
9	Mobilisation and demobilisation, welfare fee, hardship allowance for Labors in remote areas	18,215	555,558			903			4,777,795
10	Chinese Skilled Labor	4,200	128,100			5,250			6,405,000
11	Chinese Maneger and technician	1,950	59,475			7,875			4,460,625
L	Total	42,580	1,298,690	42,250	13,350	42,928	6,616,757	21,054, 44 0	30,081,103

- 6.70. CIHC feels that Authority's decision is unjustifiable as the the cost of labor is different in Gwadar due to its location, security reasons, non-availability of civic facilities and off-course hardship of area. The cost mentioned in the Bulletin is for local labor like Raj Mistry, Mason, Electrician or unskilled labor. But the cost of highly skilled labor cannot be justified under the same. All government entities offer hardship allowance to their employees when transferred in hard area. Examples are generation allowance to GENCO employees working in Guddu, Panjgur etc. which is 100% of basic pay and Authority is well aware of it.
- 6.71. The Authority allowed US\$ 11.38 million on account of incremental labour cost against US\$ 38.00 million requested by the Petitioner. Upon inquiry by NEPRA, Executive Engineer, Gwadar Development Authority of Government of Baluchistan vides its letter dated April 03, 2019 submitted the comparison of local labour rates with the Bulletin rates (without referring to any incremental labour impact as compared to Karachi) and the same is reproduced below:





Component	Local Rate	Bulletin Rate	Difference
Mason	1660	1700	-2%
Labour	860	700	23%
Carpenter	1800	1200	50%
Carpent. Helper	1000	-	-
Plumber	1750	1200	46%
Plumber Helper	850	-	
Electrician	2500	1100	127%
Per Point	260	110	136%
Painter	1500	-	_
Painter Helper	1000	-	-

6.72. Based on information provided by GDA vide letter dated 3rd May 2019 referred above, the Authority has decided to re-examine the matter and re-determine the cost under this head. According to the submissions of GDA, an average incremental labour cost of 37.5% may be expected at Gwadar over those at Karachi. Accordingly, the Authority has decided to allow US\$ 14.94 million on account of incremental labour cost.

Summary of EPC Cost

6.73. Summary of the approved EPC cost is provided hereunder:

Description	US\$ Million
Main EPC Cost	255.01
Additional Cost in the EPC Scope:	66.40
Black Start Generator	6.90
Construction Power	8.80
Desalination Plant	5.45
Initial Construction Water	0.56
Construction Water	0.85
Bridges	1.70
Residential Colony	8.66
Anti-Corrosion Measures	2.62
Site Leveling	9.35
Boundary Wall	0.98
Incremental Material Cost	5.58
Incremental Labour Cost	14.94
Total EPC Cost	321.41
Offshore EPC	217.37
Onshore EPC	104.04





6.74. The approved EPC cost is also consistent with the International Benchmarks. One of the reports prepared by consultant Parsons Brinckerhoff namely "Coal Fired Power Stations Operating at Higher Temperatures" provides following details under the head of Comparative Modelling for reference purposes:

Coal fired Power Plant	Sub Critical Boiler
EPC Cost (Mill US\$/MW)	1.015 ~ 1.370
Total Cost (Mill US\$/MW)	1.220 ~ 1.650

Adjustment on Account of Custom Duties, Withholding Tax and Sales Tax;

- 6.75. According to the Petitioner, the Authority has not clarified whether nonadjustable sales tax will be included in the Project cost or will be allowed as a passthrough item to be recovered from CPPA-G. The Company would appreciate a clarification from the Authority in this regard.
- 6.76. The Authority while adjusting tariff at the time of COD of a new commissioned coal power plant included non-adjustable sales tax during construction period on import of plant & equipment and construction activities in the project cost and the same mechanism shall apply in the instant case.

Adjustment on Account of Non-EPC cost;

6.77. The Petitioner submitted following in respect of Non-EPC cost:

Satellite Communication System:

- 6.78. According to the Petitioner, the Authority has disapproved communication system cost of USD 1.64 million based on the premise that it is typically included in the EPC cost. It may be noted that this cost is unique to this Project where as there is no connectivity for communication and the Company will need to install communication towers, walkie talkie systems and will need to pay bandwidth fee and monthly fee to the communication operator. These costs are not typical to any project and hence should be allowed to the Project.
- 6.79. While analysing company's submissions it is noted that the company did not provide any new evidence in support of its claim. It may be noted that cellular networks are available in the area which may be used for communication purposes. Moreover, with the passage of time more options regarding communications will be in place that may be utilized by the project company for

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fulfilling their requirements. Accordingly, the Authority has decided to maintain its earlier decision under this head.

Training:

- 6.80. According to the Petitioner, the Authority has disapproved training cost of USD 2.33 million based on the premise that it is typically included in O&M mobilization. Training costs have been allowed as a separate cost component from O&M mobilization by the Authority in Bhikki and Balloki power projects and the Authority's decision is not in line with precedents. As a further explanation, the cost comprises training of 150 Pakistani engineers and technicians with annual college fees of USD 2,500 per person per year and travel cost of USD 2,000 per person. It also includes 6-month training in China for USD 1,000 per month per person including accommodation and practical experience. Such training is typically not provided by other projects and hence may kindly be allowed by the Authority in the instant case.
- 6.81. The submissions made by the Petitioner has been examined carefully. In case of Bhikki and Balloki, as referred by the Petitioner, US\$ 2.30 million each was requested for construction of plant simulator and training centres. The Authority allowed the construction of one simulator and training centre at Bhikki subject to its verification at the time of COD. In case of Bhikki and Balloki US\$ 1.7 million and US\$ 1.3 million were also requested on account of training costs as part of administrative expenses which were rejected on the ground that these have been covered in the EPC contract and only US\$ 0.2 million and US\$ 0.15 million respectively were allowed for management trainings subject to verification at the time of COD. Moreover, as per EPC contract of JPCL which is being used as a reference project, training along with training simulator is the contractor's responsibility.
- 6.82. The benchmark used by the Authority for allowing O&M mobilization cost includes training cost as well. Keeping in view the foregoing, the Authority has decided to maintain its earlier decision.

Vehicles:

6.83. According to the Petitioner, the Authority has disapproved vehicles cost of USD 0.90 million based on the premise that it is a pre-operation cost. The Authority should note that Project personnel will require extensive travelling during operations as well and the use is not limited to reoperations phase.





6.84. The cost of vehicles is part of administrative cost during construction period and part of O&M during operation period. There is no justification to include it as separate item in non-EPC cost. The Authority has decided to maintain its earlier decision under this head.

Adjustment on Account of Project Development and Company & Sponsor Costs

- 6.85. According to the Petitioner, the Authority has approved an amount of USD 7.73 million for project development, company and sponsor costs against the USD 47.87 million claimed by the Company. The Authority's basis for the same is the unsuccessful 330 MW Pind Dadan Khan Salt Range Power Project where the EPC contractor was the project sponsor as well. Furthermore, it is not reasonable to benchmark such costs against capex of 1,200 MW thermal projects as the absolute cost remains in the same range regardless of project size. Moreover, RLNG projects costs were based on local sponsor/employee costs, a package deal with NESPAK across three similar projects and locations far more developed than Gwadar.
- 6.86. According to the Petitioner, fearing Authority's use of inapplicable benchmarks, the Company in its correspondence had also requested the Authority to evaluate each item under these heads objectively instead of using percentage benchmarks with other projects. The Authority has itself acknowledged in the past that these costs do not have a linear relationship with project size and hence comparison with other thermal projects with much larger size is not warranted. In light of the above, it is requested that the Authority evaluates each item objectively and approve them accordingly.
- 6.87. According to the Petitioner, the costs under these heads normally include cost related to salaries of local and expat employees, insurances, office and vehicle rentals, travel, utilities and other establishment costs. CIHC submitted that the benchmark cost of thermal projects were based on local sponsors and were located in far more developed areas as compared to Gwadar. On the contrary in respect of the Project due to high risk, remoteness, poor physical and service infrastructure facilities, unforeseen delays, lack of commercial transportation, unavailability of skilled labor etc. higher Project Development Costs and Sponsor Costs are required to be determined by the NEPRA.
- 6.88. The petitioner vide letter no. CHIC/POCPEC/2019-219 dated April 16 2019 provides information to support its argument regarding the non-linear

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relationship of project development and company sponsor cost with project size as follows:

Project Name	Construction Period	Capacity	NEPRA Approved Project Development/ Company Sponsor Costs		
	(Months)		% of EPC	% of Project	
			Cost	Cost	
Balloki	27	1,223 MW	2.91	2.11	
Haveli Bahadur	27	1,230 MW	2.92	2.09	
Shah					
Bhikki	27	1,180 MW	3.39	2.44	
Jhang	26	1,263 MW	4.12	3.06	
Kohala	78	1,124 MW	6.04	4.47	
Karot	60	720 MW	6.37	4.83	
Azad Pattan	69	700 MW	7.30	5.45	
Suki Kinari	72	870 MW	7.52	5.73	

6.89. The petitioner also stated that if the Authority wants to evaluate project development and company sponsor costs based on past precedence, it may approve the cost based on the construction time-period of different projects. In support of this methodology, the petitioner has provided the following information, showing the adjustment in project development and company sponsor cost according to the construction time-period of existing projects:

Project Name	Construction Period (Months)	NEPRA Approved Project Development/ Company Sponsor Costs (US\$ Million)	Adjusted based on construction period of 30 months
Balloki	27	16.87	18.74
Haveli Bahadur Shah	27	17.85	19.83
Bhikki	27	18.79	20.88
Jhang	26	21.67	25.01
Kohala	78	108.20	55.79
Karot	60	81.44	40.72
Azad Pattan	69	73.95	33.94
Suki Kinari	72	97.84	40.77





- 6.90. While analysing company's submissions it is noted that the company did not provide any supporting documents in support of its claim. The information provided by the Petitioner gives a range for different projects. The Project development/Company sponsor costs in terms of percentage vary between 2 to 3 percent of the project cost for thermal projects whereas for hydro projects these costs range between 4.47 to 5.73% of the project costs.
- 6.91. The EPC contract of JPCL, which is being used as a reference project, clearly shows that it's the contractors responsibility to complete all survey, study and report preparation including:
 - i. Site Surveys, including topography, bathymetric, geotechnical, seismic conditions, hydrographic;
 - ii. Meteorology studies;
 - iii. Hydrographic study;
 - iv. Hydraulic calculations steady state and dynamic;
 - v. Project design report;
 - vi. Hazop studies; and
 - vii. Electrical studies for grid connection
- 6.92. Notwithstanding above, it is noted that the company has now submitted vide its letter dated April 16 2019 that if the Authority desires to set project development and company sponsor costs based on past precedence, then it may approve the cost based on the construction time-period of different projects. In this regard, coal fired subcritical PC boiler based CMEC power plant having capacity of 330 MW provides a reasonable reference to allow the cost (in absolute numbers adjusted for 30 months construction period) under this head. In the referred project, the Petitioner requested US\$ 14 million under this head for a construction period of 40 months. Accordingly, the Authority has decided to allow proportionate cost of US\$ 10.50 million under this head for 30 months construction period of another construction period of a months construction and company & Sponsor's cost.

Adjustment on Account of Insurance during Construction;

6.93. According to the Petitioner, the Company applied for insurance during construction based on 1% of EPC cost which was in line with precedent determinations by the Authority for similar projects. However, the Authority has reduced the same based on Tariff Benchmark Guidelines vide SRO 763 (I)/2018







dated June 19, 2018 ("Guidelines") notified by the Authority, whereby the Guidelines have "proposed" insurance during construction for thermal projects at 0.75% of EPC cost and the same has been used by the Authority in the Impugned Order.

- 6.94. According to the Petitioner, the Authority may kindly note that as per Article 1(2) of the Guidelines, the Guidelines shall come into force after three months from the date of notification of the Guidelines i.e. 19 September 2018. As per Article 2 of the Guidelines, the Guidelines shall be applicable to all applications for tariff determination under NEPRA Tariff Standards and Procedure Rules, 1998, and the NEPRA Up-front Tariff (Approval & Procedure) Regulations, 2011 filed after the coming into force of these guidelines i.e. 19 September 2018.
- 6.95. According to the Petitioner, since the Company submitted their application for tariff determination on 12 January 2018, well before the publication of the Guidelines, the benchmarks as per the Guidelines should not be used in the instant case and are inapplicable. The NEPRA Authority has misdirected itself by taking into account the benchmarks as laid down in the Guidelines.
- 6.96. The insurance cost at 0.75% of the EPC cost during construction period of the project is based on current insurance market trend. NEPRA (Benchmarks for Tariff Determination) Guidelines, 2018 was only used as a reference. It is not binding on the Authority to allow 1% of the EPC cost even if the current market shows a declining trend. Therefore, the Authority has decided to maintain its earlier decision. However, with the revision in the EPC cost, the revised insurance cost during construction has been assessed as US\$ 2.41 million.

Adjustment on Account of O&M Mobilization Cost;

- 6.97. According to the Petitioner, the Company applied for an O&M mobilization cost of USD 6.49 million in the Tariff Petition. The Authority has reduced the same on the premise that O&M mobilization and training together range around 1% of EPC cost in case of thermal projects.
- 6.98. According to the Petitioner, the Authority seems to be referring to the cost approved for RLNG projects in the Impugned Order whereby the Authority should note that O&M mobilization cost and training cost were determined separately for all RLNG projects and total cost for the same were around 1.12%, 1.26% and 1.39% for Haveli Bahadur Shah, Balloki and Bhikki, respectively, in contrast to the 1% of EPC cost specified by the Authority in the Impugned Order. Moreover, it would be appropriate that the Authority evaluate O&M mobilization





breakup provided to the Authority rather than basing its decisions on comparison of tariffs determined 4 times the size of the instant Project.

6.99. While analysing company's submissions it is noted that the company did not provide any new evidence or supporting documents to substantiate its claim. It may be noted that as per available literature and benchmarks, the O&M mobilization cost (including training cost) of around 1% of EPC Costs is a reasonable estimate for thermal power projects. In case of 400 MW UCH-II project, The Authority even allowed 0.67% of EPC cost as O&M mobilization, therefore, petitioner's stance regarding comparing its plant to large size RLNG based project is not valid. The Authority considers that the earlier decision of 1% of EPC cost is reasonable and decided to maintain the same. However, with the revision in the EPC cost, the revised O&M mobilization and training cost has been assessed as US\$ 3.21 million.

Adjustment on Account of Non-reimbursable fuel and start-up charges

- 6.100. According to the Petitioner, the Company in the original Tariff Petition had sought USD 3.44 million for fuel and start-up charges; however, the Authority has capped the same at USD 2.74 million. According to the Petitioner, being a cost of non-reimbursable nature, this should be reimbursed at actual rather than imposing a ceiling on the same.
- 6.101. According to the Petitioner, due to high risk, remoteness, poor physical and service infrastructure facilities, unforeseen delays, lack of commercial transportation, unavailability of skilled labor etc. higher fuel and start up charges are admissible and so required to be determined by the NEPRA compared to other power projects being established in close proximity of metropolitan cities of Pakistan. Therefore, the company requested that any cost of start-up charges should be allowed at actual rather than imposing a ceiling on the same and the same be verified by Independent Engineer at the time of commissioning of the power plant.
- 6.102. While analysing company's submissions, the Petitioner did not provide any new evidence or supporting documents in support of its claim. On the basis of cost allowed to a similar power plant, the Authority has allowed US\$ 2.74 million on account of non-reimbursable fuel and start-up cost prior to synchronization with maximum cap subject to adjustment as per actual on the basis of verifiable documentary evidence at the time of COD. The Authority has decided to maintain its earlier decision.







Adjustment on Account of Sinosure Fee

- 6.103. According to the Petitioner, the Authority has allowed a Sinosure fee of 0.60% of yearly outstanding principal and interest amount during construction and operation period against the 0.75% assumed by the Company in the Tariff Petition. For clarification, the proposal of 0.75% included withholding tax of 20%, resulting in net Sinosure fee of 0.60%, which we would appreciate is clarified by the Authority, that whether withholding tax will be allowed as a pass-through item or the tariff component will be adjusted accordingly.
- 6.104. The Authority in many recent cases has allowed sinosure fee @0.6%/annum without the separate provision for withholding tax. In accordance with the decisions in similar cases, the Authority has decided to maintain its earlier decision of allowing sinosure fee @0.6%/annum without the separate provision for withholding tax. However, on the basis of revised CAPEX cost and revised debt financing of the project, Sinosure fee during construction works out US\$ 3.44 million which shall be subject to adjustment as per actual with maximum of 0.6% of the yearly loan drawdown and interest amount during the construction period. Separate tariff component has been worked out for Sinosure fee during operation on the basis of annual outstanding loan amount and interest payment. In case of alternative Sinosure fee arrangement, the same shall be compared with the cost allowed as per the above mechanism and in case the alternative arrangement is within the allowed cost, the same shall be considered for adjustment at the time of COD.

Adjustment on Account of Financing Fees & Charges

- 6.105. According to the Petitioner, the Company applied for financing fees and charges based on 3% of total Project debt which was in line with precedent determinations by the Authority for similar projects. However, the Authority has reduced the same based on Tariff Benchmark Guidelines vide SRO 763 (I)/2018 dated June 19, 2018 ("Guidelines") notified by the Authority, whereby the Guidelines have "proposed" financing fees and charges for thermal projects at 2% of debt and the same has been used by the Authority in the Impugned Order.
- 6.106. According to the Petitioner, the Authority may kindly note that as per Article 1(2) of the Guidelines, the Guidelines shall come into force after three months from the date of notification of the Guidelines i.e. 19 September 2018. As per Article 2 of the Guidelines, the Guidelines shall be applicable to all applications for tariff determination under NEPRA Tariff Standards and Procedure Rules, 1998, and the NEPRA Up-front Tariff (Approval & Procedure) Regulations, 2011 filed after the coming into force of these guidelines i.e. 19 September 2018.







- 6.107. According to the Petitioner, since the Company submitted their application for tariff determination on 12 January 2018, well before the publication of the Guidelines, the benchmarks as per the Guidelines should not be used in the instant case and are inapplicable. The NEPRA Authority has misdirected itself by taking into account the benchmarks as laid down in the Guidelines.
- 6.108. The financing fees and charges were allowed on the basis of current market due diligence of the financial market. NEPRA (Benchmarks for Tariff Determination) Guidelines, 2018 was used as a reference. The Authority is not constrained to follow the 3% limit in line with the past determinations when the current market shows a declining trend. Therefore, the Authority has decided to maintain its earlier decision. However, on the basis of revised CAPEX cost and revised debt financing of the project, financing fees and charges works out US\$ 5.79 million which shall be subject to adjustment as per actual with maximum of 2% of the total loan amount.

Interest During Construction

6.109. Revised Interest during construction of US\$ 28.57 million has been worked out on the basis of revised CAPEX and current LIBOR of 2.6% plus a premium of 4% which shall be subject to adjustment as per actual at the time of COD.

Summary of Project Cost

Description	US\$ Million
EPC Cost	321.41
CD, WHT and Sales Tax	10.87
Non EPC Costs	5.77
Land	4.73
Project Development Costs	10 50
Company and Sponsor Costs	10.50
Insurance during Construction	2.41
O&M Mobilization	3.21
Testing & Commissioning	2.74
CAPEX	361.64
SINOSURE Fee	3.44
Financing Fees & Charges	5.79
Interest During Construction	28.57
Project Cost	399.43
EPC Cost/MW	1.07
Project Cost/MW	1.33

6.110. In accordance with recommendations made in the preceding Paragraphs, sur





Adjustment on Account of Auxiliary Consumption and Thermal Efficiency

- 6.111. According to the Petitioner, the Authority has approved auxiliary consumption as 8% for the Project, which result in Net output to 276 MW. The Authority shall note that the requirement is too strict and unreasonable for the coal-fired power plant of this unit size. Generally, the auxiliary power consumption of similar size unit is at 9%~9.5% for PC boiler technology, which is based on many power plants in international domain. It is also consistent with the No. NEPRA/TRF-UTC/2013/7195-7197 "Decision of the Authority regarding Reconsideration Request filed by Government of Pakistan in the matter of Upfront Tariff for Coal Power Projects" for the similar capacity unit with the same technology. The test conditions for auxiliary power consumption of the unit shall finally conform to relevant stipulations of Pakistan. Referenced itemized list of major equipment included into the auxiliary power consumption test (for two units) are attached, which result in total 26.936 MW for two units.
- 6.112. According to the Petitioner, on the basis of above data, calculated auxiliary power consumption rate is 8.98%, considering the possible little change of different manufacture in future, the guaranteed auxiliary power consumption rate of 9% is reasonable for 150MW capacity unit. Based on the above, the Company humbly requests the Authority to reconsider the auxiliary consumption as 9% of Gross output.
- 6.113. The Petitioner requested to cap the auxiliary consumption as per the actual electricity consumption during commissioning tests before COD and witnessed by Independent Engineer and humbly requested the Authority to reconsider the auxiliary consumption as 9% of Gross output at present instead of earlier claimed 8.98% of gross output.
- 6.114. Regarding thermal efficiency, the Petitioner submitted that the Authority has approved net thermal efficiency of 37.65% for the power plant, which is based on auxiliary consumption of 8% with the following data:
 - a) Gross Efficiency of boilers at RSC: 92.79%
 - b) Gross Efficiency of steam turbine at RSC: 44.78%
 - c) Gross Efficiency of generators at RSC: 98.5
- 6.115. According to the Petitioner, the Authority may note that the requirement is too strict and unreasonable for the coal-fired power plant of this size class. According

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to ASME standard, the net thermal efficiency of the whole plant should be calculated as following:

 $\eta = \frac{P_{net}}{\overline{m \, Q_{ar,net}}}$

Where;

η: efficiency

Pnet: net output of two units, 273.132 kW m: consuming rate of fuel of two units, 32.872kg/s Qar, net: net calorific value, 22459.4 kJ/kg

Thus, $\eta = 37.00$ % shall be applied

- 6.116. According to the Petitioner, even if based on the same method that the Authority adopted, considering feasible auxiliary consumption of 9%, the calculated net thermal efficiency of plant is 37.24%, due to the possible little difference of heat rate from different OEMs, the guaranteed net thermal efficiency of plant is recommended as 37%. It is in line with NEPRA previous decisions for 220MW unit capacity power plants, for the unit capacity of 150MW power plants, the net efficiency of the project is fair and reasonable at 37%. The Company requested the Authority to reconsider the adjusted net thermal efficiency of 37% for the project.
- 6.117. The petitioner in its latest submissions dated May 14, 2019 regarding Applied Methodology for Net Efficiency of Power Plant submitted as follows:

".... the two methods of net efficiency of power plant are recommended in the tariff review justifications which are reverse equilibrium calculation method and Positive equilibrium method.

Positive equilibrium method is provided in the above paragraph. Reverse equilibrium calculation method is provided hereunder:

$$\eta_{cp(net)} = \eta_b * \eta_{stg} * \eta_p * (1 - Raux)$$

Where : $\eta_{cp(net)}$ is the Net efficiency of the power plant, % ;

 η_b is the Gross efficiency of boilers, %;



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 η_{stg} is the Gross Efficiency of steam turbine generator, %; the Efficiency of generators is often taken as 98.5% and merged into steam turbine to considered as Heat Rate of in Heat Balance Diagram;

 η_p is the efficiency of the pipes, %, which is usually taken as 98.5%~99%, and for small capacity units it often takes 98.5%;

Raux is the auxiliary consumption Rate of power plant:9%.

- 6.118. According to the Petitioner, the above formula is applicable for single unit power plant, but for multiple units the formula is not accurate due to common system auxiliary consumption, like cooling water pumps etc. We can conclude that the calculation method adopted by the Authority is according to the reverse equilibrium calculation method but we applied for the positive equilibrium calculation method because CPPA(G) and NTDC adopted the positive equilibrium test method which is only applicative method for the power plants with 2(two)units instead of reverse equilibrium test method ...".
- 6.119. The submissions of the Petitioner have been examined carefully. It would be pertinent to mention that the references provided by the company in support of its claim are unsatisfactory and are contradictory with its request as showing higher efficiency numbers based on varying sizes of the projects like 38.64% net LHV than determined value i.e. 37.65% net LHV.
- 6.120. The formula provided by the Petitioner for computation of efficiency numbers while discussing Positive Equilibrium Method has some variables in it like Net Output, Net Calorific Value (NCV) of coal and Coal Consumption Rate (CCR) etc. that may change significantly depending on technology deployed. It is pertinent to mention here that the company has now provided different auxiliary consumption, NCV and CCR values like 8.95% of gross, 22,459.4 KJ/kg and 32.872 kg/sec instead of earlier submitted 8.98% of gross, 23,012 KJ/kg and 32.0705 kg/sec respectively which has impact on thermal efficiency calculations. In the absence of OEM/EPC guaranteed NCV and CCR values this method for efficiency calculations cannot be considered.
- 6.121. While discussing Reverse Equilibrium Calculation Method for efficiency calculations keeping in view the proposed guaranteed performance values of boiler, steam turbine, generator and auxiliary consumption, the net LHV thermal efficiency works out to be 37.24%. It is further mentioned by the petitioner that the





formula discussed under this method is applicable for single unit power plant, but for multiple units the formula is not accurate due to common system auxiliary consumption, like cooling water. It may be noted that in case the impact of common auxiliaries is considered by the Authority then it will lead to reduced auxiliary consumption as percent of gross capacity which ultimately results in improved efficiency numbers than claimed by the petitioner. The arguments provided by the petitioner are vague.

- 6.122. The Petitioner has also referred to 37% efficiency for upfront tariff. It would be pertinent to mention that that any efficiency levels under upfront tariff are set with a larger cross section of power plants in front, whereas the efficiency in the instant case is project specific and cannot be compared with the upfront tariff.
- 6.123. Keeping all above in view, the Authority has decided to allow auxiliary consumption at 8.98% of gross capacity and net LHV thermal efficiency at 37.25%. The output degradation, heat rate degradation and partial load adjustments shall be applicable as per standard clauses of the PPA and as per curves provided by the OEM. Startup costs shall also be dealt with the Power purchaser in accordance with the PPAs.
- 6.124. Net efficiency and net output shall be subject to performance tests at the time of COD by an Independent Engineer and in case the net efficiency and net output of the complex are established higher than the approved values, downward adjustments shall be made in fuel cost component and capacity charge components. No adjustments shall be made in tariff components in case the net efficiency and net output of the complex are established lower than the approved values.

Fuel Cost Component

6.125. In the decision dated 19th December 2018, coal price of US\$ 107.40/ton was used based on custom duty @ 3%. Currently the rate of custom duty is 5% and the same has been incorporated in the coal price. Accordingly the revised coal price works out US\$ 109.27/ton. Based on the revised coal price, revised efficiency and exchange rate of Rs. 105/US\$, the fuel cost component works out Rs. 4.8157/kWh.

Cost of Working Capital

6.126. Similarly on the basis of revised coal price and current KIBOR of 10.99%, the cost of working capital works out Rs. 0.2406/kW/hour.



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Adjustment on Account of O&M Costs;

- 6.127. According to the Petitioner, the Company submitted a total O&M tariff of PKR 0.9001 per kWh (at 85% PF) which includes several operator and non-operator costs such as O&M contractor fee, corporate overheads, security cost, ash disposal, desulphurization etc. The Company believes the aforesaid cost to be justified on following grounds:
 - a) This includes special security cost of USD 2.26 million per annum (PKR 0.1167 per kWh), which given the strategic nature of the Project and its location is fully justified and should be allowed as a pass through item. O&M tariff net of special security cost works out to be PKR 0.7834 per kWh.
 - b) The amount includes cost of ash disposal of USD 1.64 million per annum (PKR 0.0847 per kWh) as well. This information has already been shared with the Authority on 2 September 2018. O&M cost (net of security and ash disposal cost) works out to be around PKR 0.6987 per kWh.
 - c) The Project has adopted sea-water flue gas desulphurization ("SWFGD") process, breakup of which has not been provided separately by the O&M contractor due to which precise amount for the standalone process cannot be provided by the Company. In this regard, the Authority should rely on Upfront Tariff 2014, in which PKR 0.09 per kWh was provided for limestone cost. The Authority may kindly note that although the Project will not use limestone in the Project, the purpose of using limestone is not eliminated entirely and desulphurization process still needs to be performed, which has certain cost associated to it. Therefore, using desulphurization cost of PKR 0.09 per kWh, net O&M cost works out to be PKR 0.6087 per kWh.
- 6.128. According to the Petitioner, compared to the above the Authority has allowed an O&M cost of PKR 0.49/kWh whilst comparing it with a 220 MW project under Upfront Tariff 2014. Firstly, it may be noted that O&M cost for a 220 MW is not comparable to O&M cost of a 150 MW unit; a fact which has been acknowledged in the Upfront Tariff 2014 itself when awarding different O&M tariffs for different project sizes. Secondly, benchmark tariff is being used from the determination which was published around 4.5 years back where indexed values of the same have increased to around PKR 0.54 per kWh @ PKR 105/USD.



- 6.129. According to the Petitioner, based on the indexed values, net O&M cost of PKR 0.6087 per kWh is only 12.7% higher compared to indexed O&M tariff of Upfront Tariff 2014, which stands justified on grounds of substantial escalator in terms of manpower and services cost which prevail in Gwadar compared to other similar projects developed in Pakistan.
- 6.130. The Petitioner vide its letter dated April 25, 2019 submitted the results of investigation conducted by the project company of O&M cost of power plant in China sharing same characteristics with 300MW power plant at Gwadar. The project company submitted the following evidences for reference purposes regarding Yearly O&M Cost Comparison for 2x150 MW Power Plant and 2X600 MW Power Plant in China:

7,000 hours		Uni	t 10,000 US\$
Item	2×150MW	2×600MW	Ratio
Fix cost	929.72	1722.54	54%
Manpower	555.22	913.43	61%
administration	46.27	76.12	61%
Fix maintenance cost	193.86	339.26	57%
A overhaul (Years of amortization)	22.99	78.81	29%
B overhaul (Years of amortization)	43.10	147.76	29%
C overhaul (Years of amortization)	28.73	98.51	29%
desulfurization facilities overhaul	13.43	31.34	43%
Utility system overhaul	15.67	22.39	70%
Production buildings and ancillary facilities	10.45	14.93	70%
Variable cost	279.13	1241.55	22%
consumable material for production	144.81	346.03	42%
desulfurizer materials	59.70	373.13	16%
materials for denitration reductant	44.78	298.51	15%
Chemical for reclaim water	29.85	223.88	13%
Total	1208.86	2964.10	41%

Note

• The total cost ratio of 300MW plant and 1200 MW plant is about 41% which is

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13% lower than the fix cost part but 19% higher than variable cost part.

- The above-mentioned power plants are located in the same areasin China and owned by same owner if those conditions change the data will alter accordingly but the cost ratio will remain non-significant change.
- The manpower cost, administration cost and spare parts cost will be increased sharply if location of plants are outside of China due to the foreign subsidiary of employees, travel expense and relevant cost.
- The ash of power plants will be recycled timely and the limestone is easily approachable in the area of power plants location.
- The O&M unit cost of larger capacity plants is much lower than the smaller one and the comparison sheet above demonstrated no strict linear relationship of O&M cost but a certain of reduction.
- 6.131. The submissions of the Petitioner have been carefully examined. It would be pertinent to mention that the requested security cost of US\$ 2.26 million per annum may not be realistic as it is derived from signed security contract with Chinese company namely Beijing Qianxiang Security Services amounting to USD 5.77 million based on 30 months construction period. In case of 1263 MW large scale RLNG based Punjab Thermal Power Project security cost of USD\$ 0.61 million/annum under the head of O&M cost during operation phase was approved and the same is being approved in the instant case.
- 6.132. According to Regulation 29 of the CERC Tariff Regulations 2014 India, the benchmark O&M cost is IRs. 30.51 Lakh/MW for 200/210/250 MW Sets for FY 2018-19. On the basis of prevailing exchange rate of approximately IRs. 72/US\$, the O&M cost works out US\$ 42,375/MW. On the basis of CERC benchmark, the total annual O&M budget for 300 MW works out US\$ 12.71 million. The Authority has decided to rebase the annual O&M cost on regional benchmark of US\$ 12.71 million along with annual security cost of US\$ 0.61 million. Accordingly, US\$ 13.32 million is being approved on account of annual O&M cost. The determined O&M cost shall be subject to approved indexations during the term of the PPA. The details of the O&M tariff is provided as under:

Item	Cost	Tariff Component	
Variable O&M Cost:	US\$ 2.67 million	Rs. 0.1379/kWh	
Local	52%	Rs. 0.0717/kWh	
Foreign	48%	Rs. 0.0662/kWh	
Fixed O&M Cost:	US\$ 10.65 million	Rs. 0.4676/kW/h	
Local	50%	Rs. 0.2338/kW/h	
Foreign	50%	Rs. 0.2338/kW/h	



Adjustment on Account of Debt to Equity Ratio;

- 6.133. According to the Petitioner, as per Article 19.3 of the Impugned Order, the Authority has determined that once proposed by the project company, change in capital structure resulting in higher tariff shall not be allowed. The Company proposed in the Tariff Petition that project will be funded by 80% debt based on indicative term sheet provided by lenders, which is pending final approval based on final tariff to be determined by the Authority. Capital structure typically determined by the Authority in the past allowed debt within the range of 70% 80% and even the Guidelines have not provided any change in this regard. In light of the same, the Authority may kindly retain the flexibility in debt to equity ratio as per the precedent.
- 6.134. The decision of the Authority to fix the proposed debt equity structure of 80:20 by the Petitioner and not to allow adjustment for actual equity investment higher than 20 % is in line with the recent decisions of the Authority in similar cases. The Authority has decided to maintain its earlier decision in the matter.
- 6.135. On the basis of revised project cost of US\$ 399.428 million, revised loan amount of US\$ 319.543 million and current LIBOR of 2.60% plus a premium of 4%, the debt servicing component of tariff works out Rs. 1.6567/kW/Hour and the same is being approved. At the time of COD, the tariff shall be trued up on the basis of allowed adjustment and the reference debt servicing component shall be re-established. Thereafter during the repayment period of the loan, the debt servicing component of tariff shall be adjusted for variation in LIBOR and exchange rate.

Adjustment on Account of Return on Equity;

- 6.136. According to the Petitioner, the Authority has unilaterally reduced Return on Equity ("ROE") from 17% to 14% on the following basis:
 - a) Overall country risk has come down;
 - b) The need for power projects has reduced over time.
- 6.137. According to the Petitioner, the Authority may note that country risk of a country is depicted by its macro-economic indicators such as foreign exchange reserves, current account balance, reserves adequacy, GDP growth etc. all of which are trending negatively since 2014. Mere addition of power to the grid does not itself bring down the overall country risk.
- 6.138. A brief summary of the overall country risk position is provided below:





- a) Total debt and liabilities have increased from PKR 17.4 trillion in 2014 to PKR 28.4 trillion in 2018, an increase of 63.2%. The increase in the same as % of GDP is from 69% to 83% over the same period.
- b) Current account deficit has increased from USD 3.13 billion in 2014 to USD 18.13 billion in 2018, an increase of 479%. The increase in the same as % of GDP is from 1.3% to -5.8% over the same period.
- c) Foreign exchange reserves have reduced from USD 13.5 billion in 2015 to USD 9.89 billion in 2018, a decrease of 26.7%.
- d) Credit rating at the start of 2015 by Fitch and Moody's was B and B3 respectively, which is considered a highly speculative country to invest in. The credit rating provided by Fitch and Moody's recently is B- and B3 respectively, which still falls under highly speculative category for investment.
- 6.139. Moreover, the Project is situated in a high risk zone as well as the CSR requirements imposed on the Company further justify the need for a higher return. In light of the above, the Petitioner requested the Authority to reconsider its decision on the matter and approve the return sought by the Company of 17%.
- 6.140. The approved ROE of 14% on IRR basis is in line with the return allowed to other power technologies/fuels in recent times e.g. wind, solar hydro and nuclear. The Authority has already initiated proceedings for benchmarking of equity returns for different technologies/fuels. The proposed ROE on IRR basis for similar imported coal projects is less than the 14% allowed to the instant project. The ROE has been determined keeping in view the peculiar location of the project. Therefore, the Authority has decided to maintain its earlier decision of allowing ROE of 14% on IRR basis in the instant case.
- 6.141. On the basis of revised project cost of US\$ 399.428 million, revised equity investment of US\$ 79.886 million and ROE on IRR basis of 14%, the ROE component of tariff including ROEDC works out Rs. 0.5922/kW/Hour and the same is being approved. At the time of COD, the tariff shall be trued up on the basis of allowed adjustment and the reference ROE component shall be re-established. Thereafter during the term of the PPA, the ROE component of tariff shall be adjusted for variation in exchange rate.

Adjustment on Account of Fuel Cost Component;

6.142. According to the Petitioner, as per Article 22.4 of the Impugned Order, the Authority has set the fuel pricing mechanism dated 23 September 2016 ("Fuel Pricing Mechanism") as the governing document for pricing coal. The Authority

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should note that Fuel Pricing Mechanism has only set API-4 as the relevant index to be used for South-African coal regardless of the calorific value of the same. Therefore, until and unless the Fuel Pricing Mechanism is not adjusted and a revised mechanism is not published by the Authority, any partial revision without any decision by the Authority may not be imposed on the Project.

- 6.143. According to the Petitioner, moreover, as per Article 22.3 of the Impugned Order, the Authority has changed the benchmark index for coal price from API-4 to API-3 on the premise that the design coal requirements for the Project is 5,500 kCal/kg. The Authority may note that as per the performance guarantees submitted to the Authority, the design coal calorific value is 5,371 kCal/kg (LHV) on as received basis, which is basically the minimum calorific value required to ensure performance of the boiler. Therefore, calorific value of coal used may be beyond 5,500 kCal/kg during operations upon which API-4 will be the relevant index. Therefore, it is proposed that the relevant index may be kept flexible based on which calorific value coal will be procured by the Company.
- 6.144. The Petitioner in its original petition calculated fuel cost component on the basis of coal proposed coal procurement of NAR 5,500 kcal/kg. from South Africa. The Petitioner suggested to use API-4 index for NAR 6,000 kcal/kg. in line with the decision of the Authority dated 23rd September 2016. The Authority used API-3 (NAR 5,500 kcal/kg.) for benchmark price index as it had been observed from the fuel price adjustments of coal based IPPs that coal of 5,500 kcal/kg. was being traded at a discount and if benchmark index of API-4 was used, linear adjustment of API-4 for lower CV would not give true price. Therefore, the appropriate index in the instant case was Argus Mcloski's API-3 (NAR 5,500 kcal/kg.). Accordingly, the Authority decided to use API-3 for NAR 5,500 kcal/kg. as the benchmark index along with other indices approved by the Authority in its decision dated 23rd September 2016. The Petitioner is free to buy coal at API-4 (NAR 6,000 kcal/kg.) as provided in the referred decision. Further, the Authority has already decided to review the benchmark price indices provided in the decision dated 23rd September 2016 and proceedings in the matter have already been initiated to introduce other price indices including API-3 in the fuel price adjustment mechanism for coal based IPPs. Therefore, the Authority has decided to maintain its earlier decision.

Adjustment on Account of Insurance during Operations;

6.145. According to the Petitioner, the Company applied for insurance during operations based on 1% of EPC cost which was in line with precedent determinations by the Authority for similar projects. However, the Authority has reduced the same based on Tariff Benchmark Guidelines vide SRO 763 (I)/2018 dated June 19, 2018 ("Guidelines") notified by the Authority, whereby the Guidelines have "proposed" insurance during operations for thermal projects at 0.70% of EPC cost and the same has been used by the Authority in the Impugned Order.





- 6.146. According to the Petitioner, as per Article 1(2) of the Guidelines, the Guidelines shall come into force after three months from the date of notification of the Guidelines i.e. 19 September 2018. As per Article 2 of the Guidelines, the Guidelines shall be applicable to all applications for tariff determination under NEPRA Tariff Standards and Procedure Rules, 1998, and the NEPRA Up-front Tariff (Approval & Procedure) Regulations, 2011 filed after the coming into force of these guidelines i.e. 19 September 2018. According to the Petitioner, since the Company submitted application for tariff determination on 12 January 2018, well before the publication of the Guidelines, the benchmarks as per the Guidelines should not be used in the instant case and are inapplicable.
- 6.147. The insurance cost at 0.70% of the EPC cost during operation period of the project is based on current insurance market trend. NEPRA (Benchmarks for Tariff Determination) Guidelines, 2018 was only used as a reference. The Authority is not constrained to allow 1% of the EPC cost even if the current market shows a declining trend. Therefore, the Authority has decided to maintain its earlier decision. However, on the basis of revised EPC cost, insurance cost works out US\$ 2.25 million and the insurance component of tariff works out Rs. 0.0988/kW/Hour which shall be subject to adjustment as per actual with maximum of 0.7% of the EPC cost at the prevailing exchange rate.

Payment mechanism for Capacity Payments.

- 6.148. According to the Petitioner, the Authority erred while prescribing that any delay on the part of the Power Purchaser / NTDC to complete the interconnection works shall result in 'Take and Pay' arrangement. This means that although the plant is ready for commissioning and operations, it cannot provide electricity to the national grid due to non-availability of the interconnection arrangement.
- 6.149. Furthermore, even though the delay is caused by and on account of the Power Purchaser / NTDC, the Company will be penalized in not getting the payments and shall therefore default on the payments to the lenders and contractors whereas the Power Purchaser / NTDC will get away without any penalty. They shall have no incentive or an obligation to complete the interconnection works in time as there are no penal consequences attached with it.
- 6.150. According to the Petitioner, this new proposal and term and condition of the Tariff is unprecedented and contrary to the terms and conditions of the Power Purchase Agreements approved by the Government of Pakistan since 1994 and in breach of the Power Generation Policy 2015 wherein the responsibility of providing timely interconnection works lies with the Power Purchaser / NTDC. Moreover, in project financing, the risk and cost of a particular cause or event is borne by a party that can best handle or manage it which in this particular case for interconnection







works is Power Purchaser / NTDC. It is therefore submitted that this condition is deleted and same terms and conditions are made applicable that were given to other power projects.

6.151. The submissions made by the Petitioner merits consideration and needs to be addressed. Accordingly, the Authority has decided to remove the condition of take and pay tariff till the time of interlinking of the project to the national grid. CPPA-G is directed to agree COD timelines keeping in view the timelines for interconnection with local grid and interlinking of the project with national grid. The average monthly capacity charges at the proposed tariff are approximately Rs. 627 million. In case there exist a mismatch between the COD of the project and availability of the national grid for interlinking of the project resulting in idle capacity charges to the project, specific approval shall be sought from the appropriate forum for passing on the same to the end consumers.

Summary of Tariff

6.152. In accordance with the decisions of the Authority in the preceding Paragraphs, the summary of the approved tariff is as under:

Description	Tariff	
Energy Charge (Rs./kWh):		
Fuel Cost Component	4.8157	
Variable O&M (foreign)	0.0662	
Variable O&M (Local)	0.0717	
Total	4.9536	
Capacity Charge (Rs./kW/hour):		
Fixed O&M (Local)	0.2338	
Fixed O&M (Foreign)	0.2338	
Cost of working capital	0.2406	
Insurance	0.0988	
SINOSURE Fee (Average) 1-13 Yrs	0.0523	
ROEDC	0 5022	
Return on Equity	0.3922	
Debt servicing (1-13 years only)	1.6567	
Total 1-13 years	3.1082	
Total 14-30 years	1.3992	
Avg. Tariff 1-13 years (Rs./kWh)	8.6103	
Avg. Tariff 14-30 years (Rs./kWh)	6.5997	
Levelized tariff (Rs./kWh)	8.1227	
Levelized tariff (Cents/kWh) 7.73		

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7. Order

I. In pursuance of Section 7(3)(a) & (g) of the Regulation of Generation, Transmission and Distribution of Electric Power Act 1997 read with Rule 6 of the NEPRA licencing (Generation) Rules, 2000, the Authority hereby determines and approves the generation tariff along with terms & conditions for CIHC Pak Power Company Limited for its 300 MW coal Power Project at Gawadar and adjustments/indexations for delivery of electricity to the power purchaser. The schedule of tariff and debt servicing schedule are attached as Annex-I and Annex-II respectively.

II. One-time Adjustment at COD

- a. Since the exact timing of payment to EPC contractor is not known at this point of time, therefore, an adjustment for relevant foreign currency fluctuation for the EPC portion of payment in the foreign currency shall be made against the reference exchange rate of Rs. 105/US\$ on the basis of actual payment. The adjustment shall be made only for the currency fluctuation against the reference parity value.
- b. For cost items other than foreign EPC cost, the amounts allowed in USD will be converted in PKR using the reference PKR/USD rate of 105 to calculate the maximum limit of the amount to be allowed at COD.
- c. Adjustment as per actual with maximum cap of the cost allowed for, bridges, housing colony, site levelling, boundary wall, security cost, project development and company & Sponsor cost, Anti-Corrosion Measures and fuel & startup cost before synchronization.
- d. In case NTDC do not validate the requirement of black start facility, the cost of US\$ 6.9 million on account of black start facility shall be excluded from the project cost at the time of COD adjustment of tariff.
- e. Cost of construction power shall be adjusted for actual consumption during construction period and for any energy received from QESCO.
- f. The Customs Duties and Cess shall be adjusted as per actual.
- g. Adjustment of the cost of land on actual basis.
- h. Adjustment of Sinosure fee as per actual with maximum of 0.6% of the yearly outstanding principal and interest amount during the construction period.
- i. Adjustment as per actual of the Financing Fees & Charges subject to maximum of 2.0% of the debt amount.
- j. The IDC shall be re-established at the time of COD on the basis of applicable LIBOR, actual premium, actual loan and actual loan drawdown.



k. ROE component of tariff shall be adjusted for variation in actual equity drawdown during the construction period.

III. Adjustments due to Performance Test

Net efficiency and net output shall be subject to performance tests at the time of COD and in case the net efficiency and net output of the complex are established higher than the approved values, downward adjustments shall be made in fuel cost component and capacity charge components respectively. No adjustments shall be made in tariff components in case the net efficiency and net output of the complex are established lower than the approved values.

IV. Adjustment in Insurance as per actual

The actual insurance cost for the minimum cover required under contractual obligations with the Power Purchaser not exceeding 0.7% of the EPC cost shall be treated as pass-through. Insurance component of reference tariff shall be adjusted annually as per actual upon production of authentic documentary evidence according to the following formula:

AIC	=	Ins(Ref) / P(Ref)* P(Act)
Where		
AIC	=	Adjusted Insurance Component of Tariff
Ins (PEE)	=	Reference Insurance Component of Tariff
		Reference Premium US\$ 2.25 million at Rs. 105/US\$.
P(Act)	=	Actual Premium or 0.7% of the EPC cost at exchange rate
		prevailing on the 1st day of the insurance coverage period
		whichever is lower

V. Indexations

The following indexations shall be applicable to the reference tariff;

i) Indexation of Return on Equity (ROE)

ROE component of tariff shall be quarterly indexed on account of variation inRs./US\$ parity according to the following formula:

ROE (Rev)	=	ROE(Ref)*ER(Rev)/ER(Ref)
Where		
ROE (Rev)	=	Revised ROE Component of the Tariff
ROE (Ref)	=	Reference ROE Component of the Tariff
ER(Rev)	=	The revised TT & OD selling rate of US dollar as notified by the National Bank of Pakistan
ER(Ref)	=	The reference exchange rate of Rs. 105/US\$





ii) Indexation applicable to O&M

O&M components of tariff shall be adjusted on account of local CPI, US CPI and exchange rate quarterly on 1st July, 1st October, 1st January and 1st April based on the latest available information with respect to CPI notified by the Pakistan Bureau of Statistics (PBS), US CPI (All Urban Consumers) issued by US Bureau of Labor Statistics and revised TT & OD selling rate of US Dollar notified by the National Bank of Pakistan as per the following mechanism:

F V. O&M(REV)	=	F V. O&M (REF) * US CPI(REV) / US CPI(REF) *ER(REV)/ER(REF)
L V. O&M(REV)	=	L V. O&M (REF) * CPI (REV) / CPI (REF)
L F. O&M(REV)	=	L F. O&M (REF) * CPI (REV) / CPI (REF)
F F. O&M(REV)	=	F F. O&M (REF) * US CPI(REV) / US CPI(REF) *ER(REV)/ER(REF)
Where:		
F V. O&M(REV)	=	The revised Variable O&M Foreign Component of Tariff
L V. O&M(REV)		The revised Variable O&M Local Component of Tariff
L F. O&M(REV)	=	The revised Fixed O&M Local Component of Tariff
F F. O&M(REV)	=	The revised Fixed O&M Foreign Component of Tariff
F V. O&M(REF)	=	The reference Variable O&M Foreign Component of Tariff
L V. O&M(REF)		The reference Variable O&M Local Component of Tariff
L F. O&M(REF)	=	The reference Fixed O&M Local Component of Tariff
F F. O&M(REF)	=	The reference Fixed O&M Foreign Component of Tariff
CPI(REV)	=	The revised CPI (General)
CPI(REF)	=	The reference CPI (General) for June 2019
US CPI(REV)	=	The revised US CPI (All Urban Consumers)
US CPI(REF)	=	The reference US CPI (All Urban Consumers) for June 2019
ER(REV)	=	The revised TT& OD selling rate of US dollar
ER(REF)	=	The reference TT& OD selling rate of RS. 105/US\$

iii) Indexation for LIBOR Variation

The interest part of capacity charge component will remain unchanged throughout the term except for the adjustment due to variation in interest rate as a result of variation in 3 months LIBOR according to the following formula;

ΔΙ	=	P(REV)* (LIBOR(REV) - 2.60%) /4		
Where:				
ΔΙ	=	the variation in interest charges applicable corresponding to		
		variation in 3 months LIBOR. Δ I can be positive or negative		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
			IER DA	~

3		depending upon whether LIBOR _(REV) is > or < 2.60%. The interest payment obligation will be enhanced or reduced to the extent of ΔI for each quarter under adjustment applicable on quarterly basis.
P(REV)	=	The outstanding principal (as indicated in the attached debt service schedule to this order) on a quarterly basis on the relevant period calculation date. Period 1 shall commence on the date on which the 1 st installment is due after availing the grace period.
LIBOR(Rev)	=	Revised 3 month LIBOR as at the last date of the preceding quarter

iv) Cost of Working Capital

The cost of working capital shall be adjusted quarterly for variation in KIBOR and fuel price.

v) Fuel Price Adjustment

The fuel cost component of tariff subsequent to adjustment of heat rate test at COD shall be adjusted on account of fuel price variation in accordance with the mechanism stipulated in the decision of the Authority dated 23rd September 2016 modified from time to time.

vi) SINOSURE FEE

Sinosure fee component of tariff during operation will be adjusted based on the revised principal and interest components.

VI. Terms & Conditions

The following terms and conditions shall apply to the determined tariff:

- **i.** All plant and equipment shall be new and shall be designed, manufactured and tested in accordance with the acceptable standards.
- ii. The verification of the new machinery will be done by the independent engineer at the time of the commissioning of the plant duly verified by the power purchaser.







- **iii.** The tariff has been determined on the basis of debt equity ratio of 80:20. For equity share of more than 20%. For equity share of more than 20%, allowed IRR shall be neutralized for the additional cost of debt:equity ratio.
- iv. The sponsor of the project can arrange foreign financing in American Dollar (\$), British Pound Sterling (£), Euro (€) and Japanese Yen (¥) or in any currency as the Government of Pakistan may allow.
- **v.** Debt servicing & Sinosure fee components of tariff shall be applicable for the 1st twelve and a half years of the tariff control period.
- vi. The plant availability shall be 85%.
- vii. The tariff control period shall be 30 years from the date of commercial operation.
- **viii.** The dispatch will be at appropriate voltage level mutually agreed between the power purchaser and the power producer.
 - ix. The dispatch shall be in accordance with economic merit order.
 - x. CPPA-G is directed to agree COD timelines keeping in view the timelines for interconnection with local grid and interlinking of the project with national grid. In case there exist a mismatch between the COD of the project and availability of the national grid for interlinking of the project resulting in idle capacity charges to the project, specific approval shall be sought from the appropriate forum for passing on the same to the end consumers.
 - xi. In case the company is obligated to pay any tax on its income from generation of electricity, or any duties and/or taxes, not being of refundable nature, are imposed on the company, the exact amount paid by the company on these accounts shall be reimbursed on production of original receipts. This payment shall be considered as a pass-through payment. However, withholding tax on dividend shall not be passed through.
- xii. No provision for the payment of Workers Welfare Fund and Workers Profit Participation has been made in the tariff. In case, the company has to pay any such fund, that will be treated as pass through item in the PPA.
- **xiii.** General assumptions, which are not covered in this determination, may be dealt with as per the standard terms of the Power Purchase Agreement.







VII. CSR Activities

The Petitioner shall ensure completion of following CSR activities communicated vide letter No. CIHC/POCPEC/2018-186 dated 19th November 2018:

- i. CPPCL will comply with various federal, state, and local community regulations.
- ii. CPPCL will recruit law-abiding corporate citizens for the development of the local communities.
- **iii.** CPPCL will provide services to the local communities that at least meet minimal legal requirements.
- iv. CPPCL is bound to observe health and safety and healthy working conditions.
- v. CPPCL follows non-discriminatory employment policy.
- vi. CPPCL will construct a training centre for fishermen of Gawadar District to uplift their life style and to increase their business activities.
- vii. Tree plantation shall be carried out by CPPCL, the figure would be commonly concurred amongst CPPCL and GOB.
- **viii.** The company will provide solar energy panels to the surrounding communities.
- ix. The maximum number of unskilled and skilled occupations will be given to local people preferably Gawadar District and then of Makran and different parts of Baluchistan Province.
- **x.** Small contracts and use of logistic services like dumpers, tractors, water tankers shall be given to the local community based on transparency and fair competitiveness.
- **xi.** The CPPCL will build up a school for boys and girls in vicinity of power plant. The running of the school shall be carried out with the assistance of GOB and concerned organization.
- xii. The Company will look after the health, general medical, education, mobility, dignity and different needs of 100 debilitate individuals of both genders from local families of Gwadar. The selection criteria will be finalized in consultation with steering committee.
- **xiii.** CPPCL will contribute a certain level of profit after an assessment on CSR i.e. wellbeing, education, occupation and other community welfare activities.
- **xiv.** CPPCL will give preferential employment to local communities and other parts of Baluchistan. Local Engineers will be also hired for the power plant operations, and

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local engineers will also be sending to China to get them trained in relevant fields.

- **xv.** CPPCL shall meet the national environmental protection emission standards of Pakistan in line with international standards.
- **xvi.** CPPCL shall ensure that the marine life feeding, resting or reproductive habitat is not harmed and their ability to survive is ensured.
- xvii. CPPCL shall carry out training and awareness of waste handling workers.
- **xviii.** CPPCL shall adhere to the concerns of the GOB regarding CSR and environmental health issues.
 - xix. CPPCL shall establish bricks factories for recycling of ash produced from the Power Plant.

VIII. NOTIFICATION

The above Order of the Authority along with 2 Annexes shall be notified in the Official Gazette in terms of Section 31(7) of the Regulations of Generation, Transmission and Distribution of Electric Power Act, 1997.

AUTHORITY

(Saif Ullah Chattha) Member

(Rafique Ahmed Shaikh) Member

(Rehmatullah Bal

Vice Chairman



CIHC PAK POWER COMPANY LIMITED REFERENCE TARIFF TABLE

		Energy Purchase Price (Rs./kWh)		Nh)	Capacity Purchase Price (PKR/kv					KR/kW/Ho	₹/k₩/Hour)				Total Tariff		
	Year	Fuel Cost Component	Var. O&M		Total	Fixed	08.M	8.M Cost of			Sinosure	Debt	Interest	Total	Capacity		
			Foreign	Local	EPP	Local	Foreign	W/C	Insurance	ROE	Fee	Repayment	Charges	CPP	Charge@ 85%	Rs./kWh	Cents/kWh
	1	4.8157	0.0662	0.0717	4.9536	0.2338	0.2338	0.2406	0.0988	0.5922	0.0896	0.7492	0.9075	3.1455	3.7006	8.6542	8.2421
	2	4.8157	0.0662	0.0717	4.9536	0.2338	0.2338	0.2406	0.0988	0.5922	0.0848	0.7999	0.8568	3.1407	3.6950	8.6485	8.2367
	3	4.8157	0.0662	0.0717	4.9536	0.2338	0.2338	0.2406	0.0988	0.5922	0.0797	0.8540	0.8027	3.1356	3.6889	8.6425	8.2310
	4	4.8157	0.0662	0.0717	4.9536	0.2338	0.2338	0.2406	0.0988	0.5922	0.0742	0.9118	0.7449	3.1301	3.6825	8.6361	8.2248
	5	4.8157	0.0662	0.0717	4.9536	0.2338	0.2338	0.2406	0.0988	0.5922	0.0684	0.9735	0.6832	3.1243	3.6756	8.6292	8.2183
	6	4.8157	0.0662	<u>0.0717</u>	4.9536	0.2338	0.2338	0.2406	0.0988	0.5922	0.0621	1.0393	0.6174	3.1180	3.6683	8.6219	8.2113
	7	4.8157	0.0662	0.0717	4.9536	0.2338	0.2338	0.2406	0.0988	0.5922	0.0555	1.1096	0.5470	3.1114	3.6604	8.6140	8.2038
	8	4.8157	0.0662	0.0717	4.9536	0.2338	0.2338	0.2406	0.0988	0.5922	0.0484	1.1847	0.4720	3.1043	3.6521	8.6057	8.1959
	9	4.8157	0.0662	0.0717	4.9536	0.2338	0.2338	0.2406	0.0988	0.5922	0.0408	1.2649	0.3918	3.0967	3.6432	8.5967	8.1874
	10	4.8157	0.0662	0.0717	4.9536	0.2338	0.2338	0.2406	0.0988	0.5922	0.0327	1.3504	0.3063	3.0886	3.6336	8.5872	8.1783
	11	4.8157	0.0662	0.0717	4.9536	0.2338	0.2338	0.2406	0.0988	0.5922	0.0240	1.4418	0.2149	3.0799	3.6234	8.5770	8.1686
	12	4.8157	0.0662	0.0717	4.9536	0.2338	0.2338	0.2406	0.0988	0.5922	0.0148	1.5393	0.1174	3.0707	3.6126	8.5662	8.1582
	13	4.8157	0.0662	0.0717	4.9536	0.2338	0.2338	0.2406	0.0988	0.5922	0.0050	1.6166	0.0401	3.0609	3.6010	8.5546	8.1472
	14	4.8157	0.0662	0.0717	4.9536	0.2338	0.2338	0.2406	0.0988	0.5922		÷		1.3992	1.6461	6.5997	6.2854
	15	4.8157	0.0662	0.0717	4.9536	0.2338	0.2338	0.2406	0.0988	0.5922	-	-	<u> </u>	1.3992	1. 64 61	6.5997	6.2854
	16	4.8157	0.0662	0.0717	4.9536	0.2338	0.2338	0.2406	0.0988	0.5922			<u> </u>	1.3992	1.6461	6.5997	6.2854
	17	4.8157	0.0662	0.0717	4.9536	0.2338	0.2338	0.2406	0.0988	0.5922	·	-		1.3992	1.6461	6.5997	6.2854
	18	4.8157	0.0662	0.0717	4.9536	0.2338	0.2338	0.2406	0.0988	0.5922		-	<u>-</u>	1.3992	1.6461	6.5 9 97	6.2854
	19	4.8157	0.0662	0.0717	4.9536	0.2338	0.2338	0.2406	0.0988	0.5922		-		1.3992	1.6461	6.5997	6.2854
	20	4.8157	0.0662	0.0717	4.9536	0.2338	0.2338	0.2406	0.0988	0.5922		-		1.3992	1.6461	6.5997	6.2854
ELECTRIC	21	4.8157	0.0662	0.0717	4.9536	0.2338	0.2338	0.2406	0.0988	0.5922		-	-	1.3992	1.6461	6.5997	6.2854
Str. S	22	4.8157	0.0662	0.0717	4.9536	0.2338	0.2338	0.2406	0.0988	0.5922		-	<u>·</u>	1.3992	1.6461	6.5997	6.2854
	23	4.8157	0.0662	0,0717	4.9536	0.2338	0.2338	0.2406	0.0988	0.5922		-		1.3992	1.6461	6.5997	6.2854
	<u>p 24</u>	4.8157	0.0662	0.0717	4.9536	0.2338	0.2338	0.2406	0.0988	0.5922		-		1.3992	1.6461	6.5997	6.2854
	P 25	4.8157	0.0662	0.0717	4.9536	0.2338	0.2338	0.2406	0.0988	0.5922		-	-	1.3992	1.6461	6.5997	6.2854
	26	4.8157	0.0662	0.0717	4.9536	0.2338	0.2338	0.2406	0.0988	0.5922				1.3992	1.6461	6.5997	6.2854
	27	4.8157	0.0662	0.0717	4.9536	0.2338	0.2338	0.2406	0.0988	0.5922		-	-	1.3992	1.6461	6.5997	6.2854
OHINA VAO	28	4.8157	0.0662	0.0717	4.9536	0.2338	0.2338	0.2406	0.0988	0.5922		-	-	1.3992	1.6461	6.5997	6.2854
N A	29	4.8157	0.0662	0.0717	4.9536	0.2338	0.2338	0.2406	0.0988	0.5922			-	1.3992	1.6461	6.5997	6.2854
de 1	30	4.8157	0.0662	0.0717	4.9536	0.2338	0.2338	0.2406	0.0988	0.5922	-	-	-	1.3992	1.6461	6.5997	6.2854
() ()	Averag	e					<u> </u>								<u> </u>	<u> </u>	
	1-13	4.8157	0.0662	0.0717	4.9536	0.2338	0.2338	0.2406	0.0988	0.5922	0.0523	1.1412	0.5155	3.1082	3.6567	8.6103	8.2003
	14-30	4.8157	0.0662	0.0717	4.9536	0.2338	0.2338	0.2406	0.0988	0.5922	-			1.3992	1.6461	6.5997	6.2854
	1-30	1 4.815/	0.0662	0.0717	4.9536	0.2338	0.2338	0.2406	0.0988	0.5922	0.0227	0.4945	0.2234	2.1398	2.51/4	1.4/10	7.1152
	1. 20	A 2157	0.0662	0.0717	4 05 26	0 2229	0.0338	0.2406	0.0000	0 5022	0.0462	0 7803	0.4500	2 6027	3 1601	8 1 2 2 7	7 7350
4	<u> </u>	L4.0137	0.0002		ad Tari	<u>0.∠330</u> ff =	8 1223	Re /LA/	1 0.0500	7 7250		U.1093	0.4590	2.0937	1 0.1091	0.1227	1.1333
				Levenz	cu i ali	–	0.1221	113./1141		1.1333	JUUR	***	\mathcal{O}				
									52				3			64	-

CIHC PAK POWER COMPANY LIMITED Debt Servicing Schedule Rs./US\$ Parity Debt (US\$ Million)

Gross Capacity (MW) Net Capacity (MW) LIBOR Spread over LIBOR Total Interest Rate

300.00 273.06 2.60% 4.00% 6.60%

105.00 319.54

l otal interest	Rate	0.00%						
Period	Principal	Principal Repayment	interest	Baiance Outstanding	Debt Servicing	Principai Repayment	interest	Debt Servicing
	US\$ Min.	US\$ Min.	US\$ Min.	US\$ Min.	US\$ Min.	Rs./kW/h	Rs./kW/h	Rs./kW/h
1	319.54	4.16	5.27	315.38	\$9.44			
2	315.38	4.23	5.20	311.15	9.44			
3	311.15	4.30	5.13	306.85	9.44	0 7492	0 9075	1 6567
1st Year	306.65	17.07	20.67	302.47	37.74	0.7432	0.3073	1,0007
5	302 47	4 44	4 99	298.03	9 44			
6	298.03	4.52	4.92	293.51	9.44			
7	293.51	4.59	4.84	288.92	9.44			
8	288.92	4.67	4.77	284.25	9.44	0.7999	0.8568	1.6567
2nd Year		18.22	19.52		37.74			
9	284.25	4.75	4.69	279.51	9.44			
10	279.51	4.82	4.61	274.68	9,44			
11	274.68	4.90	4.53	269.78	9.44	0.9540	0 9027	1 6567
12 3rd Voar	269.78	4.98	4.45	254.80	9.44	0.8540	0.8027	1.0007
12	264.90	13.40	10.49	250 72	31.14			
13	259.73	5.07	4.37	259.75	9.44			
14	254 58	5.13	4.29	234.56	9.44			
16	249.35	5.32	4.11	244.03	9.44	0.9118	0.7449	1.6567
4th Year	210.00	20.77	16.97	211.00	37.74			
17	244.03	5.41	4.03	238.62	9.44			
18	238.62	5.50	3.94	233.12	9.44			
19	233.12	5.59	3.85	227.53	9.44			
20	227.53	5.68	3.75	221.85	9,44	0.9735	0.6832	1.6567
5th Year		22.18	15.56		37.74			
21	221.85	5.77	3.66	216.07	9.44			
22	216.07	5.87	3.57	210.20	9.44			
23	210.20	5.97	3.47	204.24	9.44	1 0303	0.6174	1 6567
Sth Voar	204.24	23.68	14.06	196.17	37 74	1.0393	0.0174	1.0007
25	108 17	6.17	3 27	192.01	9.44			
26	192.01	6.27	3.17	185.74	9.44			
27	185.74	6.37	3.06	179.37	9.44			
28	179.37	6.48	2.96	172.89	9.44	1.1096	0.5470	1.6567
7th Year		25.28	12.46		37.74			
29	172.89	6.58	2.85	166.31	9.44			
30	166.31	6.69	2.74	159.62	9.44			
31	159.62	6.80	2.63	152.82	9.44	4 40 47	0.4700	4 6567
32	152.82	6.91	2.52	145.90	9.44	1,1047	0.4720	1,0007
oth fear	445.00	26.99	10.75	100.00	37.74			
33	145.90	7.03	2.41	138.88	9.44			
35	130.00	7.14	2.29	124 47	9.44			
36	124.47	7.38	2.05	117.09	9.44	1.2649	0.3918	1.6567
9th Year		28.81	8.93		37.74			
37	117.09	7.50	1.93	109.59	9.44			
38	109.59	7.63	1.81	101.96	9.44			
39	101.96	7.75	1.68	94.21	9.44			
40	94.21	7.88	1.55	86.33	9.44	1.3504	0.3063	1.6567
10th Year		30.76	6.98		37.74			
41	86.33	8.01	1.42	78.32	9.44			
42	/8.32	8.14	1.29	70.17	9.44			
43 44	61.90	8.28	1.16	61.89	9.44	1 4418	0 2140	1 6567
11th Year	01.09	32.85	1.02	53.48	37 74	0197.1	0.2170	1.0007
45	53.48	8.55	0.88	44 93	9 4 4			
46	44.93	8.69	0.74	36.23	9.44			
47	36.23	8.84	0.60	27.40	9,44			
48	27.40	8.98	0.45	18.41	9.44	1.5393	0.1174	1.6567
12th Year		35.07	2.67		37.74			
49	18.41	9.13	0.30	9.28	9.44			
50	9.28	9.28	0.15	0.00	9.44	1.6166	0.0401	1.6567
13th Voar		18 41	0.46		18 87			

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