State of Industry Report 2019

National Electric Power Regulatory Authority

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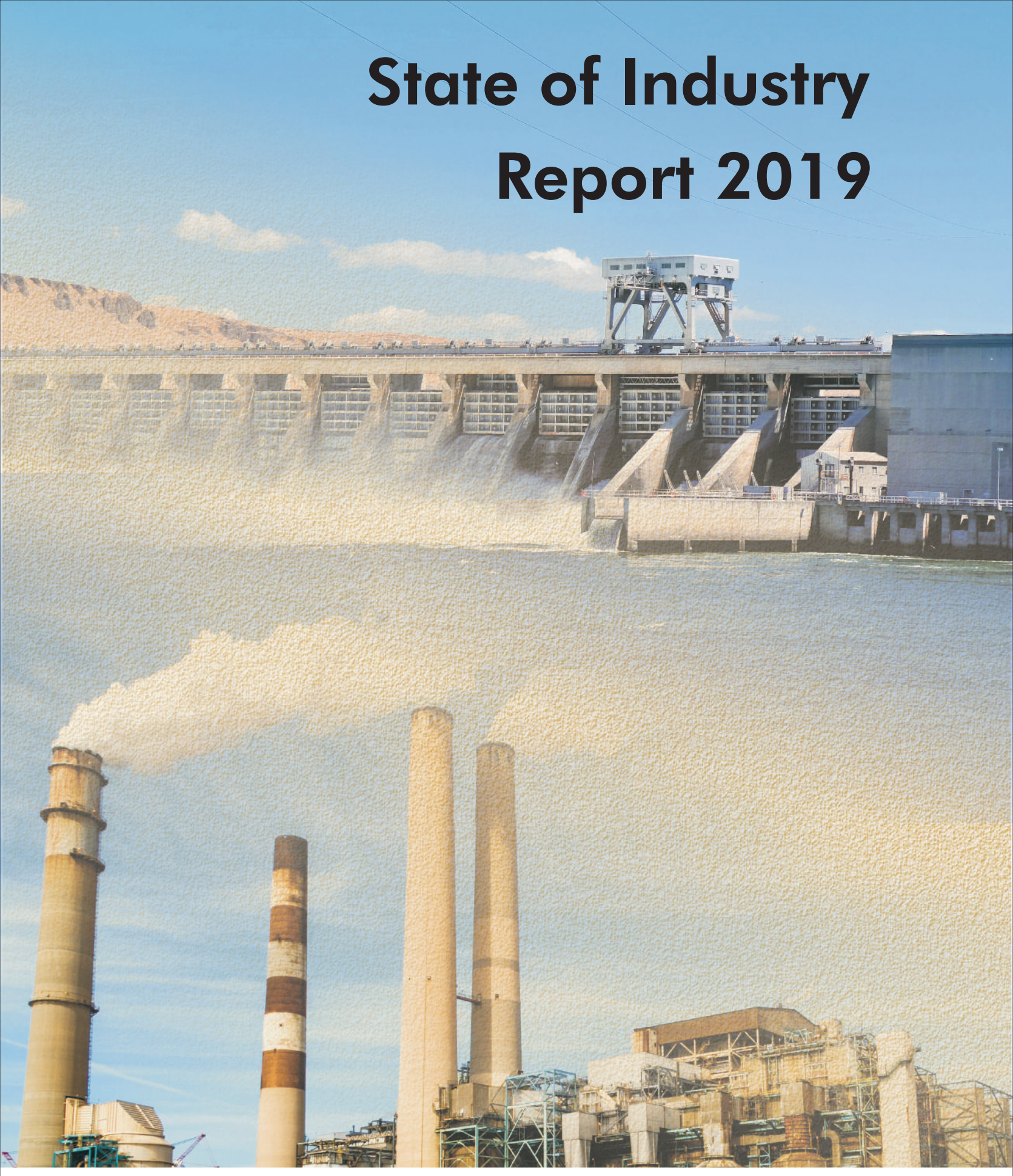

National Electric Power Regulatory Authority

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FOREWORD

In performing its functions under the Act, NEPRA is mandated to protect the interests of the consumers and companies providing electric power services in Generation, Transmission and Distribution sectors. NEPRA under the new leadership is redefining the course of Pakistan power sector.

The power sector is under extreme financial pressure due to high cost of electricity supply and poor performance of distribution sector. Coupled to the higher costs are shrinking energy sales, which has resulted in higher cost for the end-consumers; further damping energy usage. The vicious circle has to be broken to expect any upturn of the sector. Consequently, the Federal Government has to grapple with diverging objectives of viability of the entities and affordability of consumers to pay, higher tariffs. The circular debt of more than Rupees 1.6 trillion and its continuing accumulation calls for immediate corrective measures.

There are many factors to the state of affairs, which aggravated over years of bad governance, flawed planning and absence of balanced policies. Therefore, the new government has to face tremendous challenges it inherited from the past. Although the electricity sector of Pakistan presents complex settings to solve, lessons can be learned from the efforts made earlier. In this respect, measures such as injection of cash in the sector would only provide temporary support as long as the real issues are not addressed. Similarly DISCOs' practice of conducting load shedding on so called "high loss" distribution circuits may show short term gains, however essentially they will negatively impact overall sales growth.

During last year, however the Ministry of Energy (Power Division) had embarked upon specifically controlling losses on the high loss making feeders and improving recovery ratios in DISCOs, the two fundamental factors hurting the most. NEPRA fully supports the government in its efforts as reduction in number of "high loss" feeders will also result in sales growth so critical for overall reduction in consumer-end tariff. At the same time, efforts on war footing are to be initiated in all of the DISCOs so that high losses are brought to acceptable levels.

Another major contributor to the high cost of electricity generation is the operation of RLNG based power plants having long-term supply contracts. These plants due to nature of their contracts are required to operate in preference over other cheaper power plants. As a result, system operator is required to compromise overall economic merit order operation of power generation plants most of the times.

Due to technological advancements and steep decline in costs over the past few years, renewable energy is now challenging major conventional technologies as a choice for grid connected power generation. There are demonstrated innovative solutions to overcome intermittency and forecasting issues once considered as major bottlenecks to induction of renewables. Hybridization of renewable energy power plants is providing answers to many of the concerns for new renewable energy projects. For instance wind and solar or combination of hydro and solar have proved to overcome the intermittency issues while improving the overall capacity factors and efficient utilization of transmission capacity. It is however, the consumers, who have shown tremendous interest in going for NEPRA net metering regime mainly using solar panels. DISCOs on the other hand have continued to resist net metering regime as such. Although DISCOs have not been able to demonstrate through any analysis, they have claimed that the net metering regime is going to hurt them financially. Similar response by DISCOs is noted on "Wheeling" regime introduced by NEPRA in 2016. NEPRA is presently carrying out consultations with all stakeholders to address their relevant concerns.

Although preparation of short and long-term expansion plans by National Transmission and Despatch Company Limited (NTDC) is one of the main requirements of the Grid Code, this critically important function was completely ignored for the last many years. Presently on NEPRA's directions, a long-term Indicative Generation Capacity Expansion Plan (IGCEP) is being developed by NTDC. NEPRA has held a number of consultative sessions to ensure that all the "inputs" to the expansion plan like "demand forecast" are thoroughly analysed by the stakeholders including private sector experts. NEPRA expects to conduct more such consultative sessions before final approval of the Plan. Recently approved Renewable Energy Policy by Council of Common Interests (CCI) would also redefine the directions of long-term generation capacity expansion plans.

The real dilemma of the sector is that due to continued centralized control at every level, the DISCOs tend to seek shield against any measure, which leads to competition and opening of the sector. It is to be understood by the relevant agencies managing and in control of DISCOs that new concepts of electricity supply and delivery are being introduced at a fast pace. The NEPRA Amendment Act, 2018 has also entirely changed the concept of DISCOs' exclusivity to distribute electricity to consumers in their respective service territories. Therefore, continuity of those inefficiencies, which were accumulated earlier by DISCOs, cannot be allowed as such, with their new roles under the Amendment Act, 2018.

NEPRA in its earlier reports has kept on stressing that the prevailing governance model has totally failed to deliver and it would not be out of place to mention here that the present problems have emanated from centralized control. Persisting with this model would only reinforce the failure. Therefore, for any recovery of the sector, DISCOs have to be made independent, while total or partial privatization of DISCOs must be undertaken forthwith.

NEPRA also supports the Federal Government efforts for the possible privatization of two RLNG based combined cycle power plants at Balloki (District Kasur) and Haveli Bahadur Shah (District Jhang) having combined generation capacity of 2,453 MW. The proceeds from privatization would provide critical financial support to the country. NEPRA had already determined tariffs of these plants. In order to fetch maximum sale price out of these the Federal Government would like to make them attractive for the prospective bidders and tariff allowed by NEPRA to these power plants is one of such factors closely examined by the bidders. Nevertheless, NEPRA is mandated under the Act, to strike a balance to safeguard interests of investors and electricity consumers alike.

In order to make timely availability of transmission facilities and for provision of reliable electricity supply, NEPRA has granted licence to the first Provincial Grid Company as foreseen under the Amendment Act. Sindh Transmission and Dispatch Company Limited obtained a licence and is now authorized to engage in transmission of electric power within the territorial limits of the Province of Sindh. NEPRA expects that such licenses would promote competition in the transmission sector also, which is generally considered as a monopoly function.

The detailed statistics and data provided on the power sector in the State of Industry Report 2019, besides being a source of information, would also be useful for the decision makers as in the past.

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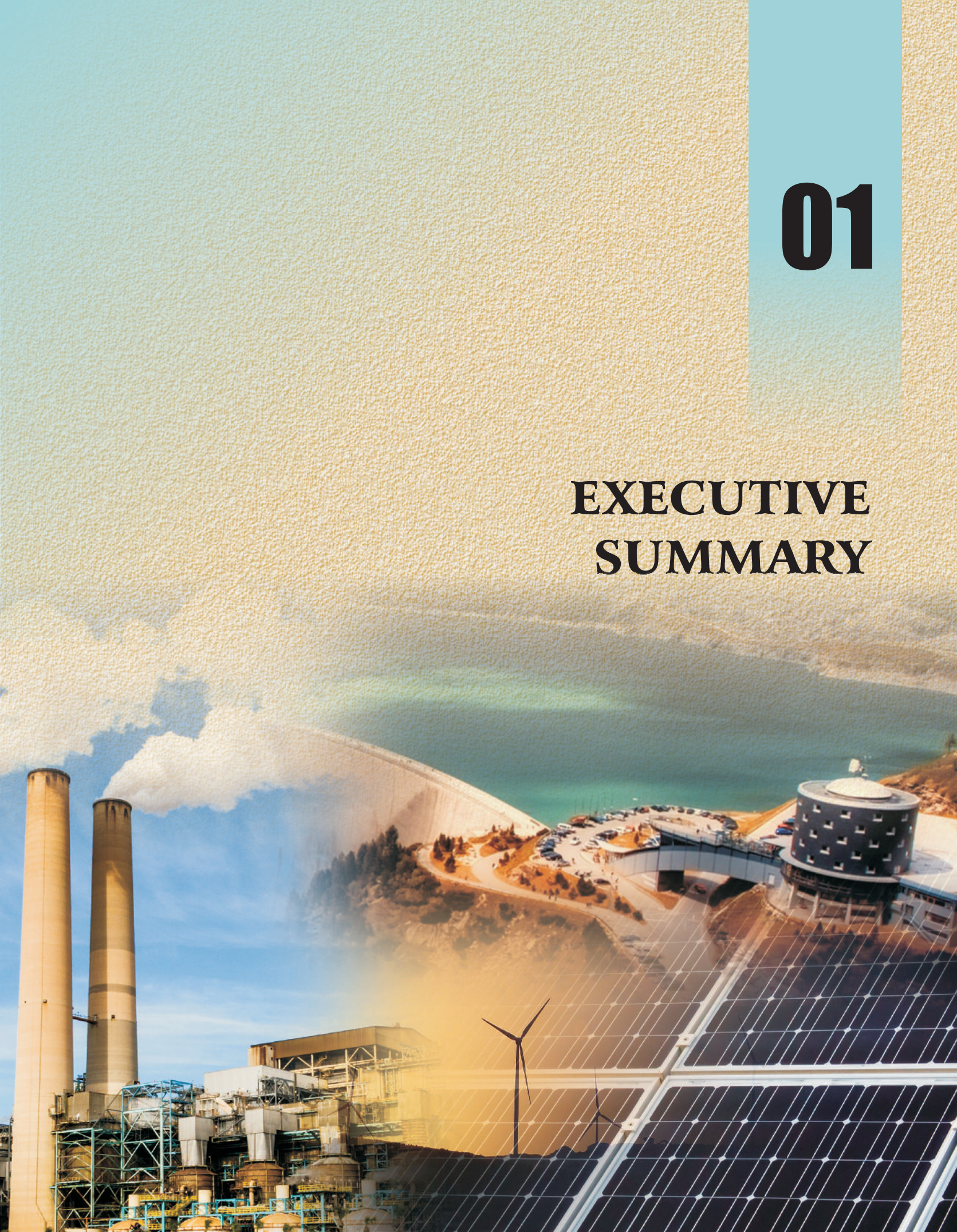
EXECUTIVE SUMMARY



EXECUTIVE SUMMARY

The State of Power industry is in a flux due to lop-sided and one-dimensional policies of the past many years. The whole process of power sector expansion starting with demand projections, planning and finally implementation lacked integrated approach throughout, with the result that in spite of massive investment in the generation sector over recent past years, the consumers of electricity have to face same issues including expensive energy, unreliable and inferior quality of power supply and overbilling.

A look at the historical trend shows the cyclic nature of development specifically in the power generation sector. Due to excessive and frequent shortages of electricity in nineties, 1994 Policy for power generation was introduced which attracted Independent Power Producers (IPPs) and by 2002 Pakistan was contemplating export of power to India. It is to be noted that due to availability of electricity relatively higher growth in electricity consumption was also witnessed, however over the next years, no new generation was added with the result that by 2009-10 the load shedding again hit the country. Taking cognizance, the policy makers at that time pursued a single point agenda to eliminate load shedding and more than 12,000 MW of power generation plants have already been added over a period of three years.

Though generation capacity has been added, some of the important issues like expensive cost of energy supply could not be resolved. A number of reasons may be worth mentioning here. With the exception of a few newer power plants, public sector GENCOs with drastically inferior efficiencies, which under some cases have deteriorated to about, half of their design values have not been taken out of the system against the recommendations of the regulator. Domestic gas, which is one of the scarce resources of the country, is being provided to the captive power plants who use it for running smaller size machines with very low efficiencies. If such gas is diverted to efficient machines, the cost of supply to the grid may be brought down. Similarly, long-term contracts for RLNG import have added constraints for the system operator to operate it optimally.

At the same time, the transmission and distribution sectors have been ignored completely. As also pointed out by NEPRA in its earlier industry reports the centralized governance model for DISCOs has failed to bring any noticeable improvements over a period of more than 15 years now. The distribution losses and recovery ratio have stayed where they were about five years back. The skill set and capacity of DISCOs to handle problems and their ability to meet the challenges of regulatory regime under the Amendment Act, 2018 is non-existent.

1.1 INSTALLED POWER GENERATION CAPACITY

Installed power generation capacity of Pakistan as of June 30, 2019 stands at 39,145 MW, of which 36,061 MW is connected with NTDC system whereas 3,084 MW is connected with K-Electric Limited (KE) system. Source-wise installed capacity for the years 2017-18 and 2018-19 is shown in the following table. It may be noted that close to 1,700 MW of thermal capacity was added in the PEPCO system during the period; an increase of 7.30% over the last year. About 1,100 MW of hydro-based capacity was also added in the system during the same period:

Source-wise Installed Capacity by Type (MW)

As on 30th June	2018	2019	Variation	
			Capacity	%
A. PEPCO/NTDC SYSTEM				
WAPDA Hydel	8,341	9,389	1,048	12.56
IPPs Hydel	372	372	0	0.00
TOTAL HYDEL	**8,713**	**9,761**	**1,048**	**12.03**
GENCOs with PEPCO	5,637	5,637	0	0.00
IPPs Connected with PEPCO	15,297	16,946	1,649	10.78
SPPs/CPPs Connected with PEPCO	340	340	0	0.00
CHASNUPP (I, II, III & IV)	1,330	1,330	0	0.00
TOTAL THERMAL including Nuclear	**22,604**	**24,253**	**1,649**	**7.30**
RE Power Plants connected with PEPCO	1,779	2,047	268	15.06
TOTAL PEPCO/NTDC	**33,096**	**36,061**	**2,965**	**8.96**
B. K-ELECTRIC SYSTEM				
KE Own	2,294	2,294	0	0.00
IPPs Connected with KE	366	366	0	0.00
SPPs/CPPs connected with KE	87	87	0	0.00
KANUPP	137	137	0	0.00
RE Power Plants connected with KE	--	200	200	0.00
TOTAL KE	**2,884**	**3,084**	**200**	**6.93**
Total Installed Capacity of the Country	**35,979**	**39,145**	**3,165**	**8.80**

Source: NTDC/KE

1.2 POWER BALANCES

1.2.1 NTDC System:

The installed capacity does not fully contribute to energy production due to various factors like auxiliary consumption, impact of site reference conditions and seasonality effects on the renewables and large hydropower plants. After accounting for above factors, the capacity, known as the Generation Capability, is effectively used for meeting the electricity demand. The data about generation capability and future demand as reported by NTDC is shown in the following table. It may be noted that in the year 2020 and onwards, the generation capability would be more than the demand:

Year ending 30th June	Installed Capacity (MW)	Planned Generation Capability as per NTDC (MW)	NTDC's Projected Demand Growth Rate (%)	NTDC's Projected Demand during Peak Hours (MW)*	Surplus/ (Deficit) (MW)
2019	35,924	26,887	3.9	27,261	(374)
2020	39,200	28,189	4.1	28,155	34
2021	42,008	30,582	4.2	29,325	1,257
2022	45,195	32,989	5.4	30,921	2,068
2023	48,915	35,896	3.3	31,953	3,943
2024	51,764	37,918	5.5	33,696	4,222
2025	57,224	39,157	5.1	35,422	3,735
2026	59,634	42,075	2.2	36,206	5,869
2027	60,758	40,433	5.6	38,227	2,206
2028	66,419	44,639	5.5	40,324	4,315
2029	67,559	45,437	5.4	42,519	2,918
2030	69,959	47,127	5.7	44,958	2,169

** NTDC develops the Demand Projections of Peak Demand only.*

- *Electricity Demand Forecast based on Regression Report (Period 2018-2040)*
- *Summary of Power Balance based on latest IGCEP 29 October, 2018*

Source: NTDC

1.2.2 K-Electric Limited System:

Following table shows power supply and demand position in KE system based on the investment plans of KE. It may be noted that throughout the period, KE is not able to meet the expected demand at peak times and outage of a power plant may result in breakdown of the system. Even the surplus expected in 2023 would not be enough to operate KE system with technically prudent margins:

Year ending 30th June	Installed Capacity (MW) [1]	Planned Generation Capability as per KE (MW) [2]	KE's Projected Demand Growth Rate (%) [3]	KE's Projected Demand during Peak hours (MW) [4]	Surplus/ (Deficit) (MW)
2020	3,132	3,155 [94]	7.42	3,392	(237.00)
2021	3,682	3,380 [134]	7.23	3,816	(436.00)
2022	5,082	3,916 [212]	7.67	4,228	(312.00)
2023	6,032	4,853 [212]	8.50	4,650	203.00

1. *Including KE (Own, Nuclear, IPPs, SPPs, CPPs etc.).*
2. *Including own generation and import from all sources including 650 MW from NTDC. Further, this includes supply from IPPs, which are under planning/approval and accordingly are subject to change. Numbers in [ ] indicate planned supply from renewable sources, however, given the intermittent nature of renewable projects, supply from these have not been accounted in projecting generation capability against peak demand.*
3. *Growth in peak demand does not include adjustments for AT&C based load-shed.*
4. *Peak Demand is after adjustment for AT&C based load-shed.*

Source: KE

1.3 PERFORMANCE OF GENERATION SECTOR

1.3.1 Public Sector (GENCOs, Nuclear and Hydel):

1.3.1.1 Jamshoro Power Company Limited (GENCO-I):

There has been no increase in the installed capacity of 1,024 MW of GENCO-I Power Stations at the end of June 2019 over that of 2018. The energy generated by GENCO-I during FY 2018-19 was 917.28 GWh, while, it was 1,887 GWh in FY 2016-17; a decrease of 970 GWh over last year. Net efficiency of GENCO-I during FY 2018-19 reduced to 26.71% for TPS Jamshoro and 23.13% for GTPS Kotri as compared to 27.46% and 25.19% respectively over the last year. With a capacity factor of 57.38% for TPS Jamshoro and 56.20% for GTPS Kotri due to outages and various maintenance issues, the overall performance of GENCO-I has not been satisfactory.

1.3.1.2 Central Power Generation Company Limited (GENCO-II):

Total installed capacity of GENCO-II, up to June 30, 2019 has been noted as 2,402 MW (excluding 28 MW TPS Quetta). No new generation plant was inducted during the year under review for GENCO-II. The energy generated by GENCO-II during FY 2018-19 has been recorded at 9,385 GWh while, it was 8,775 GWh during FY 2017-18. The energy generated by GENCO-II during FY 2018-19, has increased by 610 GWh compared with that of the last year.

It is observed that various units of GENCO-II have been off-bar for several years due to maintenance issues, forced outages, fuel constraints and rehabilitation activities etc. and are not being fully utilized. With reduced annual efficiency and increased auxiliary consumption, the overall performance of GENCO-II has remained unsatisfactory. The capacity factor of 747 MW CCPP Guddu as reported is 106.83% (reference CPGCL letter No. CPGCL/CEO/MIS/19/16326-28 dated 07-10-2019) which is unrealistic. The net efficiency of the 747 MW CCPP for the FY 2018-19 remained at 47.03% which is considerably low as compared to guaranteed efficiency of 54.4%. The performance of other units of GENCO-II was also not satisfactory as their reported efficiency remained at 24%~35%.

1.3.1.3 Northern Power Generation Company Limited (GENCO-III):

Total installed capacity of GENCO-III, up to June 30, 2019 has been noted as 2,061 MW similar to the last year's capacity levels. The energy generated by GENCO-III during FY 2018-19 was 2,716 GWh, while it was 5,871 GWh during FY 2017-18, showing a decrease of 3,155 GWh, compared with the last year owing to various reasons.

It is observed that the overall net efficiencies of TPS Muzaffargarh, SPS Faisalabad, GTPS Faisalabad and Nandipur remained very low. Due to various maintenance issues, forced outages and fuel constraints etc. considerably low annual capacity utilization factors of 7.97%, 0%, 15.74% and 39.10% for TPS Muzaffargarh, SPS Faisalabad, GTPS Faisalabad and Nandipur Power Plants respectively have been reported. The net efficiency of the CCPP Nandipur for the FY 2018-19 remained at 46% which is considerably low as compared to approved efficiency of 49% on gas fuel. The overall performance of GENCO-III was not satisfactory.

1.3.1.4 Lakhra Power Generation Company Limited (GENCO-IV):

Total installed capacity of GENCO-IV, up to June 30, 2019 has been noted as 150 MW. GENCO-IV had three units of 50 MW and during FY 2018-19 generated, zero GWh as compared to 3.39 GWh produced during FY 2017-18. The utilization factor of 0% for FY 2018-19 is noted in respect of GENCO-IV.

1.3.1.5 Nuclear (CHASNUPP-I, II, III & IV) and KANUPP:

During the FY 2018-19, total installed capacity of Nuclear Power Plants connected with NTDC's system, is noted as 1,467 MW similar to that of last year. The energy generated by Nuclear Power Plants during the FY 2018-19 stands at 9,136 GWh which is an increase of 85 GWh over the energy during the FY 2017-18. The overall performance of Nuclear Power Plants connected with NTDC's system has remained satisfactory during the FY 2018-19 as no major outage is noted.

1.3.1.6 Hydropower:

The installed capacity of WAPDA Hydropower increased to 9,389 MW at the end of June, 2019 as compared to 8,341 MW, recorded in FY ended June 2018. The increase is due to addition of 108 MW Golen Gol HPP and Tarbela 4th Extension having capacity of 1,410 MW. The 31,168 GWh generated in FY 2018-19 shows increase of 4,217 GWh from the last year. The Hydel IPPs, contributed 810 GWh more energy in the system during FY 2018-19 as compared to FY 2017-18. The hydropower production pattern over the year shows a downward trend as compared to the historical trends owing to seasonal variations and water flows. The availability and overall performance of major hydropower plants including Tarbela and Mangla remained satisfactory during the year FY 2018-19.

1.3.2 Private Sector (Independent Power Producers):

Total installed capacities of thermal IPPs connected with NTDC system at the end of June, 2019 are noted as 16,946 MW; 1,649 MW higher as compared to FY 2017-18. The enhancement in capacity has been recorded due to induction of coal fired 1,320 MW China Power Hub Plant and 330 MW Engro Thar Energy Power Plant. The energy generated by thermal IPPs connected with NTDC system during the FY 2018-19 is noted as 62,598 GWh against 62,434 GWh during the FY 2017-18 showing an increase of 164 GWh.

1.4 TRANSMISSION SYSTEM

As of 30 June 2019, NTDC is maintaining 16 (sixteen) 500 kV grid stations with a transformation capacity of 24,791 MVA. There are 42 (forty-two) 500/220 kV transformers and 34 (thirty-four) 220/132 kV transformers installed at these grid stations. At 220 kV level there are 45 grid stations with a transformation capacity of 29,935 MVA. There are 124 (one hundred and twenty four) 220/132 kV transformers installed at 220 kV grid stations.

Out of 42 transformers at 500/220 kV level, 24 transformers (57%) are loaded above 80% of their rated capacity. Similarly out of 158 transformers at 220/132 kV level, 69 are overloaded representing around 44% overloading in the system.

1.4.1 Outages on NTDC Transmission Lines (500 kV and 220 kV):

As reported by NTDC the number of planned outages at 500 kV and 220 kV levels in 2018-19 have decreased as compared to 2017-18. It is observed that the number of forced outages at 500 kV level in 2018-19 have also decreased as compared to 2017-18, whereas at 220 kV level the number of forced outages have slightly increased in 2018-19 as compared to 2017-18. As for duration of outages, the total duration of planned outages at 500 kV level have increased whereas, at 220 kV level the same has decreased in 2018-19 as compared to 2017-18. For forced outages, the total duration also increased in 2018-19 as compared to 2017-18 for both 500 kV and 220 kV levels. Therefore, the reliability levels did not show improvement as 220 kV deteriorated relative to last year:

Year	Description	Planned Outages		Forced Outages	
		500 kV	220 kV	500 kV	220 kV
2017-18	No. of Outages	812	1893	145	451
	Total Duration in Minutes	306551	858850	50551	273037
	Maximum Duration of any Single Outage (Min.)	25930	29037	7407	43411
2018-19	No. of Outages	704	1577	119	461
	Total Duration in Minutes	377422	785674	64896	317331
	Maximum Duration of any Single Outage (Min.)	23740	51258	23063	38542

Source: NTDC

1.5 DISTRIBUTION SYSTEM

1.5.1 Overloading in DISCOs System (Province-Wise):

Power delivery through DISCOs' networks mainly depends on the adequacy of three major components including 11 kV feeders, power transformers (mostly 132/11 kV transformers) and finally the distribution transformers. Province-wise statistics of overloading position for FY 2018-19 is shown in the following table:

Description	Punjab	Sindh	Khyber Pakhtunkhwa	Balochistan	Total
Total No. of 11 kV Feeders	6,247	1,064	1,271	642	**9,224**
Over-loaded 11 kV Feeders (Nos.)	957	186	488	200	**1831**
Over-loaded 11 kV Feeders (%)	**15.32**	**17.48**	**38.39**	**31.15**	**19.85**
Total No. of Power Transformers	1,352	251	291	180	**2,074**
Over-Loaded Power Transformers (Nos.)	187	58	127	66	**438**
Over-Loaded Power Transformers (%)	**13.83**	**23.11**	**43.64**	**36.66**	**21.12**
Total No. of Distribution Transformers	505,378	75,501	94,856	60,870	**736,605**
Over-loaded Distribution Transformers (Nos.)	35,564	3,668	8,047	9,823	**57,102**
Over-loaded Distribution Transformers (%)	**7.04**	**4.86**	**8.48**	**16.14**	**7.75**

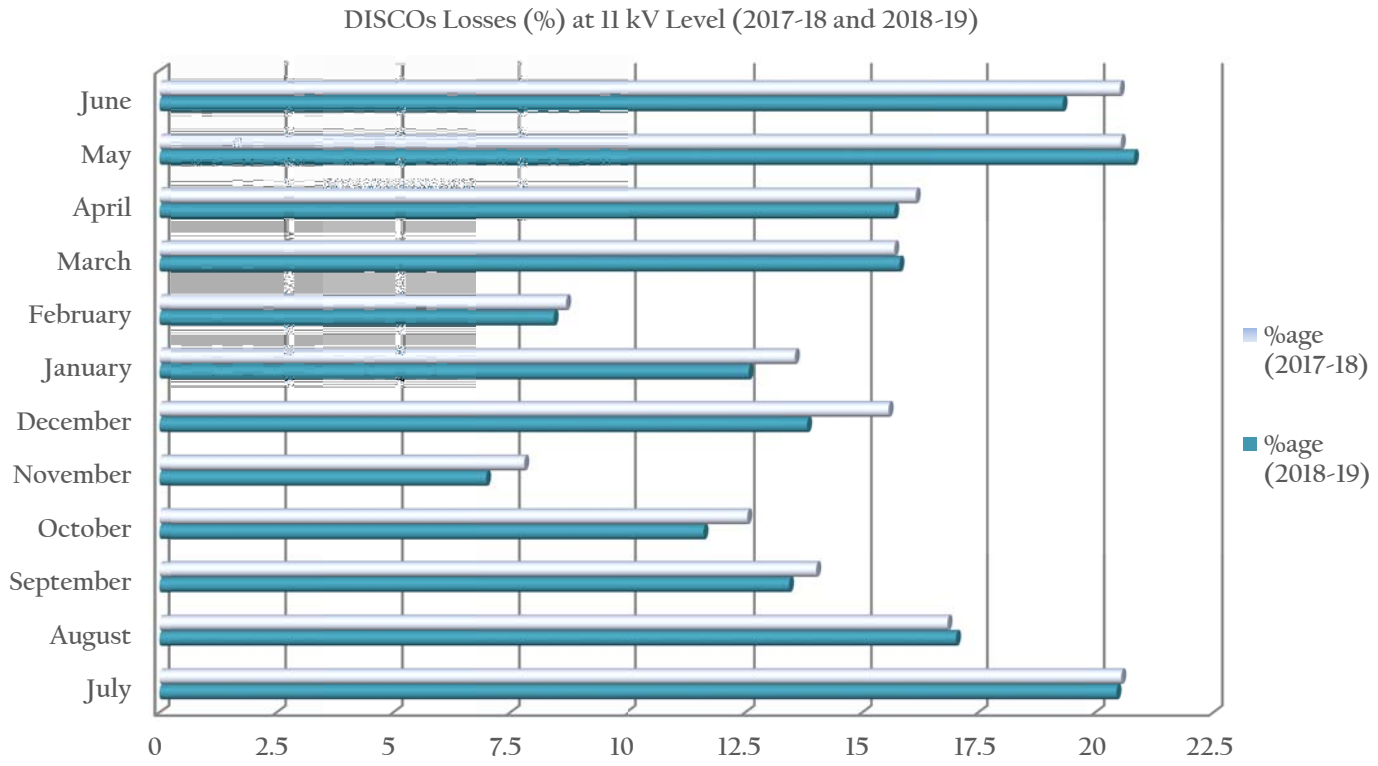
Source: DISCOs

1.5.2 Transmission and Distribution Losses of DISCOs:

The following table shows a comparison of DISCOs' performance in the area of Distribution losses below 11 kV over a period of last 2 years:

Month	FY 2018-19 (Units in GWh)				FY 2017-18 (Units in GWh)				Losses Inc./(Dec.)
	Purchased	Sold	Losses	%age	Purchased	Sold	Losses	%age	
July	13,064	10,393	2,671	20.45	12,022	9,551	2,471	20.55	200
August	13,324	11,055	2,269	17.03	12,185	10,132	2,053	16.85	216
September	11,923	10,318	1,605	13.46	11,034	9,486	1,548	14.03	57
October	9,205	8,135	1,070	11.62	9,698	8,482	1,216	12.54	-146
November	7,306	6,795	511	6.99	6,971	6,428	543	7.79	-32
December	7,325	6,311	1,014	13.84	7,383	6,235	1,148	15.55	-134
January	7,325	6,404	921	12.57	7,558	6,532	1,026	13.58	-105
February	6,409	5,870	539	8.41	6,746	6,161	585	8.67	-46
March	7,295	6,144	1,151	15.78	8,269	6,973	1,296	15.67	-145
April	9,382	7,912	1,470	15.67	9,691	8,129	1,562	16.12	-92
May	11,960	9,470	2,490	20.82	11,599	9,217	2,382	20.54	108
June	12,685	10,240	2,445	19.27	12,423	9,874	2,549	20.52	-104
Total	**117,203**	**99,047**	**18,156**	**15.49**	**115,579**	**97,200**	**18,379**	**15.90**	**-223**

Source: PEPCO



It is evident from above that in last two years sudden dips occurred in percentage losses in the month of November and February. The losses dipped from October and shot up sharply in December. Similarly losses took a dip in January and registered a steep rise in March. Both of these trends are difficult to explain except that some adjustments are made by DISCOs to show improved results for their loss position. The overbilling issue therefore still haunts the consumers of electricity. The highlighted numbers show that DISCOs are still involved in the systematic manipulation of the electricity units to manage their distribution losses which are factually higher.

In this regard, campaign launched by the Ministry of Energy (Power Division) against overbilling and reduction in losses is fully supported. It is important to mention about the amendment to the NEPRA Act, 1997 – Section 35A which stipulates imprisonment for a term which may extend to three years or to a fine which may extend to 10 Million Rupees for overbilling by an employee of Licensee.

1.5.3 Recovery Position of DISCOs (%):

The following table provides a comparison of recovery percentages of all the DISCOs over last two years:

Year	PESCO	TESCO	IESCO	GEPCO	LESCO	FESCO	MEPCO	HESCO	SEPCO	QESCO	Overall DISCOs
2017-18	89.55	66.28	90.36	97.26	97.80	99.60	97.27	76.75	59.79	25.57	**90.07**
2018-19	88.62	67.91	87.61	96.37	97.68	99.28	99.35	74.47	63.28	27.33	**90.25**
Inc./(Dec.)	(0.93)	1.63	(2.75)	(0.89)	(0.12)	(0.32)	2.08	(2.28)	3.49	1.76	**0.18**

Source: DISCOs

It is noted from above that, PESCO recovery position deteriorated about 1% whereas TESCO has shown an increase of about 1% in recovery position in 2018-19 as compared to 2017-18. In Punjab and Capital Territory, IESCO's and GEPCO's recovery percentages dropped by 2.75% and 0.89% respectively. Whereas LESCO and FESCO have shown almost same recovery ratios in last two years. MEPCO improved its recovery position by about 2% this year over last year.

In the province of Sindh, HESCO's recovery ratio deteriorated by approximately 2% whereas SEPCO improved its recovery position by 3.49%. QESCO, operating in the province of Balochistan, has improved its recovery ratio by 1.76%.

1.5.4 Receivables of DISCOs:

The overall receivables of all the DISCOs have increased by Rs. 248.85 billion which are considerably higher than the receivables of Rs. 166.26 billion during FY 2017-18. As on June 30, 2019 the overall distribution sector receivables stood at Rs. 1,145 billion whereas, the receivables at the start of this financial year were Rs. 896.15 billion.

During FY 2018-19, receivables of DISCOs from the Federal Government have increased by Rs. 6.52 billion as compared to FY 2017-18. The receivables of DISCOs from provincial governments of Punjab, Khyber Pakhtunkhwa, Sindh and Balochistan have also increased in this financial year. In addition, FATA receivables from domestic consumers have increased from Rs. 26.85 billion in FY 2017-18 to Rs. 32.58 billion in FY 2018-19. The receivables from KE in FY 2018-19 have increased by Rs. 13.33 billion.

1.6 PERFORMANCE OF K-ELECTRIC LIMITED

The installed capacity of KE's own generation fleet during FY 2018-19 has been noted as 2,294 MW same as compared to FY 2017-18. Since KE is responsible for maintaining integrated systems of generation, transmission and distribution, therefore KE is required to look for other sources to meet the supply and demand gap. Inability of KE to effectively increase its generation capacity has made it dependent on external power sources, including the import from NTDC system. During FY 2018-19, in addition to purchasing power from IPPs/CPPs including Gul Ahmed, Tapal Energy, KANUPP, Anoud Power, International Steel Limited, International Industries Limited, FFBL Power, SNPCL and Oursun Pakistan, KE also imported around 650 MW from NTDC system whereas agreement for purchasing electricity from three wind power plants of 150 MW has also been signed with NTDC.

KE generated 10,727 GWh during FY 2018-19 that is an increase of 389 GWh over the last year. In addition to its own generation, KE imported 7,769 GWh to meet its increasing demand. It is noted that the performance of KE own power plants are un-satisfactory for last year as compared to allowed targets set by the Authority in respect of heat rate/efficiency and auxiliary consumption despite that reasonable O&M had been allowed to KE under MYT. The deteriorated performance of KE plants may be due to the reason that major overhauling of some units/machines was not carried out on timely basis.

Historical record shows that KE underutilized its power plants whereas it continued to carryout load shedding. KE has reported that the reasons for the low capacity factors of KE power plants are supply and gas pressure issues. Since the fuel availability is KE's responsibility therefore it cannot be absolved of the negative impact such underutilization can cause on consumer end tariff. In addition, power plants of KE remained on standby mode for significant period, during FY 2018-19, wasting the potential to generate significant amount of economical energy whereas adding to non-productive energy during standby mode in the form of auxiliary power consumption resulting in financial loss.

1.6.1 Loading Position of Power Transformers:

KE has a total of 10 Grid Stations at 220/132 kV level, with 13 auto transformers of 3580 MVA transformation capacity, 66 Grid Stations at 132/11 kV level, with 160 power transformers with a transformation capacity of 6078 MVA. Operational record of 220/132 kV grid stations shows no overloading during the reported period of 2018-19 whereas, 28.13% of KE's power transformers (i.e. 45 out of 160) at 132/11 kV level were found overloaded in the same period.

1.6.2 Transmission Outage Statistics:

The following table provides a comparison of transmission outages for FY 2017-18 and FY 2018-19 as reported by KE. It is noted that at 132 kV level, number of planned and forced outages, total duration of outages and maximum duration of any single outage in FY 2018-19 have increased as compared to FY 2017-18 data:

Year	Description	Planned Outages		Forced Outages	
		220 kV	132 kV	220 kV	132 kV
2017-18	No. of Outages	0	7	0	26
	Total Duration in Minutes	0	4855	0	2451
	Maximum Duration of any Single Outage (Min.)	0	2320	0	362
2018-19	No. of Outages	0	10	0	46
	Total Duration in Minutes	0	13049	0	4997
	Maximum Duration of any Single Outage (Min.)	0	3723	0	469

Source: KE

1.6.3 Comparison of Loading Position of Different Components:

The following table provides overloading position (above 80%) of overloaded components in KE for FY 2017-18 and FY 2018-19:

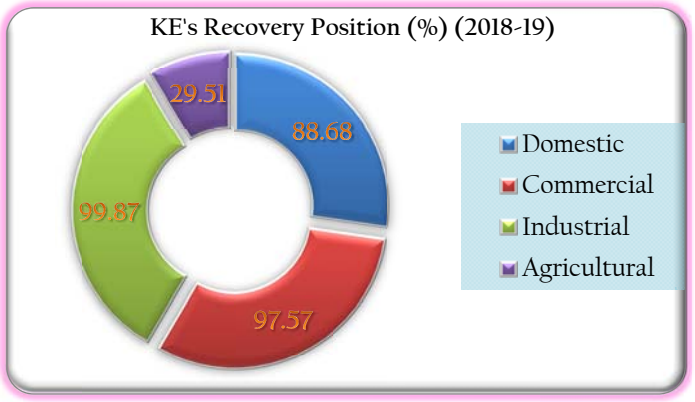
Description	2017-18	2018-19
Total No. of Over-Loaded 11 kV Feeders (above 80%)	29	48
Percentage of Total Over-Loaded 11 kV Feeders (above 80%)	**1.68**	**2.66**
Total No. of Over-Loaded Power Transformers (above 80%)	48	45
Percentage of Total Over-Loaded Power Transformers (above 80%)	**32.65**	**28.13**
Total No. of Over-Loaded Distribution Transformers (above 80%)	478	808
Percentage of Total Over-Loaded Distribution Transformers (above 80%)	**1.75**	**2.87**

Source: KE

KE could not maintain the improvement it achieved in 2017-18 as overloading on 11 kV feeders increased in 2018-19 relative to 2017-18. Similarly overloading on distribution transformers also increased in 2018-19.

1.6.4 Recovery Position:

The following table shows KE's recovery position for different consumer categories. The overall recovery ratio of 92.62% has slightly improved over the last year ratio of 91%. The recovery position in domestic sector has also improved from 84.21% in FY 2017-18 to 88.68% in FY 2018-19, however considering the share of domestic sector (43.67%) in the overall billing, the recovery in domestic sector needs to be increased further:



Recovery Position of K-Electric Limited (2017-18 and 2018-19)

Category	Amount of Billed Units (Rs. in Million)		Amount Realized and %age Recovery to Billed Amount (Rs. in Million)		(%)	
	2017-18	2018-19	2017-18	2018-19	2017-18	2018-19
Domestic	104,499	104,293	87,998	92,483	84.21	88.68
Commercial	43,613	45,236	41,650	44,138	95.50	97.57
Industrial	60,656	65,080	61,789	64,998	101.87	99.87
Agricultural	1,296	1,071	343	316	26.47	29.51
Public Lighting	2,809	2,784	1,066	266	37.95	9.55
Bulk Supply	9,009	9,078	9,146	8,515	101.52	93.80
Others	266	1,098	264	1,041	99.25	94.81
Total	**222,148**	**228,640**	**202,256**	**211,757**	**91.05**	**92.62**

Source: KE

1.7 OTHER ISSUES OF POWER SECTOR

1.7.1 Indicative Generation Capacity Expansion Plan (IGCEP):

Least Cost Generation Expansion Plan is important as it helps provide the planners and policy makers medium to long-term direction about the type and technology induction while optimally using the internal and external resources. NTDC is obligated under Planning Code (PC 4) of the Grid Code for preparation of IGCEP every year for review and approval of NEPRA. In the reporting year i.e. FY 2018-19, NTDC submitted IGCEP (2018-2040) to NEPRA. It is pointed out that for the very first time NEPRA conducted detailed consultative sessions and returned it to NTDC as it was missing some key aspects.

The Plan contains that by the year 2040, a capacity of around 8,500 MW will be retired. The following table highlights addition of different types of generation capacities over a period ending in 2040:

Year	Local Coal	Hydro	RLNG	Nuclear	Imported Coal	Renewable Energy	Natural Gas	Furnace Oil	Total (MW)
2018	30	7,244	7,218	1,232	1,821	1,691	3,711	4,768	**27,715**
2020	600	2,747	1,243	-	1,821	479	-	-	**6,890**
2025	2,703	6,164	(1,502)	3,046	1,518	3,970	(1,301)	(200)	**14,398**
2030	(30)	12,735	(731)	-	-	-	(126)	(3,279)	**8,569**
2035	6,611	6,350	(180)	-	-	6,300	(763)	-	**18,318**
2040	15,025	3,550	396	-	-	3,600	-	(370)	**22,201**
Total	**24,939**	**38,790**	**6,444**	**4,278**	**5,160**	**16,040**	**1,521**	**919**	**98,091**

According to the provisions of Grid Code, the IGCEP must contain three main aspects i.e. Load Demand, Indicative Generation and Transmission System Expansion. However, transmission system expansion for interconnection schemes of the generation plants has not been considered. It is noted that load demand and energy forecast used in IGCEP is not based on DISCOs' data including pending applications for connections with DISCOs. Therefore, growth pattern of every DISCO is not accurately assessed.

The IGCEP is not consistent with the targets set for Renewable Energy penetration by Government of Pakistan. Whereas the policy statements set 20% share of renewable energy by 2025 and 30% share by 2030, the IGCEP submitted by NTDC recommended 12% and 11% Renewable Energy share by 2025 and 2030 respectively. IGCEP did not include KE system which may lead to sub-optimal expansion planning for the overall country.

One of the major constraints in developing an optimal generation plan for Pakistan is treatment of committed plants. These power plants which have already been planned and decided to be built, directly impact the selection of future power plants (from the list of candidate plants) as the committed plants are forced in the model and occupy their position on the "load duration curve" dictating a sub-optimal simulation. In Pakistan scenario, these include some large hydro, nuclear and certain projects under some high level commitments. The IGCEP submitted by NTDC contained more than 17 GW until 2025, which are more than adequate to meet the forecasted demand in 2025. Whether these committed plants satisfy the least cost expansion criteria no such simulations have been carried out, however there is a need to sensitize this issue so that the policy makers are mindful of the excess costs the sector has to pay due to suboptimal addition of such power plants.

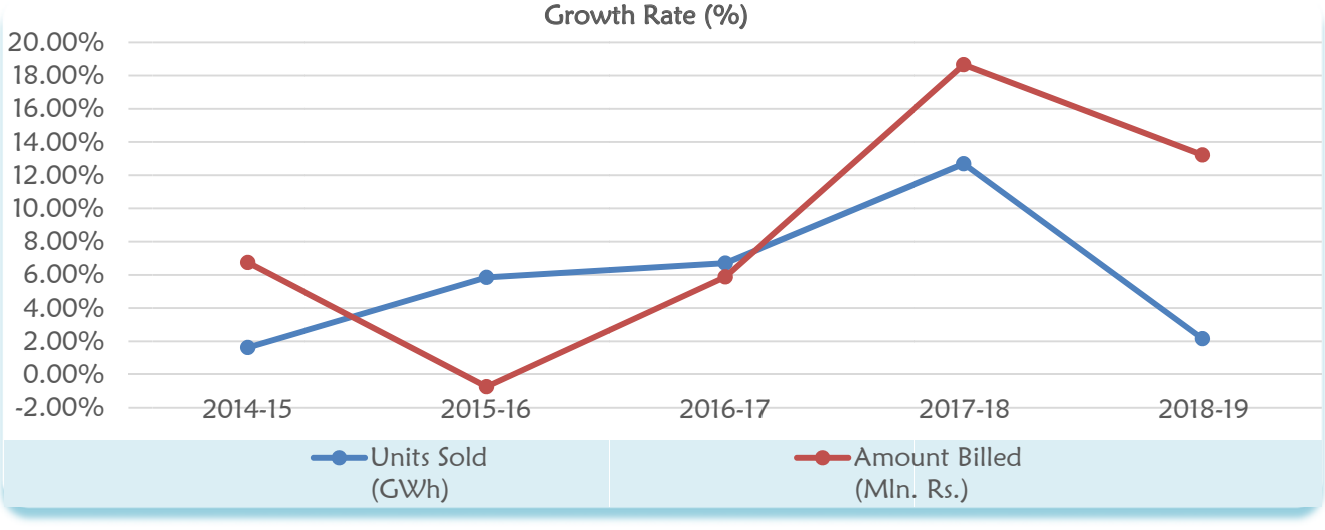
All the provinces are major stakeholders in the development and implementation of generation power plants, specifically under the present scenario where the provinces have been quite proactive for promoting overall competition and participation in the development of a market. The provinces however claimed that they were not duly consulted in the development of IGCEP. The Authority therefore feels that the provinces must be taken on board by NTDC and the required inputs and the outputs of the simulation model and their relevance to the provinces must be comprehensively explained to them.

Some of the factors, which could affect the electricity demand projections, have not been considered for developing demand forecast for the simulation. For instance, the demand expected to be created due to introduction of electric vehicles and mega housing projects have not been considered. The IGCEP should not be a static plan rather the document must contain as many sensitivity analyses as possible so that the policy makers can evaluate possible options under different scenarios. These may include different GDP forecasts and resulting demands, impact of AT&C load shedding, off grid developments and other Demand Side Management (DSM) efforts.

1.7.2 Ministry of Energy (Power Division) Initiatives for Loss Control and Improvement in Recovery Ratios:

As discussed earlier the Federal Government has started vigorous efforts for reduction in losses and improvement in recovery position. Ministry of Energy has presented that it was able to recover 16.51% more amount over the last year's amount collected. The following table shows energy sales and the amount billed to the end-consumers by DISCOs. The information gives an interesting picture. Whereas the units sold registered an increase of only 2.16% over the last year the amount billed was 13.22% more than the last year. Further review reveals that incremental amount billed is mainly due to increase in consumer end tariff, whose notification was pending since 2015-16 and subsequently notified in March, 2018. Therefore, at national level, DISCOs have shown meager improvement in "recovery" and "losses" and have largely maintained the last year's level in these areas. For any improvement, the foremost parameter to focus is the energy sold. Based on the data provided to NEPRA, by DISCOs as part of earlier State of Industry Reports, it may be noted that close to 6% increase per year was achieved for units sold over a period from 2015 to 2017. During the FY 2017-18 the units sold registered an increase of over 12.5%, which sharply declined to around 2% during FY 2018-19 (for 2018-19 the data has been taken from PEPCO report). A healthy growth in energy sold is key to the survival of the power sector as that would help in bringing the capacity costs down which would lead to lowering of overall energy cost.

Year	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Units Purchased (GWh)	87,540	89,140	93,372	99,382	112,517	114,086
Growth Rate (%)		**1.83**	**4.75**	**6.44**	**13.22**	**1.39**
Units Sold (GWh)	71,053	72,209	76,431	81,558	91,902	93,887
Growth Rate (%)		**1.63**	**5.85**	**6.71**	**12.68**	**2.16**
Amount Billed (Mln. Rs.)	901,526	962,317	955,292	1,011,381	1,200,016	1,358,609
Growth Rate (%)		**6.74**	**-0.73**	**5.87**	**18.65**	**13.22**
Amount Recovered (Mln. Rs.)	804,479	857,251	902,557	937,080	1,052,492	1,226,211
Growth Rate (%)		**6.56**	**5.29**	**3.83**	**12.32**	**16.51**



1.7.3 Development of a Power Market:

Consistent with the objectives of the government, a market-based regime is foreseen for the power sector and CPPA through international consultants is currently working on proposals to develop competitive market model for the country. Competition in the market is expected essentially to provide choice of suppliers of electricity and to bring the overall cost of electricity down to affordable levels for the end-consumers. Different market models are followed successfully in different countries and we can learn a lot from the experience of other countries. One

of the fundamental requirements before evaluating any of the models is to understand the ground realities and readiness of the stakeholders. A model being practiced with a high degree of success in another country may not necessarily prove a panacea for Pakistani market.

Being the regulator of sector, NEPRA is interacting with its licensees at different levels and it is felt that the required understanding among stakeholders is not there. In this respect the performance of public sector DISCOs alone, presents a fairly good account as to what can be expected from the sector if a market model is thrusted without creating necessary enabling conditions. After the unbundling exercise, pursuant to the 1992 reform process, DISCOs were expected to operate as independent entities; performing different tasks starting with planning, network studies, designing and implementation of distribution schemes and fully conversant and compliant with the Grid and Distribution Codes. However, the reality is that the DISCOs are not in a position to take decisions even on network studies and other connectivity issues. Due to obvious lack of capacity issues, DISCOs have shown their inability to undertake construction activities of important 132 kV networks, whereas they have failed to have direct agreements with the generation companies due to same reasons and lack of understanding about the overall concept. DISCOs' mindset is obviously to remain in the background; however, their reluctance to embrace the change has resulted in increased centralization in the form of CPPA-G.

NEPRA also notes with concern that real issues afflicting the sector have been put on back burner during the development of market model while highlighting those issues, which may defeat the very purpose of reforms and the objectives, enshrined in the Amendment Act. For instance it is desirable to put more efforts in loss reduction and improving recovery ratios as these are arguably more sensitive to the sector well being. However, DISCOs seem to be more interested in creating hurdles in allowing "wheeling" and "net-metering" regimes, which are expected to bring competition in the sector. Furthermore DISCOs have no historical data to prove that these regimes have resulted in more losses for them. The stakeholders must show that they are ready and fully understand their roles as market players. In this respect, it is not essential that any market model be finalized upfront. The Amendment Act provides quite elaborate framework for the future market and the roles to be played by different entities. The first step therefore should be to let these entities ameliorate their capacity and skill levels to take up future roles as defined under the Act. The Competitive Market Model should have different phases and the first one should be a transition phase during which these entities would operate as foreseen under the Act for one to two years. Once all the stakeholders are comfortable with the skill levels of these entities and they are assured of the transparent operations, only then any future competitive market model could be examined. Introduction of new layers of entities is also not desirable unless it is proved that the end consumers would get relatively cheaper electricity.

1.7.4 National Electricity Policy and Plan:

Under the Amendment Act, 2018, the Federal Government will develop national electricity policy, which would be binding upon NEPRA to follow. Further, the Federal Government is also required to develop a number of "Rules and Guidelines" for smooth transition from the existing regulatory regime to the new one under the Amendment Act. The Policy on Renewable Energy has also expired on March, 2018. Till the writing of this report, the Federal Government has not approved National Electricity Policy; consequently plans under the policy have also not been prepared. Similarly, the Federal Government has not yet announced its new policy on renewable energy. Absence of these policies have added to uncertainty in the sector for all stakeholders and since NEPRA is now bound to follow National Electricity Policy, therefore any long term regulatory framework may not be finalized. The requirement on part of the government to make rules and guidelines pursuant to the Amendment Act are also needed so that the regulator may develop its regulations accordingly. As pointed out earlier that due deliberations before approval of the Amendment Act were not done, therefore at this stage, it is critical that relevant Policies, Rules and Guidelines are in place as early as possible.

1.7.5 Governance of Sector:

Although Pakistan power sector comprises both private sector and public sector controlled entities, however overall the public sector represents considerably larger chunk of the pie i.e. 75%. Elaborating further, in the generation function, private sector (Independent Power Producers or IPPs) accounts for 46.36% % of the total installed capacity. The rest of it 53.64% represents the public sector. Similarly transmission and distribution functions in the country are mainly owned and controlled by public sector with the exception of Karachi where, transmission and distribution functions are controlled by KE; a private entity. In terms of number of consumers, public sector DISCOs serve more than 23 million consumers while private sector serves around 2.4 million consumers.

In the generation sector, most of the power generation plants in public sector GENCOs are being operated at substantially lower performance levels than NEPRA determined levels, their designed values and as per prudent practices. Therefore, wasteful use of resources not only adds to the circular debt but also deprives the sector of relatively cheaper electricity if these resources are diverted to more efficient power generation plants. Therefore, urgent steps are needed to be taken to retire these plants and if essential to have generation facilities in the area, these may be replaced with power plants that are more efficient.

NTDC carries out the transmission of electricity through Extra High Voltage (EHV) network operating at 500 and 220 kV. NTDC is allowed necessary investment by NEPRA for its operations and future expansion plans and although still, there are issues like system constraints, preventing optimal operation of power plants and transmission of electricity, it is the failure of the company to move towards automation and transparency, which is negatively affecting the overall direction of the sector.

On an overall basis, the DISCOs have failed to reduce their T&D losses. The DISCOs reported actual losses of 18.6% in the FY 2013-14, showed a slight dip to 17.95% in FY 2016-17, whereas in FY 2017-18 reported losses of 18.3%. During FY 2018-19 the overall losses showed a reduction of 0.6% and stand at 17.7%. The recovery of billed amount also shows similar trends. The actual recovery ratio was at 89.11% in FY 2013-14, which improved to 94.45% in FY 2015-16; however, the position again deteriorated to 90.07% in FY 2017-18. In FY 2018-19 the recovery of DISCOs stood at 90.25%. Reduction in losses and improvement in recovery ratio combined shows 0.7% representing around Rupees 10 billion savings. However, in the face of about Rupees 1,600 billion circular debt the improvement is negligible. The Federal Government has contemplated to stop incremental additions to circular debt through certain measures like budgeting subsidy amounts; notification of NEPRA determined tariffs and other measures to control losses. However, it is to be noted that efforts to improve through such accounting measures, so that balance sheets of DISCOs show a healthy position, would not suffice.

Viewing above, the role and performance of power sector under public control is critical, for the efficient operation of whole of the sector. The regulator notes that while the Federal and Provincial Governments are striving for the improvement in the sector, continuation of the Federal Ministry with the centralized control of day-to-day operations of public sector entities, has led those to unacceptable levels of technical and financial performance. It is disappointing that in spite of regular directions and advisories by the regulator to the licensees and the relevant ministry, public sector entities have not been provided with any degree of control as required under the reform process. It is more concerning to see that lately the fundamental principles of reforms have been disputed, which have been followed in many countries to successfully bring transparency, quality, competition and lowering of electricity prices. For instance tinkering with tariff determinations which is the sole domain of NEPRA is against transparency and reversing the established regulatory regime. It is advised that backtracking from the reform agenda and not following it in letter and spirit would leave the power sector in complete tatters and the negative drag of public sector resulting from poor governance would not only bring the sector down but also result in further slow-down of the overall economy of the country.

1.7.6 Operation of Power Plants:

Role of NPCC, which is the nerve centre for network operations, is critical for the sector. Even at the present rudimentary level, NPCC is obligated to ensure safe and reliable provision of electricity in a non-discriminatory manner. It is the fundamental responsibility of NPCC to dispatch all available electricity generation resources in a manner such that total cost of electricity is minimized. In preparing final dispatching sequence of generation facilities, NPCC is required to keep complete record of events and relevant communications, so that its responsibilities for non-discriminatory operations can be transparently established.

However, it is noted that NPCC has not been able to clearly establish that all of its operations are based on prudent utility practices. As part of monthly fuel cost adjustment proceedings, the Authority noted that invariably every month NPCC operated such power generation plants, which were very low in merit order. It was also noted that NPCC unilaterally curtailed generation from those power plants, which were to be operated as "must run" in the system. NPCC provided different explanations, which ranged from system and fuel constraints to maintaining quality of the system.

NPCC is however required to demonstrate that its operations are carried out independently with complete transparency. All the steps must be taken in accordance with established principles of system operations. All relevant record and communications must be available for the regulator's intervention as and when required.

At the same time, it is also important that the operational constraints, identified by NPCC for out-of-merit dispatch of generation facilities, be removed on priority. By not rectifying the problems, would mean that the system would continue to be operated by NPCC on similar grounds resulting in financial loss to the overall sector.

As a regulator, NEPRA has clear objectives to bring electricity supply security and lowering of tariff to the end-consumer. In this respect, NEPRA has given clear directions to NPCC not to operate furnace oil based power plants. Similarly, for lowering of consumer-end tariff, NEPRA has decided not to allow generation tariff on take-or-pay basis.

1.7.7 Safety of System:

Safety in the provision of service is one of the most important objectives under the Act. Under Section 18 of the Act, National Grid Company shall be responsible to operate and provide safe and reliable transmission and inter-connection services. Under Section 21, DISCOs are duty bound to follow the performance standards laid down by the Authority for distribution and transmission of electric power including, safety, health and environmental protection instructions issued by the Authority or any governmental agency or Provincial Government. DISCOs are also required to follow NEPRA approved Distribution Codes, which require them to design, implement and operate their systems so that their distribution facilities do not harm human life.

NEPRA seeks Annual Reports from DISCOs about safety incidents. In addition, through its monitoring department, major safety incidents are investigated. During the month of July, 2019 after heavy rains in Karachi, scores of people lost their lives. NEPRA while taking cognizance of the serious issue formed a Committee of professionals for thorough investigation and necessary steps would be taken in light of the Committee's Report.

1.8 CONCLUSIONS

1.8.1	Public Sector GENCOs are contributing to expensive energy production due to their inferior efficiencies. The Government may consider retiring these plants and/or replace them with efficient power generation facilities.
1.8.2	Fuel constraints and unavailability of fuel, especially during winter season has been noted as one of the major reasons for un-economic despatch of generation facilities.
1.8.3	The Transmission Sector (NTDC system) has shown improvements to a certain extent. However, constraints for evacuation of wind energy from Jhimpir Corridor still prevail. Similarly, power production from newly constructed Guddu Power Plant had to be curtailed due to transmission constraints.
1.8.4	Overloading of 500 kV & 220 kV transformers in NTDC system continued in 2018-19.
1.8.5	In the absence of National Electricity Policy and Plan and the Rules to be framed by the Federal Government, pursuant to NEPRA Amendment Act, 2018, clear goals for the sector are not available for the stakeholders to move forward. Similarly, transition from the existing regulatory regime to the competitive market may not be completed without National Electricity Policy/Plan and supporting Rules/Guidelines.
1.8.6	XW-DISCOs could not reduce their overall T&D losses. Statistics for over the past five years show that only a slight reduction of 0.6% has been achieved in FY 2018-19 as compared to the losses of FY 2017-18. Similarly, no significant improvement in the performance has been noted in the area of overall revenue recovery of DISCOs as the recovery ratio in FY 2018-19 (without subsidy) has improved by only 0.18% over the previous year. These improvements combined translated into savings of around Rupees 10 billion.
1.8.7	Circular Debt continued to accumulate to almost Rupees 1,600 billion due to inefficiencies of GENCOs, DISCOs' inability to achieve targets for T&D losses and recovery ratios as allowed by NEPRA and other governance issues like delay in tariff notification.
1.8.8	Continuation of centralized control of DISCOs and public sector GENCOs, is seen as one of the main reasons for not only the substandard performance of these entities, but also a major factor for accumulation of Circular Debt.
1.8.9	Safety of human life has been noted as one of the major issues in the design, implementation and operations of KE's system.

1.9 RECOMMENDATIONS

1.9.1 In order to reduce the cost of expensive energy mix, the Federal Government must take an early decision on the fate of inefficient GENCOs. The Regulator considers that inefficient power plants are needed to be retired on top priority.

1.9.2 To reduce the impact of idle capacity on the overall tariff, Federal Government is recommended to carry out a thorough analysis of any requirement for the import of additional power by K-Electric from NTDC system. NEPRA considers that it will be in the interest of the overall system, as it will help improve the utilization of power plants, reduce excess capacity itself and provide continuity of power supply to K-Electric consumers in the short to medium term.

1.9.3 Sales growth policies are to be vigorously pursued for bringing more consumers to the DISCOs' network and for retaining the existing consumers, there is a need to ensure affordable and reliable supply of electricity. Load-shedding policies must be targeted to the areas with least recovery for short term. Separation of feeders may be considered to isolate paying and non-paying areas. Regressive policies to impose load shedding on larger areas would result in higher tariffs for the rest of the paying consumers.

1.9.4 NTDC must continue its work on improving the quality of its network so that constraints are removed expeditiously. Similarly, the overloading of its transformers should be addressed so that no further hotspots are introduced. Its planning and monitoring functions are expected to be swift to timely notify about such conditions.

1.9.5 The Regulator supports the efforts of the Federal Government for targeting the high loss 11 kV feeders for bringing down T&D losses in DISCOs and the approach needs to be extended to all DISCOs. Automatic Metering at different voltage level to track and account for electricity flow should also be initiated in all DISCOs as early as possible.

1.9.6 The existing setup, with PEPCO assuming central control, is not capable of delivering the necessary improvement in the system and controlling accumulation of Circular Debt. For arresting Circular Debt, the accounting measures only, would not be enough and structural changes are required to be made. In this respect besides allowing due independence as foreseen under the 1992 power sector reform plan to GENCOs and DISCOs, total privatization or public-private model may be explored by the Federal Government.

1.9.7 CPPA-G is required to take into view ground realities, preparedness and capacity levels of the stakeholders for development of market model for the power sector. The model is recommended to be simple and a tailor-made solution while capitalizing on the vital experiences gained during the implementation of such models in other parts of the world.

02

PERFORMANCE OF GENERATION SECTOR

PERFORMANCE OF GENERATION SECTOR

2.1 GENERAL

The total installed generation capacity of Pakistan as on 30th June, 2019 stands at 39,145 MW, against 35,980 MW on 30th June 2018, recording an increase of 3,165 MW or 8.30% over the last year. The power plants connected with NTDC and KE system, generated 137,039 GWh during FY 2018-19 as compared to 133,593 GWh units produced during FY 2017-18. During FY 2018-19, the major additions to the system included hydel, thermal and renewable energy based power projects.

2.2 INSTALLED CAPACITY AND ELECTRICITY GENERATION

The following tables give additional details of source-wise installed capacity and electricity generation by power plants connected with NTDC and KE system during FY 2017-18 and 2018-19:

Source-wise Installed Capacity (MW) and Electricity Generation (GWh) by Type

As on 30th June	Installed Capacity (MW)				Electricity Generation (GWh)			
	2018	2019	Variation		2017-18	2018-19	Variation	
			Capacity	%			Energy	%
HYDEL								
WAPDA Hydel	8,341	9,389	1,048	12.56	26,951.19	31,167.85	4,216.66	15.65
IPPs Hydel	372	372	0	0.00	1,118.04	1,928.04	810.00	72.45
THERMAL								
GENCOs with PEPCO	5,637	5,637	0	0.00	16,199.10	13,016.93	-3,182.17	-19.64
KE Own	2,294	2,294	0	0.00	10,337.75	10,727.68	389.93	3.77
IPPs Connected with PEPCO	15,297	16,946	1,649	10.78	62,433.73	62,597.73	164.00	0.26
IPPs Connected with KE	366	366	0	0.00	1,824.81	2,131.72	306.91	16.82
SPPs/ CPPs connected with PEPCO	340	340	0	0.00	665.53	405.13	-260.40	-39.13
SPPs/ CPPs connected with KE	87	87	0	0.00	550.49	523.74	-26.75	-4.86
CHASNUPP (I, II, III & IV)	1,330	1,330	0	0.00	8,719.87	9,005.68	285.81	3.28
KANUPP	137	137	0	0.00	330.86	129.99	-200.87	-60.71
IMPORT								
Import from Iran					554.74	486.80	-67.94	-12.25
RENEWABLE ENERGY (WIND, SOLAR AND BAGASSE)								
Connected with PEPCO	1,779	2,047	268	15.06	3,907.12	4,840.59	933.47	23.89
Connected with KE	0	200	200	0.00	0.00	76.92	76.92	0.00
Total Installed Capacity of the Country	**35,980**	**39,145**	**3,165**	**8.30**	**133,593.23**	**137,038.80**	**3,445.57**	**2.58**

Source: NTDC/KE

2.3 HYDROPOWER

The installed capacity of WAPDA Hydropower increased to 9,389 MW at the end of June, 2019 as compared to 8,341 MW, recorded in FY ended June 2018. The increase is due to addition of 108 MW Golen Gol HPP and Tarbela 4th Extension having capacity of 1,410 MW. The 31,168 GWh generated in FY 2018-19 is an increase of 4,217 GWh from the last year. The hydel IPPs, contributed 810 GWh more energy in the system during FY 2018-19 as compared to FY 2017-18. The hydropower production pattern over the year shows a downward trend as compared to the historical trends owing to seasonal variations and water flows. The availability and overall performance of major hydropower plants including Tarbela and Mangla remained satisfactory during the year FY 2018-19.

2.3.1 Power Purchase Agreements/Energy Purchase Agreements:

Power Purchase Agreements of five (05) hydropower projects, namely Kohala HPP (1100 MW), Jagran-I HPP (30.2 MW), Pehur HPP (18 MW), Ranolia (17 MW) and Dharal Khwar HPP (36 MW) were received for approval by NEPRA in the FY 2018-19. The PPA of Kohala HPP has been submitted without Schedule-I. A letter to CPPA-G had been issued to submit the complete PPA along with schedules and all annexures for approval of the Authority. All other PPAs are under-process.

2.3.2 Competitive Bidding of Hydropower Projects:

No project under CBTR-2017 has been submitted to NEPRA in the FY 2018-19.

2.3.3 Performance Monitoring of Hydropower Projects:

Monitoring of different hydropower projects was carried out in 2018-19 to check their performance according to the terms and conditions set in Licence, Power Purchase Agreement, Tariff Determination and other relevant rules and regulations. All the under-construction private sector hydropower projects namely Gulpur HPP (102 MW), Suki Kinari HPP (870 MW) and Karot HPP (720 MW) are progressing satisfactory and are on schedule.

2.3.4 Implementation of Authority's Direction:

An MOU was signed between NEPRA and US-Pakistan Center for Advanced Studies in Energy (USPCAS-E) in order to facilitate a long-term technical and research collaboration between the two entities.

The Authority took notice of the inordinate delay in signing of PPAs by CPPA-G and PESCO of hydropower projects such as the 18 MW Pehur HPP, 2.6 MW Machai HPP, 36.6 MW Daral Khwar HPP and 17 MW Ranolia HPP. In accordance with the direction of the Authority, a letter had been issued to Khyber Pakhtunkhwa Government to execute the PPAs of four (4) hydropower projects, namely Pehur HPP (18 MW), Machai HPP (2.6 MW), Ranolia HPP (17 MW) and Dara Khwar HPP (36.6 MW) that have already been developed. Out of these, Pehur HPP is in operation since as long ago as March, 2010.

2.4 OVERVIEW OF PUBLIC SECTOR GENCOS

2.4.1 Jamshoro Power Company Limited (GENCO-I):

There has been no increase in the installed capacity of 1,024 MW of GENCO-I Power Stations at the end of June 2019 over that of 2018. The energy generated by GENCO-I during FY 2018-19 was 917.28 GWh, while, it was 1,887 GWh in FY 2016-17; a decrease of 970 GWh over last year. Net efficiency of GENCO-I during FY 2018-19 reduced to 26.71% for TPS Jamshoro and 23.13% for GTPS Kotri as compared to 27.46% and 25.19% respectively over the last year. With a capacity factor of 57.38% for TPS Jamshoro and 56.20% for GTPS Kotri due to outages and various maintenance issues, the overall performance of GENCO-I has not been satisfactory.

2.4.2 Central Power Generation Company Limited (GENCO-II):

Total installed capacity of GENCO-II, up to June 30, 2019 has been noted as 2,402 MW (excluding 28 MW TPS Quetta). No new generation plant was inducted during the year under review for GENCO-II. The energy generated by GENCO-II during FY 2018-19 has been recorded at 9,385 GWh while, it was 8,775 GWh during FY 2017-18. The energy generated by GENCO-II during FY 2018-19, has increased by 610 GWh compared with that of the last year.

It is observed that various units of GENCO-II have been off-bar for several years due to maintenance issues, forced outages, fuel constraints and rehabilitation activities etc. and are not being fully utilized. With reduced annual efficiency and increased auxiliary consumption, the overall performance of GENCO-II has remained unsatisfactory. The capacity factor of 747 MW CCPP Guddu as reported is 106.83% which is unrealistic. The net efficiency of the 747 MW CCPP for the FY 2018-19 remained at 47.03% which is considerably low as compared to guaranteed efficiency of 54.4%. The performance of other units of GENCO-II was also no satisfactory as their reported efficiency remained at 24%~35%.

2.4.3 Northern Power Generation Company Limited (GENCO-III):

Total installed capacity of GENCO-III, up to June 30, 2019 has been noted as 2,061 MW similar to the last year's capacity levels. The energy generated by GENCO-III during FY 2018-19 was 2,716 GWh, while it was 5,871 GWh during FY 2017-18, showing a decrease of 3,155 GWh, compared with the last year owing to various reasons.

It is observed that the overall net efficiencies of TPS Muzaffargarh, SPS Faisalabad, GTPS Faisalabad and Nandipur remained very low. Due to various maintenance issues, forced outages and fuel constraints etc. considerably low annual capacity utilization factors of 7.97%, 0%, 15.74% and 39.10% for TPS Muzaffargarh, SPS Faisalabad, GTPS Faisalabad and Nandipur Power Plants respectively have been reported. The net efficiency of the CCPP Nandipur for the FY 2018-19 remained at 46% which is considerably low as compared to approved efficiency of 49% on gas fuel. The overall performance of GENCO-III was not satisfactory.

2.4.4 Lakhra Power Generation Company Limited (GENCO-IV):

Total installed capacity of GENCO-IV, up to June 30, 2019 has been noted as 150 MW. GENCO-IV had three units of 50 MW and during FY 2018-19 generated 0 GWh as compared to 3.39 GWh produced during FY 2017-18. The utilization factor of 0% for FY 2018-19 is noted in respect of GENCO-IV.

2.5 NUCLEAR (CHASNUPP-I, II, III & IV) AND KANUPP

During the FY 2018-19, total installed capacity of Nuclear Power Plants connected with NTDC's system, is noted as 1,467 MW same as that of last year. The energy generated by Nuclear Power Plants during the FY 2018-19 stands at 9,136 GWh which is an increase of 85 GWh over the energy during the FY 2017-18. The overall performance of Nuclear Power Plants connected with NTDC's system has remained satisfactory during the FY 2018-19 as no major outage is noted.

2.6 INDEPENDENT POWER PRODUCERS (IPPS)

Total installed capacities of thermal IPPs connected with NTDC system at the end of June, 2019 are noted as 16,946 MW; 1,649 MW higher as compared to FY 2017-18. The enhancement in capacity has been recorded owing to induction of coal fired 1,320 MW China Power Hub Plant and 330 MW Engro Thar Energy Power Plant. The energy generated by thermal IPPs connected with NTDC system during the FY 2018-19 is noted as 62,598 GWh against 62,434 GWh during the FY 2017-18 showing an increase of 164 GWh.

2.7 RENEWABLES

2.7.1 Wind:

During FY 2018-19, 200 MW of wind power has been added to the NTDC's system, for a total wind based power of about 1,248 MW in the system. The energy generated by wind based power plants during FY 2018-19 has been noted as 3,231.64 GWh; increase of 1,086.57 GWh over the last year. The additions of wind power capacity include 50 MW Tricon Boston Consulting-A, 50 MW Tricon Boston Consulting-B, 50 MW Tricon Boston Consulting-C and 50 MW Zephyr Power.

2.7.2 Solar:

During FY 2018-19, no new energy project has been added to NTDC's network. The total energy through solar has been recorded at 714.52 GWh for an increase of 12.35 GWh over the energy generated through solar during FY 2017-18.

2.7.3 Bagasse:

During FY 2018-19, there is an increase of about 48 MW in the installed generation capacity of bagasse based power plants for about 369 MW in the NTDC's system. The new addition is 36 MW Almoiz Industries and 22 MW Chanar Energy. The energy generated by bagasse based power plants during FY 2018-19 has been noted as 832 GWh.

2.7.4 Bagasse/Coal:

During FY 2018-19, a bagasse/coal fired project namely Fatima Energy Limited did not generate energy.

2.8 PERFORMANCE OF K-ELECTRIC LIMITED

The installed capacity of KE's own generation fleet during FY 2018-19 has been noted as 2,294 MW same as compared to FY 2017-18. Since KE is responsible for maintaining integrated systems of generation, transmission and distribution, therefore KE is required to look for other sources to meet the supply and demand gap. Inability of KE to effectively increase its generation capacity has made it dependent on external power sources, including the import from NTDC system. During FY 2018-19, in addition to purchasing power from IPPs/CPPs including Gul Ahmed, Tapal Energy, KANUPP, Anoud Power, International Steel Limited, International Industries Limited, FFBL Power, SNPCL and Oursun Pakistan, KE also imported around 800 MW (650+150 MW from WPPs) of power from NTDC on regular basis.

KE generated 10,727 GWh during FY 2018-19 which is an increase of 389 GWh over the last year. In addition to its own generation, KE imported 7,769 GWh to meet its increasing demand. It is noted that the performances of KE own power plants are un-satisfactory for last year as compared to allowed targets set by the Authority in respect of heat rate/efficiency and auxiliary consumption despite of the fact that reasonable O&M had been allowed to KE under MYT. The deteriorated performance of KE plants may be due to non-major overhauling of some units/machines which were not carried out on timely basis.

As reported, the low capacity factors of KE power plants are due to gas supply/pressure issues. The fuel availability is generally the power producer's responsibility by entering into Fuel Supply Agreements. This fact has already been established that underutilization of plants even caused by non-availability of fuel ultimately impacts the electricity tariff of end consumer and protection of the consumer from undue charges is regulator's concern.

It is noted that power plants of KE remained on standby mode for significant period, during FY 2018-19, thereby squandering the potential to generate significant amount of economically efficient energy. On top of that, the units/machines of KE have drawn substantial energy during standby mode under the head of auxiliary power consumption resulting in financial loss.

2.8.1 Actual Heat Rates (Btu/kWh) and Auxiliary Consumptions (KE Own Plants):

Following table shows the actual heat rate/efficiency and auxiliary consumption of KE own power plants v/s the determined values. Based on the historical record it may be noted that KE could not maintain the Authority allowed heat rates and auxiliary consumption levels for different power plants. As a prudent utility KE should have maintained those levels which were allowed. One of the major reasons for KE's inability to keep those levels is that it had not carried out required maintenance routines. Sub-optimal operation of power plants also adds to inferior levels of such parameters.

Auxiliary	FY-2016-17 (%)	FY-2017-18 (%)	FY-2018-19 (%)	Determined (%)
Bin Qasim-I (Unit-I)	10.2	9.0	9.8	8.11
Bin Qasim-I (Unit-2)	9.4	9.9	8.7	8.00
Bin Qasim-I (Unit-3)	12.3	10.2	10.0	8.25
Bin Qasim-I (Unit-4)	12.3	9.7	10.5	8.18
Bin Qasim-I (Unit-5)	8.0	8.0	8.0	7.75
Bin Qasim-I (Unit-6)	8.5	8.4	9.5	7.71
Bin Qasim-I	**9.5**	**9.0**	**9.2**	**8.00**
Korangi CCPP	**8.1**	**7.9**	**7.3**	**6.92**
SGTPS-II	**3.4**	**3.3**	**3.5**	**2.50**
KGTPS-II	**3.5**	**4.1**	**3.8**	**2.50**
Bin Qasim-II	**6.2**	**6.4**	**6.1**	**6.11**

KE Power Plants	FY-2016-17		FY-2017-18		FY-2018-19		Determined	
	Heat Rate (Btu/kWh)	Efficiency (%)	Heat Rate (Btu/kWh)	Efficiency (%)	Heat Rate (Btu/kWh)	Efficiency (%)	Heat Rate (Btu/kWh)	Efficiency (%)
BQ-I (U-I)	11,857	28.78	11,218	30.42	11,783	28.96	10,802	31.59
BQ-I (U-2)	11,573	29.48	11,810	28.89	11,650	29.29	10,650	32.04
BQ-I (U-3)	14,045	24.29	12,571	27.14	12,327	27.86	10,996	31.03
BQ-I (U-4)	13,343	25.57	12,051	28.31	12,282	27.78	10,899	31.31
BQ-I (U-5)	11,362	30.03	11,147	30.61	11,249	30.33	10,304	33.11
BQ-I (U-6)	10,944	31.18	11,117	30.69	11,489	29.70	10,249	33.29
Bin Qasim-I	11,799	28.92	11,543	29.56	11,732	29.08	10,650	32.04
Korangi CCPP	8,821	38.68	8,382	40.71	8,667	39.37	8,497	40.16
SGTPS-II	9,701	35.17	9,281	36.77	9,139	37.33	8,746	39.01
KGTPS-II	9,638	35.40	9,619	35.47	9,503	35.91	8,738	39.05
Bin Qasim-II	8,668	39.37	8,329	40.97	8,441	40.43	8,359	40.82

The following table shows details of Major Overhauls carried out by KE for its power plants:

Bin Qasim Power Station-I (Major Overhauls):

Unit	Type of Major Overhaul	Date From	Date To
1	Turbine	06-01-2017	10-05-2017
2	Turbine	01-01-2018	13-05-2018
3	Turbine	27-11-2006	09-02-2007
4	Turbine	24-09-2015	25-03-2016
5	Turbine	01-12-2015	05-03-2016
6	Turbine	01-01-2019	22-04-2019

From above table it is noted that Unit 3 of BQPS-I requires major overhauling which was not carried out since last 12 years. Moreover, Unit 4 and 5 were last overhauled in the year 2016.

Bin Qasim Power Station-II (Major Overhaul):

Unit	Type of Major Overhaul	Date From	Date To
GT-1	MI	30-08-2018	24-09-2018
GT-2	MI	08-01-2019	05-02-2019
GT-3	MI	09-01-2018	01-02-2018
ST	MI + Rotor Replacement	01-12-2016	25-01-2017

It is noted that the company did not carry out Major Overhauls and only Major Inspections have been conducted at Bin Qasim-II. Whether major inspections ruled out the need for major overhauls require further clarifications by KE.

Korangi Combined Cycle Power Plant (Major Overhaul):

Unit	Type of Major Overhaul	Date
GT-1	GT in Package-1	April, 2014
GT-2	GT in Package-2	15 January, 2017
GT-3	GT in Package-3	13 August, 2017
GT-4	GT in Package-4	23 January, 2016
STG-A (GT-3/4)	Major Overhauling and Rotor Repair	26 February, 2017

It may be noted that GT-I of KCCPP requires major overhauling as it was last overhauled in April, 2014.

Korangi Gas Turbine Power Station:

Engine No.	30K Start Date	30K End Date
E11	25-Mar-16	12-Apr-16
E12	28-Jan-16	28-Feb-16
E13	27-Feb-17	31-Mar-17
E14	19-Jun-15	24-Jul-15
E15	30-Jun-16	29-Jul-16
E16	24-Mar-16	15-Apr-16
E17	12-Dec-15	27-Jan-16
E18	05-May-16	26-May-16
E21	11-Jun-15	30-Jun-15
E22	21-May-15	10-Jun-15
E23	13-Jan-15	28-Jan-15
E24	06-Mar-15	06-Apr-15
E25	11-Jan-15	24-Feb-15
E26	13-Nov-14	09-Dec-14
E27	26-Feb-15	12-Mar-15
E28	04-Dec-14	17-Jan-15

Engine No.	30K Start Date	30K End Date
E31	17-Nov-16	20-Dec-16
E32	09-Mar-15	28-Apr-15
E33	06-May-17	10-Jun-17
E34	03-Sep-15	19-Sep-15
E35	02-Nov-15	12-Dec-15
E36	23-Jun-15	14-Jul-15
E37	03-Sep-15	23-Sep-15
E38	26-May-15	26-Jun-15
E41	27-Sep-15	15-Oct-15
E42	06-Dec-15	19-Jan-16
E43	11-Jan-16	09-Feb-16
E44	22-Aug-16	26-Sep-16
E45	30-Nov-15	07-Jan-16
E46	23-May-16	23-Jun-16
E47	04-Oct-15	31-Oct-15
E48	26-Oct-15	30-Nov-15

SITE Gas Turbine Power Station (Type of Major Overhaul 30K):

Unit/GT/ Engine/ST	Date From	Date To
E12	11-Jul-18	08-Aug-18
E13	28-Mar-18	23-Apr-18
E14	31-Oct-17	25-Nov-17
E15	12-Nov-18	18-Dec-18
E16	23-Feb-17	07-Apr-17
E17	17-May-17	09-Jul-17
E18	05-Aug-17	06-Sep-17
E21	27-Apr-18	31-May-18
E22	11-Apr-18	11-May-18
E23	13-Mar-18	05-Apr-18
E24	17-Jul-17	09-Aug-17
E25	03-May-17	05-Jun-17
E26	20-Feb-17	17-Mar-17
E27	16-Mar-17	19-Apr-17
E28	09-Jun-18	23-Jul-18
E31	04-Apr-17	04-May-17

Unit/GT/ Engine/ST	Date From	Date To
E32	26-Nov-16	14-Dec-16
E33	13-Mar-17	30-Mar-17
E34	21-Feb-17	08-Mar-17
E35	15-Apr-17	16-May-17
E36	24-Aug-17	28-Sep-17
E37	06-Apr-18	27-Apr-18
E38	08-Mar-18	29-Mar-18
E41	19-Aug-19	29-Aug-19
E42	24-Nov-18	18-Jan-19
E43	24-Dec-18	28-Feb-19
E44	27-Jul-18	31-Aug-18
E45	22-Jan-19	04-Mar-19
E46	12-Dec-18	12-Feb-19
E47	01-Dec-18	18-Jan-19
E48	21-Jan-19	21-Mar-19

It is noted that a number of engines of KGTPS and SGTPS have completed 30,000 operating hours since last MOH. However, the maintenance of said engines is still pending. Overall the performances of KE's own power plants for last three years is inferior as compared to allowed targets set by the Authority in respect of heat rate/ efficiency and auxiliary consumption, despite that reasonable O&M had been allowed to KE under Multi Year Tariff.

2.8.2 Under-utilization of KE Power Plants and External Sources:

A review of the following tables for the last three years shows that KE has underutilized its power plants although the issue had been taken up by the Authority with KE in the past. It is noted that KE is still continuing its policy about not supplying electricity to its certain categories of consumers, in spite of the fact that some of its own generation plants were intentionally underutilized. While analyzing the available information it is noted that the utility is subjecting its consumers to undue and unauthorized load shedding by underutilizing its owned generation capacity.

As per submissions of KE, the company faced gas (fuel) and outage (scheduled, forced and maintenance) constraints throughout three years for all the power plants. The fuel availability is the power producer's responsibility and KE is required to have Fuel Supply Agreements urgently to overcome these issues. It is to be noted that underutilization of plants even caused by non-availability of fuel ultimately impacts the electricity tariff of end consumer.

Another main cause of underutilization of efficient power plants could be transmission system constraints existing in KE's transmission network, such as overloading of transmission lines, insufficient transformation capacity, outages of transmission lines due to tripping, faulty transformers etc. Under applicable documents, KE is responsible for evacuation of power from power plants, which are supplying electricity in KE system. Non-evacuation of electricity that can be generated through cheaper power plants is a failure of KE.

S. No.	Power Plants (Own + External)	2016-17		2017-18		2018-19	
		Average	Determined	Average	Determined	Average	Determined
1	BQPS-I (Gas)	100%	-	100%	-	100%	-
2	BQPS-I (FO)	35%	70%	40%	70%	36%	70%
3	Korangi CCPP	53%	85%	47%	85%	59%	85%
4	SITE GTPS	45%	92%	58%	92%	43%	92%
5	Korangi GTPS	45%	92%	37%	92%	45%	92%
6	BQPS-II	85%	85%	81%	85%	88%	85%
7	KANUPP	67%	-	54%	-	21%	-
8	Tapal Energy	69%	86%	70%	86%	60%	86%
9	Gul Ahmed	71%	86%	64%	86%	60%	86%
10	CPPA-G	89%	-	90%	-	87%	-
11	Anoud Power	52%	-	42%	-	49%	-
12	ISL/IIL	35%	-	34%	-	29%	-
13	FFBPL	82%	85%	96%	85%	90%	85%
14	SNPCL	n.a.	92%	53%	92%	88%	92%
15	OURSUN	n.a.	-	n.a.	-	20%	-
16	CPPA-G (150 MW)	n.a.	-	n.a.	-	19%	-

2.8.3 Economic Merit Order and System Operating Procedures of KE:

For following economic merit order, KE is required to incorporate incremental cost curves along with constraints list such as outages status, fuel shortage and power evacuation issues in its dispatch routines. For economic merit order dispatch a dedicated software, which takes into account the variable cost (fuel cost) on daily/hourly basis to operate the available power plants is required for which according to KE, procurement process is being initiated.

2.8.4 KE Generation Capacity kept on Standby Mode:

From the data in the following tables, it is observed that power plants of KE remained on standby mode for significant period, during July 2016 to June 2019, thereby wasting the potential to generate significant amount of economically efficient energy. On top of that, these machines have drawn energy during standby mode resulting in higher auxiliary power consumption.

KE Power Plants	Total Stand-by Hours
BQPS-I U-1	307.42
BQPS-I U-2	764.73
BQPS-I U-3	3,374.79
BQPS-I U-4	1,653.00
BQPS-I U-5	45.28
BQPS-I U-6	337.53
BQPS-I*	-
BQPS-II GT-1	1,739.49
BQPS-II GT-2	1,709.98
BQPS-II GT-3	1,329.81
BQPS-II ST	-
BQPS-II CCPP	55.75

KE Power Plants	Total Stand-by Hours
KCCPP GT-1	4,275.82
KCCPP GT-2	9,126.40
KCCPP GT-3	7,615.75
KCCPP GT-4	5,454.65
KCCPP ST-1	3,806.85
KCCPP ST-2	5,372.05
220 MW Korangi CCPP*	2,768.43
SGTPS-II Engines **	239,852.32
SGTPS-II ST	4,904.08
SGTPS-II*	2,049.29
KGTPS-II Engines**	351,259.91
KGTPS-II ST	9,901.68

* *Station standby hours reflect all units on standby at a particular time.*
** *SITE and Korangi Engine standby hours are cumulative sum of 32 Engines.*

2.9 ELECTRICITY PURCHASES FROM SPPS/CPPS/N-CPPS

During the FY 2018-19, the surplus installed capacity available with Sugar Mills and Textile Mills etc. was utilized by different DISCOs as shown in the following table:

CPPs/SPPs/N-CPPs	DISCO	Type	Fuel	Contract Capacity (MW)	Energy (kWh)
Sitara Energy	FESCO	SPP	RFO	25	0
Galaxy Textile	FESCO	N-CPP	Gas	11.6	0
Shakarganj Energy	FESCO	CPP	Bagasse	6	0
Shakarganj Sugar Mills	FESCO	CPP	Bagasse	2	6
Ramzan Sugar Mills	FESCO	CPP	Bagasse	12	0
Noon Sugar Mills	FESCO	CPP	Bagasse	12	2,045,200
Bhone Sugar Mills	FESCO	CPP	Bagasse	1	60
Indus Sugar Mills	MEPCO	CPP	Bagasse	4	80
Ashraf Sugar Mills	MEPCO	CPP	Bagasse	3	0
Jamal Din Wali Sugar Mills	MEPCO	CPP	Bagasse	10	0
Hamza Sugar Mills	MEPCO	CPP	Bagasse	2.5	0
Roomi Fabrics	MEPCO	CPP	Gas	5	0
Roomi Fabrics	MEPCO	N-CPP	Gas	10.5	0
Rahim Yar Khan Sugar Mills	MEPCO	CPP	Bagasse	8.5	0
Thal Industries	MEPCO	CPP	Bagasse	4	0
Thatta Power (Pvt.) Ltd.	HESCO	N-CPP	Gas	18.8	47,195,500
Anoud Textile	HESCO	N-CPP	Gas	10	3,851,888
Agar Textile Mills	HESCO	CPP	Gas	2	75,268,224
Faran Sugar Mills	HESCO	CPP	Bagasse	5	2,533,368
Omni Power	HESCO	N-CPP	Gas	10	7,023,360
Omni – 1	HESCO	N-CPP	Gas	10	7,859,200
Omni – 2	HESCO	N-CPP	Gas	10	7,605,608
Chamber Sugar Mills	HESCO	CPP	Bagasse	1.5	18,702
Sanghar Sugar Mills	HESCO	CPP	Bagasse	3.4	3,829,464
Bandhi Sugar Mills	HESCO	CPP	Bagasse	10	5,179,688
Salim Yarn Mills	HESCO	CPP	Gas	2	0

CPPs/SPPs/N-CPPs	DISCO	Type	Fuel	Contract Capacity (MW)	Energy (kWh)
Mekotex	HESCO	CPP	Gas	4	0
Hi-Tech Pipe and Engineering	HESCO	CPP	Gas	8	3,711,632
Mehran Sugar Mills	HESCO	CPP	Bagasse	2	570,992
Tando Allah Yar Sugar Mills	HESCO	CPP	Bagasse	9	644,130
Lucky Cement Factory	HESCO	N-CPP	Gas	20	143,896,320
AL Noor Sugar Mills	SEPCO	CPP	Bagasse	8	8,267,760
Daharki Sugar Mills	SEPCO	CPP	Bagasse	4	0
Ghotki Sugar Mills	SEPCO	CPP	Bagasse	8	0
Dadu Energy	SEPCO	N-CPP	Gas	19.2	39,395,300
Naudero Energy	SEPCO	N-CPP	Gas	15.8	0
Lodra Power	SEPCO	N-CPP	Gas	16	34,307,500
Brothers Sugar Mills	LESCO	CPP	Bagasse	3	0
Layyah Sugar Mills	MEPCO	CPP	Bagasse	4	0
Kumhar Wala Powerhouse-I	--	CPP	--	5	0
Kumhar Wala Powerhouse-II	--	CPP	--	10.5	8,934,760
Habib Sugar Mills	HESCO	CPP	Bagasse	3.4	2,914,386
Sukkur IBA Sukkur	--	--	--	--	75,160
				339.7	**405,128,288**

Source: CPPA-G

2.10 OPERATIONAL PERFORMANCE OF GENERATION FACILITIES

The performance of generation power plants may be gauged through analyzing a number of parameters including their unit-wise and complex based availability. NEPRA has also prescribed generation performance standards, which include Key Performance Indicators (KPIs) for evaluation of performance. The performance of generation power plants with respect to their design parameters has been discussed in earlier sections, whereas their operational performance is discussed in the following sections.

2.10.1 Availability of GENCOs' Power Plants:

The availability factor of a power plant is the amount of time, during which, the plant is able to produce electricity over a certain period, divided by the amount of time in the period. The availability of a power plant varies greatly, due to the type, of fuel, the design of the plant and how the plant is operated. Unit-wise availability of GENCOs' power plants is shown in the below tables:

2.10.1.1 Unit-wise Availability Factors:

Unit-wise Availability Factors (AFs) of GENCOs' power plants during the period under review are shown in the following tables:

	Unit	Availability Factor (%)
TPS Jamshoro	Unit-1	34.03
	Unit-2	88.56
	Unit-3	84.84
	Unit-4	86.56

	Unit	Availability Factor (%)
TPS Guddu	Block-III (Unit 3-4)	100.00
	Block-II (Unit 5-10)	90.87
	Block-I (Unit 11-13)	90.92
	Block-V (Unit 14-16)	90.32

	Unit	Availability Factor (%)
TPS Kotri	Unit-3	56.72
	Unit-4	99.84
	Unit-5	58.24
	Unit-6	99.99
	Unit-7	87.57

	Unit	Availability Factor (%)
TPS Muzaffar Garh	Unit-1	99.06
	Unit-2	99.94
	Unit-3	99.96
	Unit-4	98.41
	Unit-5	99.99
	Unit-6	97.82

	Unit	Availability Factor (%)
GTPS Faisalabad	Unit-1	100.00
	Unit-2	100.00
	Unit-3	100.00
	Unit-4	100.00
	Unit-5	99.60
	Unit-6	95.59
	Unit-7	96.92
	Unit-8	72.39
	Unit-9	72.46

2.10.1.2 Plant-wise Availability Factors (%):

On an overall plant basis a comparison of AFs for FY 2017-18 and FY 2018-19 is shown in the accompanying table. Mostly the AFs for the two years are similar, Lakhra Complex has serious issues showing zero AF in 2018-19. It is also pertinent to mention here that although, the AFs of GTPS Kotri, GTPS and SPS Faisalabad appear to be within the acceptable range, but most of the time these power stations remained on standby mode due to which their potential was not utilized.

Power Station	2017-18	2018-19
TPS Jamshoro	85	74
GTPS Kotri	93	81
TPS Guddu (1-13)	61	64
TPS Guddu (14-16)	75	90
TPS Muzaffargarh	87	99
GTPS Faisalabad	98	93
SPS Faisalabad	45	0
CCPP Nandipur	93	92
Lakhra FBC	5	0

2.10.2 Performance of Generation Facilities under NEPRA Performance Standards (Generation) Rules, 2009:

NEPRA Performance Standards (Generation) Rules 2009, specify a number of Key Performance Indicators (KPIs) which relate plant operational parameters to gauge performance of generation licensees, who are required under the rules to submit their performance reports to NEPRA. Of these, the major ones are defined hereunder:

The first such parameter is Net Capacity Factor (NCF) which works out the actual energy produced by a unit/ machine during a particular period compared to its full potential for power generation during that period. Net Output Factor (NOF) is the second indicator, which measures the actual energy over the time when the units/machines were actually synchronized with the system. Energy Availability Factor (EAF) calculates the amount of time in which a unit/machine practically remained available less any equivalent planned/unplanned de-rated hours, for generation of power at full net capacity. Another parameter which is commonly used in NTDC system is the "Standby Mode", which is the period when machine is available for generation but not actively utilized either due to fuel constraints or less demand, on the instruction of System Operator or otherwise. It is to be noted that a collective analysis of these KPI would lead to drawing conclusions about the performance of power plants. The following sections provide data about these KPIs for power plants controlled by GENCOs:

2.10.2.1 Net Capacity Factor (NCF) (%):

On an average, the NCF for all the power plants remained very low in FY 2018-19. A comparison with FY 2017-18 shows that except for TPS Guddu (1-13) and TPSS Guddu (14-16) which have higher NCF in FY 2018-19 as compared to FY 2017-18 the factor for other power plants declined. The NCF for CCPP Nandipur went down from 61% to 40% whereas other power plants also had lower factors than last year. The data shows that most of the time these power stations remained either on standby mode or on planned/unplanned outage during the subject period. Therefore, relative to the previous year, the performance on this account has deteriorated.

Power Station	2017-18	2018-19
TPS Jamshoro	32	16
GTPS Kotri	10	2
TPS Guddu (1-13)	34	40
TPS Guddu (14-16)	59	78
TPS Muzaffargarh	29	8
GTPS Faisalabad	6	7
SPS Faisalabad	1	0
CCPP Nandipur	61	40
Lakhra FBC	5	0

2.10.2.2 Net Output Factor (NOF) (%):

The NOF of all the power plants in 2018-19 deteriorated compared to 2017-18 except for Guddu (14-16) for which NOF showed slight improvement. A factor above 90% shows that generally the power plant was operated in a prudent manner as it produced 90% of the time, the energy it could have produced. Based on the given data the performance of GENCOs was extremely poor.

Power Station	2017-18	2018-19
TPS Jamshoro	71	47
GTPS Kotri	76	33
TPS Guddu (1-13)	65	50
TPS Guddu (14-16)	79	88
TPS Muzaffargarh	68	51
GTPS Faisalabad	84	20
SPS Faisalabad	87	0
CCPP Nandipur	73	44
Lakhra FBC	108	0

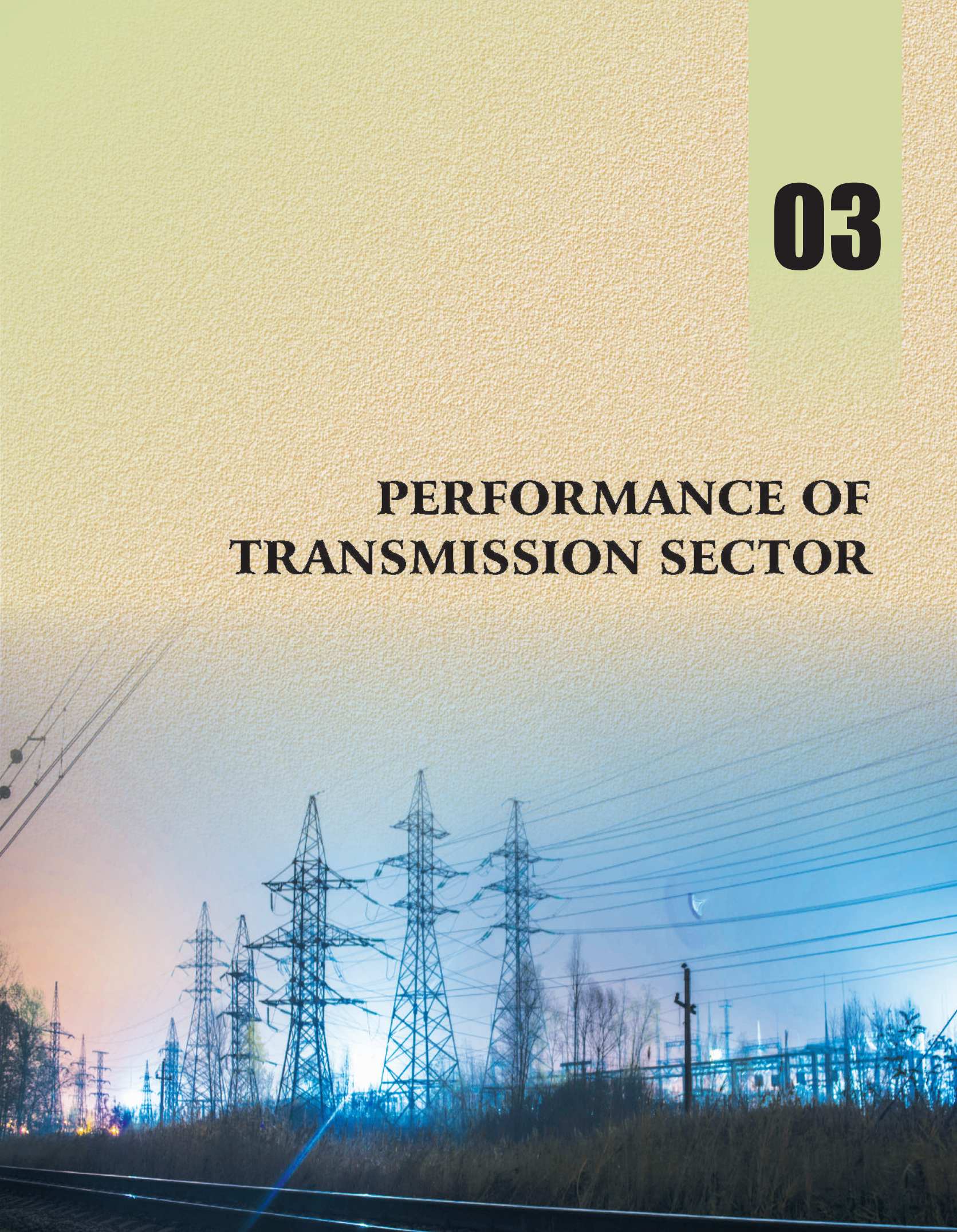
2.10.2.3 Energy Availability Factor (EAF) (%):

EAFs as shown in the accompanying table and AFs discussed earlier have been noted to differ for TPS Jamshoro, TPS Guddu, TPS Muzaffargarh and CCPP Nandipur, implying that their net capacities were temporarily reduced due to equivalent planned and unplanned de-ratings during the reported period.

Power Station	2017-18	2018-19
TPS Jamshoro	64	53
GTPS Kotri	93	81
TPS Guddu (1-13)	58	41
TPS Guddu (14-16)	75	90
TPS Muzaffargarh	62	96
GTPS Faisalabad	97	93
SPS Faisalabad	45	0
CCPP Nandipur	56	85
Lakhra FBC	5	0

03

PERFORMANCE OF TRANSMISSION SECTOR



PERFORMANCE OF TRANSMISSION SECTOR

3.1 GENERAL

The transmission line network of NTDC includes 6,417 km long transmission lines operating at 500 kV level and 10,103 km long 220 kV lines. As of 30 June 2019, NTDC is maintaining 16 (sixteen) 500 kV grid stations with a transformation capacity of 24,791 MVA. There are 42 (forty-two) 500/220 kV transformers and 34 (thirty-four) 220/132 kV transformers installed at these grid stations. At 220 kV level there are 45 grid stations with a transformation capacity of 29,935 MVA. There are 124 (one hundred and twenty four) 220/132 kV transformers installed at 220 kV grid stations.

In addition to transmission lines of NTDC, a 37 km long 132 kV D/C transmission line has been energized in 2016 by Fatima Transmission Company Limited. A 95 km long 132 kV D/C transmission line of Sindh Transmission and Dispatch Company Limited (STDC) has achieved its COD in January, 2018. The construction activities on 878 km long HVDC bi-pole transmission line operating at ±660 kV have been initiated.

3.2 POWER BALANCES OF NTDC SYSTEM

The following table provides yearly installed capacity, planned generation capability and peak time demand of NTDC system, to the year 2030 and surplus/deficit statistics. It may be noted that from 2020 and onwards, a supply surplus scenario is expected:

Year ending 30th June	Installed Capacity (MW)	Planned Generation Capability as per NTDC (MW)	NTDC's Projected Demand Growth Rate (%)	NTDC's Projected Demand during Peak Hours (MW)*	Surplus/ Deficit (MW)
2019	35,924	26,887	3.9	27,261	(374)
2020	39,200	28,189	4.1	28,155	34
2021	42,008	30,582	4.2	29,325	1,257
2022	45,195	32,989	5.4	30,921	2,068
2023	48,915	35,896	3.3	31,953	3,943
2024	51,764	37,918	5.5	33,696	4,222
2025	57,224	39,157	5.1	35,422	3,735
2026	59,634	42,075	2.2	36,206	5,869
2027	60,758	40,433	5.6	38,227	2,206
2028	66,419	44,639	5.5	40,324	4,315
2029	67,559	45,437	5.4	42,519	2,918
2030	69,959	47,127	5.7	44,958	2,169

** NTDC develops the Demand Projections of Peak Demand only.*

- *Electricity Demand Forecast based on Regression Report (Period 2018-2040)*
- *Summary of Power Balance based on latest IGCEP 29 October, 2018*

Source: NTDC

3.3 LOADING POSITION OF NTDC'S 500 KV AND 220 KV GRID STATIONS

As of 30 June 2019, NTDC is maintaining 16 (sixteen) 500 kV grid stations with a transformation capacity of 24,791 MVA. There are 42 (forty-two) 500/220 kV transformers and 34 (thirty-four) 220/132 kV transformers installed at these grid stations. At 220 kV level there are 45 grid stations with a transformation capacity of 29,935 MVA. There are 124 (one hundred and twenty four) 220/132 kV transformers installed at 220 kV grid stations.

Out of 42 transformers at 500/220 kV level, 24 transformers (57%) are loaded above 80% of their rated capacity. Similarly out of 158 transformers at 220/132 kV level, 69 are overloaded representing around 44% overloading in the system.

A. Overloading of 500 kV & 220 kV Power Transformers installed at 500 kV Grid Stations (as of June, 2019):

Region	Name of Grid Station	Auto and Power T/F	Voltage Level	Capacity (MVA)	Capacity (Ampere)	Load (Ampere)	Overload (above 80%)
Islamabad	Rawat	T-1	500/220	450	1125	900	80.00
		T-2	500/220	450	1125	1000	88.89
		T-3	500/220	450	1125	1000	88.89
		T-4	500/220	750	1968	1760	89.43
		T-5	220/132	250	1093	1030	94.24
		T-6	220/132	250	1093	1030	94.24
		T-7	220/132	250	1093	1030	94.24
	Sheikh Muhammadi	T-1	500/220	450	1180	1030	87.29
		T-2	500/220	450	1180	1030	87.29
		T-9	500/220	450	1180	1030	87.29
		T-3	220/132	250	1093	890	81.43
		T-4	220/132	250	1093	890	81.43
		T-5	220/132	250	1093	890	81.43
		T-8	220/132	250	1093	890	81.43
Lahore	Nokhar	T-1	500/220	600	1575	1330	84.44
		T-2	500/220	600	1575	1330	84.44
		T-4	220/132	160	700	670	95.71
		T-5	220/132	160	700	670	95.71
		T-6	220/132	160	700	670	95.71
	Gatti	T-1	500/220	450	1181	1069	90.52
		T-2	500/220	450	1181	1097	92.89
		T-3	500/220	450	1181	1052	89.08
		T-4	500/220	450	1181	1052	89.08
		T-5	500/220	600	1575	1370	86.98
	Sheikhupura	TB-1	500/220	600	1575	1320	83.81
		TB-2	500/220	600	1575	1320	83.81
		TB-3	500/220	600	1575	1320	83.81
		TB-4	500/220	600	1575	1320	83.81
		T-5	220/132	160	700	560	80.00
		T-6	220/132	160	700	615	87.86
		T-7	220/132	160	700	670	95.71
		T-8	220/132	160	700	640	91.43
	Yousafwala	T-1	500/220	600	1575	1490	94.60
		T-2	500/220	600	1575	1490	94.60
		T-3	220/132	160	700	642	91.71
		T-4	220/132	160	700	642	91.71
		T-5	220/132	160	700	642	91.71
		T-6	220/132	160	700	642	91.71
Multan	Multan	TR-1	525/231/22	450	1125	1088	96.71
		TR-2	525/231/22	450	1125	1088	96.71
		TR-3	220/132	160	700	646	92.29
		TR-4	220/132	160	700	646	92.29
		TR-5	220/132	160	700	646	92.29
	Muzaffargarh	ATB-1	525/231/23	600	1575	1300	82.54
		ATB-2	525/231/23	600	1575	1440	91.43
Hyderabad	Jamshoro	T-1	500/220	450	1125	915	81.33
		T-2	500/220	450	1125	915	81.33
	Guddu	T-1	500/220	450	1125	908	80.71
		T-2	500/220	450	1125	908	80.71

Source: NTDC

B. Overloading of 220 kV Power Transformers installed at 220 kV Grid Stations (as of June, 2019):

Region	Name of Grid Station	Auto and Power T/F	Voltage Level	Capacity (MVA)	Capacity (Ampere)	Load (Ampere)	Overload (above 80%)
Islamabad	Mardan	T-1	220/132	250	1093	1000	91.49
		T-2	220/132	250	1093	1000	91.49
		T-3	220/132	250	1093	1000	91.49
	Daud Khail	T-1	220/132	160	700	693	99.00
		T-2	220/132	160	700	693	99.00
	Sang Jani	T-1	220/132	160	700	605	86.43
		T-2	220/132	160	700	605	86.43
		T-3	220/132	160	700	620	88.57
		T-4	220/132	160	700	620	88.57
	University	T-1	220/132	250	1093	1000	91.49
Lahore	N/Abad	T-3	220/132	160	700	630	90.00
	JWR	T-1	220/132	160	700	632	90.29
		T-2	220/132	160	700	630	90.00
		T-3	220/132	160	700	620	88.57
		T-4	220/132	160	700	660	94.29
	Sammundri Road	T-1	220/132	250	1093	920	84.17
		T-2	220/132	160	700	580	82.86
		T-3	220/132	160	700	620	88.57
	Ludewala	T-1	220/132	160	700	680	97.14
		T-2	220/132	250	1095	1040	94.98
		T-3	220/132	250	1095	1040	94.98
	Bandala	T-2	220/132	160	700	600	85.71
	Kala Shah Kaku	T-3	220/132	160	700	580	82.86
		T-4	220/132	160	700	580	82.86
	NKLP LHR	T-1	220/132	250	1093	1100	100.64
		T-2	220/132	250	1093	1100	100.64
		T-3	220/132	250	1093	1100	100.64
	Ravi LHR	T-1	220/132	250	1093	970	88.75
	Sarfaraz Nagar	T-1	220/132	160	700	670	95.71
		T-2	220/132	160	700	670	95.71
		T-3	220/132	160	700	670	95.71
		T-6	220/132	160	700	670	95.71
	WAPDA Town	T-1	220/132	160	700	605	86.43
		T-2	220/132	160	700	605	86.43
		T-3	220/132	160	700	605	86.43
Multan	Chishtian	T-1	220/132	160	700	611	87.29
		T-2	220/132	160	700	611	87.29
	Muzaffargarh	T-1	220/132	160	700	615	87.86
		T-2	220/132	160	700	615	87.86
	Bahawalpur	T-1	220/132	160	700	620	88.57
		T-2	220/132	250	1093	983	89.94
		T-3	220/132	250	1093	983	89.94
	Vehari	T-1	220/132	125/160	700	685	97.86
		T-2	220/132	125/160	700	685	97.86
		T-3	220/132	250	1093	973	89.02
	Kassowal	T-1	220/132	160	700	658	94.00
		T-2	220/132	160	700	658	94.00
Hyderabad	Hala Road	T-1	220/132	160	700	580	82.86
		T-2	220/132	160	700	580	82.86
	Jhampir	T-1	220/132	250	1093	962	88.01
		T-2	220/132	250	1093	962	88.01

	Shikarpur	T-1	220/132	160	700	600	85.71
		T-2	220/132	250	1093	960	87.83
		T-3	220/132	160	700	620	88.57
Quetta	Quetta	T-1	220/132	160	700	600	85.71
		T-2	220/132	160	700	600	85.71
	Sibbi	T-1	220/132	160	700	580	82.86
	Khuzdar	T-1	220/132	160	700	580	82.86
		T-2	220/132	160	700	580	82.86

Source: NTDC

3.4 CONSTRAINTS IN NTDC SYSTEM

Most of the system constraints in FY 2018-19 were experienced in NTDC's Southern network resulting in power dispersal issues from 1,320 MW Port Qasim Power Plant and Wind Power Plants situated at Jhimpir and Gharo.

(a) 1320 MW Port Qasim Power Plant:

1320 MW Port Qasim Power Plant is the leading energy project under CPEC, which commenced commercial operations on 25th April, 2018. Port Qasim Power Plant is connected with southern network of NTDC through 500 kV transmission lines.

Since the COD, Port Qasim Power Plant is operating on interim arrangement. Furthermore, the existing 500 kV network in south is quite old, fragile and deteriorated due to higher levels of humidity in air being near to coastal belt. Due to inadequate capacity of 500 kV transmission lines around Port Qasim Power Plant and frequent tripping of 500 kV transmission lines, the plant faced power evacuation issues.

Actual Scope of Interconnection	Interim Arrangement
500 kV D/C T/L from Port Qasim Power Plant to 500 kV Matiari Grid Station, 185 km.	500 kV D/C T/L from Port Qasim Power Plant to Interconnection Point of 500 kV Circuit-1 Hub-Jamshoro Transmission Line, 50 km.

Steps taken by NTDC towards redressal of power evacuation problem from Port Qasim Power Plant:

To mitigate the issue of frequent tripping of 500 kV Port Qasim transmission line, the existing disc insulators on both circuits of 500 kV Port Qasim T/Line have been replaced with RTV coated disc insulator during March – April 2019. With completion of work, NTDC has reported considerable reduction in tripping and improvement in power evacuation issues.

(b) Power Curtailment of Wind Power Plants at Jhimpir Cluster:

As reported, instability of 220 kV New Jhimpir Grid Station caused frequent grid failure, load curtailments from wind power plants located in Jhimpir cluster and grid voltages beyond permissible limits. As per information provided by Sapphire Wind Power, Tricon Boston, Hawa Energy, Act Wind, FFC Energy, Sachal Energy, Gul Ahmed Wind and Artistic Energy, they have continuously supplied reactive power to maintain power quality at 220 kV New Jhimpir Grid Station in compliance with the requirements under the Grid Code however tripping and power curtailment issues continued to persist.

The instability of 220 kV New Jhimpir grid station is due to procurement and installation of substandard disc insulators used in 220 kV New Jhimpir – Tando Muhammad Khan circuits I&II. The disc insulators have failed to sustain the hot, humid and dusty environment of Jhimpir area and resulted in excessive faults and tripping of 220 kV lines. Reportedly NTDC has replaced all the substandard insulators by imported fog type disc insulators on 70 km 220 D/C New Jhimpir – TM Khan transmission line. The replacements on both circuits completed on 15-02-2019.

It is noted that despite above efforts made by NTDC and wind power plants, power curtailment issues have not been resolved. Further, constraints on some 132 kV transmission lines of HESCO around wind corridor of Jhimpir and Gharo have also been noted to restrict power flow capacity on these transmission lines. Furthermore, HESCO is also forced to draw lesser power than its allocated quota, which also results in power curtailments from WPPs. In this regard, HESCO identified the constraints and submitted the progress of remedial works as under:

S. No.	Constraints	Progress
1	At GTPS Kotri end of the 132 kV Jhampir-Kotri Line, the CT ratio is 600/5 and the capacity of 132 kV Bus Bar of GTPS Kotri is not sufficient to cater high magnitude load.	Work is under progress with PD GSC.
2	132 kV Thatta-Sujawal T/L of HESCO is severely hit by costal effect. HESCO is in process of rehabilitation of this deteriorated line, which is expected to be complete by the end of the year 2019.	Main estimate submitted to higher office by PD GSC for approval.
3	Due to ageing and harsh saline atmospheric effect the conductor of 132 kV Sujawal-Bulri Shah Karim-TM Khan is oxidized. The subject line may not be operated at higher loads. HESCO is under process of construction of new 132 kV Sujawal-TM Khan T/L, which is expected to be complete by the end of the year 2020.	Survey work completed and profile submitted to Design Office NTDC by PD GSC for approval.

Source: NTDC

HESCO stated that transmission lines in Gharo/Thatta pass through costal area and have deteriorated, hence HESCO is in process of reconductoring/rehabilitation of those lines. On issue of less drawl HESCO stated that it carries load management on high loss feeders as per instructions of Ministry of Energy (Power Division), due to which at times its drawl is less than that of allocated quota.

(c) Wind Power Plants at Gharo Cluster:

There are 3 wind power plants in Gharo Cluster namely Zephyr Wind, Hydro China Dawood and Tenaga Generasi. These power plants have been provided with interim arrangement i.e. 132 kV transmission line for Gharo to 220 kV Jhimpir Grid Station. Actual scope of work for WPPs in Gharo included 220 kV GIS Gharo Grid Station and 220 kV Gharo–Jhimpir Transmission Line. Due to absence of 220 kV Gharo Grid Station the power plants in Gharo Cluster are facing power evacuation issues.

(d) Development Projects and their completion:

The latest status of ongoing development works (grid stations) and power evacuation projects (transmission lines) during FY 2018-19 is given below:

S. No.	Name of Grid Station	Contractual Compl. Date	Actual Date of Completion	Delay (months)	Reasons of Delay
1	220 kV Chakdara	December, 2016	September, 2018	21 months	▪ Rebidding of tender. ▪ Delay in land acquisition. ▪ RoW issues in transmission line (220 kV Mardan – Chakdara) ▪ Non-serious attitude of contractor and consultant toward project activities.
2	220 kV D.I. Khan	December, 2016	February, 2019	26 months	▪ Tendering process was annulled due to offered prices substantially higher than Engineer's estimate.
3	220 kV Nowshehra	December, 2016	April, 2019	28 months	▪ Tendering process was annulled due to offered prices substantially higher than Engineer's estimate. ▪ Delay in acquisition of land.
4	220 kV Ghazi Road	October, 2016	April, 2019	30 months	▪ Non-qualified project manager of M/s Altsom. ▪ Non-establishment of site office by contractor. ▪ Frequent submission of incomplete/irrelevant technical data/drawings.

Source: NTDC

In addition to above, NTDC also carried out several rehabilitation/augmentation works at 500 kV and 220 kV network to ensure uninterrupted power supply to DISCOs in summer 2019. The DISCO-wise details are as follows:

DISCO	Name of Grid Station/ Transmission Line	Relief Project	Completion month
IESCO	220 kV Tarbella – Burhan D/C T/L	Re-conductoring from single rail to twin bundled rail conductor	February, 2019
	500 kV Rawat	Addition of 750 MVA T/F	April, 2019
LESCO	500 kV Sheikhupura (Lahore)	Addition of 3rd T/F 750 MVA at Lahore South	April, 2019
FESCO	220 kV Toba Tek Singh	Augmentation of 1x160 MVA T/F to 1x250 MVA	January, 2019
	220 kV Ludewala	Augmentation of 1x160 MVA T/F to 1x250 MVA	March, 2019
	220 kV Summandri Road	Augmentation of 1x160 MVA T/F to 1x250 MVA	April, 2019
	500 kV Gatti	Addition of 600 MVA T/F	May, 2019
MEPCO	220 kV Vehari	Augmentation of 1x160 MVA to 1x250 MVA T/F	April, 2019
QESCO	220 kV Quetta Industrial	Augmentation of 1x160 MVA to 1x250 MVA T/F	May, 2019

Source: NTDC

(e) Benefits achieved through investments made by NTDC in 2018-19:

NTDC was able to meet the peak demand of 21,582 MW in June, 2019 as compared to previous year peak demand of 19,020 MW.

3.5 INVESTMENT PLANS OF NTDC

A. Transmission Lines Expansion Plans (as per approved PC-I) of NTDC:

S. No.	Name of Project	Transmission Lines		Expected Completion Date	Estimated Cost (Million Rs.)
		Voltage Level (kV)	Line Length (km)		
1	D/C Quad Bundle T/L for Interconnection 500 kV K2/K3 D/C of with HUBCO to Jamshoro	500	11.24	November, 2019	7,501.41
2	Dispersal of Power from 1320 MW Power Plant at Port Qasim to Matiari (Phase-II: Lot-III)	500	25.62	December, 2019	14,163.00
3	Dispersal of Power from 747 MW Guddu Power Plant	500	260	December, 2019	7,873.00
4	3rd 500 kV Circuit from Jamshoro to Rahim Yar Khan	500	600	2019-20	36,857.00
5	Evacuation of Power from 660 MW Lucky Electric Power Company	500	15	2020-21	1,226.00
6	Evacuation of Power from 330 MW Siddiqsons Limited	500	21	2020-21	2,177.00
7	Evacuation of Power from 50 MW Tricom Wind, 50 MW Shaheen Foundation, 50 MW Western Energy and 50 MW Master Green Wind Power Projects	132	Tricom 11.73, Shaheen 15.12, Western 1.002	Tricom, Shaheen and Western: June, 2020 Master Green: December, 2020 (subject to availability of material)	10,753.00 (includes cost for evacuation of power from 1224 MW WPPs at Jhimpir Cluster)
8	D/C T/L from HUBCO Coal Fired Power Plant to Jamshoro	500	180	June, 2020	16,500.00
9	Construction of New 220 kV Guddu-Sibbi T/L for improvement of Power Supply System in South Area	220	360	June, 2021	8,366.00
10	T/L from DI Khan-Zhob along with 220 kV Zhob Substation	220	220	2022-23	6,878.00
11	Mirpur Khas G/S and Associated T/L	220	70	2022-23	4,153.00

Source: NTDC

B. Grid Station Expansion Plans of NTDC

Period of Report	500/220 kV Grids				220/132 kV Grids			
	Nos.	MVA Capacity	Expected COD	Estimated Cost (Rs. Million)	Nos.	MVA Capacity	Expected COD	Estimated Cost (Rs. Million)
(a) New Grid Station								
2020-21	-	-	-	-	1	750	2020-21	1,581.00
(b) Extension								
2019-20	2	1,050	2019-20	2,165.00	-	-	-	-
2020-21	2	1,050	2020-21	2,854.00	-	-	-	-
(c) Addition/Reinforcement of Transformers at Overloaded Grid Stations								
2020-21	-	-	-	-	26	6,096	2020-21	13,672.00

Source: NTDC

3.6 NTDC POWER EVACUATION PROJECTS

The following table shows interconnection arrangement to evacuate power from up-coming (Public and Private Sector) power projects carried out by NTDC:

S. No.	Name of Power Project	Plant Cap. (MW)	Expected COD	Proposed Transmission Scheme
1	Guddu New Power Plant	747	2019-20	500 kV D/C T/L from Guddu to Muzaffargarh (256 km)
2	Neelum-Jhelum Hydropower Project	969	2019-20	500 kV D/C T/L Neelum-Jhelum from Domeli to Gujranwala (125 km) Phase-II
3	HUBCO Coal Power Plant	1320	2019-20	500 kV D/C T/L from HUB Coal Power Plant to Jamshoro 500 kV Grid Station (181 km)
4	Port Qasim Coal Fired Power Plant	1320	2019-20	500 kV D/C T/L from Port Qasim Coal PP to Matiari Switching Station (T/L is 174 km from which 158 km is complete and 16 km is remaining)
5	Trimmu RLNG Power Plant	1230	2019-20	Extension of 220/132 kV 1x250 MVA Transformer at TT Singh
				220 kV Two Nos. D/C T/L from Trimmu RLNG PP to TT Singh (50 km)
			2020-21	220 kV S/C T/L for looping In/Out of Trimmu RLNG PP-TT Singh at Jaranwala Road via 220 kV Grid Station Sumandari Road (70 km)
6	Evacuation of Power from K2/K3 Nuclear Power Plants	2200	2020-21	500 kV S/C T/L for looping In/Out of Port Qasim CFPP-Matiari at K2/K3 (102 km)
				500 kV S/C T/L for looping In/Out of HUBCO Coal Power Plant-Jamshoro at K2/K3 via Existing 500 kV S/C T/L HUBCO-NKI (10 km)
7	Lucky Electric Coal Fired Power Plant	660	2020-21	500 kV S/C T/L for looping In/Out of Port Qasim CFPP-Matiari at Lucky Electric (15 km)
8	Thar Energy Coal Fired Power Plant	330	2020-21	500 kV S/C T/L for looping In/Out of Engro CFPP-Matiari at Thar Energy CFPP (1 km)
9	ThalNova Coal Fired Power Plant	330	2020-21	500 kV S/C T/L for looping In/Out of Engro CFPP-Matiari at ThalNova CFPP (1 km)
10	Siddiqsons Coal Fired Power Plant	330	2021-22	500 kV S/C T/L for looping In/Out of ThalNova CFPP-Matiari at Siddiqsons CFPP (1 km)
11	Karot Hydropower Project	720	2021-22	500 kV S/C T/L for looping In/Out of Neelum Jhelum HPP-Gujranwala at Karot HPP (5 km)
12	Shanghai Electric Coal Fired Power Plant	1320	2021-22	500 kV D/C T/L from Shanghai Electric CFPP to Matiari (220 km) 500 kV S/C T/L for looping In/Out of Thar CFPP-Matiari at Shanghai Electric CFPP (1 km)
13	Wind Power Plants at Jhimpir Clusters	1224	2021-22	220 kV G/S Jhimpir-II with 22/132 kV 3x250 MVA Transformers
				220 kV D/C T/L for In/Out of 220 kV Jhimpir-I-Gharo S/C at Jhimpir-II (7 km)
				220 kV D/C T/L for looping In/Out of Jamshoro-KDA at Jhimpir-II (18 km)
14	Evacuation of Power from 2160 MW Dasu HPP (Stage-I)	4320	December, 2024	756 kV HVAC Double Circuit Hexa-Bundle

Source: NTDC

3.7 OUTAGES ON TRANSMISSION LINES OF NTDC (500 KV AND 220 KV)

The following table provides circuit-wise details of outages (during June, 2019 and January-June, 2019) on 500 kV and 220 kV transmission lines as reported by NTDC:

S. No.	Name of Circuit	June, 2019	January-June, 2019	S. No.	Name of Circuit	June, 2019	January-June, 2019
			500 kV Transmission Lines				
1	Tarbela-Barotha No. 1	0	1	18	DG Khan-Guddu	0	4
2	Tarbela-Barotha No. 2	0	1	19	Multan-RY Khan	0	5
3	Barotha-Gatti No. 1	0	1	20	RY Khan-Guddu 747 MW	0	5
4	Barotha-Gatti No. 2	0	2	21	Multan-Muzaffargarh	0	1
5	QATPL-Bhikki-SKP	0	1	22	M/Garh-Guddu	0	1
6	M/Garh-HB Shah	0	1	23	Guddu 747 MW-Guddu Old	0	4
7	Gatti-HB Shah-1	0	1	24	CPHGC-Jamshoro	2	9
8	Gatti-HB Shah-2	0	1	25	Dadu-Jamshoro-I	0	4
9	CFPP-Lahore (SKP)	0	1	26	Jamshoro-Dadu-II	0	3
10	Balloki-New Lahore (South-I)	0	2	27	Guddu-Shikarpur-I (in & out)	0	2
11	Balloki-New Lahore (South-II)	0	3	28	Shikarpur-Dadu-I (in & out)	0	3
12	Lahore (SKP) – New Lahore (South)	0	3	29	Guddu-Shikarpur-II (in & out)	0	1
13	Tarbela-Sheikh Muhammadi Peshawar	2	2	30	Hub-NKI	0	2
14	Tarbela-Rawat	1	2	31	Port Qasim-Jamshoro	0	1
15	Barotha-Rawat-I	0	1	32	Engro Power Thar-Jamshoro	0	1
16	Rawat-Nokhar-I	1	3	33	Hub-Jamshoro-II	0	2
17	Multan-DG Khan	0	2				
			220 kV Transmission Lines				
1	Gatti-NBD No. 1	2	5	57	ISPR-Mansehra-II	0	2
2	Gatti-NBD No. 2	2	7	58	Mansehra-Alai Khawar-I	0	2
3	Gatti-JWR No. 1	0	7	59	Mansehra-Alai Khawar-II	1	2
4	Gatti-JWR No. 2	0	4	60	Ghazi Barotha-Sheikh Muhammadi Peshawar	0	1
5	Gatti-Yousafwala No. 1	0	2	61	Burhan-ISPR	0	1
6	Gatti-Yousafwala No. 2	0	2	62	Rawat-ISPR	0	1
7	Gatti-L/Wala No. 1	0	1	63	Mangla-Rawat-II	0	2
8	Gatti-L/Wala No. 2	0	2	64	Barotha-Nowshehra-I	0	1
9	Multan-TTS No. 1	0	1	65	Peshawar-Nowshehra	2	2
10	Multan-TTS No. 2	0	1	66	Multan-NGPS-I	0	3
11	TT Singh-SRD No. 1	1	2	67	Multan-NGPS-II	0	2
12	TT Singh-SRD No. 2	3	6	68	Multan-TTS (upto Head Sidhnai)-I	0	1
13	SRD-NBD No. 1	2	5	69	Multan-TTS (upto Head Sidhnai)-II	0	1
14	SRD-NBD No. 2	3	8	70	TPS M/Garh (Ph-I)-B/Pur-I	0	1
15	Bandala-Gatti No. 1	0	1	71	TPS M/Garh (Ph-I)-B/Pur-II	0	2
16	Bandala-Gatti No. 2	0	3	72	TPS M/Garh (Ph-I)-Multan-I	2	4
17	KS Kaku-Bandala-I	0	2	73	TPS M/Garh (Ph-I)-Multan-IV	0	1
18	KS Kaku-Bandala-II	0	2	74	TPS M/Garh (Ph-II)-Multan-III	0	1
19	Bund Road-Sheikhupura-I	1	2	75	M/Garh-Multan-II	1	2
20	Bund Road-Sheikhupura-II	0	2	76	M/Garh-TPS M/Garh (Ph-II)	0	1
21	Bund Road-Sheikhupura-III	0	1	77	KAPCO-Multan-III	0	2
22	Bund Road-Sheikhupura-IV	0	1	78	KAPCO-Multan-IV	0	1
23	Bund Road-KS Kaku-I	0	4	79	KAPCO-Multan-V	0	2
24	Bund Road-KS Kaku-II	0	6	80	KAPCO-Multan-VI	0	1
25	Bund Road-New Kot Lakhpat-I	3	11	81	KAPCO-TPS M/Garh (Ph-I)	0	1
26	Bund Road-New Kot Lakhpat-II	0	9	82	KAPCO-Pak Gen-II	0	2
27	New Ghakkar-Ghakkar	0	2	83	Vehari-Multan-I	1	4
28	KS Kaku-Mangla-I	0	3	84	Vehari-Multan-II	0	7
29	KS Kaku-Ravi	0	2	85	Vehari-Kassowal-I	0	2
30	KS Kaku-Ghazi	1	6	86	Vehari-Kassowal-II	0	1
31	Shalamar-Ghazi	1	8	87	Vehari-Chishtian-II	0	1
32	Ravi-Shalamar	0	2	88	Bahawal Pur-Lal Sohanra-I	0	2
33	Ravi-Lahore (SKP)	0	2	89	Bahawal Pur-Lal Sohanra-II	0	1
34	Ravi-Atlas Power	0	2	90	Jamshoro-KDA33-II	0	2

S. No.	Name of Circuit	June, 2019	January-June, 2019	S. No.	Name of Circuit	June, 2019	January-June, 2019
			220 kV Transmission Lines				
35	SKP-Atlas Powerhouse	0	1	91	Jamshoro-Hala Road-I	0	2
36	New Kot Lakhpat-Lahore (SKP)	0	3	92	Jamshoro-Hala Road-II	0	2
37	New Kot Lakhpat-WAPDA Town	0	3	93	Jamshoro-TM Khan Road-I	0	2
38	WAPDA Town-Sheikhupura	0	1	94	Jamshoro-TM Khan Road-II	0	1
39	New Kot Lakhpat-Sarfraz Nagar	2	12	95	Jhampir-TM Khan-I	2	10
40	Sarfraz Nagar-New Okara-I	0	2	96	Jhampir-TM Khan-II	1	9
41	Sarfraz Nagar-New Okara-II	0	2	97	Guddu-Sibbi (Direct Ckt)	0	2
42	Kassowal-Yousafwala-I	0	2	98	Guddu-Shikarpur-I	0	3
43	Kassowal-Yousafwala-II	0	3	99	Guddu-Shikarpur-II	1	8
44	Yousafwala-Okara-I	0	1	100	Shikarpur-Uch-II	0	4
45	Yousafwala-Okara-II	0	4	101	Uch-Sibbi-I	0	5
46	New Kot Lakhpat-New Lahore (South)	0	5	102	DM Jamali-Sibbi	0	4
47	Sarfraz Nagar-New LHR	1	4	103	Uch-Sibbi-I	0	1
48	Daudkhel-Sheikh Muhammadi Peshawar-I	0	2	104	Uch-Sibbi-II	1	1
49	Daudkhel-CHASNUPP-I	0	2	105	Daharki-Engro	0	2
50	Daudkhel-CHASNUPP-II	0	1	106	Rohri-Engro-I	0	2
51	DI Khan-CHASNUPP-I	0	2	107	Shikarpur-Rohri-I	0	4
52	DI Khan-CHASNUPP-II	0	2	108	Shikarpur-Rohri-II	0	2
53	Ghazi Barotha-Mardan	0	1	109	Dadu-Khuzdar-I	1	11
54	CHASNUPP-Bannu-I	0	2	110	Dadu-Khuzdar-II	0	5
55	CHASNUPP-Bannu-II	0	1	111	DG Khan-Loralai-II	0	1
56	ISPR-Mansehra-I	0	1				

Source: NTDC

3.8 DETAILS OF MAJOR POWER BREAKDOWNS IN NTDC SYSTEM

The following table provides a list of major power breakdowns in NTDC system during FY 2018-19 causing cascaded tripping in different parts of the country.

S. No.	Date	DETAILS OF MAJOR HAPPENING
1	August 1, 2018	Power Breakdown in Lahore due to tripping of 220 kV Bund Road Grid Station.
2	August 12, 2018	Tripping of NTDC's 500 kV and 220 kV Transmission Lines in South due to high humidity and pollution affecting power supply to K-Electric from National Grid as well as generation from 1320 MW Port Qasim Power Plant and Wind Power Plants operating in region of Jhimpir and Gharo. Tripping details are as under: (i) 500 kV Jamshoro – Hub Transmission Line (ii) 500 kV Port Qasim – Jamshoro Transmission Line (iii) 500 kV Port Qasim – NKI Transmission Line (iv) 220 kV Jhimpir – TM Khan-II Transmission Line (v) 220 kV NKI – KDA Transmission Line
3	September 24, 2018	Tripping of NTDC's 500 kV and 220 kV Transmission Lines in South due to high humidity and pollution affecting power supply to K-Electric from National Grid as well as generation from 1320 MW Port Qasim Power Plant and Wind Power Plants operating in region of Jhimpir and Gharo. Tripping details are as under: (i) 500 kV Jamshoro – Hub China Transmission Line (ii) 500 kV Port Qasim – Jamshoro Transmission Line (iii) 500 kV Port Qasim – NKI Transmission Line (iv) 220 kV Jhimpir – TM Khan-I & II Transmission Line (v) 220 kV Jamshoro – Hala Road-I & II Transmission Line (vi) 220 kV Jamshoro – KDA-II Transmission Line

S. No.	Date	DETAILS OF MAJOR HAPPENING
4	October 2, 2018	Tripping of NTDC's 500 kV and 220 kV Transmission Lines in South due to high humidity and pollution affecting power supply to K-Electric from National Grid as well as generation from 1320 MW Port Qasim Power Plant. Tripping details are as under: (i) 500 kV Jamshoro – Engro Thar Transmission Line (ii) 500 kV Jamshoro – Hub China Transmission Line (iii) 500 kV Port Qasim – Jamshoro Transmission Line (iv) 500 kV Port Qasim – NKI Transmission Line (v) 500 kV Hub – NKI Transmission Line (vi) 220 kV NKI – Baldia Transmission Line (vii) 220 kV NKI – KDA Transmission Line (viii) 220 kV Jamshoro – KDA-II Transmission Line
5	October 4, 2018	Tripping of NTDC's 500 kV and 220 kV Transmission Lines in South due to high humidity and pollution affecting power supply to K-Electric from National Grid as well as generation from 1320 MW Port Qasim Power Plant. Tripping details are as under: (i) 500 kV Jamshoro – Engro Thar Transmission Line (ii) 500 kV Jamshoro – Hub China Transmission Line (iii) 500 kV Port Qasim – NKI Transmission Line (iv) 220 kV Jamshoro – KDA-I & II Transmission Line (v) 220 kV Jamshoro – TM Khan-I Transmission Line
6	October 25, 2018	Tripping of NTDC's 500 kV and 220 kV Transmission Lines in South due to high humidity, pollution and smog affecting power supply to K-Electric from National Grid as well as generation from 1320 MW Port Qasim Power Plant. Tripping details are as under: (i) 500 kV Jamshoro – Port Qasim Transmission Line (ii) 500 kV Jamshoro – Hub China Transmission Line (iii) 500 kV Port Qasim – NKI Transmission Line (iv) 220 kV Jamshoro – KDA-I & II Transmission Line
7	November 12, 2018	Tripping of NTDC's 500 kV and 220 kV Transmission Lines in South due to high humidity, pollution and smog affecting power supply to K-Electric from National Grid as well as generation from 1320 MW Port Qasim Power Plant. Tripping details are as under: (i) 500 kV Jamshoro – Port Qasim Transmission Line (ii) 500 kV Jamshoro – Hub China Transmission Line (iii) 220 kV Jamshoro – KDA-I & II Transmission Line
8	January 25, 2019	(a) Tripping of 500/220 kV transmission lines in Guddu, Shikarpur and Multan region due to extreme weather conditions caused by dense fog/smog and pollution/contaminated layers on insulators caused by variety of sources (i.e. sea, salt, industries). (b) This tripping caused tripping of HUBCO, Port Qasim and Guddu Power Plants thereby resulting in power failure to large parts of Sindh (NTDC network as well as K-Electric) and Balochistan.

Source: NTDC

3.9 POWER BALANCES OF K-ELECTRIC LIMITED SYSTEM

The power balances show the year wise position of demand and supply gap in the system. It also helps in assessing the load management policy of the power utility company. The following table shows the power balances of KE:

Year ending 30th June	Installed Capacity (MW) [1]	Planned Generation Capability as per KE (MW) [2]	KE's Projected Demand Growth Rate (%) [3]	KE's Projected Demand during Peak hours (MW) [4]	Surplus/ (Deficit) (MW)
2020	3,132	3,155 [94]	7.42	3,392	(237.00)
2021	3,682	3,380 [134]	7.23	3,816	(436.00)
2022	5,082	3,916 [212]	7.67	4,228	(312.00)
2023	6,032	4,853 [212]	8.50	4,650	203.00

1. *Including KE (Own, Nuclear, IPPs, SPPs, CPPs etc.).*
2. *Including own generation and import from all sources including 650 MW from NTDC. Further, this includes supply from IPPs, which are under planning/approval and accordingly are subject to change. Numbers in [ ] indicate planned supply from renewable sources, however, given the intermittent nature of renewable projects, supply from these have not been accounted in projecting generation capability against peak demand.*
3. *Growth in peak demand does not include adjustments for AT&C based load-shed.*
4. *Peak Demand is after adjustment for AT&C based load-shed.*

Source: KE

3.10 LOADING POSITION OF POWER TRANSFORMERS IN K-ELECTRIC LIMITED SYSTEM

KE has 10 Grid Stations at 220/132 kV level, with 13 auto-transformers of 3580 MVA transformation capacity, 66 Grid Stations at 132/11 kV level, with 160 power transformers having a transformation capacity of 6078 MVA. Operational record of 220/132 kV grid stations shows no overloading during the reported period of 2018-19 whereas, 28.13% of KE's power transformers (i.e. 45 out of 160) at 132/11 kV level were noted as overloaded in the same period.

3.11 K-ELECTRIC LIMITED TRANSMISSION OUTAGE STATISTICS

The following table provides a comparison of transmission outages for FY 2017-18 and FY 2018-19 as reported by KE. It is noted that at 132 kV level, number of planned and forced outages, total duration of outages and maximum duration of any single outages in FY 2018-19 have increased as compared to FY 2017-18 data:

Year	Description	Planned Outages		Forced Outages	
		220 kV	132 kV	220 kV	132 kV
2017-18	No. of Outages	0	7	0	26
	Total Duration in Minutes	0	4855	0	2451
	Maximum Duration of any Single Outage (Min.)	0	2320	0	362
2018-19	No. of Outages	0	10	0	46
	Total Duration in Minutes	0	13049	0	4997
	Maximum Duration of any Single Outage (Min.)	0	3723	0	469

Source: KE

3.12 NEPRA PERFORMANCE STANDARDS (TRANSMISSION) RULES, 2005

In order to encourage safe, efficient and reliable transmission service, NEPRA has framed the Performance Standards (Transmission) Rules, 2005 (PSTR). Under PSTR, each transmission licensee is required to submit to NEPRA an Annual Performance Report (APR) in a manner prescribed therein.

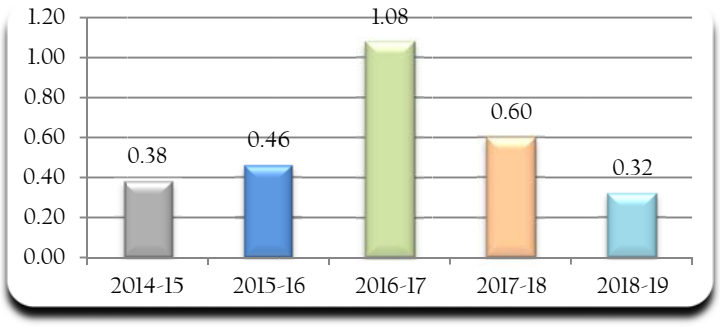
3.12.1 National Transmission and Despatch Company Limited:

NTDC has submitted its report for the FY 2018-19. The same was analyzed in light of the performance parameters such as System duration of interruption, System frequency of interruption, Energy Not Served (ENS), Loss of Supply Incidents, System Collapses/Splitting/Isolation, Voltage and Frequency Variations violating limits prescribed in PSTR. Highlights of the analysis/findings are given in succeeding paras.

3.12.1.1 SYSTEM RELIABILITY

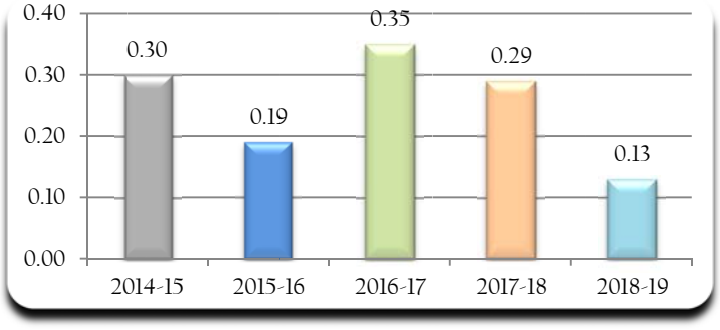
(i) System Duration of Interruption (Hrs/Point):

This KPI shows the average duration of outage an interconnection point experienced during a year. It was noted as 0.32 hrs. in FY 2018-19 as shown in the figure indicating 46.7% decrease in average outage duration per interconnection point as compared to preceding year.



(ii) System Frequency of Interruption (Nos./Circuit):

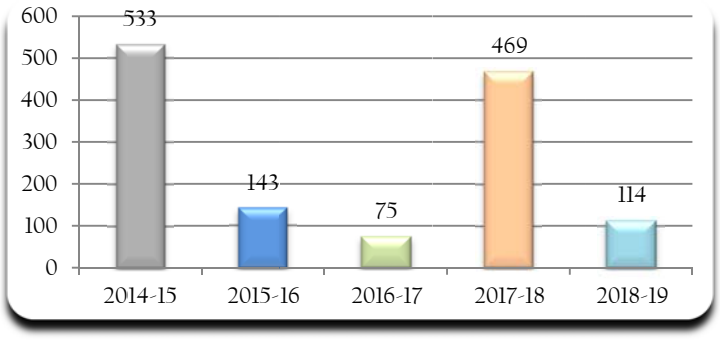
This parameter indicates the average number of outages at a circuit during a year. During FY 2018-19 it remained 0.13 as shown in the accompanying figure for 55.2% decrease in average number of outages per circuit as compared to preceding year.



3.12.1.2 SYSTEM SECURITY

(i) Energy Not Served (ENS) (MkWh):

This KPI shows the estimates of the total energy not served (ENS) contributed by loss of supply incidents during the year. The ENS decreased from 469 GWh in FY 2017-18 to 114 GWh in FY 2018-19; a decrease by 75.7% as compared to previous year.



(ii) Loss of Supply Incidents, Average ENS per Incident and Average duration per Incident:

The table shows considerable improvement in loss of supply incidents (reduced by more than 50% during FY 2018-19 over FY 2017-18) and average energy not served per incident. Therefore, NTDC is required to continue its efforts to achieve acceptable reliability levels:

Year	Loss of Supply Incidents (Nos.)	Average ENS per Incident (MWh)	Average Duration per Incident (Hrs:Min)
2014-15	125	4264	01:12
2015-16	87	1644	02:24
2016-17	165	454	03:07
2017-18	142	3304.9	02:06
2018-19	66	1722.7	2:40

(iii) System Collapses and System Splitting:

The loss of supply incidents include 04 system collapse and system splitting and 01 complex tripping at CHASNUPP during the year 2018-19. Chronological details of incidents for five years is shown in the following table. The record shows that during FY 2018-19, no major system breakdown happened, however consistency in this parameter is the key and performance of NTDC system over next couple of years would be monitored to ascertain that.

No. of Incident	2014-15	2015-16	2016-17	2017-18	2018-19
1	12-12-2014 Partial system collapse	15-01-2016 Partial system collapse	26-09-2016 System splitting	03-11-2017 Partial Breakdown	20-10-2018 Partial system collapse in South
2	22-12-2014 Splitting of network	21-01-2016 Major system collapse	10-12-2016 System splitting	01-05-2018 Partial Breakdown	21-01-2019 System splitting
3	01-08-2015 Partial system collapse		11-12-2016 System splitting	21-05-2018 Partial system collapse	23-01-2019 System splitting
4	01-08-2015 Partial system collapse		01-01-2017 System splitting	27-06-2018 Grid Fault at Port Qasim	25-01-2019 Shikarpur-HUBCO-K-Electric Collapse
5	21-10-2015 Partial system collapse		02-01-2017 System splitting		26-02-2019 CHASNUPP Complex Tripping
6	24-01-2015 Partial system collapse		03-01-2017 System splitting		
7	25-01-2015 Partial system collapse		04-01-2017 System splitting		
8	25-01-2015 Partial system collapse		21-05-2017 System splitting		
9	25-01-2015 Partial system collapse		28-05-2017 Isolation of KE from NTDC		
10	25-01-2015 Partial system collapse		30-05-2017 Isolation of KE from NTDC		

3.12.1.3 SYSTEM FREQUENCY

Rule 8 of Performance Standards (Transmission) Rules, 2005 prescribes limits for frequency. The frequency data as reported by NTDC indicated variation in frequency limits beyond the permissible limits of ±1%. A gradual improvement in this area has been observed:

(i) NTDC System Frequency

Year	Number of times Frequency remained outside the Limits			Time duration the Frequency remained outside the Limits			Maximum Continuous period of Deviation	
	In a year	Average/month	Average/day	days	hours	% of year	hours	Minutes
2014-15	1264	105	3.500	10.430	250.33	2.860	2.48	149
2015-16	248	21	0.700	1.600	37.90	0.430	1.50	89
2016-17	35	2.9	0.096	0.175	4.20	0.048	0.25	15
2017-18	25	2.1	0.068	0.171	4.10	0.047	0.18	11
2018-19	25	2.1	0.07	0.12	2.98	0.34	--	--

(ii) NTDC Monthly Highest System Frequency (Hertz)

Month	2014-15	2015-16	2016-17	2017-18	2018-19
July	50.71	50.75	NIL	50.55	50.66
August	50.68	50.69	50.72	50.56	50.54
September	50.55	50.69	50.60	50.56	50.60
October	50.69	50.53	NIL	NIL	50.58
November	50.62	50.62	NIL	NIL	NIL
December	58.63	50.71	50.63	NIL	50.64
January	54.69	51.47	50.68	50.64	50.67
February	49.49	NIL	50.65	NIL	NIL
March	50.65	50.64	50.61	50.54	50.59
April	50.66	NIL	50.63	50.56	50.68
May	50.69	NIL	50.65	50.62	NIL
June	50.68	49.49*	50.64	50.60	50.79

** cannot be validated*

(iii) NTDC Monthly Lowest System Frequency (Hertz)

Month	2014-15	2015-16	2016-17	2017-18	2018-19
July	48.74	49.07	NIL	50.51*	50.51
August	48.91	49.15	49.36	50.51*	50.51
September	48.93	49.19	50.51*	50.51*	50.51
October	48.99	49.21	NIL	NIL	50.51
November	48.83	49.22	NIL	NIL	NIL
December	45.00	49.32	49.44	NIL	50.51
January	45.00	45.00	49.37	NIL	49.44
February	49.06	NIL	50.53*	NIL	NIL
March	49.11	50.52	50.51*	NIL	50.51
April	49.02	NIL	49.32	NIL	50.52
May	49.20	NIL	50.52*	NIL	NIL
June	50.51	49.35	50.51*	NIL	50.51

** Data was provided for only three months.*

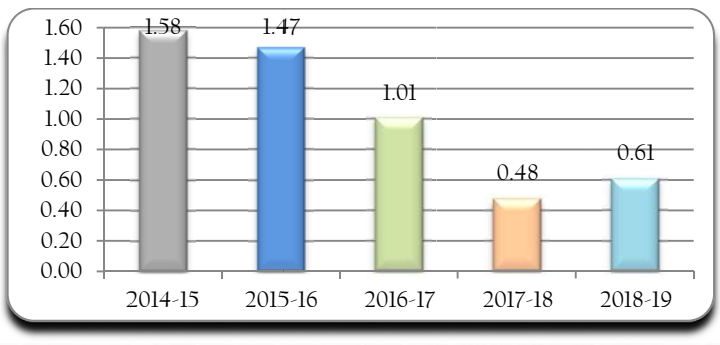
3.12.2 K-Electric Limited:

KE has submitted its APR for the FY 2018-19, under Performance Standards (Transmission) Rules, 2005. The same has been analyzed and following main observations have been noted:

3.12.2.1 SYSTEM RELIABILITY

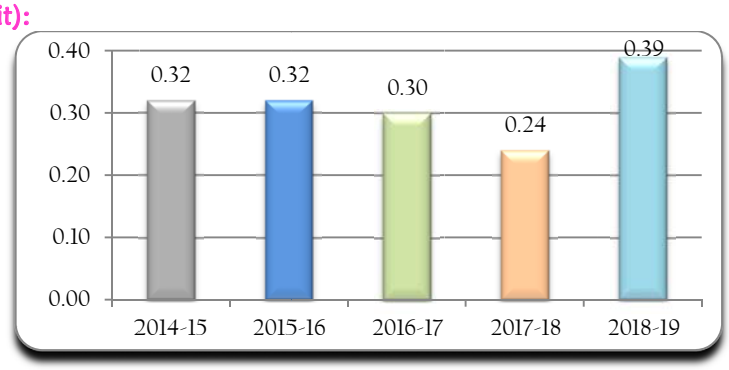
(i) System Duration of Interruption (Hrs/Point):

This KPI shows the average duration of outage an interconnection point observes during a year and it remained 0.61 hrs. in the year 2018-19 as shown in the accompanying figure. This indicates a 27.1% increase in average outage duration per interconnection point as compared to preceding year.



(ii) System Frequency of Interruption (Nos./Circuit):

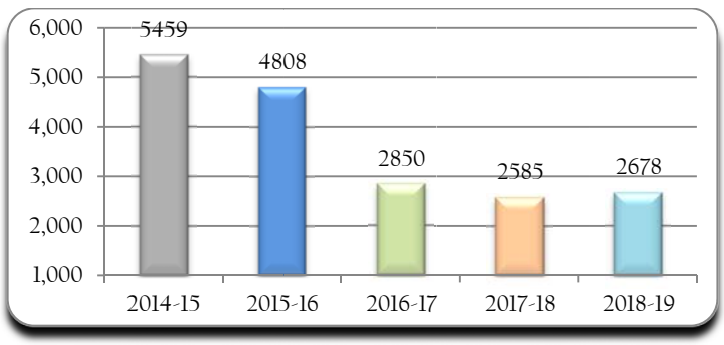
It indicates the average number of outages at a circuit during a year. As shown in the figure it remained 0.39 in the year 2018-19 (62.5% increase with respect to preceding year).



3.12.2.2 SYSTEM SECURITY

(i) Energy Not Served (ENS) (MWh):

This KPI shows the estimates of the total ENS as a result of loss of supply incidents during the year. The ENS in KE increased in 2018-19 compared to the last year, implying that KE could not keep the momentum going in this area, by achieving gradual improvement since 2015-16. The number of incidents increased compared to last year.



(ii) Loss of Supply Incidents, Average ENS per Incident and Average Duration per Incident

Year	Loss of Supply Incidents (Nos.)	Average ENS per Incident (MWh)	Average Duration per Incident (Hrs:Min)
2014-15	10	545.9	01:06
2015-16	10	481	01:00
2016-17	10	285	00:71
2017-18	8	323.1	00:42
2018-19	13	206	0:33

3.12.2.3 SYSTEM FREQUENCY

(i) Monthly Highest System Frequency (Hertz)

KE reported frequency deviations in months of September, 2018 and January, 2019 as shown in the table.

Month	2014-15	2015-16	2016-17	2017-18	2018-19
July	50.58	50.60	50.60	N/A	--
August	50.64	Nil	Nil	N/A	--
September	50.51	Nil	Nil	N/A	51.5
October	50.53	Nil	Nil	N/A	--
November	50.55	0	Nil	N/A	--
December	50.82	50.60	Nil	N/A	--
January	50.54	50.70	50.60	50.90	50.8
February	50.51	Nil	Nil	N/A	--
March	50.58	Nil	Nil	N/A	--
April	50.51	Nil	Nil	50.60	--
May	50.57	50.60	50.60	50.60	--
June	50.52	Nil	Nil	N/A	--

N/A: Not Applicable because no frequency violation.

(ii) Monthly Lowest System Frequency (Hertz)

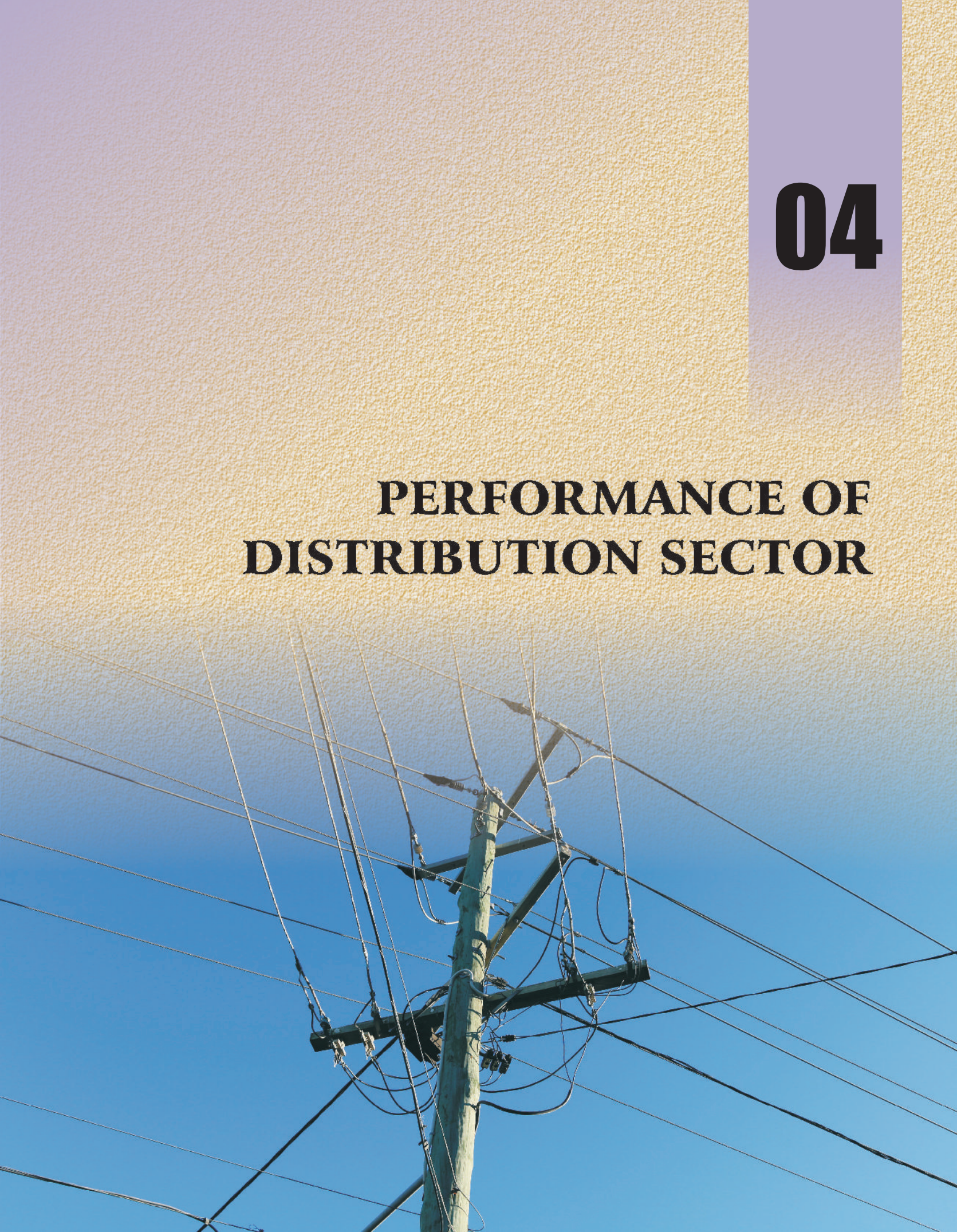
KE reported no frequency violations in FY 2017-18 and FY 2018-19.

Month	2014-15	2015-16	2016-17	2017-18	2018-19
July	48.97	49.40	Nil	N/A	--
August	49.10	49.40	Nil	N/A	--
September	49.13	49.40	Nil	N/A	--
October	49.18	49.40	Nil	N/A	--
November	48.94	Nil	Nil	N/A	--
December	49.15	Nil	Nil	N/A	--
January	49.07	49.40	Nil	N/A	--
February	49.39	Nil	Nil	N/A	--
March	49.26	Nil	Nil	N/A	--
April	49.26	Nil	49.30	N/A	--
May	49.29	Nil	Nil	N/A	--
June	49.32	49.40	Nil	N/A	--

N/A: Not Applicable because no frequency violation.

04

PERFORMANCE OF DISTRIBUTION SECTOR



PERFORMANCE OF DISTRIBUTION SECTOR

4.1 GENERAL

The unbundling of WAPDA through power sector reforms resulted in creation of ten (10) DISCOs fully owned by Federal Government. DISCOs are responsible for the operation and maintenance of the transmission and distribution assets at 132 kV and below. These include the following:

(a) 27,929 km of 132 kV Transmission Lines,
(b) 828 Nos. of 132 kV G/Ss with 2,074 PTs having transformation capacity of 53,517 MVA,
(c) 9,224 Nos. of 11 kV Feeders, 337,231 km long,
(d) 736,605 Nos. of Distribution Transformers having transformation capacity of 45,371 MVA and
(e) 237,486 km of LT Lines.

In addition to above, KE maintains and operates the following:

(a) 336 km of 220 kV Transmission Lines,
(b) 10 Nos. of 220 kV Grid Stations with transformation capacity of 3,580 MVA,
(c) 798 km of 132 kV Transmission Lines,
(d) 66 Nos. of 132 kV Grid Stations having transformation capacity of 6,647 MVA,
(e) 1,807 Nos. of 11 kV Feeders, 9,876 km long,
(f) 28,183 No. of Distribution Transformers having transformation capacity of 7,702 MVA and
(g) 19,751 km of LT Lines.

4.2 TRANSMISSION AND DISTRIBUTION LOSSES OF DISCOS

The following table gives actual T&D losses of DISCOs for FY 2018-19 and a comparison between the actual T&D losses (%) for two years i.e. FY 2017-18 and FY 2018-19. Overall DISCOs have shown an improvement in losses of 0.62 % over the last year. PESCO, MEPCO and FESCO have been able to reduce their losses close to 1%. LESCO also improved its losses by 0.66%. Other DISCOs including IESCO, TESCO, GEPCO, HESCO and TESCO showed marginal improvement in this area. On the other hand SEPCO's losses deteriorated by 0.30% while QESCO's T&D losses worsened by more than 1%. Reduction in losses for all DISCOs combined translates into a saving of around Rs. 6 Billion.

DISCO	2018-19 (Units in GWh)			Losses (%)		
	Purchased	Sold	Lost	2018-19	2017-18	Inc./(Dec.)
PESCO	14,427	9,074	5,353	37.10	38.11	(1.01)
TESCO	1,821	1,603	218	11.97	12.46	(0.49)
IESCO	11,838	10,789	1,049	8.86	9.13	(0.27)
GEPCO	11,100	10,004	1,096	9.87	10.01	(0.14)
LESCO	24,338	21,132	3,206	13.17	13.83	(0.66)
FESCO	14,974	13,500	1,474	9.84	10.57	(0.73)
MEPCO	19,363	16,310	3,053	15.77	16.59	(0.82)
HESCO	5,557	3,916	1,641	29.53	29.88	(0.35)
SEPCO	4,412	2,781	1,631	36.97	36.67	0.30
QESCO	6,257	4,779	1,478	23.62	22.44	1.18
Overall Average	**114,087**	**93,888**	**20,199**	**17.70**	**18.32**	**(0.62)**

Source: PEPCO

4.3 RECOVERY POSITION OF DISCOS

The following table shows a comparison of recovery ratios for all the DISCOs for the two years.

DISCOs	July, 2018 to June, 2019			July, 2017 to June, 2018			Inc./Dec.
	Billing (Rs./Mln)	Collection (Rs./Mln)	%age Recovery	Billing (Rs./Mln)	Collection (Rs./Mln)	%age Recovery	
PESCO	135,418	120,003	88.62	109,271	97,852	89.55	-0.93
TESCO	23,830	16,182	67.91	18,554	12,426	66.28	1.63
IESCO	176,112	154,293	87.61	142,179	128,473	90.36	-2.75
GEPCO	144,008	138,780	96.37	122,229	118,885	97.26	-0.89
LESCO	325,610	318,043	97.68	272,552	266,552	97.8	-0.12
FESCO	184,633	183,311	99.28	156,530	155,899	99.6	-0.32
MEPCO	210,506	209,146	99.35	180,375	175,459	97.27	2.08
HESCO	59,055	43,979	74.47	52,675	40,428	76.75	-2.28
SEPCO	42,542	26,923	63.28	41,478	24,798	59.79	3.49
QESCO	56,896	15,550	27.33	52,328	13,378	25.57	1.76
TOTAL	**1,358,609**	**1,226,211**	**90.25**	**1,148,171**	**1,034,149**	**90.07**	**0.18**

Source: DISCOs

It is noted from above that, PESCO recovery position deteriorated about 1% whereas TESCO has shown an increase of about 1% in recovery position in 2018-19 as compared to 2017-18. In Punjab and Capital Territory, IESCO's and GEPCO's recovery percentages dropped by 2.75% and 0.89% respectively. Whereas LESCO and FESCO have shown almost same recovery ratios in last two years. MEPCO improved its recovery position by about 2% this year over last year.

In the province of Sindh, HESCO's recovery ratio deteriorated by approximately 2% whereas SEPCO improved its recovery position by 3.49%. QESCO, operating in the province of Balochistan, has improved its recovery ratio by 1.76%.

Overall the recovery position improved by 0.18% which translates to approximately Rupees 2.5 billion savings.

4.4 RECEIVABLES OF DISCOS

As on 30th June 2019, the overall distribution sector receivables stood at Rs. 1,145 billion whereas, the receivables at the start of this financial year were Rs. 896.15 billion. Following is a detailed break-up of receivables for the FY 2018-19:

(Rs. in Billion)

S. No.	Category	Receivables (FY ended June, 2018)	July, 2018 to June, 2019		Receivables (FY ended June, 2019)
			Billing	Collection	
1	FEDERAL GOVERNMENT				
a)	Federal Governments Departments	1.45	17.50	16.43	2.53
b)	Local Bodies under Federal Govt.	0.68	5.30	4.55	1.43
c)	Autonomous Bodies under Fed. Govt.	2.20	9.57	9.17	2.56
d)	Defence	0.77	24.50	20.59	4.69
e)	W&P	2.10	1.79	1.34	2.50
	Total (Federal Government)	**7.20**	**58.66**	**52.08**	**13.72**
2	AJ&K GOVERNMENT				
i)	GoP Share	0.40	0.00	0.00	0.40
ii)	DISCOs Share	0.00	0.00	0.00	0.00
iii)	AJ&K Share	98.87	32.91	5.41	126.37
	Total (AJ&K)	**99.27**	**32.91**	**5.41**	**126.77**

S. No.	Category	Receivables (FY ended June, 2018)	July, 2018 to June, 2019		Receivables (FY ended June, 2019)
			Billing	Collection	
3	PROVINCIAL GOVT. DEPTTS./AGENCIES				
a)	Punjab	3.21	32.71	31.73	4.28
b)	Khyber Pakhtunkhwa	19.50	8.30	7.46	20.34*
c)	Sindh	6.13	18.01	12.35	11.92
d)	Balochistan	11.54	6.47	1.66	16.36
	Total (Provi. Govt. Depts./Agencies)	40.38	65.49	53.20	52.89
	TOTAL (1 TO 3)	146.84	157.06	110.70	19.38
4	FATA (DOMESTIC CONSUMERS)	26.85	17.07	11.34	32.58
5	AGRICULTURAL TUBE WELLS IN BALOCHISTAN				
i)	GOP Share	23.86	7.61	0.00	31.47
ii)	GOB Share	20.08	11.41	3.10	28.39
iii)	GST Subsidy Agri. Tube well Balochistan	0.12	0.00	0.00	0.12
iv)	Consumers Share @ Rs. 10,000/-	188.40	35.61	1.29	222.72
	Total (Agri. Tube wells in Balochistan)	232.46	54.63	4.39	282.69
6	PRIVATE (Including 4+5)	670.70	1,305.94	1,119.97	856.88
7	IPPS	0.21	5.07	3.04	3.01
8	K-ELECTRIC LIMITED	78.40	59.67	17.30	91.73**
	GRAND TOTAL (3+6+7+8)	896.15	1,527.75	1,251.01	1,145.00

** Includes Rs. 18.6 billion assessed or Khyber Pakhtunkhwa consumers for the period 05-09-2008 to 15-09-2010 on account of differential of tariff, after the withdrawal of Khyber Pakhtunkhwa petition from PHC. The said assessed amount has not been passed on to consumers. The payment of these receivables has been linked with the markup on NHP arrears payable to Government of Khyber Pakhtunkhwa, as proposed by Khyber Pakhtunkhwa.*

*** Reconciled and agreed receivable by CPPA-G in 08-2018 with K-Electric to Rs. 50.95 billion instead of Rs. 78.40 billion with difference of Rs. 27.45 billion.*

Source: PEPCO

The overall receivables of all the DISCOs have increased by Rs. 248.85 billion which are considerably higher than the receivables of Rs. 166.26 billion during FY 2017-18. As on June 30, 2019, the overall distribution sector receivables stood at Rs. 1,145 billion whereas, the receivables at the start of this financial year were Rs. 896.15 billion.

During FY 2018-19, receivables of DISCOs from the Federal Government have increased by Rs. 6.52 billion as compared to FY 2017-18. The receivables of DISCOs from Provincial Governments of Punjab, Khyber Pakhtunkhwa, Sindh and Balochistan have also increased in this financial year. In addition, FATA receivables from domestic consumers have increased from Rs. 26.85 billion in FY 2017-18 to Rs. 32.58 billion in FY 2018-19. The receivables from KE in FY 2018-19 have increased by Rs. 13.33 billion.

4.5 CIRCULAR DEBT

Circular debt is a major issue confronting power sector. One of the contributors of circular debt is the high transmission and distribution losses in DISCOs. Failure of DISCOs to show any improvement in their actual level of losses viz-a-viz the Authority's allowed target resulted in an annual loss of around Rs. 30 billion based on the tariff that remained notified during the period under consideration i.e. FY 2018-19. It is pertinent to mention that notified weighted average T&D losses target for the FY 2018-19 was 15.72%, whereas DISCOs reported actual T&D losses for the same period remained around 17.70%.

Adding further to circular debt is the low recovery ratio of DISCOs. While setting the consumer-end tariff for DISCOs the Authority considers 100% recovery percentage, however the actual reported recovery percentage of DISCOs, remained at around 90.25% for the year 2018-19 (as per DISCOs' Performance Statistics published by PEPCO). The impact of lesser recoveries viz-a-viz Authority's set target of 100% has resulted in an annual shortfall of around Rs. 130 billion.

4.6 OVERLOADING IN DISCOS' SYSTEM

Power delivery through DISCOs' networks mainly depends on the adequacy of three major components including 11 kV feeders, power transformers (mostly 132/11 kV transformers) and finally the distribution transformers. The following tables provide a comparison of overloaded components in all DISCOs for FY 2017-18 and FY 2018-19:

4.6.1 Loading Position of 11 kV Feeders:

On an overall basis, overloading on 11 kV feeders has also decreased as 19.85% of the total feeders are loaded above 80% compared to 24.91% last year. On individual DISCO level, TESCO has the highest percentage i.e. 69.30% of overloaded 11 kV feeders followed by PESCO with 32.10%, QESCO with 31.15% and LESCO with 27.51%. SEPCO showed about 22.22% overloading at 11 kV level but it is noted that SEPCO also showed an improvement of about 10% in 2018-19 as compared to 2017-18. IESCO and HESCO have shown almost same number of overloaded 11 kV feeders this year as compared to previous year. FESCO and GEPCO have shown an improvement of about 2% respectively in this area.

DISCO	Total No. of 11 kV Feeders		Total No. of Over-Loaded 11 kV Feeders (Above 80%)		Percentage of Total Over-Loaded 11 kV Feeders (Above 80%)	
Upto June	2018	2019	2018	2019	2018	2019
PESCO	1,012	1,056	412	339	40.71	32.10
TESCO	207	215	207	149	100.00	69.30
IESCO	1,068	1,116	25	27	2.34	2.42
GEPCO	835	864	59	44	7.07	5.09
LESCO	1,741	1,821	541	501	31.07	27.51
FESCO	1,023	1,054	149	128	14.57	12.14
MEPCO	1,324	1,392	373	257	28.17	18.46
HESCO	502	533	69	68	13.75	12.76
SEPCO	490	531	157	118	32.04	22.22
QESCO	641	642	211	200	32.92	31.15
Total	**8,843**	**9,224**	**2203**	**1831**	**24.91**	**19.85**

Source: DISCOs

4.6.2 Loading Position of Distribution Transformers:

Overloading of distribution transformers has decreased from 8.89% in FY 2017-18 to 7.75% in FY 2018-19 as detailed below. Except for LESCO with 24.10%, TESCO with 21.23% and QESCO with 16.14%, other DISCOs have shown better loading position of their distribution transformers:

DISCO	Total No. of Distribution Transformers		Total No. of Over-Loaded Distribution Transformers (Above 80%)		Percentage of Total Over-Loaded Distribution Transformers (Above 80%)	
Upto June	2018	2019	2018	2019	2018	2019
PESCO	74,104	76,126	6,183	4,070	8.34	5.35
TESCO	18,475	18,730	4,484	3,977	24.27	21.23
IESCO	47,830	49,109	3,770	786	7.88	1.60
GEPCO	64,344	67,587	1,741	1,959	2.71	2.90
LESCO	105,185	110,092	28,404	26,532	27.00	24.10
FESCO	104,058	108,652	392	614	0.38	0.57
MEPCO	161,197	169,938	5,844	5,673	3.63	3.34
HESCO	36,670	37,305	1,382	1,080	3.77	2.90
SEPCO	37,562	38,196	3,736	2,588	9.95	6.78
QESCO	59,336	60,870	7,094	9,823	11.96	16.14
Total	**708,761**	**736,605**	**63,030**	**57,102**	**8.89**	**7.75**

Source: DISCOs

4.6.3 Loading Position of Power Transformers:

On an overall basis, overloading on power transformers has reduced to 21.12% in FY 2018-19 from 26.20% as in FY 2017-18. On DISCO-to-DISCO comparison, PESCO with above 45% has the most number of overloaded Power Transformers among all the DISCOs followed by QESCO with 36.66% and TESCO with 35.42%. Though HESCO is having more than 28% overloaded Power Transformers this year, it also showed an improvement of about 12% as compared to last year. Similarly GEPCO, MEPCO and SEPCO have shown considerable improvement in their loading position of about 15%, 11%, and 20% respectively. LESCO with 19.95% in 2018-19 showed 4% more overloading as compared to 2017-18, whereas, IESCO with 3.11% overloaded power transformers in FY 2018-19 showed an improvement of more than 3% as compared to last year.

DISCO	Total No. of Power Transformers		Total No. of Over-Loaded Power Transformers (Above 80%)		Percentage of Total Over-Loaded Power Transformers (Above 80%)	
Upto June	2018	2019	2018	2019	2018	2019
PESCO	236	243	125	110	52.97	45.27
TESCO	45	48	16	17	35.56	35.42
IESCO	248	257	16	8	6.45	3.11
GEPCO	174	176	51	25	29.31	14.20
LESCO	373	391	60	78	16.09	19.95
FESCO	225	235	42	42	18.67	17.87
MEPCO	292	293	65	34	22.26	11.60
HESCO	121	121	49	34	40.50	28.10
SEPCO	126	130	49	24	38.89	18.46
QESCO	175	180	55	66	31.43	36.66
Total	**2015**	**2074**	**528**	**438**	**26.20**	**21.12**

Source: DISCOs

4.7 FUEL PRICE ADJUSTMENT OF DISCOS

NEPRA as per its mandate protects the electricity consumers, by passing on any applicable adjustment on monthly basis on account of actual fuel costs. The following table shows a month-wise/unit (Rs./kWh) adjustment, passed on to the consumers during 2018-19:

[Increase/(Decrease) Rs./kWh]

July	August	September	October	November	December	January	February	March	April	May	June
0.35	1.16	0.20	0.47	(0.34)	0.57	1.72	0.81	(0.04)	0.55	0.10	0.13

Source: NEPRA

4.8 LOADING POSITION OF POWER TRANSFORMERS, 11 KV FEEDERS AND DISTRIBUTION TRANSFORMERS IN K-ELECTRIC LIMITED SYSTEM

The following table provides overloading position of overloaded components in KE for FY 2017-18 and FY 2018-19:

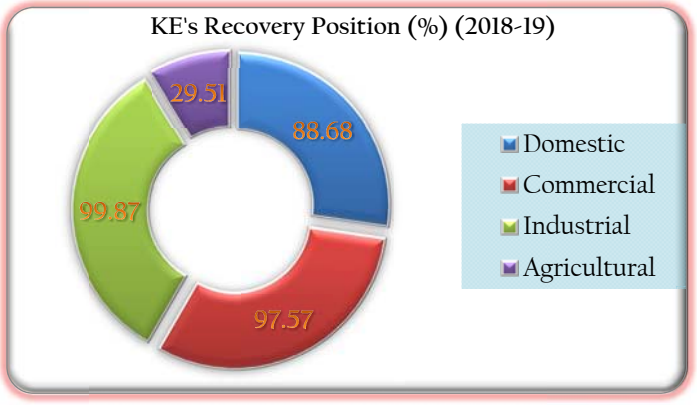
Description	2017-18	2018-19
Total No. of Over-Loaded 11 kV Feeders (above 80%)	29	48
Percentage of Total Over-Loaded 11 kV Feeders (above 80%)	**1.68**	**2.66**
Total No. of Over-Loaded Power Transformers (above 80%)	48	45
Percentage of Total Over-Loaded Power Transformers (above 80%)	**32.65**	**28.13**
Total No. of Over-Loaded Distribution Transformers (above 80%)	478	808
Percentage of Total Over-Loaded Distribution Transformers (above 80%)	**1.75**	**2.87**

Source: KE

It is noted that more than 28% power transformers of KE are overloaded in FY 2018-19, whereas in FY 2017-18 approximately 32% power transformers were operating above 80% of their rated capacity. Further, increase in the overloading of 11 kV feeders and distribution transformers is noted relative to the previous year.

4.9 RECOVERY POSITION OF K-ELECTRIC LIMITED

The following table shows KE's recovery position for different consumer categories. The overall recovery ratio of 92.62% has slightly improved over the last year ratio of 91%. The recovery position in domestic sector has also improved from 84.21% in FY 2017-18 to 88.68% in FY 2018-19, however considering the share of domestic sector (43.67%) in the overall billing, the recovery in domestic sector needs to be increased further:



Recovery Position of K-Electric Limited (2017-18 and 2018-19)

Category	Amount of Billed Units (Rs. in Million)		Amount Realized and %age Recovery to Billed Amount (Rs. in Million)		(%)	
	2017-18	2018-19	2017-18	2018-19	2017-18	2018-19
Domestic	104,499	104,293	87,998	92,483	84.21	88.68
Commercial	43,613	45,236	41,650	44,138	95.50	97.57
Industrial	60,656	65,080	61,789	64,998	101.87	99.87
Agricultural	1,296	1,071	343	316	26.47	29.51
Public Lighting	2,809	2,784	1,066	266	37.95	9.55
Bulk Supply	9,009	9,078	9,146	8,515	101.52	93.80
Others	266	1,098	264	1,041	99.25	94.81
Total	**222,148**	**228,640**	**202,256**	**211,757**	**91.05**	**92.62**

Source: KE

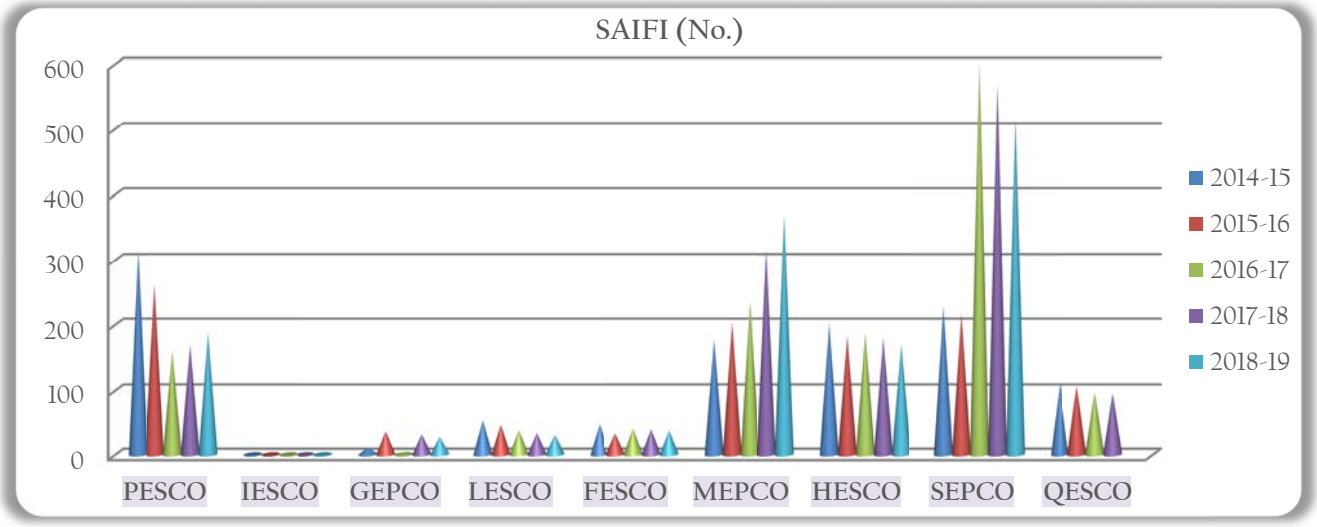
4.10 DISCOS PERFORMANCE UNDER NEPRA STANDARDS

Following tables and graphs show the performance of DISCOs under different parameters for the year 2018-19 along with comparison of last four years:

System Average Interruption Frequency Index (SAIFI-No.):

DISCO	2014-15	2015-16	2016-17	2017-18	2018-19
PESCO	315.40	261.65	160.60	170.10	189.01
IESCO	0.036	0.03	0.029	0.04	0.05
GEPCO	10.41	35.44	3.26	30.97	27.13
LESCO	52.49	45.79	37.44	32.92	30.19
FESCO	46.54	32.41	39.99	38.87	36.86
MEPCO	177.61	203.00	235.00	316.22	369.159
HESCO	202.33	184.00	188.40	180.74	170.86
SEPCO	227.96	216.71	601.37	568.59	516.37
QESCO	112.58	107.00	96.92	95.18	n.p.

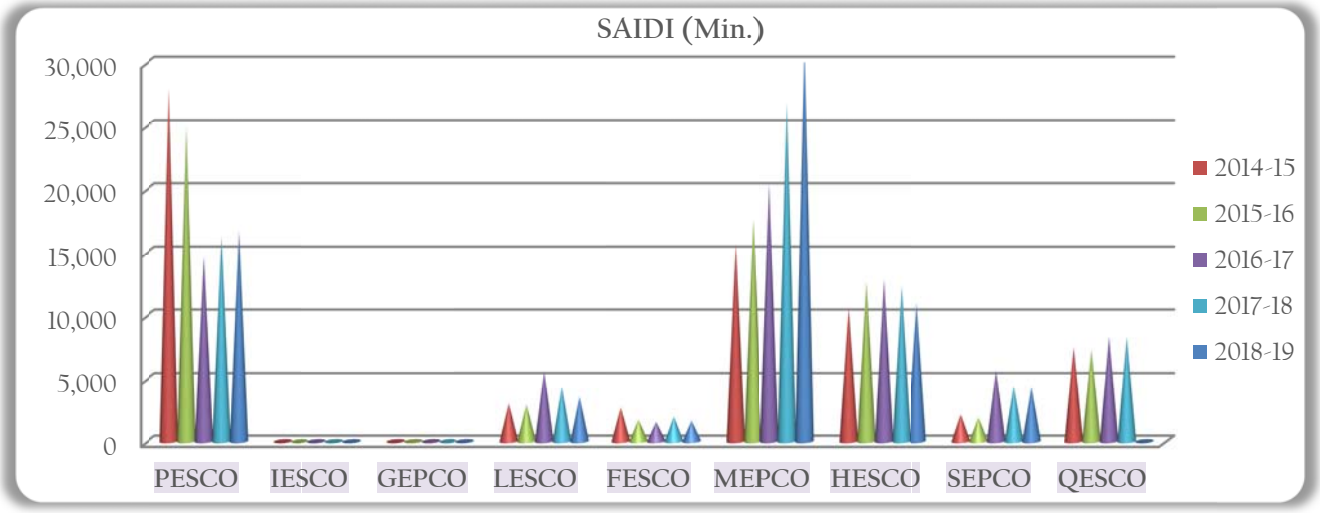
Source: DISCOs



System Average Interruption Duration Index (SAIDI-Minutes):

DISCO	2014-15	2015-16	2016-17	2017-18	2018-19
PESCO	27,934.98	24,927.12	14,643.00	16,222.79	16,696.51
IESCO	0.10	0.82	0.79	0.73	1.27
GEPCO	13.20	59.49	55.03	53.67	45.19
LESCO	3,010.29	2,926.29	5,595.63	4,338.23	3,538.93
FESCO	2,682.58	1,714.00	1,532.04	1,951.38	1,627.99
MEPCO	15,677.65	17,592.00	20,411.32	26,822.35	31,419.30
HESCO	10,642.74	12,623.00	12,799.12	12,292.57	10,973.67
SEPCO	2,141.36	1,879.37	5,666.01	4,397.44	4,306.74
QESCO	7,506.81	7,290.00	8,310.40	8,287.90	n.p.

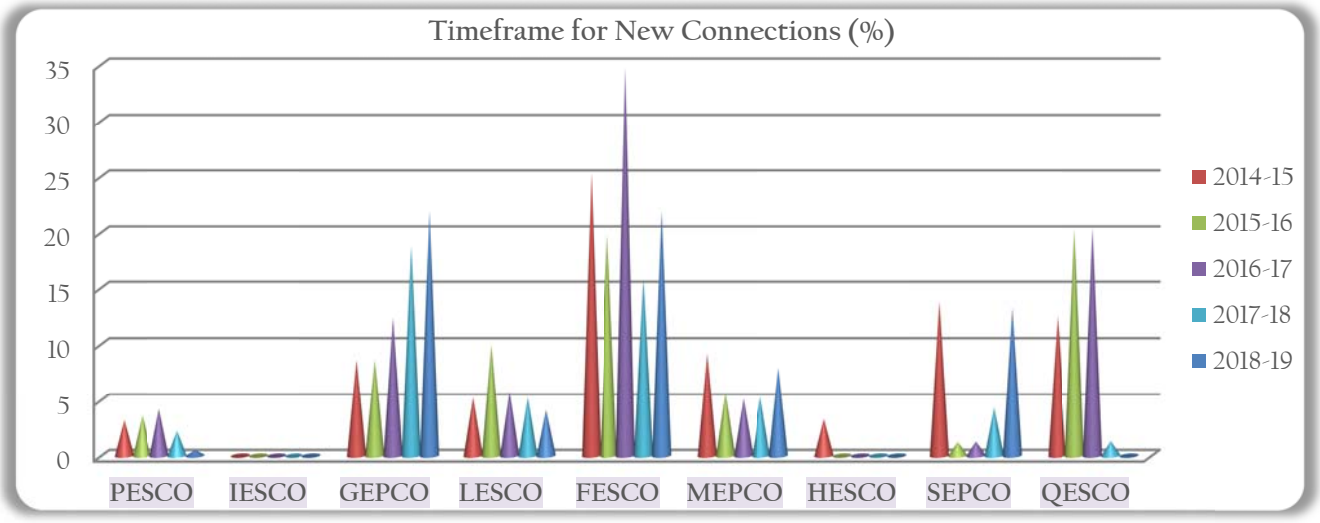
Source: DISCOs



Timeframe for New Connections (%):

DISCO	2014-15	2015-16	2016-17	2017-18	2018-19
PESCO	3.20	3.60	4.20	2.23	0.50
IESCO	0.00	0.00	0.00	0.00	0.00
GEPCO	8.60	8.60	12.35	18.79	21.90
LESCO	5.24	9.95	5.77	5.23	4.10
FESCO	25.30	19.80	34.70	15.94	21.90
MEPCO	9.15	5.70	5.14	5.28	7.90
HESCO	3.30	0.00	0.00	0.03	0.003
SEPCO	13.80	1.23	1.27	4.30	13.20
QESCO	12.50	20.30	20.40	1.31	n.p.

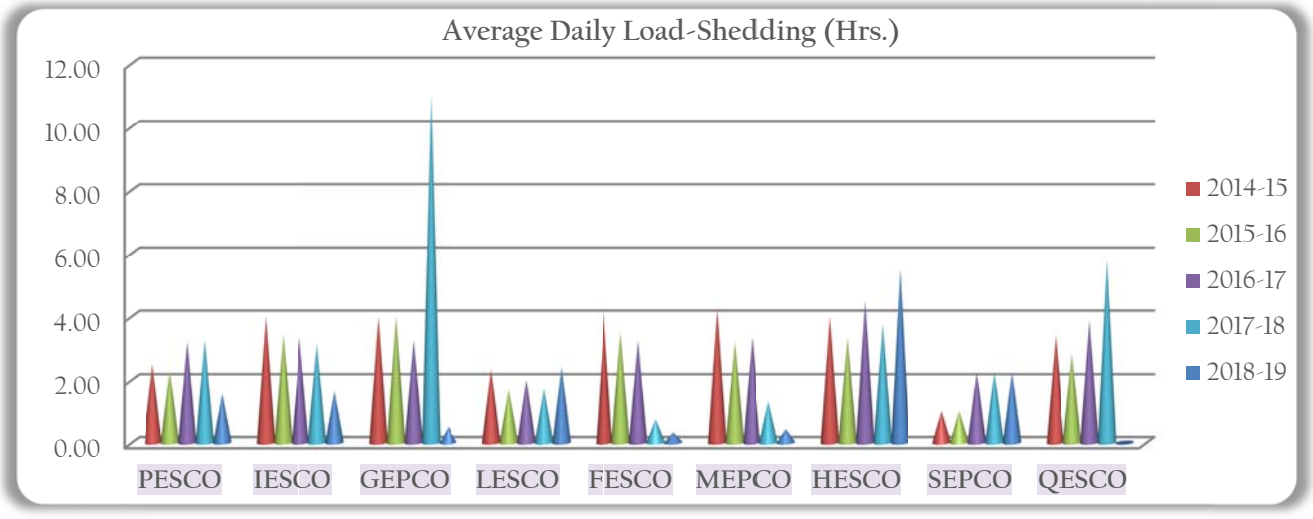
Source: DISCOs



Average Daily Load-Shedding (Hrs.):

DISCO	2014-15	2015-16	2016-17	2017-18	2018-19
PESCO	2.50	2.30	3.20	3.25	1.55
IESCO	4.00	3.43	3.33	3.13	1.625
GEPCO	4.00	4.00	3.25	11.00	0.50
LESCO	2.33	1.67	2.00	1.70	2.40
FESCO	4.33	3.50	3.23	0.74	0.32
MEPCO	4.25	3.20	3.35	1.30	0.43
HESCO	4.00	3.33	4.50	3.75	5.50
SEPCO	1.00	1.00	2.25	2.25	2.25
QESCO	3.40	2.83	3.88	5.80	n.p.

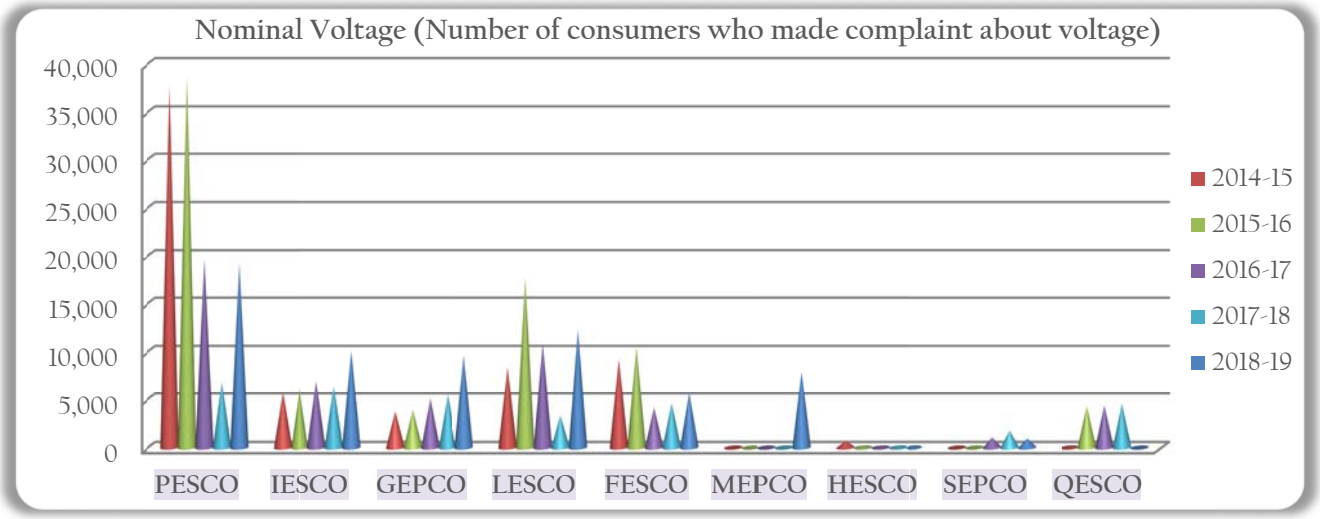
Source: DISCOs



Nominal Voltage (Number of consumers who made complaint about voltage):

DISCO	2014-15	2015-16	2016-17	2017-18	2018-19
PESCO	37,704	38,635	19,564	6,812	19,118
IESCO	5,710	6,508	6,890	6,352	10,079
GEPCO	3,744	3,906	5,071	5,485	9,604
LESCO	8,363	17,631	10,887	3,303	12,287
FESCO	9,223	10,488	4,127	4,572	5,682
MEPCO	0	0	0	0	7,888
HESCO	681	186	201	212	191
SEPCO	0	0	1,033	1,734	928
QESCO	144	4,273	4,355	4,541	n.p.
Total	**65,569**	**81,627**	**52,128**	**33,011**	**65,777**

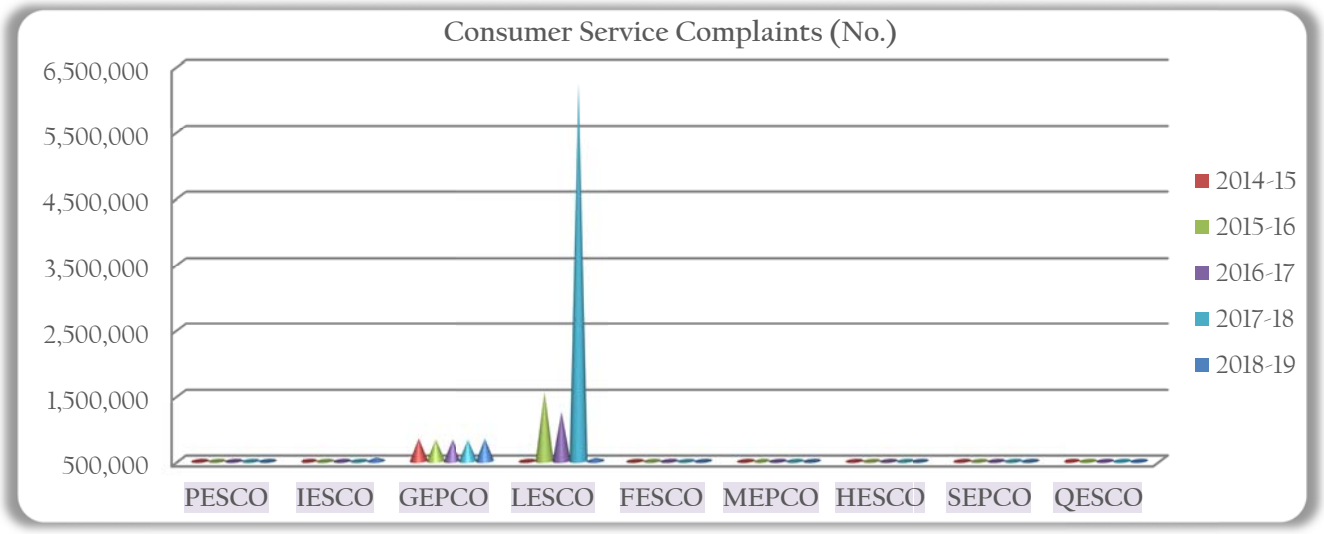
Source: DISCOs



Consumer Service Complaints (No.):

DISCO	2014-15	2015-16	2016-17	2017-18	2018-19
PESCO	102,859	103,983	441,951	99,729	79,832
IESCO	62,167	63,831	46,587	43,504	555,437
GEPCO	841,178	826,226	824,816	820,260	838,502
LESCO	227,596	1,548,464	1,245,699	6,231,274	548,487
FESCO	392,399	353,019	496,176	464,662	354,801
MEPCO	91,373	73,296	74,869	48,425	88,785
HESCO	5,696	56,602	61,925	62,269	90,703
SEPCO	8,857	8,516	9,085	28,900	7,571
QESCO	41,952	5,198	52,211	68,876	n.p.
Total	**2,231,563**	**3,520,196**	**5,928,587**	**7,867,899**	**2,564,118**

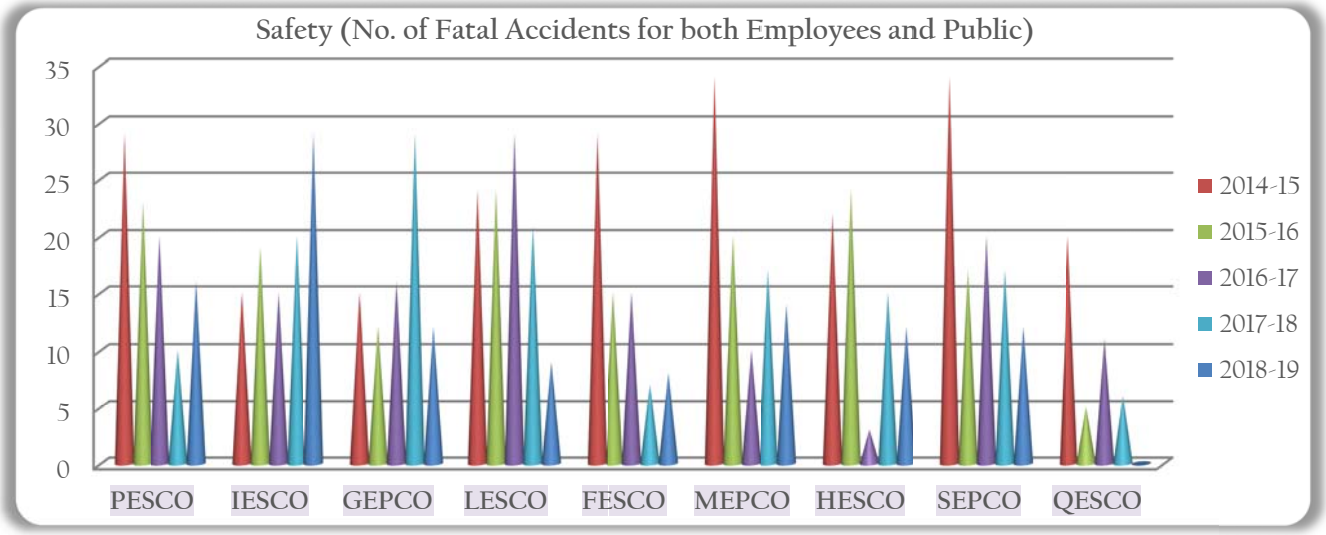
Source: DISCOs



Safety (No. of Fatal Accidents for both Employees and Public):

DISCO	2014-15	2015-16	2016-17	2017-18	2018-19
PESCO	29	23	20	10	16
IESCO	15	19	15	20	29
GEPCO	15	12	16	29	12
LESCO	24	24	29	21	9
FESCO	29	15	15	07	08
MEPCO	34	20	10	17	14
HESCO	22	24	3	15	12
SEPCO	34	17	20	17	12
QESCO	20	5	11	06	n.p.
Total	**226**	**172**	**147**	**142**	**112**

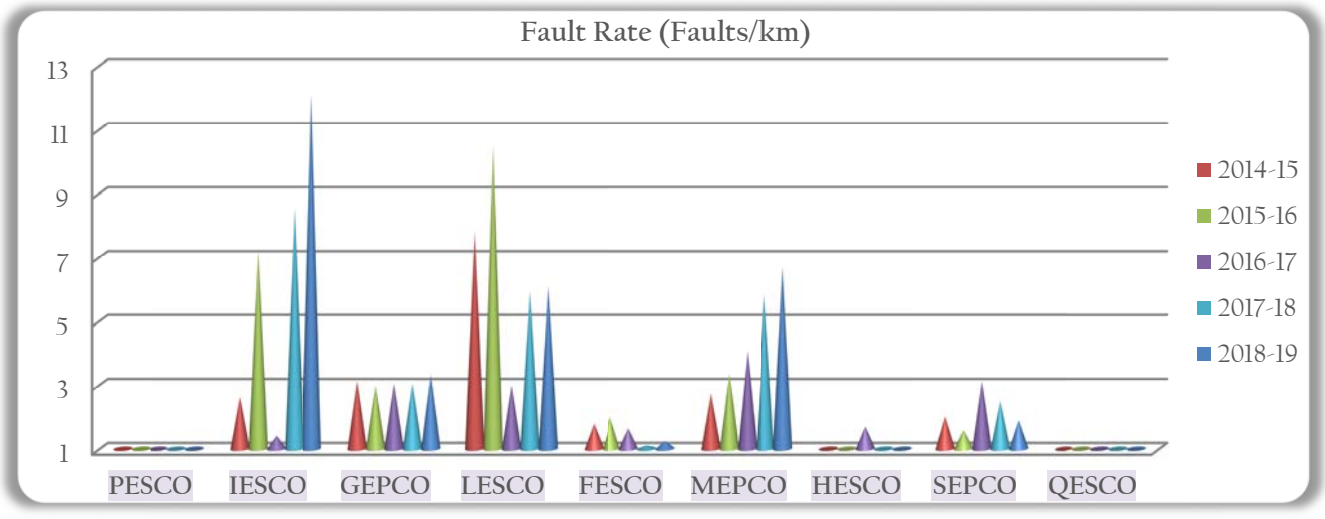
Source: DISCOs



Fault Rate (Faults/km):

DISCO	2014-15	2015-16	2016-17	2017-18	2018-19
PESCO	0.78	0.93	0.86	0.45	0.574
IESCO	2.62	7.20	1.41	8.52	12.09
GEPCO	3.12	2.97	3.04	3.04	3.327
LESCO	7.79	10.48	2.99	5.91	6.08
FESCO	1.78	1.99	1.64	1.11	1.247
MEPCO	2.72	3.35	4.06	5.82	6.67
HESCO	0.78	0.89	1.696	0.84	0.998
SEPCO	2.004	1.58	3.12	2.49	1.89
QESCO	0.59	0.53	0.49	0.48	n.p.

Source: DISCOs

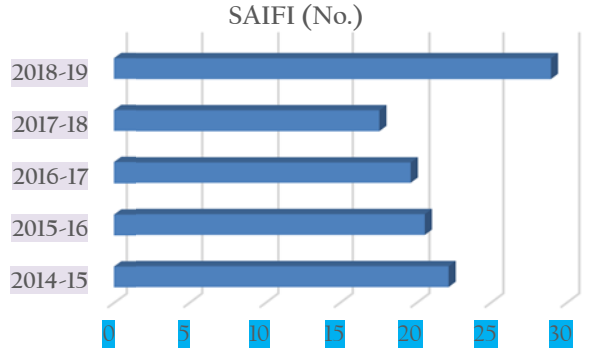


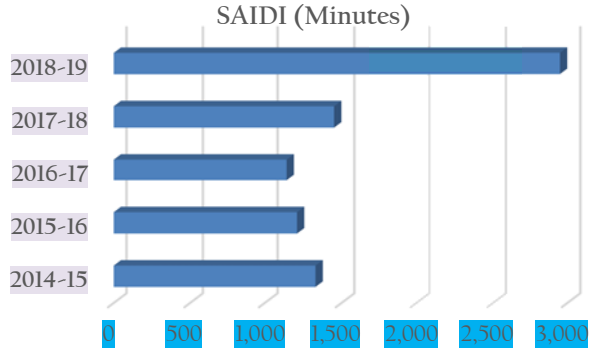
4.11 K-ELECTRIC LIMITED PERFORMANCE UNDER NEPRA STANDARDS

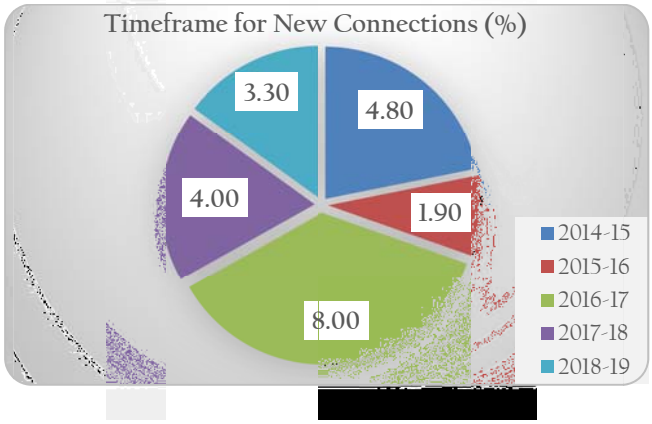
Following table and graphs show the performance of KE under different parameters for the FY 2018-19 along with comparison of last four years:

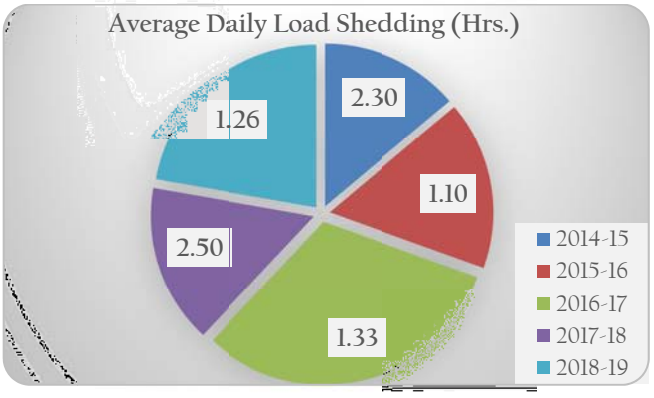
Description	2014-15	2015-16	2016-17	2017-18	2018-19
System Average Interruption Frequency Index (SAIFI-No.)	22.21	20.52	19.60	17.55	28.95
System Average Interruption Duration Index (SAIDI-Minutes)	1,330.30	1,210.00	1,142.50	1,451.42	2,950.22
Timeframe for New Connections (%)	4.80	1.90	8.00	4.00	3.30
Average Daily Load-Shedding (Hrs.)	1.10	1.33	2.50	1.26	1.77
Nominal Voltage*	258	253	293	628	3,069
Consumer Service Complaints (No.)	457,486	481,061	2,675,268	1,966,269	1,807,368
Safety**	04	13	08	10	54
Fault Rate (Faults/km)	1.55	1.39	0.95	0.85	1.31

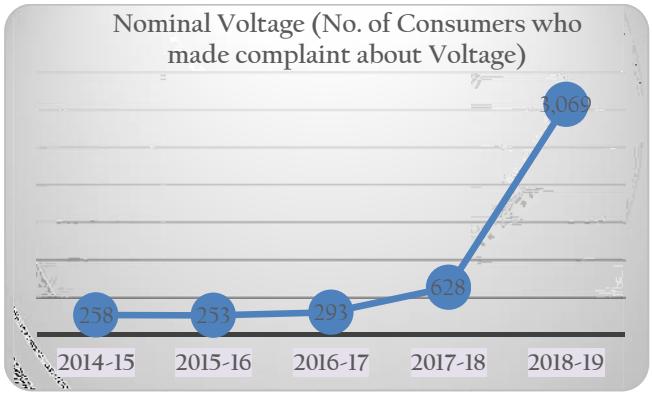
** Number of Consumers who made Complaint about Voltage.*
*** Number of Fatal Accidents for both Employees and Public.*
Source: KE

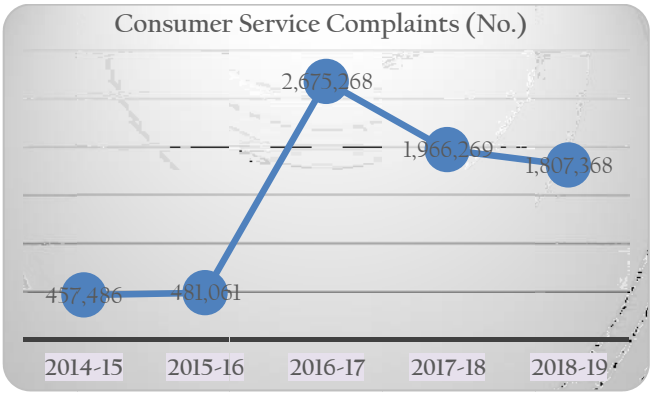


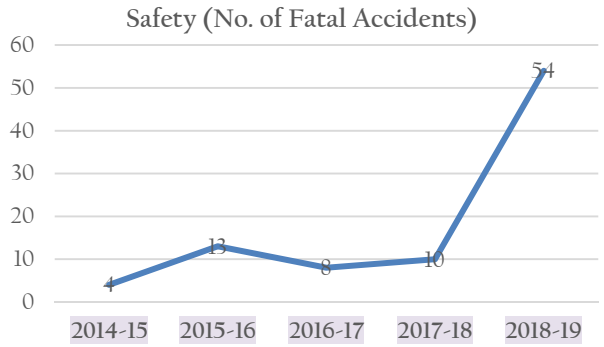


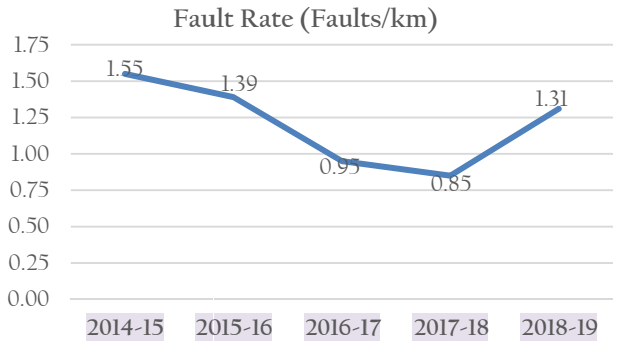





Nominal Voltage (No. of Consumers who made complaint about Voltage)
258
253
293
628
3,069
2014-15
2015-16
2016-17
2017-18
2018-19


Consumer Service Complaints (No.)
457,486
481,061
2,675,268
1,966,269
1,807,368
2014-15
2015-16
2016-17
2017-18
2018-19


Safety (No. of Fatal Accidents)
60
50
40
30
20
10
0
4
13
8
10
54
2014-15
2015-16
2016-17
2017-18
2018-19


Fault Rate (Faults/km)
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
1.55
1.39
0.93
0.85
1.31
2014-15
2015-16
2016-17
2017-18
2018-19

05

MONITORING OF THE SECTOR

MONITORING OF THE SECTOR

5.1 GENERAL

NEPRA Act, Rules and Regulations under the Act provide a framework for regulating the sector. Monitoring the performance of its licensees is one of the key elements in this respect. Monitoring activities are also carried out pursuant to NEPRA decisions, determinations and applicable documents on different matters. Consequently, responsibilities of licensees are evaluated pursuant to their roles during different phases, including planning, design, implementation and operation. In the following sections, details about monitoring and enforcement by NEPRA of its licensees and their compliance with the relevant rules and regulations, terms and conditions of their licences and other applicable documents are presented.

5.2 INDICATIVE GENERATION CAPACITY EXPANSION PLAN (IGCEP) 2018-40 SUBMITTED BY NTDC

Pursuant to clause PC-4 of the Planning Code of Grid Code, NTDC is under obligation for preparation of the Indicative Generation Capacity Expansion Plan (IGCEP) on annual basis. The IGCEP inter-alia shall identify new capacity requirements, location and possible commissioning dates while considering; loss of load probability criteria, load growth forecast, operating reserve requirements and other related capacity planning criteria. It is pointed out that NTDC did not meet its obligations since the Grid Code approval by NEPRA in 2005.

In view of the above extensive efforts were initiated by NEPRA requiring NTDC to prepare a comprehensive generation capacity expansion plan while involving all the stakeholders of the sector and modeling accurate base line conditions of the system. NTDC submitted its first simulation results of IGCEP in February 2019 for review and approval of NEPRA. After initial review of IGCEP, following deficiencies amongst others were observed:

(a) The data/information regarding various power projects being implemented by different project executing agencies including PEDO was not included in the NTDC plan.
(b) The input of Provincial Governments and other stakeholders had also not been obtained.
(c) The IGCEP did not include the impact of any ongoing or planned activity regarding Demand Side Management (DSM) on the future demand of the system.
(d) IGCEP was based software tool (WASP-IV) which has such limitations, which would affect the study outcome.
(e) Hydel power projects of less than 30 MW capacity were not included in the IGCEP. Furthermore, several other hydropower projects (of greater than 30 MW Capacity) being implemented by PEDO were noted to be missing from the IGCEP.

NEPRA directed NTDC to re-submit a comprehensive revised IGCEP after incorporating all the comments by NEPRA, PEDO, Provincial Governments and other stakeholders.

NTDC submitted its revised plan in September 2019 to NEPRA. To evaluate revised IGCEP, the Authority decided to conduct a consultative session with NTDC, CPPA-G, AEDB, PPIB, Ministry of Energy and Panel of Experts, which was held at NEPRA Head office Islamabad in October 2019. The following was highlighted;

(a) That the prior decisions of now "committed projects" totaled more than 17 GW, which are more than adequate to meet the forecasted demand upto 2025. Considerably lower levels of Loss of Load Probability (LOLP) indices than the criteria in the IGCEP also indicate that the "committed projects" would be more than the demand of the system. The Authority therefore noted that any least-cost optimization upto the year 2025 is inconsequential from a planning and approval perspective. Any new projects in the said period shall be on a need basis against an identified shortfall between demand projections and committed supply. Beyond 2025, there is a need for planning optimization for least-cost generation expansion.

(b) NTDC would be required to ensure that provinces' perspective is properly covered in the IGCEP. Specific formats for seeking data should be shared with the relevant provincial agencies.

(c) NTDC should include K-Electric system in the IGCEP to deliver a national plan applicable to all consumers.

(d) NTDC should perform include additional sensitivity analyses to address IMF revised GDP forecast and the impact of AT&C based load shedding.

(e) IGCEP has not taken into account the Demand Side Management (DSM), off grid solar installations net metering, second tier supply authorization for bulk consumers, captive power and wheeling etc. which may have considerable impact in the future power system and as such needs to be captured in planning cycle (forecasting, IGCEP and TSEP).

(f) An integral part of IGCEP should be the corresponding impact on generation basket price and consumer end tariff. However, tariff evaluation is missing from the NTDC plan. NTDC should include multiple scenarios in IGCEP and provide the impact of each scenario output on future basket price and consumer end tariff (the later part will also include the cost of transmission and distribution investments).

(g) Given the declining trends in wind and solar technology costs, NTDC should use its own resources in developing and evaluating costs for setting up all types of power plants. The Authority, as part of its IGCEP review, shall assess whether the costs allocated by NTDC to each technology are justified.

(h) Procedure for selection of candidate power projects must be explained more clearly and comprehensively.

(i) NTDC should make cost-benefit analysis and recommend whether power plants in the IGCEP should retire based on the expiry of respective PPAs or completion of useful life.

(j) The project completion timelines regarding hydel power plants and other projects should take into consideration the policy framework, rules and regulations governing the development of such projects.

(k) The capacity additions in the system need to be rationalized in terms of their resource availability and implementation time. The location of all projects including wind and solar should be identified in the IGCEP as per Grid Code.

(l) As WASP tool is outdated, NTDC should use more sophisticated tools e.g. PLEXOS, OPTGen etc. for IGCEP simulations.

(m) NTDC should ask WAPDA to re-check the constructability schedule of all hydropower projects. Moreover, the possibility of construction of six parallel sites simultaneously without any hurdle on same river should also be checked. IGCEP should include realistic timelines regarding completion of projects.

(n) World Bank has conducted study that indicates very high penetration of REs in the grid, that does not match with WASP based study done by NTDC. The quantum of REs in the grid should be determined based on holistic approach of the power sector, not simply on technical feasibility. Thus, NTDC in the IGCEP should recommend the level of penetration of REs that has the least cost outcome.

The Authority considered the observations of all stakeholders and noted that, the energy and demand forecast is a primary document based on which IGCEP was prepared. Therefore, the Authority decided to conduct a daylong session with DISCOs and other relevant stakeholders including Panel of Experts to discuss the medium term load demand and energy forecast (2019-2028) and to satisfy itself with regard to the credibility of the load demand and energy forecast figures given in the IGCEP. Accordingly, the session was held in October 2019. During the meeting, the DISCO's representatives were not able to respond to the queries of the Authority and other stakeholders about the method of computation of medium term energy and demand forecast. It was also observed by the presentation given by CPPA-G that, during the year 2018-19, CPPA-G purchased 122,541 GWh from different sources. Whereas, for the year 2019-20, NTDC has planned 158,143 GWh, which indicates 30% growth in generation during the year 2019-20 as compared to the previous year that seems un-realistic. Accordingly, the Authority as well as different stakeholders including the panel of experts showed their dissatisfaction with the data used in preparation of IGCEP. Some of the main observations made during energy and demand forecast session are listed below:

(a) Reduction of T&D losses for XW-DISCOs should be realistically reflected in demand forecast.
(b) Assumptions used for load factors in the demand forecast needs to be elaborated and their basis should be discussed.
(c) The details regarding pending new connections applications (pending load), load surveyed, and quantification of AT&C based load management, load management due to constraints and other such parameters should be considered for future demand forecast. The econometric forecast should also entail scenario with load management.
(d) The impact of distributed generation (net metering) as well as second tier authorization for supply of electricity to BPCs should also be considered while projecting the demand forecast.
(e) NTDC shall have consultations with DISCOs to devise the strategy for collecting data for roof top solar systems to prepare energy and demand forecast.
(f) Revised IGCEP to be prepared by using new software tool i.e. PLEXOS/OPTGen should be based on different demand scenarios including realistic demand.
(g) The purchase of electricity by DISCOs through CPPs shall also be intimated by DISCOs to CPPA-G and NTDC, so that the same could be taken into account while preparing the IGCEP.

In order to assess the preparedness of NTDC on delivering transmission facilities for effective evacuation of electricity from all over Pakistan, after IGCEP and Demand Forecast sessions, another long session was conducted with NTDC, CPPA-G, Industry Experts and other stakeholders in November 2019. It was also noted that the following two initiatives have not been included in the IGCEP:

(a) Expected Load of Electric Vehicle as per Government of Pakistan's recently approved Policy on EV.
(b) Expected Load of Prime Minister's Housing Project.

Considering the importance of these two significant initiatives, Authority observed that potential load demand of these initiatives should also be considered in the IGCEP.

The Authority observed that medium term energy and demand forecast is fundamental for preparation of IGCEP, however accuracy of data used was not satisfactory. Furthermore, software tool (WASP-IV) used to prepare IGCEP is outdated and has certain limitations with regard to its modeling capabilities. Such limitations to the software tool are certainly to have an impact on the study outcome.

Based on the above observations, the Authority did not approve NTDC plan and directed it to re-submit it after addressing above observations of the Authority, Stakeholders, and Industry Experts.

5.3 LEGAL ACTIONS INITIATED AGAINST WAPDA

As per Authority's instructions, Show Cause Notices had been issued to Chairman WAPDA, on account of un-satisfactory response against Explanation issued by NEPRA under NEPRA (Fines) Rules, 2002 on the closure of Tarbela (Ext. 4) Power Project.

5.4 MONITORING OF THE GENCOS

5.4.1 Legal Proceedings against GENCO-II & GENCO-III for poor maintenance of 220 kV switchyards of TPS Guddu & TPS Muzaffargarh:

NEPRA regularly monitors the performance and operation of transmission network and solicits reports from NTDC on loss of supply incidents. In this respect, NEPRA has imposed a fine of Rs. 5 million each on GENCO-II and GENCO-III for negligence in maintenance of 220 kV switchyards of TPS Guddu and TPS Muzaffargarh, respectively.

5.5 MONITORING OF TRANSMISSION SECTOR

5.5.1 Imposition of Fine and Legal Proceedings against NTDC for Frequent Tripping:

As per Authority's instructions, Show Cause Notice is being issued to NTDC under NEPRA (Fines) Rules, 2002 due to frequent tripping of NTDC's network around Chashma Nuclear Power Plant, which adversely affected its operation. Another fine had been imposed on NTDC (Rs. 1 million) due to poor operational performance as well as under-utilization of power plants.

In addition to above, monitoring for the effective implementation of following areas of Grid Code 2005 has been initiated during the reporting period:

(a) Load dispatching/merit and scheduling order of power plants.
(b) Interconnection schemes of new power plants and monitoring of timely completion.
(c) System improvements relating to stability and reliability etc.

The Authority noted that a number of power projects are waiting approval of grid interconnection studies by NTDC. The delay in approval of Grid Interconnection Studies (GIS) is a major hurdle in materialization of projects, therefore explanation followed by Show Cause Notice has been issued to NTDC for violations of provision of Grid Code 2005 in instant case. The legal proceedings are ongoing against NTDC.

A fine of Rs. 10 million has also been imposed on NTDC for delay in power evacuation projects i.e. transmission lines and development works i.e. grid stations.

Legal proceedings were also initiated against NTDC for its failure to operate and maintain 220 kV transmission lines associated with Chashma Nuclear Power Plant thereby resulting in damage to nuclear power plant machinery and loss of generation from plant.

1320 MW Port Qasim Coal Fired Power Plant reported frequent tripping on NTDC 500 kV transmission line interconnection with National Grid, thereby resulting in damage to its plant equipment and machinery. NEPRA issued directions to NTDC for resolving frequent grid tripping issues and as result, NTDC has taken remedial measures which included application of RTV coating on disc insulators and addition of Nos. of insulators per string on complete length (54 km) of both 500 kV Port Qasim circuits. After Completion of this work, the tripping of 500 kV Port Qasim Line has drastically reduced.

Wind power plants i.e. Master Wind Energy Limited, Gul Ahmad Wind Power, Act Wind and Hydro China Dawood raised issue of instability of 220 kV New Jhimpir grid station and allied transmission line which adversely affects the operation of wind turbine and allied equipment.

A comprehensive report based on the visit of NTDC/HESCO/WPPs was furnished and the same was placed before the Authority. The Authority directed NTDC and HESCO to take measures to ensure reduced tripping, voltage stability within permissible limits and drawl of available power from Wind Power Plants. The directions of the Authority have been conveyed to NTDC, HESCO and WPPs for strict compliance.

5.6 MONITORING OF DISTRIBUTION SECTOR

5.6.1 Imposition of Fine and Legal Proceedings against PESCO:

PESCO was directed to remove system constraints and upgrade/rehabilitate its network, so that allocated quota of power may be utilized in full and relief may be provided to consumers. However, PESCO failed to achieve substantial progress in this regard.

The Authority viewed poor progress of PESCO seriously and decided to initiate legal proceedings against PESCO under NEPRA Fines (Rules), 2002 on account of non-compliance of directions of the Authority, violation of Section 21 of the NEPRA Act as well as Article 7 of the Distribution Licence, violation of clause SPR 3 of Distribution Code 2005 and violation of Grid Code 2005. Legal proceedings were initiated against PESCO, and the Authority imposed a fine of Rs. 8 million on PESCO.

5.6.2 Daily Data of DISCOs regarding Energy Dispatched to DISCOs against their Allocated Quota:

Daily energy dispatch data is being analyzed and presented to the Authority on daily basis. Based on the reports, matter was taken up with concerned DISCOs who failed to utilize allocated quota of power against their demand. DISCOs were further directed to improve their distribution system in order to minimize the load shedding and fully utilize the power allocated to them. The details of power allocated and load drawn etc. during FY 2018-19 is tabulated as under:

DISCOs	Demand (MW)	Quota Allocated (MW)	Load Drawn (MW)	Less Drawn (-) Over Drawn (+) (MW)	Shortage (MW)
PESCO	2,185	2,035	1,429	-606	756
IESCO	1,482	1,539	1,401	-138	80
GEPCO	1,248	1,362	1,195	-167	53
LESCO	2,734	2,830	2,584	-246	150
FESCO	1,657	1,778	1,600	-178	57
MEPCO	13,733	12,036	11,078	-958	2,654
HESCO	754	778	582	-197	172
SEPCO	736	725	424	-301	312
QESCO	1,808	1,106	623	-482	1,184

Source: DISCOs

5.6.3 Digitized Plotting of Distribution Network of DISCOs':

DISCOs and K-Electric were required to complete digitized plotting of their distribution system on maps within three years of issuance of licence and submit the quarterly progress reports to the Authority on regular basis. The deadline for completion of the digitized mapping of distribution network was fixed as 30-06-2019 by the Authority for XW-DISCOs and KE. As on June 2019, IESCO, GEPCO and HESCO and KE have completed the task. However PESCO, LESCO, SEPCO and QESCO failed to complete the task. The percentage progress of DISCOs regarding digitized mapping of distribution network as on June, 2019 is as under:

%age Progress	PESCO	IESCO	GEPCO	LESCO	FESCO	MEPCO	HESCO	SEPCO	QESCO	KE
11 kV Feeders	90	100	100	82	99	99	100	75	25	100
Distribution Transformers	93	100	100	98	99	100	100	90	26	98

Source: DISCOs and KE

5.7 SAFETY ISSUES

NEPRA has taken serious view on the fatal incidents in KE after heavy rains in Karachi. NEPRA teams have carried out investigations and the reports will be presented to the Authority.

06

INITIATIVES BY NEPRA

INITIATIVES BY NEPRA

Following sections provide details of initiatives by NEPRA pursuant to its functions under the NEPRA Act:

6.1 NEPRA WHEELING REGULATIONS

In order to facilitate wheeling of power, NEPRA made National Electric Power Regulatory Authority (Wheeling of Electric Power) Regulations in 2016. Under these regulations generation companies who are connected to the transmission and distribution networks or those who intend to be connected to these networks, can transport their power using transmission or distribution networks to supply power to their BPCs.

NEPRA Wheeling Regulations had been framed with a view to bringing deregulation in market - wherein market forces and participants were foreseen to operate and compete among themselves with minimum necessary regulations. Accordingly roles and responsibilities and rights and obligations of participants including wheeler of power, DISCOs/Transmission Company and BPCs were included, whereas the operational and other contractual arrangements were left for the market participants to decide bilaterally.

However, due to various reasons the subject regulations could not achieve the desired results. Among the reasons apprehensions of DISCOs about shrinking of their future revenue due to wheeling mechanism, DISCOs fear that industrial consumers who cross-subsidize other consumer classes would leave their system thus undermining their financial health. It is also very pertinent that a significant number of BPCs intend to pursue "Wheeling of Power".

6.1.1 Concerns of DISCOs:

(a) Tariff Structure and the Cross Subsidies

The current Tariff structure provides for cross subsidization between the consumer classes. Subsidizing class of consumers like industrial consumers and other BPCs if leave DISCOs, would impact the economic condition of the DISCO and would burden other consumer classes.

(b) Tariff Structure and the Fixed (Capacity) Costs

Under the existing setup DISCOs are required to supply to the all the eligible consumers – therefore long term power purchase contracts have been in place. Therefore BPC leaving DISCOs' system are seen as a threat to DISCOs as their capacity cost commitments have to be honoured.

(c) Transmission and Distribution Energy Losses

There is a concern among some stakeholders that energy losses on account of T&D infrastructure have not been accounted for in the existing Wheeling Regulations.

(d) Wheeling of Renewable Energy

The existing Regulations that were framed in 2016 were not technology centric – rather they provided for a broader scheme under which market forces were envisaged to compete. However, now recently with the continuous declining of RE costs, there are concerns that non-firm supply of the RE resources in wheeling arrangement would require complicated procedures.

In view of the above aspects, except for an agreement between Multan Electric Power Company Limited (MEPCO) and a generation company, to carry out wheeling of power, the DISCOs generally resisted NEPRA Regulations on one pretext or the other. Interestingly their concerns lacked historical analysis to support their claims however persistent resistance by DISCOs have not allowed the generation companies to meaningfully participate in this regime.

NEPRA has initiated Consultative Sessions with relevant stakeholders and it expects to hold public hearings to proposing any modifications in the existing Wheeling Regulations.

6.2 LICENSES GRANTED

The generation of electric power for the purpose of sale, is a licensed activity. NEPRA grants generation licence to different power producing companies who want to be involved in sale of electric power to national grid or to Bulk Power Consumers. However, there is no need of generation licence for those electric power producers, who produce electricity for their own use. The details of all categories of licenses granted by NEPRA under Sections 14B, 14C, 16, 17, 19 and 20 of NEPRA Act up to June, 2019 are given in the following table:

S. No.	Licence Category	No. of Licence Issued
A	**Generation Licence**	
1	Hydel Projects (including WAPDA and Private Hydel)	32
2	Nuclear Projects	05
3	Public Sector Generation Companies	04
4	Generation Licence to K-Electric	01
5	Independent Power Producers under Power Policy 1994	15
6	Independent Power Producers under Power Policy 2002	28
7	Independent Power Producers under Power Policy 2015	07
8	Wind Power Projects under Renewable Energy Policy 2006	48
9	Solar Power Projects under Renewable Energy Policy 2006	26
10	Bagasse/Biomass Power Projects under Renewable Energy Policy 2006	37
11	Small Power Producers	14
12	Captive Power Producers	68
13	Isolated Generation Companies	09
14	New Captive Power Plants	09
15	Distributed Generation Plants	01
16	Short-Term Independent Power Producers	02
17	Other IPPs	06
18	Net-Metering Licences	1,625
B	**Transmission Licence**	
1	Transmission Licence Granted to Public Companies	01
2	Transmission Licence Granted to K-Electric	01
3	SPTL Granted to Private Companies	03
C	**Distribution Licence**	
1	Distribution Licence Granted to Public Sector Companies	10
2	Distribution Licence Granted to K-Electric Limited	01
3	Distribution Licence Granted to Housing Colonies	02
4	Distribution Licence Granted to Small Power Producers	09
5	Distribution Licence Granted to Captive Power Producers	01
D	**Market Operator Registration**	
1	Central Power Purchasing Agency Guarantee Limited	01

6.2.1 Generation Licences:

During the FY 2018-19, NEPRA received 23 new applications for the grant of generation licence with combined capacity of almost 557.29 MW. In this regard, processing of 12 applications with installed capacity 652.54 MW was completed and generation licences were issued whereas, various applications remained in processing. Summary of the granted generation licences issued during the period under consideration is given hereunder:

S. No.	Name of Company	Installed Capacity (MW) as per Licence	Plant Type	Date of Licence Issued
1	Gharo Solar (Pvt.) Limited, Thatta, Sindh	50.12	Solar	17-07-2018
2	Sadiqabad Power (Pvt.) Limited, Rahim Yar Khan, Punjab	45.00	Bagasse	17-07-2018
3	Reon Alpha (Pvt.) Limited, Tharparkar, Sindh	5.00	Solar	27-07-2018
4	Digri-Gen Limited, Mirpur Khas, Sindh	25.00	Bagasse	08-08-2018
5	Al-Arabia Sugar Mills Limited, Sargodha, Punjab	18.00	Bagasse	08-08-2018
6	Tricom Wind Power (Pvt.) Limited, Thatta, Sindh	50.00	Wind	08-08-2018
7	Siddiqsons Energy Limited, Tharparkar, Sindh	330.00	Thar Coal	08-08-2018
8	Lahore Xingzhong Renewable Energy Company (Pvt.) Limited, Lahore, Punjab	40.00	Solid Waste	09-08-2018
9	Ranipur Energy (Pvt.) Limited, Khairpur, Sindh	60.00	Bagasse	13-08-2018
10	Lalpir Solar Power (Pvt.) Limited, Mehmood Kot, Muzaffargarh, Punjab	11.12	Solar	17-08-2018
11	Jilani Energy (Pvt.) Limited, Lahore, Punjab	6.50	Imported Coal	10-09-2018
12	Pakhtunkhwa Energy Development Organization (Karora Hydropower Project), Shangla, Khyber Pakhtunkhwa	11.80	Hydel	24-10-2018
Total Installed Capacity (MW) as per Licence		**652.54**		

6.2.2 Net Metering Licences:

The NEPRA (Alternative & Renewable Energy) Distributed Generation and Net Metering Regulations, 2015 notified in September, 2015, have attracted a large number of consumers who started installation of distributed solar generation facilities. During the period under consideration, 1,167 distributed generation licences with total installed capacity of 19.15 MW were issued, under the net-metering regime.

DISCO-wise Details of Net-Metering Licensees

S. No.	DISCO	No. of Net-Metering Licence Issued				Installed Capacity (kW)			
		2015-16	2016-17	2017-18	2018-19	2015-16	2016-17	2017-18	2018-19
1	PESCO	-	-	2	10	-	-	37.56	96.60
2	TESCO	-	-	-	-	-	-	-	-
3	IESCO	2	49	114	377	1,020.00	1,008.96	1,732.81	3,849.07
4	GEPCO	-	3	31	56	-	11.00	1190.37	908.64
5	LESCO	-	36	142	348	-	468.20	3,204.43	7,154.44
6	FESCO	-	2	13	24	-	305.00	217.60	258.17
7	MEPCO	-	10	7	47	-	470.57	251.96	1,129.94
8	HESCO	-	-	-	1	-	-	-	10.08
9	SEPCO	-	-	-	1	-	-	-	964.91
10	QESCO	-	-	-	1	-	-	-	6.18
11	K-Electric	-	-	28	253	-	-	288.395	4,270.21
12	Bahria Town	-	6	13	48	-	52.95	84.79	490.62
13	DHA-XII (EME Sector)	-	-	-	1	-	-	-	10.40
	Total	**2**	**106**	**350**	**1,167**	**1,020.00**	**2,316.68**	**7,007.91**	**19,149.24**

6.2.3 Modifications in Existing Generation Licences:

Modifications in the already granted generation licences were issued to 5 licensees for different reasons including addition/deletion of BPCs, extension of term of licence, enhancement of useful life, and supply power to BPCs through wheeling. Details of the modification cases completed during the period under consideration are shown in the following table:

S. No.	Name of Licensee	Licence No.	Modification Issued on	Purpose of Modification
1	Premier Industrial Chemical Manufacturing (Pvt.) Limited	SGC/124/2018	05-09-2018	Enhancement of capacity, change of fuel and replacement of BPC
2	Tapal Energy (Pvt.) Limited	IPGL/11/2003	20-09-2018	Extension in term of licence
3	K-Electric Limited	GL/04/2002	13-03-2019	Addition of RLNG as an alternate fuel
4	Shams Power (Pvt.) Limited	SPGL/18/2017	22-04-2019	Enhancement of capacity and addition of BPCs
5	Sanjwal Solar Power (Pvt.) Limited	SPGL/01/2012	24-05-2019	Supply of power to BPC through wheeling and addition of BPCs

6.2.4 Distribution Licences:

During the FY 2018-19 a total 12 applications for grant of distribution licences by different housing societies/ colonies/industrial estates etc. remained in process. The processing of these applications could not be finalized due to different reasons such as reluctance of the host DISCOs and being sub-judice in the Court of Law. After the recent amendment in the NEPRA Act, the Authority has decided to further process these applications. Further, these applicants have been directed to apply for the grant of supplier licence under the new regime.

6.2.5 Electric Power Supplier Licence:

According to Section 23E of the NEPRA (Amendment) Act, 2018, a new category of electric power licence has been introduced for supplying power to the consumers. In this regard, the Authority admitted 4 applications for the grant of electric supplier licence including:

(a) Lake City Management (Pvt.) Limited
(b) Aujla & Associates Town Developers (Pvt.) Limited
(c) Punjab Industrial Estate Development & Management Company and
(d) Bahria Town (Pvt.) Limited, Lahore

6.2.6 Modifications in Existing Distribution Licences:

The NEPRA Act, 1997 has been amended to foster competition in the power sector by removing the exclusive right to provide distribution services in a given service territory. Therefore, the existing distribution licences are required to be modified to bring consistency with the statutory provisions of the NEPRA (Amendment) Act, 2018 and implement the market reforms introduced thereunder in letter and spirit. In this regard, the Authority Proposed Modification (APM) proceedings for 13 distribution licensees have been initiated. These included PESCO, TESCO, IESCO, GEPCO, LESCO, FESCO, MEPCO, HESCO, SEPCO, QESCO, K-Electric, BTPL and DHA-XII (EME Sector), Lahore. The APM proceedings are at advance stage of processing.

6.2.7 Registration of Market Operator:

During the FY 2018-19, the application of CPPA-G for Registration as a Market Operator was concluded and the required Registration was issued to CPPA-G on 16-11-2018 under Rule 3 of NEPRA (Market Operator Registration, Standards and Procedure) Rules, 2015.

6.2.8 Licence Applications Rejected:

During the FY 2018-19, two (02) applications, initially considered/admitted for the grant of generation licence, were rejected due to non-compliance with relevant regulations and non-submission of required documents. These included applications of Lootah Energy (Pvt.) Limited and Madina Sugar Mills Limited.

6.2.9 Revocation/Cancellation of Licence:

During the FY 2018-19 generation licences of Blue Star Electric (Pvt.) Limited, Blue Star Hydel (Pvt.) Limited, Eithad Sugar Mills Limited and Ellcot Spinning Mills Limited were cancelled on the request of licensees.

07

INITIATIVES BY STAKEHOLDERS

INITIATIVES BY STAKEHOLDERS

7.1 PPIB ROLE, PLANNED ACTIVITIES, PROGRESS AND ACHIEVEMENTS

The PPIB is "One Window" facilitator for the investors in the field of power generation on behalf of Government of Pakistan. PPIB is also processing public sector power generation projects in IPP mode for providing incentives, concessions and facilitation by PPIB to these project companies under the applicable policies as being provided to the IPPs in the private sector.

(A) PPIB's Current Portfolio of New Power Projects:

Currently PPIB is handling portfolio of twenty-six new multiple fuel (Hydro, Coal and RLNG) based IPPs with cumulative capacity of around 14,407 MW, worth multi billion dollars. These projects are at different stages of implementation. Break-up is as follows:

(a) Fifteen Hydropower based Projects: 6,411 MW

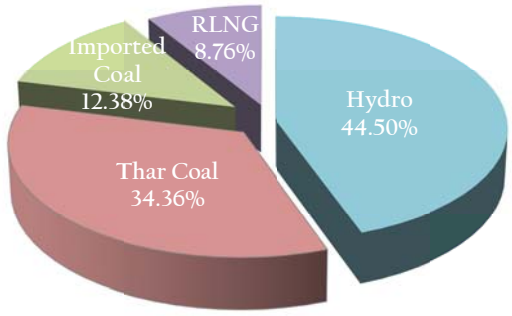
(b) Seven Thar Coal based Projects: 4,950 MW

(c) Three Imported Coal based Projects: 1,783 MW

(d) One RLNG based Project: 1,263 MW

(e) One Transmission Line Project (Matiari-Lahore) having 4,000 MW Load carrying capacity.

Under Process IPPs (26 Nos.) (14,407 MW)



(B) Role of PPIB in Implementing Power Projects under CPEC Program:

PPIB is acting as front line Institution of Government in Implementing Flagship CPEC Program by processing major chunk of Power Sector's Projects. PPIB's current portfolio includes twelve power projects under CPEC regime of 10,934 MW which are at different stages of implementation:

(a) Nine Coal based Power Projects of 8,220 MW including Five Thar Coal based Projects of 3,960 MW (660 MW Engro, partially commissioned) Four Imported Coal based Projects of 4,260 MW (1,320 MW Port Qasim and 1,320 MW Sahiwal already commissioned while 1,320 MW CPHGCL Projects is partially commissioned).

(b) Three Hydropower Projects of 2,714 MW (720 MW Karot and 870 MW Suki Kinari Hydropower Projects under construction).

(c) Approximately 900 km long 4,000 MW load transmitting capacity, ±660 kV Matiari-Lahore HVDC Transmission Line Project (under construction).

CPEC Power Project (Fuel-wise)
(10,934 MW)

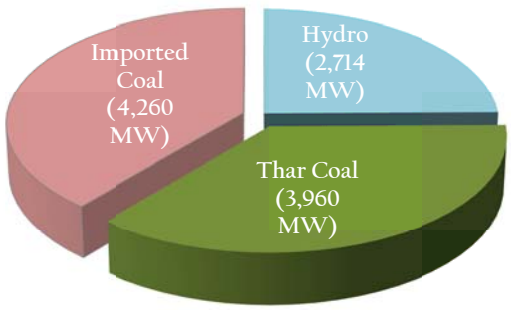


Table summarizing PPIB's portfolio of upcoming IPPs (Till 30th June, 2019)

Year	Hydel		Coal		RLNG		Total (MW)	No. of Projects
	MW	No.	MW	No.	MW	No.		
2019	102	1	1,980	2	800	1	2,882	4
2020	-	-	-	-	463*	-	463	-
2021	720	1	1,320	3	-	-	2,040	4
2022	870	1	1,290	3	-	-	2,160	4
2023	-	-	1,980*	1	-	-	1,980	1
2025	700	1	-	-	-	-	700	1
2026	1,424	2	-	-	-	-	1,424	2
2028	1,048	3	-	-	-	-	1,048	3
**	1,547	6	163	1	-	-	1,710	7
Grand Total	6,411	15	6,733	10	1,263	1	14,407	26

** Includes 2nd Units of Projects from previous year.*
*** 1 X Coal Project under litigation, while six Hydropower Projects are to be advertised soon by PPIB hence these projects are not likely to be operational before 2028.*
Source: PPIB

(C) Highlights of some Major Activities/Achievements of PPIB during FY 2018-19:

(a) 1,223 MW RLNG based Balloki Power Project achieved COD on 29th July, 2018 and started supply electricity to the national grid.

(b) First unit (330 MW) of Pakistan and also CPEC's Thar Coal based 600 MW Engro Powergen Project synchronized on 18th March, 2019 which has paved the completion of full project of 660 MW by July, 2019.

(c) First unit (660 MW) of Imported Coal based China Power Hub Generation Project another coal based Power Project synchronized on 29th December, 2018 while full project (1,320 MW) scheduled to come online by August, 2019.

(d) Transmission Line sector also witnessed remarkable progress in 2018-19. PPIB is processing Pakistan's first private sector transmission line project which would also be the first HVDC equipped project of the country. The 900 km long ±660 kV Matiari-Lahore HVDC Transmission Line Project achieved financial closing on 27th February, 2019. With the achievement, this project has entered in construction phase which is targeted to be concluded by March, 2021.

(e) 720 MW Karot Hydropower Project achieved a major milestone when construction work on embankment/ dam reservoir was started by diverting water flow from River Jhelum on 22-09-2018.

Besides, during 2018-19, PPIB remained actively engaged in facilitating projects sponsors in conducting feasibility studies, land acquisition, NEPRA's generation licenses as well as tariff approvals and execution of IA, PPA, DIA, WUA and SIA agreements. In this regard, highlights of success achieved by PPIB are as follows:

(a) GOP-IA for development of 700 MW Azad Pattan Hydropower Project was initiated on 20-11-2018 while AJ&K-IA was initialed on 22-02-2019.

(b) Tripartite Power Purchase Agreement was initiated on 24-09-2018 for development of 1,124 MW Kohala Hydropower Project.

(c) Feasibility Study for development of Turtonas-Uzghor Hydropower Project was approved on 03-06-2019 as a result project capacity has been increased from 58 MW to 82 MW.

(d) Feasibility Study for Athmuqam Hydropower Project is also final and expected to be approved within July, 2019. It is anticipated that the capacity of this project will also be increased from 350 MW to 450 MW.

(e) Feasibility Study Stage Tariff for 640 MW Mahl Hydropower Project was announced by NEPRA on 23-01-2019.

(f) Coal Supply Agreement for 330 MW Siddiqsons Thar Coal based Power Project was signed on 12-02-2019.

(g) NEPRA announced Tariff for 300 MW Imported Coal based Power Project on 19-12-2018. However, Sponsors filed Tariff Review Petition, and tariff was re-determined on 21-05-2019.

(D) Major Activities/Proposals to be undertaken by PPIB in Future:

PPIB is targeting to complete and commission twelve IPPs of more than 7,500 MW by 2022 to supply reliable, affordable and sustainable electricity to the National Grid. Majority of these projects are under construction or under financial closing stage hence anticipated to start construction in near future.

Year	Hydro (MW)	Thar Coal (MW)	Imported Coal (MW)	RLNG (MW)	Total (MW)
2019	102	660	1,320	800	2,882
2020	-	-	-	463	463
2021	720	1,320	-	-	2,040
2022	870	990	300	-	2,160
Grand Total	1,692	2,970	1,620	1,263	7,545

(a) PPIB is planning to advertise new hydropower based IPPs under ICB mode in accordance with the demand-supply study/IGCEP so that there is no situation of deficit or excess generation in the country.

(b) To remove the major bottleneck in the development of power projects in the private sector through Provinces and AJ&K, particularly the small hydropower projects that have been issued LOI by Provinces and AJ&K area referred to PPIB for subsequently handling under Tripartite Letter of Support (TLOS) regime as envisaged under Power Generation Policy 2015. In this regard, PPIB has started proceeding on the matter in accordance with the approval of Board.

(c) In addition to Matiari-Lahore Transmission Line Project, another HVDC Transmission Line Project is expected to be processed by PPIB under CPEC. Furthermore, NTDC has also recently referred few transmission line projects to PPIB for ICB. PPIB will gear-up its efforts for improving Transmission system in the coming years.

(d) Indigenous resources are being highly encouraged for future power generation, and Thar Coal will be utilized for future power projects as per requirements of the National Grid.

7.2 AEDB EFFORTS IN SUPPORTING RENEWABLES ENERGY

AEDB has been promoting and facilitating the development and deployment of alternative and renewable energy technologies in the country. The development of renewable energy based power generation projects is being pursued on IPP mode through private sector investors. The status of RE Power Projects as of 30th June, 2019 is given below:

(a) 24 Wind Power Projects of 1233.37 MW cumulative capacity were operational and providing electricity to the grid.

(b) 6 Solar Power Projects of 430 MW cumulative capacity were operational.

(c) 8 Sugar Mill based Bagasse Co-generation Projects of 259.1 MW capacity were operational. One project of 74.4 MW was under construction.

(A) Steps and Measures Taken by AEDB for Promotion and Development of Renewable Energy:

AEDB undertook a number of supportive measures in order to promote ARE technologies and to attract private sector investments. Some of the supportive measures taken by AEDB are as follows:

(a) AEDB proactively facilitated the RE Power Projects in achieving their project milestones and resolution of issues and impediments faced by the project sponsors from different public sector entities.

(b) AEDB initiated the formulation of the new Draft ARE Policy 2019 as per the direction of the Government targeting a share of 20% from RE resources in the power mix by 2025 and 30% by 2030.

(c) AEDB prepared the draft RFP for carrying out competitive bidding for development of wind and solar power projects falling under category-III of CCoE in case No. CCE-12/04/2019(V).

(d) AEDB promoted the net metering concept and facilitated the concerned stakeholders in implementation of net metering system under NEPRA's regulations. For mass deployment of net metering based systems, several supportive steps were taken including trainings and capacity building of DISCOs.

(e) AEDB with the support of GIZ, finalized the mechanism for implementation of quality standards for import of solar PV equipment in Pakistan, which was made part of the IPO.

(f) Analysis of IESCO grid network for net metering was carried out through the support of GIZ.

(g) AEDB interacted with State Bank of Pakistan for revision and extension of SBP's Financing Scheme for Renewable Energy. The financing scheme has been extended till 30th June, 2022.

(h) AEDB in collaboration with GIZ launched Solar Quality Passport (SQP) program on 24th April, 2019, which has been designed to provide system owners with confidence that the installers who issue the passport will act in compliance with all applicable national policies, regulations and standards.

(i) AEDB continued assistance in implementation of IFC Lighting Pakistan Program. A total of 170,000 products had been sold in rural areas benefitting 850,000 people.

(j) AEDB collaborated with UNIDO for implementation of program to demonstrate utilization of biomass resource in industries for generation of electricity. A 5.6 MW biomass pilot project was initiated in industries under the program.

(k) AEDB and UNIDO continued collaboration under a program to develop human resource and demonstrate utilization of renewable energy applications in different industries. Dedicated trainings were undertaken by engagement of international consultants for certified energy managers, certified energy auditors and energy management systems.

(B) Progress of ARE Power Projects during FY 2018-19:

(a) Wind Power Project developers/IPPs have been facilitated for completion of their respective projects. Five Wind Power Projects of 246.6 MW capacity were completed and achieved COD.

(b) Two Bagasse based Power Generation Projects of 58 MW capacity were completed achieved COD and started supplying electricity to the National Grid.

(C) Planned Activities for FY 2019-20:

(a) Finalization of ARE Policy 2019 and approval from the competent forums.

(b) Facilitation to projects falling under category-I and category-II of the CCoE decision in case No. CCE-12/04/2019(V) for their implementation.

(c) Finalization of RFP Package in consultation with all concerned stakeholders for carrying our competitive bidding for RE projects falling under category-III of the CCoE decision.

(d) Development of Implementation Strategy and Action Plan for implementing of the ARE Policy 2019 to achieve the 2025 and 2030 RE targets with the support of World Bank.

(e) Training of SEs, XENs, SDOs and focal persons of DISCOs on the PV ECOSYS Platform (net metering application processing) with the support of USAID.

7.3 OBJECTIVES, PROGRESS, ACHIEVEMENTS, PLANNED ACTIVITIES OF PUNJAB POWER DEVELOPMENT BOARD, GOVERNMENT OF PUNJAB

Pakistan's commitment to the sustainable development agenda recognizes the fact that only renewable energy sources, such as solar, wind, hydro, coal and biomass, will shoulder the burden of powering future society. Our economy's sectors are thoroughly and intricately interdependent; in which energy knits everything together, and makes possible everything we do. In this regard, as a statuary institution, Punjab Power Development Board (PPDB) endeavors to create momentum towards promoting sustainable energy development.

Pakistan faced serious power shortfall challenges in the past half-decade. The domestic, commercial, agricultural and industrial activities were grossly compromised due to non-availability of power. Government of Pakistan, hence, focused its resources and energies towards mitigating the situation. Government of Punjab, being representative of largest electricity consumer base in the country, played its due role in adding affordable power generation facilities to the National Grid. Energy Department, Government of the Punjab (GoPb), through the PPDB facilitated development of power projects with an aggregate capacity of about 2500 MW; both base load and renewables.

PPDB has been playing an important role since 1995, in exploring and implementing power generation projects in the private sector. PPDB is a statutory body functioning under PPDB Act, 2011, providing one window facilitation to private power projects, of all capacities based on any technology, in Punjab in line with Punjab Power Generation Policy, 2009. Utilization of indigenous resources are given priority and efficient use of imported fuels, when essential, has also been explored. Being the front desk of GoPb for liaison with other power sector entities in Pakistan including NEPRA, NTDC, PPIB, AEDB, DISCOs and other Provincial Governments, PPDB has played a vital role in 2018 to bring sustainable energy development in the Province.

(A) Key Projects:

PPDB has so far facilitated in development of many keys projects in Punjab, playing a very important role for the sustainability of the province. Following are some of the key projects done by PPDB in the recent years:

(a) 1st CPEC flagship project of 2x660 MW Coal based Power Project at Qadirabad, Sahiwal completed and have started commercial operation from October 28, 2017. This project has so far injected over 22 Billion Units into National Grid.

(b) With the active facilitation by PPDB, country's first grid-connected 4x100 MW Solar Power Projects (SPP) have successfully started commercial operations and injecting electricity into National Grid. These 4x100 MW SPPs are;
   (i) Development of 100 MW Quaid-e-Azam Solar Power Project in Punjab and
   (ii) Development of 3x100 MW Solar Power Project at Quaid-e-Azam Solar Park

(B) Captive Guidelines for Small Hydropower Projects:

PPDB is encouraging the development of small hydropower projects in captive mode for supply of generated energy for self-use of small new and existing enterprises with the vision to enhance the development of small industries and increase rural employment. In this regard, Captive Guidelines for small hydropower projects have been drafted as well.

(C) Participation in Development of ARE Policy 2019:

PPDB is facilitating development of renewable portfolio with aggregate capacity of around 2,700 MW based on solar, wind, biomass and waste resources. PPDB has participated in the development of Alternative and Renewable Energy Policy 2019, for the development of renewable energy projects i.e. solar, wind, bagasse, biomass and waste to energy.

(D) Renewable Energy Locational Study:

Ministry of Energy (Power Division) with the support of World Bank conducted a detailed study on Variable Renewable Energy Integration and Renewable Energy Locational Zones across Pakistan. The study envisages Renewable Energy potential at different locations in Pakistan based on short, medium and long-term plan till 2030. PPDB during consultation process emphasized the importance of sites identification and potential with respect to grid suitability in Punjab. PPDB has further emphasized that it is important to identify RE potential all over Pakistan, in detail, that may be realized at fullest to meet high RE targets set by Government of Pakistan.

SAHIWAL COAL FIRED POWER PLANT

SOLAR POWER PROJECT BAHAWALPUR

7.4 OBJECTIVES, PROGRESS, ACHIEVEMENTS, PLANNED ACTIVITIES OF ENERGY DEPARTMENT, GOVERNMENT OF SINDH

(A) Generation:

(a) 400 MW Renewable Energy Project sponsored by World Bank and approved by ECNEC, which will be implemented by International Competitive Bidding under NEPRA's Regulations.

(b) 1320 MW Thar Block-6 by the year 2025-26.

(B) Transmission:

Sindh Transmission and Dispatch Company (Pvt.) Limited (STDC) was incorporated on 07-01-2015 under Securities & Exchange Commission of Pakistan (SECP) Companies Ordinance, 1984 for the provision of EHV electric power infrastructure. It is a subsidiary Company of Sindh Energy Holding Company (Pvt.) Limited.

(C) Role of STDC in Power Sector:

For the last few decades, our country is facing acute shortage of Transmission Lines, which is severely hampering the evacuation of power in the transmission network. To resolve the issue the Government of Sindh has taken an initiative to establish its own Transmission Line Company to support and reduce the workload of NTDC.

(D) STDC's Planned Activities:

NEPRA has awarded the Provincial Grid Company (PGC) Licence to STDC on 5th November, 2019. STDC has also started working for resolving the long awaited issues of Evacuation at least in the province of Sindh. Indicative plans in the pipeline are as follows:

(a)	KWSB K-IV Project	50 MW	30 km T/L + 2 Grid Stations
(b)	Siachen Solar Project Gharo	100 MW	25 km T/L
(c)	Burj Capital Wind Project Gharo	40 MW	8 km T/L

(d) Unsolicited Proposal – Reon Power Generation and Energy Wheeling Arrangement of industrial area of Kotri, Sindh
(e) Unsolicited Proposal – Reon Power Generation and Energy Wheeling Arrangement of industrial area of Nooriabad, Sindh
(f) Special Economic Zone Dhabeji
(g) Perspective Evacuation/Interconnection for Renewable Energy based project with K-Electric
(h) Keti Bunder Mega Project-Power Component
(i) Operation and Maintenance of various Extra High Voltage Transmission Lines.
(j) System Study for a reliable and secure power for the Province of Sindh.

(E) Progress:

(a) Currently STDC has completed the process of hiring the services of Technical Consultant for survey, design and supervision of construction of T/L and Grid Stations for K-IV Power Component Project of KWSB at Kinjhar Lake as per Sindh Public Procurement Regulatory Authority (SPPRA) Rules.

(b) At present STDC is carrying out the Operation and Maintenance of its 132 kV Double Circuit Transmission Line as per NEPRA's Tariff Determination in which NEPRA has allowed Outage Allowance of 131.4 hours per annum. However, STDC has consumed only 61 hours and 4 minutes that is 47% during the first year of operation i.e. 2018. Details are shown below:

STDC Transmission Line Outage Allowance from January, 2018 to December, 2018

S. No.	Months	Outages	S. No.	Months	Outages
1	January, 2018 to April, 2018	No Outages	5	August, 2018	4 Hrs 43 Mins
2	May, 2018	3 Hrs 55 Mins	6	September, 2018	23 Hrs 37 Mins
3	June, 2018	11 Hrs 58 Mins	7	October, 2018	16 Hrs 29 Mins
4	July, 2018	0 Hrs 22 Mins	8	Nov. & Dec., 2018	No Outages
				Total Outage Allowance	**61 Hrs 04 Mins**

(F) Achievements:

(a) STDC has successfully constructed first ever provincial 132 kV Double Circuit Transmission Line of 95.74 km length for evacuation of 100 MW electric power from Sindh Nooriabad Power Company (Pvt.) Limited to K-Electric KDA-33 Grid Station, Karachi.

(b) First ever High Voltage Transmission Line built by a Provincial Government. No precedence in any other Province.

(c) An ISO certified company since last three years:

(i)	Achieved ISO 9001:2015 Certification	Quality Management System
(ii)	Achieved ISO 14001:2015 Certification System	Environmental Management
(iii)	Achieved ISO 45001:2018 Certification	Occupational Health and Safety
(iv)	Achieved ISO 27001:2013 Certification	Information Security
(v)	ISO 55001:2014 Certification (In Progress)	Asset Management System

(d) STDC adheres to the Policy of Zero Tolerance in Safety. Due to strict adherence to this Policy, there was zero industrial accident during the whole construction period of the line. Similarly, there is no reported incident of accident during the Operation and Maintenance period till date.

7.5 OBJECTIVES, PROGRESS, ACHIEVEMENTS, PLANNED ACTIVITIES OF PAKHTUNKHWA ENERGY DEVELOPMENT ORGANIZATION, GOVERNMENT OF KHYBER PAKHTUNKHWA

Pakhtunkhwa Energy Development Organization (PEDO) reported the following data with respect to its existing projects:

S. No.	Name of Project	Capacity (MW)	Actual/Expected Commissioning Year	Project Cost (Rs. in Million)
(A)	**Existing/on-going Projects:**			
1	Malakand-III Hydropower Project, Malakand	81.00	November, 2008	6,379.55
2	Pehur Hydropower Project, Swabi	18.00	March, 2010	900.00
3	Ranolia Hydropower Project, Kohistan	17.00	2016	5,247.00
4	Machai Hydropower Project, Mardan	2.60	2016	1,490.23
5	Daral Hydropower Project, Swat	36.60	2017	8,450.67
6	Koto Hydropower Project, Dir	40.80	February, 2019	13,998.89
7	Karora Hydropower Project, Shangla	11.80	December, 2020	4,620.06
8	Jabori Hydropower Project, Mansehra	10.20	2019	3,798.26
9	Construction of 356 Mini Micro Hydel Power Stations in Northern Districts of KPK – HDF Funded	32.50	2019	5,250.19
10	Gorkin-Matiltan Hydropower Project, Swat	84.00	November, 2020	20,722.94
11	Lawi Hydropower Project, Chitral	69.00	November, 2021	20,087.50
(B)	**Expansion of Existing Projects:**			
1	Access to Clean Energy Investment Program (ADB Funded)	53.13	2021	12,087.06

Further, PEDO is unable to share any information of its future/upcoming projects and planned activities/ achievements for the year 2018-19. However a detailed write-up on some existing Hydropower Projects (HPP) which is reproduced hereunder:

(A) Malakand-III Hydropower Project:

Malakand-III HPP was identified after the construction of Auxiliary Tunnel under Swabi SCARP on the Upper Swat Canal System. The Upper Swat Canal System was completed in 1918. It emanates from the Swat River at Amandara Head Works and irrigates 121,400 hectares of land of the Peshawar valley. A six km long canal carries water from Amandara to the foot of Malakand Hills. There the 3.5 km long Benton Tunnel pierces the Malakand Hills and passes water into the Dargai Nullah. Utilizing this water, two power plants Jabban and Dargai, each of 20 MW capacity, were set up in 1937 and 1953 respectively each between the outlet of Benton Tunnel and the tri-furcator.

Due to increase in irrigation water demand the Amandara Head Works was upgraded under the Swabi SCARP and another Auxiliary Tunnel, parallel to the existing Benton Tunnel was constructed to carry the increased design discharge of 51 cumecs. In order to avail this additional discharge for hydropower, before it is fed into Machai Branch, the Malakand-III HPP having a capacity of 81 MW was conceived. This project was proposed to be operated in conjunction with the two existing power stations of Jabban and Dargai keeping in view the variation in water availability in Swat River.

It is important to add that subsequent to the feasibility of Malakand-III, it was identified that 25,000 acres of land can be irrigated under the project, in addition to hydel benefits. Therefore, from the outlet of sediment excluder of Malakand-III and Irrigation Project "Baizai" for gravity irrigation of about 25,000 acres of land conceived which is now under construction by Irrigation Department.

Malakand-III HPP was completed in 2008 and interconnected with National Grid through 132 kV Dargai Grid Station. The power generated is being sold to NTDC under a PPA with NTDC for 25 years. The rate for sale of power to NTDC has been determined by NEPRA. The HPP had achieved its COD on November 1, 2008. Uptill

now the project is running successfully, fulfilling all the conditions and has not failed to achieve its targets. It has generated so far revenue of more than Rs. 26 Billion.

(B) Operation and Maintenance of Malakand-III Hydropower Project:

(a) The project was out-sourced for O&M purposes to M/s Hydro Tech Pak (Pvt.) Limited, Peshawar through ICB for 5 years on merit, with effect from 1st September, 2007 to 31st August, 2012.
(b) The O&M Contractor operated and maintained the Project to the entire satisfaction of the client besides making essential modifications for improving the performance and curtailing the outages.
(c) Based on its performance and in line with the provision of the Contract Agreement, the PEDO Board granted extension for another term of three years to M/s Hydro Tech Pak (Pvt.) Limited, Peshawar with effect from 1st September, 2012 to 31st August, 2015.
(d) On expiry of the extended term of M/s Hydro Tech Pak (Pvt.) Limited, Peshawar the O&M services of Malakand-III HPP were advertised and awarded through ICB to M/s Al-Fajr International-Norinco JV, Islamabad for five years with effect from 1st September, 2015 to 31st August, 2020.

(C) Machai Hydropower Project:

The Machai HPP is located in Village Alo Tehsil Katlang, District Mardan on Machai Canal, which is a part of Upper Swat Canal System off-taking from Amandara Head Works on River Swat.

It is the provincial hydel project, which delivers 2.6 MW active powers to National Grid Katlang through 11 kV Transmission Line. 2.6 MW Machai HPP was constructed on Machai Canal by PEDO and was completed in November, 2017. Kaplan type-1 Unit Turbine of 2.6 MW capable of generating approximately 15.784 GWh/annum of Net Electrical Output under maximum water flow conditions (40 m^3/sec) with Net head of 7.88 meters.

Machai HPP has started power generation since 24th November, 2016 and has exported 13,080,100 kWh upto 3rd January, 2020 duly dispatched to the National Grid. EPA is under process/pending with PESCO due to which no revenue is generated. Levelized tariff for a period of 30 years determined by NEPRA is Rs. 5.62/kWh.

(D) Operation and Maintenance of Machai Hydropower Project:

The project was out-sourced for O&M purposes to M/s Hydro Tech Pak (Pvt.) Limited, Peshawar for a period of 5 years with effect from 1st September, 2014 to 31st August, 2019 for providing O&M services for effective and smooth running of the complex.

(E) Pehur Hydropower Project:

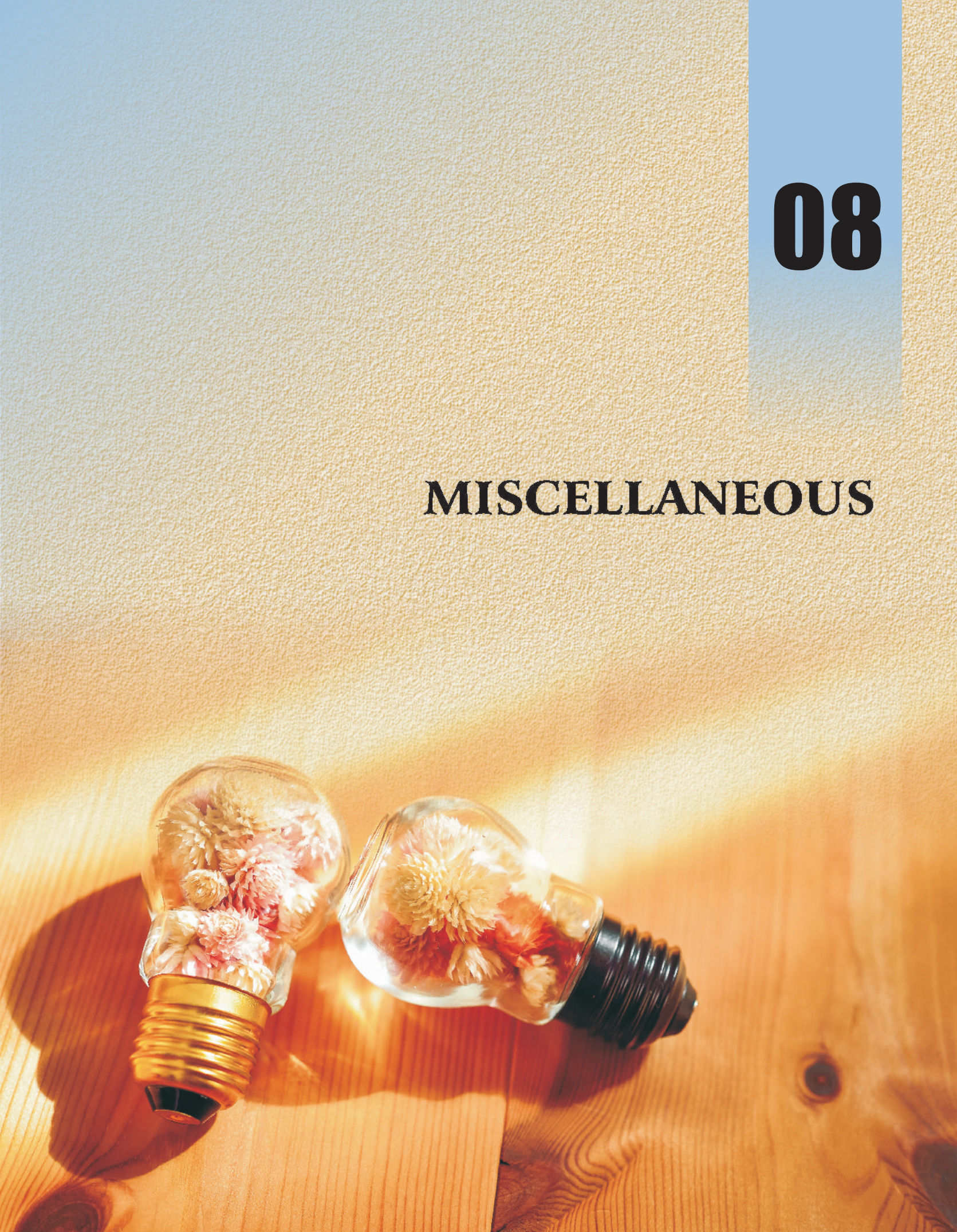
18 MW Pehur HPP constructed at the outlet of Gandaf Tunnel elevating from Tarbela Reservoir, for irrigation purpose of command area at District Swabi, Khyber Pakhtunkhwa. The plant was constructed in 2009 and commercial operation started in March, 2010. Since COD the PEDO role is to maintain operate the power plant according to standard O&M practices in order to ensure availability, reliability and optimum energy generation.

(F) Operation and Maintenance of Pehur Hydropower Project:

(a) Preventive maintenance of the power plant (Daily, Weekly, Monthly and Annual Maintenance).
(b) Emergency tackling and fault rectification work.
(c) Management of spare parts and other material required for maintenance of power plant.
(d) Maintenance of civil structure.
(e) Technical training of O&M staff and local community of the relevant filed.
(f) Submission of monthly energy invoices in coordination with relevant department.
(g) Compilation of record for onward submission.

08

MISCELLANEOUS



MISCELLANEOUS

8.1 SUMMARY OF ACTIVITIES DURING 2018-19

The following sections provide summary of various activities by NEPRA during 2018-19 and also includes brief information on the Board of Directors Meetings for GENCOs, NTDC and DISCOs.

8.1.1 Promulgation of New Rules/Regulations/Guidelines:

The following Promulgation of New Rule(s)/Regulation(s)/Guideline(s) has been made during the reporting period:

S. No.	Name of Rule/ Regulation/Guideline	Notified Vide SRO No./Date	Salient Features
1	Documents (Forms 1-15) for Application of Generation Tariff Petitions for steam-based power plants operating on coal, residual furnace oil, biomass, bagasse, solid waste or nuclear fuel.	SRO 374(I)/2019 dated 15-03-2019	Technical specifications of the steam based power plants.

Source: NEPRA

8.1.2 Amendments in NEPRA Act/Rules/Regulations/Guidelines/Codes:

The following New Amendments have been made in the existing Rules and Regulations during the reporting period:

S. No.	Name of Rule/ Regulation etc.	Notified vide SRO No./Date	Salient Features
1	Amendment in NEPRA (Alternative and Renewable Energy) Distributed Generation and Net Metering Regulations, 2015	SRO 1135(I)/2018 Dated 13-09-2018	• Eligibility of "General services or Single point bulk supply" consumers under Net Metering mechanism. • Review of mechanism for netting of Import and Export of Energy [Exports and Imports to be netted-off in corresponding time periods] • Review of payment mechanism in case of excess sales by Net Metering Consumers [Payments to be made at average Power Purchase Price of respective DISCO] • Imposition of a capacity limit per Distributed Generation Facility [up to 1.5 times sanctioned load of consumer] • Clarification on "Applicable Tariff" [Tariff determined by Authority and notified by Federal Government]
2	Amendment in NEPRA Competitive Bidding Tariff (Approval Procedure) Regulations, 2017	SRO 259(I)/2019 Dated 28-02-2019	• Appointment of reputable consultant allowed [subject to Authority determined criteria] for evaluation of bids. • Authority approved Benchmark Tariff specified as a condition of Competitive Bidding. • Clarification & transparency on disqualification of prospective bidders in pre-qualification stage and on non-responsiveness in later stages. • Rationalization of time required by the Authority for approval of RFP. • Other changes for better lucidity.

8.1.3 Advisories issued by NEPRA to the Government of Pakistan:

S. No.	Date	Subject	Sent to
1	02-10-2018	Under-utilization of GENCOs and IPPs Power Plants	Ministry of Energy (Power Division)
2	04-01-2019	Un-scheduled load shedding due to tripping of Transmission Lines	
3	10-05-2019	System constraints in NTDC's and DISCOs' network likely to affect continuity of supply during holy month of Ramadan	

Source: NEPRA

8.2 CONSUMER AFFAIRS

8.2.1 Status of Consumer Complaints (2018-2019) (Head Office):

DISCO	Total Complaints Received/Processed	Total Complaints Disposed Off	Under Process
PESCO	286	234	52
TESCO	1	0	1
IESCO	186	177	9
GEPCO	122	105	17
LESCO	216	187	29
FESCO	161	145	16
MEPCO	702	643	59
HESCO	475	468	7
SEPCO	684	660	24
QESCO	23	19	4
KE	257	243	14
BTPL	17	16	1
Total	**3,130**	**2,897**	**233**

Source: NEPRA

8.2.2 Status of Consumer Complaints (2018-2019) (Regional Offices):

Regional Office	DISCO	Total Complaints Received/Processed	Total Complaints Disposed Off	Under Process
Lahore Office	GEPCO	16	16	0
	LESCO	246	240	6
	FESCO	23	23	0
	MEPCO	48	43	5
Karachi Office	HESCO	59	55	4
	SEPCO	36	30	6
	KE	2,087	2,064	23
Peshawar Office	PESCO	217	82	135
Quetta Office	QESCO	14	8	6
Total		**2,746**	**2,561**	**185**

Source: NEPRA

8.2.3 Major Activities/Developments:

On recommendations of the National Assembly's Standing Committee on Cabinet Secretariat, NEPRA has approved the establishment of five (05) additional offices of NEPRA at DISCOs' Headquarter level, i.e. at Gujranwala, Faisalabad, Multan, Hyderabad and Sukkur, along with staff, in addition to strengthening the existing offices at Karachi, Lahore, Peshawar and Quetta.

8.3 GENCOS' BOARD OF DIRECTORS (BODS) MEETINGS

The agenda of Board of Directors (BODs) meetings in respect of public sector GENCOs (GENCO-I to IV) in FY 2018-19 comprised approving budget and business plans, approving rehabilitation works, recruitment of services - consultancy and human resource, approving Gas Supply Agreements, etc. and approving correspondences with Ministry of Energy soliciting policy directives and other administrative approvals.

S. No.	DISCO	Number of BODs Meetings held during the FY 2018-19
1	GENCO-I	07
2	GENCO-II	10
3	GENCO-III	10
4	GENCO-IV	04

8.4 NTDC'S BOARD OF DIRECTORS (BODS) MEETINGS

NTDC is governed by its BOD. A quick review of BOD meetings delineate that the agenda items of Board meetings in FY 2018-19 included approving budget, awarding contracts for design, fabrication and/or supply of material/equipment, approving PC-I for submission to Ministry of Energy, approving contracts for procurement of consultancy services for construction supervision and up-gradation of SCADA system and allied activities as well as other administrative matters.

BOD meetings in FY 2018-19 were distinctive in the sense that NTDC for the 1st time resolved to submit IGCEP to NEPRA as per requirement of the Grid Code.

8.5 DISCOS' BOARD OF DIRECTORS (BODS) MEETINGS

The DISCOs are governed by their respective BODs [except TESCO]. BODs are responsible for organizational, administrative, policy, planning, performance management and other matters for smooth functioning of DISCOs.

The agenda of Board meetings of DISCOs in FY 2018-19 included approving business plans and budgetary allocations, awarding approval for procurement of equipment [transformers, cables, conductors, energy meters, poles, etc.] Civil works and provision of services, etc. for rehabilitation, installation & augmentation and other works, approving PC-I of projects, approval of bids and overseeing and approval of other management and administrative functions.

S. No.	DISCO	Number of BODs Meetings held during the FY 2018-19
1	PESCO	09
2	TESCO	Power of BODs rest with MD-PEPCO since 2010.
3	IESCO	10
4	GEPCO	n.p.
5	LESCO	13
6	FESCO	08
7	MEPCO	09
8	HESCO	07
9	SEPCO	05
10	QESCO	08

09

ENERGY SECTOR OVERVIEW

ENERGY SECTOR OVERVIEW

9.1 GENERAL

Primary commercial energy supplies in Pakistan comprises oil, natural gas, coal, hydro and nuclear electricity. The primary energy supplies of the country during FY 2017-18 increased by 8.44% and reached 86.30 MTOE as compared to 79.58 MTOE during the preceding year. The overall contribution of gas in primary energy supplies of the country, during 2017-18, was the highest with 29.85 MTOE (34.59%) followed by the Oil 26.90 MTOE (31.17%), Hydro Electricity 6.67 MTOE (7.72%), Coal 10.93 MTOE (12.66%), Nuclear Electricity 2.36 MTOE (2.73%), LPG 1.05 MTOE (1.22%), Imported Electricity 0.13 MTOE (0.15%), LNG Imported 7.49 MTOE (8.68%) and Renewable Energy 0.92 MTOE (1.07%).

9.2 OIL RESERVES

The balance recoverable reserves of crude oil of the country as on 30th June, 2018 were 347.878 million barrels while the production during FY 2017-18 was recorded as 32.56 million barrels. The total oil refining capacity of the country as on 30th June, 2018 was 19.37 million tonnes per year while the total crude oil processed in the refineries of the country was 14.01 million tonnes. The total import of the crude oil of the country during 2017-18 was 10.33 million tonnes with cost amounting to US$ 4,903.65 million while during 2016-17 the total import of crude oil was 8.66 million tonnes with total cost of US$ 2,899.29 million. The consumption of petroleum products (Furnace Oil, Light Diesel Oil, High Speed Diesel and Motor Spirit) within the power sector was recorded as 6.377 million tonnes during 2017-18 while during 2016-17 it was recorded as 8.532 million tonnes.

9.3 GAS RESERVES

The balance recoverable reserves of natural gas of the country as on 30th June, 2018 were 19.54 trillion cft. while the production during FY 2017-18 was recorded as 1,458,936 million cft. The consumption of natural gas in power sector during 2017-18 was recorded as 544,654 million cft. while during 2016-17 it was recorded as 446,941 million cft. The total network for distribution of natural gas in Pakistan as on 30th June, 2018 was 184,681 km. The total number of natural gas consumers in Pakistan, as on 30th June, 2018 was 9,182,633 of which the share of domestic, commercial and industrial consumers were (9,091,803), (80,042) and (10,788), respectively.

9.4 COAL RESERVES

The estimated total coal reserves of the country as on 30th June, 2018 were about 186 billion tonnes while production of coal during 2017-18 was recorded as 4.30 million tonnes. The total coal imported during 2017-18 was 13.68 million tonnes, with cost amounting to Rs. 154,795 million. The total coal consumption in power sector during 2017-18 was 4,436,125 tonnes as compared to 859,600 tonnes, same period previous year. The electricity generated through coal during fiscal years 2016-17 and 2017-18 was 1,059 GWh and 12,225 GWh respectively.

9.5 PRIMARY ENERGY SUPPLIES

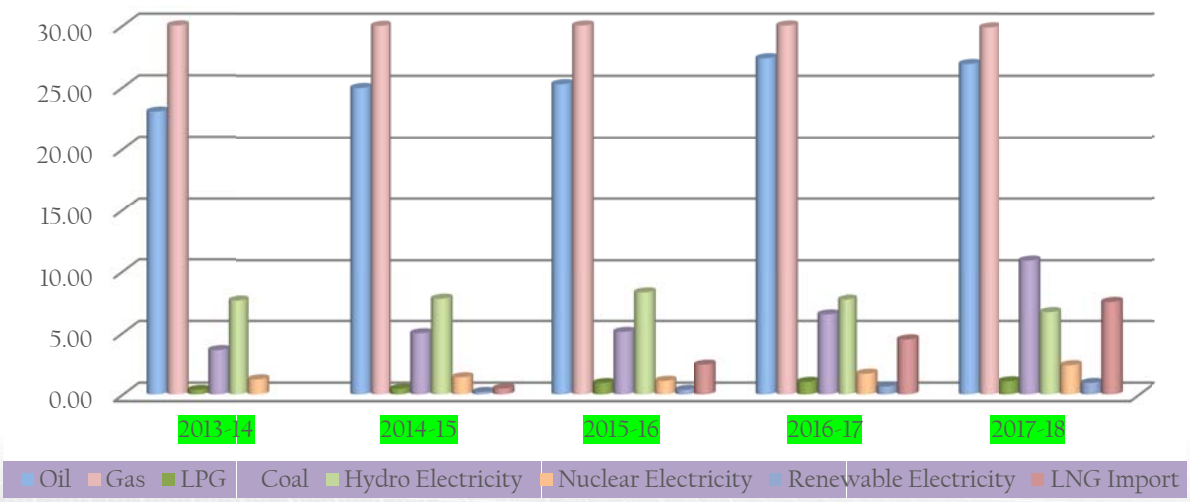
The main primary energy production of the country consists of oil, gas, coal, nuclear electricity net generation (converted to Btu using the nuclear plants heat rate); and conventional hydroelectricity net generation (converted to Btu using the fossil-fueled plants heat rate). The primary commercial energy supplies by source from 2013-14 to 2017-18 is given in table 1:

TABLE 1
Primary Energy Supplies by Source (MTOE)

Source	Unit	2013-14	2014-15	2015-16	2016-17	2017-18
Oil [1]	Million TOE	23.007	24.970	25.280	27.367	26.903
	% share	34.416	35.538	34.178	34.387	31.174
Gas	Million TOE	30.965	29.978	30.461	30.163	29.849
	% share	46.321	42.665	41.181	37.901	34.587
LPG [2]	Million TOE	0.364	0.457	0.909	1.009	1.054
	% share	0.544	0.651	1.229	1.267	1.221
Coal	Million TOE	3.590	4.953	5.067	6.482	10.925
	% share	5.371	7.049	6.850	8.145	12.659
Hydro Electricity [3]	Million TOE	7.608	7.751	8.267	7.682	6.665
	% share	11.381	11.031	11.176	9.652	7.723
Nuclear Electricity [3]	Million TOE	1.215	1.385	1.099	1.671	2.358
	% share	1.818	1.972	1.486	2.099	2.733
Renewable Electricity [4]	Million TOE		0.191	0.370	0.637	0.921
	% share		0.272	0.500	0.800	1.067
LNG Import [4]	Million TOE		0.473	2.404	4.456	7.493
	% share		0.672	3.250	5.599	8.682
Imported Electricity [5]	Million TOE	0.100	0.106	0.111	0.118	0.133
	% share	0.149	0.150	0.149	0.149	0.154
Total	**Million TOE**	**66.848**	**70.264**	**73.967**	**79.584**	**86.301**
	% share	**100.000**	**100.000**	**100.000**	**100.000**	**100.000**
Annual Growth Rate (%)		**3.499**	**5.109**	**5.270**	**7.595**	**8.440**

[1] Excluding petroleum products exports and bunkering.
[2] Include imports and production from field plants.
[3] Converted @ 10,000 Btu/kWh to represent primary energy equivalent of hydro and nuclear electricity as if this was generated by using fossil fuels.
[4] LNG Imports and Renewable Generation reported for the first time in FY 2014-15.
[5] WAPDA importing electricity from Iran since October, 2002.
Source: Pakistan Energy Yearbook, HDIP, Islamabad

Figure 1: Primary Energy Supplies by Source (MTOE)



9.6 FINAL ENERGY CONSUMPTION

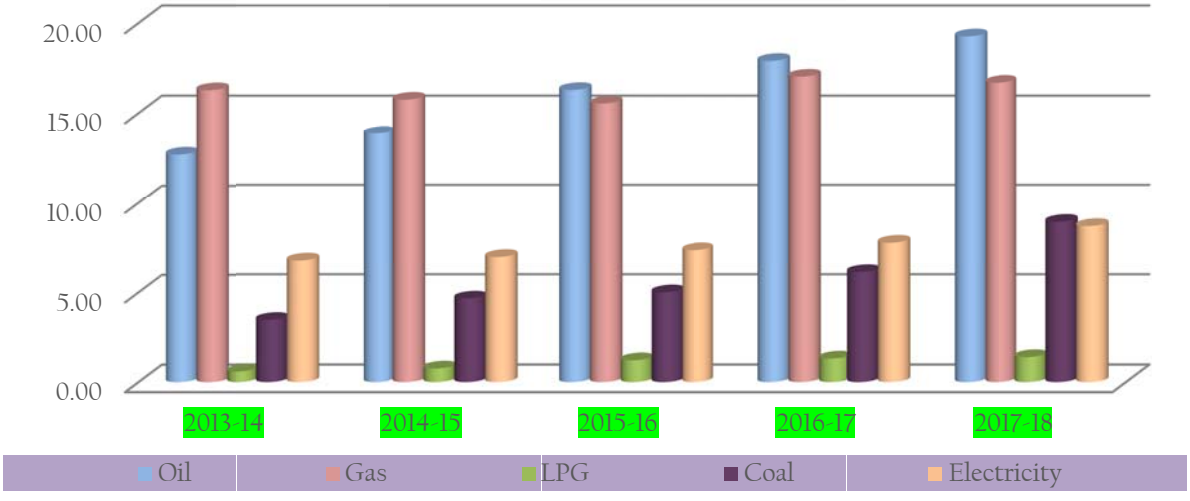
Final energy is a form of energy available to the user following the conversion from primary energy. Gasoline or diesel oil, purified coal, purified natural gas, electricity, mechanical energy are different forms of final energy. When going from primary energy to final energy, there is always loss of some energy which depends on the efficiency of the conversion equipment. The final energy consumption by source from 2013-14 to 2017-18 is given in table 2:

TABLE 2
Final Energy Consumption by Source (MTOE)

Source	Unit	2013-14	2014-15	2015-16	2016-17	2017-18
Oil[1]	Million TOE	12.718	13.851	16.290	17.905	19.265
	% share	31.939	32.992	35.893	35.723	35.032
Gas[2]	Million TOE	16.277	15.756	15.544	17.031	16.694
	% share	40.877	37.528	34.250	33.979	30.356
LPG	Million TOE	0.586	0.756	1.210	1.308	1.385
	% share	1.471	1.802	2.667	2.611	2.519
Coal[2]	Million TOE	3.446	4.632	4.975	6.098	8.940
	% share	8.654	11.032	10.963	12.166	16.258
Electricity[3]	Million TOE	6.793	6.989	7.365	7.780	8.708
	% share	17.059	16.647	16.227	15.522	15.835
Total	**Million TOE**	**39.820**	**41.984**	**45.385**	**50.122**	**54.993**
	% share	**100.000**	**100.000**	**100.000**	**100.000**	**100.000**
Annual Growth Rate (%)		**-0.909**	**5.436**	**8.100**	**10.438**	**9.717**

[1] Excluding consumption for power generation.
[2] Excluding consumption for power generation and feedstock.
[3] @ 3412 Btu/kWh being the actual energy content of electricity.
Source: Pakistan Energy Yearbook, HDIP, Islamabad

Figure 2: Final Energy Consumption by Source (MTOE)



9.7 FUEL CONSUMPTION IN POWER SECTOR

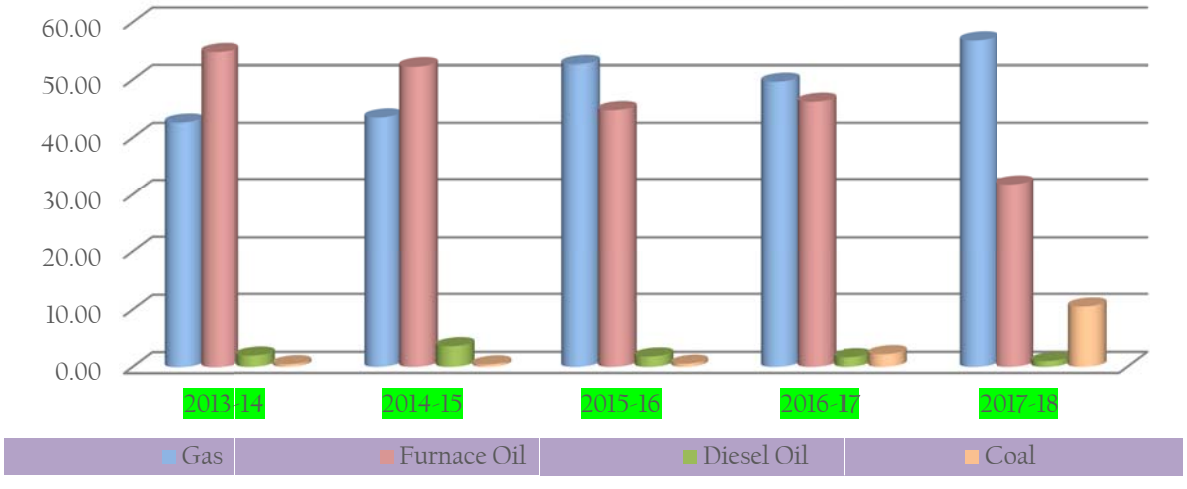
The share of installed capacity of thermal power plants using oil, natural gas and coal in the total installed capacity of the country, during 2018-19, was about 65.58% while the same share in 2017-18 was about 66.76%. The statistics of different fuels used and their percentage share to the total fuel used for thermal electricity generation of the country from 2013-14 to 2017-18 are given in table 3 as follows:

TABLE 3
Fuel Consumption for Thermal Power Generation (TOE)

Source	Unit	2013-14	2014-15	2015-16	2016-17	2017-18
Gas	TOE	6,602,422	6,847,894	8,577,146	8,643,403	10,831,662
	% share	42.69	43.57	52.78	49.80	56.89
Furnace Oil	TOE	8,486,744	8,234,479	7,288,400	8,037,139	6,029,947
	% share	54.87	52.40	44.85	46.30	31.67
Diesel Oil	TOE	304,994	565,953	294,755	291,841	194,033
	% share	1.97	3.60	1.81	1.68	1.02
Coal	TOE	71,902	67,638	91,463	384,585	1,984,722
	% share	0.46	0.43	0.56	2.22	10.42
Total	**TOE**	**15,466,062**	**15,715,964**	**16,251,764**	**17,356,968**	**19,040,364**
	% share	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Annual Growth Rate (%)		**5.40**	**1.62**	**3.41**	**6.80**	**9.70**

Source: Pakistan Energy Yearbook, HDIP, Islamabad

Figure 3: Fuel Consumption for Thermal Power Generation (%)



10

ELECTRICITY SECTOR OVERVIEW

ELECTRICITY SECTOR OVERVIEW

10.1 INSTALLED CAPACITY

The total nominal power generation capacity of Pakistan as on 30th June, 2019 was 39,145 MW; of which 25,670 MW (65.58%) was thermal, 9,761 MW (24.94%) was hydroelectric, 1,467 MW (3.75%) was nuclear and 2,247 MW (5.74%) was renewable energy (wind, solar and bagasse). The following tables (table 4 to 6) explain the total installed capacity of Pakistan from 2014-15 to 2018-19:

TABLE 4
Installed Capacity by Type (MW)

As on 30th June	2015	2016	2017	2018	2019
HYDEL					
WAPDA Hydel	6,902	6,902	6,902	8,341	9,389
IPPs Hydel	214	214	214	372	372
Sub-Total	**7,116**	**7,116**	**7,116**	**8,713**	**9,761**
% Share (Hydel Installed Capacity)	28.51	27.99	24.78	24.22	24.94
THERMAL					
GENCOs with PEPCO	5,762	5,897	5,897	5,637	5,637
KE Own	1,874	1,874	1,874	2,294	2,294
IPPs Connected with PEPCO	8,696	8,643	10,566	15,297	16,946
IPPs Connected with KE	252	252	252	366	366
SPPs/CPPs/N-CPPs connected with PEPCO	-	-	313	340	340
SPPs/CPPs/N-CPPs connected with KE	35	35	87	87	87
Sub-Total	**16,619**	**16,701**	**18,989**	**24,020**	**25,670**
% Share (Thermal Installed Capacity)	66.58	65.70	66.14	66.76	65.58
NUCLEAR					
CHASNUPP (I, II, III and IV)	650	615	1,005	1,330	1,330
KANUPP	137	137	137	137	137
Sub-Total	**787**	**752**	**1,142**	**1,467**	**1,467**
% Share (Nuclear Installed Capacity)	3.15	2.96	3.98	4.08	3.75
RENEWABLE ENERGY (WIND, SOLAR AND BAGASSE)					
RE Power Plants connected with PEPCO	439	852	1,465	1,779	2,047
RE Power Plants connected with KE	0	0	0	0	200
Sub-Total	**439**	**852**	**1,465**	**1,779**	**2,247**
% Share (RE Installed Capacity)	1.76	3.35	5.10	4.94	5.74
Total Installed Capacity of the Country	**24,961**	**25,421**	**28,712**	**35,979**	**39,145**

Source: WAPDA/GENCOs/KE/IPPs/CPPA-G

Figure 4: Share of Installed Generation Capacity by Type (%)

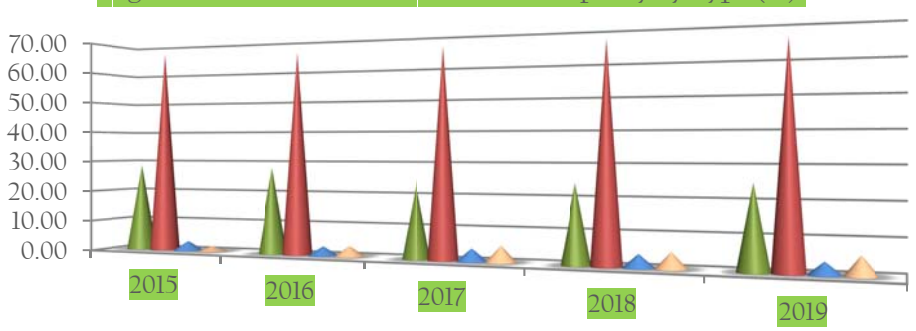


TABLE 5
Plant-wise Installed Capacity (MW) as on 30th June

Power Station	Plant Location	Type of Power Station	2015	2016	2017	2018*	2019*
		A1: Hydel (WAPDA)					
Major Hydropower Units							
Tarbela	Tarbela, KPK	Reservoir	3,478	3,478	3,478	3,948	3,478
Tarbela 4th Ext.	Tarbela, KPK	Reservoir	-	-	-	-	1,410
Ghazi Barotha	Ghazi Barotha, Punjab	Run of River	1,450	1,450	1,450	1,450	1,450
Mangla	Mangla, AJ&K	Reservoir	1,000	1,000	1,000	1,000	1,000
Warsak	Warsak, KPK	Run of River	243	243	243	243	243
Chashma	Chashma, Punjab	Run of River	184	184	184	184	184
Khan Khwar	Shangla, KPK	Reservoir	72	72	72	72	72
Allai Khwar	Battagram, KPK	Reservoir	121	121	121	121	121
Jinnah Hydel	Mianwali, Punjab	Run of River	96	96	96	96	96
Duber Khwar	Kohistan, KPK	Reservoir	130	130	130	130	130
Neelum Jhelum	Muzaffarabad, AJ&K	Run of River	-	-	-	969	969
Golen Gol	Chitral, KPK	Run of River	-	-	-	-	108
Small Hydropower Units							
Dargai	Dargai, KPK	Run of Canal	20	20	20	20	20
Rasul	Rasul, Punjab	Run of Canal	22	22	22	22	22
Shadiwal	Shadiwal, Punjab	Run of Canal	14	14	14	14	14
Chichoki Mallian	Chichoki Mallian, Punjab	Run of Canal	13	13	13	13	13
Nandipur	Nandipur, Punjab	Run of Canal	14	14	14	14	14
Kurram Garhi	Kurram Garhi, KPK	Run of Canal	4	4	4	4	4
Renala	Renala, Punjab	Run of Canal	1	1	1	1	1
Chitral	Chitral, KPK	Run of Canal	1	1	1	1	1
Gomal Zam	SW Agency, KPK	Reservoir	17	17	17	17	17
Malakand/Jabban	Malakand, KPK	Run of River	22	22	22	22	22
	Total Hydel (WAPDA)		**6,902**	**6,902**	**6,902**	**8,341**	**9,389**
		A2: Hydel (IPPs)					
Jagran (AJ&K)	Jagran, AJ&K	Hydro	30	30	30	30	30
Malakand-III (PEDO)	Malakand, KPK	Run of River	81	81	81	84	84
Pehur (PEDO)	Swabi, KPK	Run of River	18	18	18	18	18
Laraib Energy (AJ&K)	Jhelum River, AJ&K	Hydro	84	84	84	84	84
Garam Chashma	Chitral, KPK	Hydro	1	1	1	1	1
Marala Hydro (PPDCL)	Sialkot, Punjab	Run of River	-	-	-	8	8
Patrind Hydro (AJ&K)	Muzaffarabad, AJ&K	Run of River	-	-	-	147	147
	Total Hydel (IPPs)		**214**	**214**	**214**	**372**	**372**
	Total Hydel (A1+A2)		**7,116**	**7,116**	**7,116**	**8,713**	**9,761**
		B1: Thermal (GENCOs in PEPCO system)					
TPS Jamshoro	Jamshoro, Sindh	STs	880	880	880	880	880
GTPS Kotri	Kotri, Sindh	GTs+CCPP	144	144	144	144	144
TPS Guddu (Unit 1-4)	Guddu, Sindh	STs	640	640	640	640	640
TPS Guddu (Unit 5-10)	Guddu, Sindh	GTs+CCPPs	600	600	600	600	600
TPS Guddu (Unit 11-13)	Guddu, Sindh	GTs+OCPPs	415	415	415	415	415
TPS Guddu (Unit 14-16)	Guddu, Sindh	GTs+ST+CCPPs	747	747	747	747	747
TPS Quetta	Quetta, Balochistan	GT	35	28	28	0	0
TPS Muzaffargarh	Muzaffargarh, Punjab	STs	1,350	1,350	1,350	1,350	1,350
SPS Faisalabad	Faisalabad, Punjab	STs	132	132	132	0**	0**
GTPS Faisalabad	Faisalabad, Punjab	GTs+CCPPs	244	244	244	144**	144**
TPS Nandipur	Gujranwala, Punjab	GTs+CCPPs	425	567	567	567	567
FBC Lakhra	Lakhra, Sindh	STs	150	150	150	150	150
	Total Thermal (GENCOs in PEPCO system)		**5,762**	**5,897**	**5,897**	**5,637**	**5,637**

Power Station	Plant Location	Type of Power Station	2015	2016	2017	2018*	2019*
		B2: Thermal (IPPs connected with PEPCO system)					
Lal Pir Power	Mehmood Kot, Punjab	ST	362	362	362	362	362
Pak Gen. Power	Mehmood Kot, Punjab	ST	365	365	365	365	365
Altern Energy	Fateh Jang, Punjab	GEs	31	31	31	31	31
Fauji Kabirwala	Kabirwala, Punjab	GTs+CCPP	157	157	157	170	170
Habibullah Coastal	Quetta, Balochistan	GTs+CCPP	140	140	140	155	155
Hub Power	Hub, Balochistan	STs	1,292	1,292	1,292	1,292	1,292
Japan Power	Raiwind, Punjab	DE	135	135	135	120	120
KAPCO	Kot Addu, Punjab	GTs+CCPPs	1,638	1,600	1,600	1,600	1,600
Kohinoor Energy	Raiwind, Punjab	DEs+ST	131	131	131	131	131
Rousch Power	Sidhnai, Punjab	GTs+ST	450	450	450	450	450
Saba Power	Farooqabad, Punjab	ST	134	134	134	136	136
Southern Electric	Raiwind, Punjab	DEs	136	136	136	117	117
TNB Liberty Power	Daharki, Sindh	GTs+CCPP	235	235	235	235	235
Uch Power	Murad Jamali, Balochistan	GTs+ST	586	586	586	586	586
Attock Gen.	Attock Morgah, Punjab	DGs+ST	165	165	165	165	165
Atlas Power	Sheikhupura, Punjab	REs+ST	219	219	219	224	224
Engro Power Gen. Qadirpur	Qadirpur, Sindh	GT+ST	217	217	217	227	227
Saif Power	Sahiwal, Punjab	GTs+ST	225	210	210	225	225
Orient Power	Balloki, Punjab	GTs+ST	225	225	225	225	225
Nishat Power	Qasur, Punjab	REs+ST	200	200	200	202	202
Nishat Chunian	Qasur, Punjab	DEs+ST	200	200	200	202	202
Sapphire Electric	Muridke, Punjab	GTs+ST	235	235	235	235	235
Halmore Power	Bhikki, Punjab	GTs+ST	225	225	225	225	225
Narowal Energy	Narowal, Punjab	DEs+ST	214	214	214	214	214
Liberty Power Tech.	Faisalabad, Punjab	DEs+ST	202	202	202	202	202
Foundation Power	Daharki, Sindh	GT+ST	185	185	185	179	179
Davis Energen.	Jhang, Punjab	GEs	11	11	14	12	12
Uch-II Power	Murad Jamali, Balochistan	GTs+ST	381	381	381	404	404
Huaneng Shandong Ruyi (Sahiwal Imported Coal)	Sahiwal, Punjab	STs	-	-	660	1,320	1,320
QATPL (Bhikki)	Bhikki, Punjab	GTs+HRSGs+ST	-	-	832	1,231	1,231
NPPMCL (Haveli Bahadur Shah)	HBS, Punjab	GTs+HRSGs+ST	-	-	428	1,277	1,277
NPPMCL (Balloki)	Balloki, Punjab	GTs+HRSGs+ST	-	-	-	1,276	1,276
Port Qasim Electric Power	Port Qasim, Sindh	ST+CB	-	-	-	1,320	1,320
Reshma Power	Raiwind, Punjab	Reciprocating Engine	-	-	-	97	97
Gulf Powergen	Gujranwala, Punjab	Reciprocating Engine	-	-	-	84	84
China Power Hub	Lasbella, Balochistan	ST+CB	-	-	-	-	1,320
Thar Energy	Tharparkar, Sindh	ST+CB	-	-	-	-	330
Total Thermal (IPPs connected with PEPCO system)			**8,696**	**8,643**	**10,566**	**15,297**	**16,946**
Total Thermal in PEPCO system (B1+B2)			**14,458**	**14,540**	**16,463**	**20,934**	**22,583**
		C: Nuclear					
CHASNUPP-I	Chashma, Punjab	STs	325	300	325	325	325
CHASNUPP-II	Chashma, Punjab	STs	325	315	340	325	325
CHASNUPP-III	Chashma, Punjab	STs	-	-	340	340	340
CHASNUPP-IV	Chashma, Punjab	STs	-	-	-	340	340
KANUPP	Karachi, Sindh	STs	137	137	137	137	137
Total Nuclear (C)			**787**	**752**	**1,142**	**1,467**	**1,467**

Power Station	Plant Location	Type of Power Station	2015	2016	2017	2018*	2019*
D: Renewable Energy (connected with PEPCO system)							
D1: Wind Power Projects							
Zorlu Enerji Pakistan	Thatta, Sindh	WTs	56	56	56	56	56
FFC Energy	Thatta, Sindh	WTs	50	50	50	50	50
Three Gorges First Wind Farm	Thatta, Sindh	WTs	50	50	50	60	60
Foundation Wind Energy-I	Thatta, Sindh	WTs	50	50	50	50	50
Foundation Wind Energy-II	Thatta, Sindh	WTs	50	50	50	50	50
Sapphire Wind	Thatta, Sindh	WTs	-	50	50	53	53
Yunus Energy	Thatta, Sindh	WTs	-	-	50	50	50
Metro Power	Thatta, Sindh	WTs	-	-	50	50	50
Gul Ahmad Wind	Thatta, Sindh	WTs	-	-	50	50	50
Master Wind Energy	Thatta, Sindh	WTs	-	-	50	50	50
Tenaga Generasi	Thatta, Sindh	WTs	-	-	50	50	50
HydroChina Dawood Power	Thatta, Sindh	WTs	-	-	50	50	50
Sachal Energy Development	Thatta, Sindh	WTs	-	-	50	50	50
UEP Wind Power	Thatta, Sindh	WTs	-	-	99	99	99
Artistic Wind Power	Thatta, Sindh	WTs	-	-	30	50	50
Act Wind (formerly Tapal Wind Energy)	Thatta, Sindh	WTs	-	-	-	30	30
Hawa Energy	Thatta, Sindh	WTs	-	-	-	50	50
Jhimpir Power	Thatta, Sindh	WTs	-	-	-	50	50
Three Gorges Second Wind Farm	Thatta, Sindh	WTs	-	-	-	50	50
Three Gorges Third Wind Farm	Thatta, Sindh	WTs	-	-	-	50	50
Tricon Boston Consulting-A	Thatta, Sindh	WTs	-	-	-	-	50
Tricon Boston Consulting-B	Thatta, Sindh	WTs	-	-	-	-	50
Tricon Boston Consulting-C	Thatta, Sindh	WTs	-	-	-	-	50
Zephyr Power	Thatta, Sindh	WTs	-	-	-	-	50
Total Wind Power Projects			**256**	**306**	**785**	**1,048**	**1,248**
D2: Solar Power Projects							
Quaid-e-Azam Solar Park	Bahawalpur, Punjab	Solar	100	100	100	100	100
Appolo Solar	Bahawalpur, Punjab	Solar	-	100	100	100	100
Best Green Solar	Bahawalpur, Punjab	Solar	-	100	100	100	100
Crest Solar	Bahawalpur, Punjab	Solar	-	100	100	100	100
AJ Power	Khushab, Punjab	Solar	-	-	-	12	12
Harappa Solar	Sahiwal, Punjab	Solar	-	-	-	18	18
Total Solar Power Projects			**100**	**400**	**400**	**430**	**430**
D3: Bagasse/Biomass Power Projects							
Jamal Din Wali-II	Rahim Yar Khan, Punjab	Bagasse+Biomass	26	26	26	26	26
Jamal Din Wali-III	Rahim Yar Khan, Punjab	Bagasse+Biomass	27	27	27	27	27
RYK Mills	Rahim Yar Khan, Punjab	Bagasse	30	30	30	30	40
Chiniot Power	Chiniot, Punjab	Bagasse	-	63	63	63	63
Fatima Energy	Muzaffargarh, Punjab	Biomass/Coal	-	-	119	120	120
Hamza Sugar Mills	Rahim Yar Khan, Punjab	Bagasse+Biomass	-	-	15	15	15
The Thal Industries Corporation	Layyah, Punjab	Bagasse	-	-	-	20	20
Almoiz Industries	Mianwali, Punjab	Bagasse	-	-	-	-	36
Chanar Energy	Faisalabad, Punjab	Bagasse+Biomass	-	-	-	-	22
Total Bagasse/Biomass Power Projects			**83**	**146**	**280**	**301**	**369**
Total Renewable Energy (D1+D2+D3) (connected with PEPCO system) (D)			**439**	**852**	**1,465**	**1,779**	**2,047**

Power Station	Plant Location	Type of Power Station	2015	2016	2017	2018*	2019*
		E1: Thermal (KE Own)					
Bin Qasim TPS-I	Karachi, Sindh	STs	840	840	840	1,260‡	1,260
Bin Qasim TPS-II	Karachi, Sindh	GTs	572	572	572	572	572
Korangi Town GTPS-II	Karachi, Sindh	GTs	107	107	107	107	107
Site GTPS-II	Karachi, Sindh	GTs	107	107	107	107	107
Korangi CCPP	Karachi, Sindh	GTs	248	248	248	248	248
Total Thermal (KE Own)			1,874	1,874	1,874	2,294	2,294
		E2: Thermal (IPPs connected with KE system)					
Gul Ahmed	Karachi, Sindh	DE+ST	128	128	128	136	136
Tapal Energy	Karachi, Sindh	DE+ST	124	124	124	126	126
SNPCL-I (IPP-2002)	Jamshoro, Sindh	GEs+STs	-	-	-	52	52
SNPCL-II (IPP-2002)	Jamshoro, Sindh	GEs+STs	-	-	-	52	52
Total Thermal (IPPs connected with KE system)			252	252	252	366	366
		E3: Thermal (Others connected with KE system)					
PASMIC (CPP)	Karachi, Sindh	STs	-	-	-	-	-
Anoud Power (IGC)	Karachi, Sindh	DGs	12	12	12	12	12
Intl. Steel Limited (CPP)	Karachi, Sindh	GEs+DGs	19	19	19	19	19
Intl. Ind. Limited (CPP)	Karachi, Sindh	GEs+ST	4	4	4	4	4
FFBL Power (Dist. Gen.)	Karachi, Sindh	CFB+STs	-	-	52	52	52
Total Thermal (Others connected with KE system)			35	35	87	87	87
Total Thermal KE (E1+E2+E3)			2,161	2,161	2,213	2,747	2,747
		E4: Renewable Energy (connected with KE system)					
Oursun Pakistan	Sindh Coastal Highway near Gharo, Thatta	Solar	-	-	-	-	50
NTDC - 150 MW (Wind)	Thatta, Sindh	WTs	-	-	-	-	150
Total RE (connected with KE system)			0	0	0	0	200

F: SPPs/CPPs/N-CPPs connected with PEPCO System

	DISCO	Type	Fuel	Contract Capacity (MW)## 2017	2018	2019
Sitara Energy	FESCO	SPP	RFO	25	25	25
Galaxy Textile	FESCO	N-CPP	Gas	11.6	11.6	11.6
Shakarganj Energy	FESCO	CPP	Bagasse	6	6	6
Shakarganj Sugar Mills	FESCO	CPP	Bagasse	2	2	2
Ramzan Sugar Mills	FESCO	CPP	Bagasse	12	12	12
Noon Sugar Mills	FESCO	CPP	Bagasse	14.8	12	12
Bhone Sugar Mills	FESCO	CPP	Bagasse	1	1	1
Brothers Sugar Mills	LESCO	CPP	Bagasse	3	3	3
Indus Sugar Mills	MEPCO	CPP	Bagasse	4	4	4
Ashraf Sugar Mills	MEPCO	CPP	Bagasse	3	3	3
JDW Sugar Mills	MEPCO	CPP	Bagasse	10	10	10
Hamza Sugar Mills	MEPCO	CPP	Bagasse	2.5	2.5	2.5
Roomi Fabrics	MEPCO	CPP	Gas	5	5	5
Roomi Fabrics	MEPCO	N-CPP	Gas	10.5	10.5	10.5
RYK Sugar Mills	MEPCO	CPP	Bagasse	8.5	8.5	8.5
Thal Industries	MEPCO	CPP	Bagasse	4	4	4
Layyah Sugar Mills	MEPCO	CPP	Bagasse	-	4	4
Thatta Power	HESCO	N-CPP	Gas	18.8	18.8	18.8
Anoud Textile	HESCO	N-CPP	Gas	10	10	10
Agar Textile Mills	HESCO	CPP	Gas	2	2	2
Faran Sugar Mills	HESCO	CPP	Bagasse	5	5	5
Omni Power	HESCO	N-CPP	Gas	12.8	10	10
Omni-1	HESCO	N-CPP	Gas	-	10	10
Omni-2	HESCO	N-CPP	Gas	-	10	10
Chamber Sugar Mills	HESCO	CPP	Bagasse	1.5	1.5	1.5
Sanghar Sugar Mills	HESCO	CPP	Bagasse	13.5	3.4	3.4

	DISCO	Type	Fuel	Contract Capacity (MW)##		
				2017	2018	2019
Bandhi Sugar Mills	HESCO	CPP	Bagasse	10	10	10
Salim Yarn Mills	HESCO	CPP	Gas	2	2	2
Mekotex	HESCO	CPP	Gas	4	4	4
Hi-Tech Pipe & Engineering	HESCO	CPP	Gas	8	8	8
Mehran Sugar Mills	HESCO	CPP	Bagasse	2	2	2
Tando Allahyar Sugar Mills	HESCO	CPP	Bagasse	9	9	9
Lucky Cement Factory	HESCO	N-CPP	Gas	20	20	20
Habib Sugar Mills	HESCO	CPP	Bagasse	-	3.4	3.4
Al Noor Sugar Mills	SEPCO	CPP	Bagasse	8	8	8
Dharaki Sugar Mills	SEPCO	CPP	Bagasse	4	4	4
Ghotki Sugar Mills	SEPCO	CPP	Bagasse	8	8	8
Dadu Energy	SEPCO	N-CPP	Gas	19.2	19.2	19.2
Naudero Energy	SEPCO	N-CPP	Gas	15.8	15.8	15.8
Lodra Power	SEPCO	N-CPP	Gas	16	16	16
Kumhar Wala Powerhouse-I	-	CPP	-	-	5	5
Kumhar Wala Powerhouse-II	-	CPP	-	-	10.5	10.5
Sukkur IBA Sukkur	-	-	-	-	-	-
Total SPPs/CPPs/N-CPPs connected with PEPCO System (F)				**312.5**	**339.7**	**339.7**
Grand Total (A+B+C+D+E+F)			**24,961** **25,421**	**28,712**	**35,979**	**39,145**

** Installed Capacity as per valid Generation Licence. ** Licence not available, partial energy procured during July, 2017 to February, 2018.*
ǂ As per latest modification of KE Licence, Unit 3&4 are now part of KE's generation fleet.
Contract Capacity as per Tariff Determination.
Source: WAPDA/GENCOs/KE/IPPs/CPPA-G

TABLE 6
Installed Capacity by Systems and by Sectors (MW)

As on 30th June	2015	2016	2017	2018	2019
BY SYSTEM					
Total Installed Capacity in PEPCO System	**22,800**	**23,260**	**26,499**	**33,232**	**36,198**
% Share (Installed Capacity in PEPCO System)	91.34	91.50	92.29	92.37	92.47
Total Installed Capacity in KE System	**2,161**	**2,161**	**2,213**	**2,747**	**2,947**
% Share (Installed Capacity in KE System)	8.66	8.50	7.71	7.63	7.53
BY SECTOR					
Total Installed Capacity in Public Sector	**13,451**	**13,551**	**13,941**	**15,445**	**16,493**
% Share (Installed Capacity in Public Sector)	53.89	53.31	48.56	42.93	42.13
Total Installed Capacity in Private Sector	**11,510**	**11,870**	**14,771**	**20,534**	**22,652**
% Share (Installed Capacity in Private Sector)	46.11	46.69	51.44	57.07	57.87
Total Installed Capacity in the Country	**24,961**	**25,421**	**28,712**	**35,979**	**39,145**

Note: See tables 4 and 5 for breakup details.
Source: WAPDA/GENCOs/KE/IPPs/CPPA-G

Figure 6A: Share of Installed Generation Capacity by System (%)

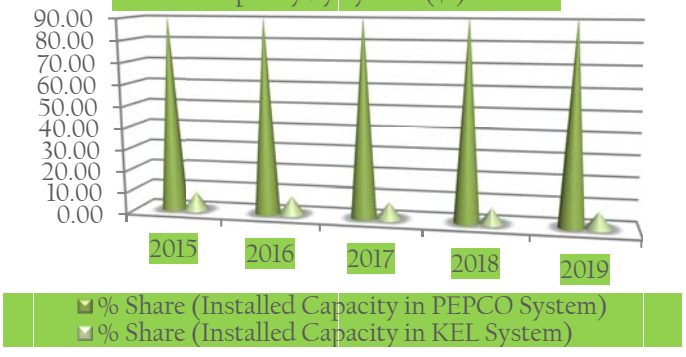
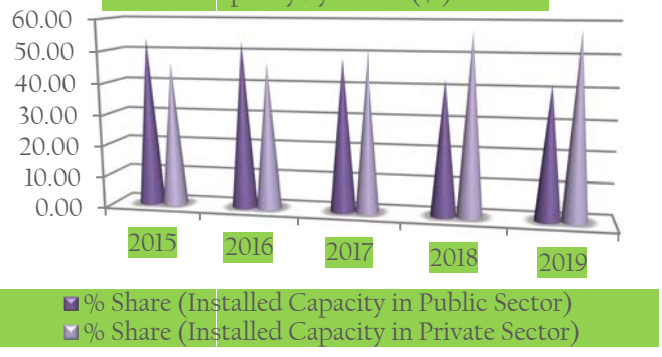


Figure 6B: Share of Installed Generation Capacity by Sector (%)



10.2 ELECTRICITY GENERATION

The total electricity generation of Pakistan as on 30th June, 2019 was 137,039 GWh; of which 89,403 GWh (65.24%) was thermal, 33,096 GWh (24.15%) was hydroelectric, 9,136 GWh (6.67%) was nuclear, 4,917 GWh (3.59%) was renewable energy (wind, solar and bagasse) and 487 GWh (0.36) was import from Iran. The following tables (table 7 to 11) explain the total electricity generation of Pakistan from 2014-15 to 2018-19:

TABLE 7
Electricity Generation by Type (GWh)

As on 30th June	2014-15	2015-16	2016-17	2017-18	2018-19
HYDEL					
WAPDA Hydel	31,525.00	33,433.33	31,091.29	26,951.19	31,167.85
IPPs Hydel	1,069.00	1,121.00	988.00	1,118.24	1,928.04
Sub-Total	**32,594.00**	**34,554.33**	**32,079.29**	**28,069.43**	**33,095.89**
% Share (Hydel Electricity Generation)	29.93	30.29	26.59	21.01	24.15
THERMAL					
GENCOs with PEPCO	13,300.55	16,391.91	18,709.99	16,199.10	13,016.93
KE Own	9,319.00	10,323.00	10,147.00	10,337.75	10,727.68
IPPs Connected with PEPCO	44,369.02	45,146.42	47,972.10	62,433.73	62,597.73
IPPs Connected with KE	1,525.00	1,421.00	1,531.00	1,824.81	2,131.72
SPPs/CPPs/N-CPPs connected with PEPCO	1,015.00	251.00	271.40	665.53	405.13
SPPs/CPPs/N-CPPs connected with KE	191.00	139.00	187.00	550.49	523.74
Sub-Total	**69,719.57**	**73,672.33**	**78,818.49**	**92,011.40**	**89,402.93**
% Share (Thermal Electricity Generation)	64.01	64.57	65.34	68.87	65.24
NUCLEAR					
CHASNUPP (I, II, III and IV)	4,996.00	3,854.00	5,868.00	8,719.87	9,005.68
KANUPP	353.00	362.00	410.00	330.86	129.99
Sub-Total	**5,349.00**	**4,216.00**	**6,278.00**	**9,050.73**	**9,135.67**
% Share (Nuclear Electricity Generation)	4.91	3.70	5.20	6.77	6.67
IMPORT					
Import from Iran	443.00	463.00	496.00	554.74	486.80
Sub-Total	**443.00**	**463.00**	**496.00**	**554.74**	**486.80**
% Share (Imported Electricity Generation)	0.41	0.41	0.41	0.42	0.36
RENEWABLE ENERGY (WIND, SOLAR AND BAGASSE)					
RE Power Plants connected with PEPCO	811.15	1,187.00	2,950.00	3,907.12	4,840.59
RE Power Plants connected with KE	0.00	0.00	0.00	0.00	76.92
Sub-Total	**811.15**	**1,187.00**	**2,950.00**	**3,907.12**	**4,917.51**
% Share (RE Electricity Generation)	0.74	1.04	2.45	2.92	3.59
Total Electricity Generation of the Country	**108,916.72**	**114,092.66**	**120,621.78**	**133,593.42**	**137,038.80**

Source: WAPDA/GENCOs/KE/IPPs/CPPA-G

Figure 7: Share of Electricity Generation by Type (%)

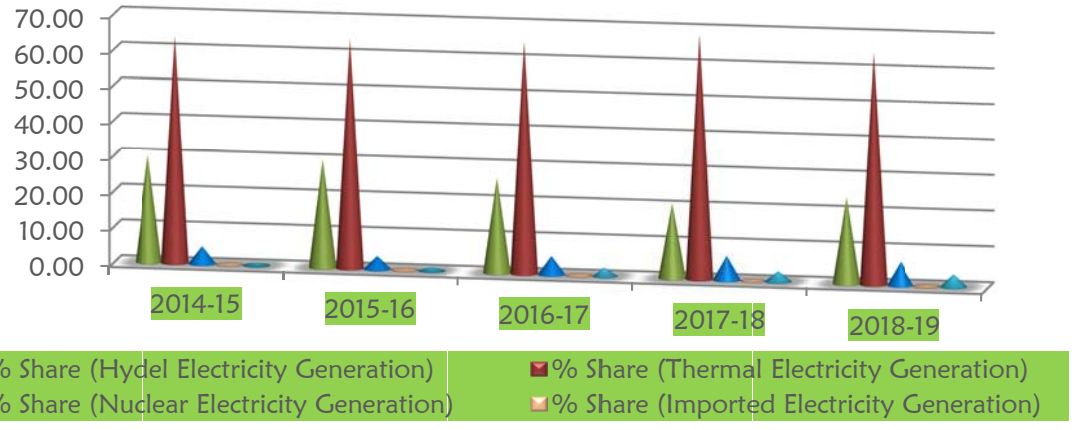


TABLE 8
Plant-wise Electricity Generation (GWh)

Power Station	Primary Fuel	Alternate Fuel	2014-15	2015-16	2016-17	2017-18*	2018-19*
			A1: Hydel (WAPDA)				
Major Hydropower Units							
Tarbela	Hydel	Hydel	14,759.00	15,990.31	15,049.44	13,356.86	10,619.28
Tarbela 4th Ext.	Hydel	Hydel	-	-	-	-	2,318.06
Ghazi Barotha	Hydel	Hydel	6,612.00	6,721.69	6,885.76	6,020.89	6,552.14
Mangla	Hydel	Hydel	6,310.00	6,864.40	5,347.57	4,141.86	3,860.85
Warsak	Hydel	Hydel	908.00	924.25	985.44	916.53	1,002.27
Chashma	Hydel	Hydel	980.00	897.05	890.33	756.00	767.16
Khan Khwar	Hydel	Hydel	249.00	37.64	199.06	170.90	237.74
Allai Khwar	Hydel	Hydel	461.00	568.42	396.66	275.89	462.09
Jinnah Hydel	Hydel	Hydel	185.00	296.32	292.69	230.25	225.63
Duber Khwar	Hydel	Hydel	610.00	643.07	589.47	514.83	594.42
Neelum Jhelum	Hydel	Hydel	-	-	-	174.08	3,964.68
Golen Gol			-	-	-	-	99.31
Small Hydropower Units							
Dargai	Hydel	Hydel	106.00	114.58	104.80	95.72	109.35
Rasul	Hydel	Hydel	67.00	95.98	93.47	65.54	71.86
Shadiwal	Hydel	Hydel	25.00	25.55	31.05	25.93	28.39
Chichoki Mallian	Hydel	Hydel	32.00	34.16	34.23	31.43	29.05
Nandipur	Hydel	Hydel	33.00	40.75	43.15	45.73	36.97
Kurram Garhi	Hydel	Hydel	19.00	23.40	18.44	17.24	14.23
Renala	Hydel	Hydel	2.00	2.03	2.20	2.31	2.19
Chitral	Hydel	Hydel	4.00	3.60	4.20	3.45	3.51
Gomal Zam	Hydel	Hydel	43.00	11.86	6.17	0.36	32.68
Malakand/Jabban	Hydel	Hydel	120.00	138.27	117.16	105.39	135.99
Total Hydel (WAPDA)			**31,525.00**	**33,433.33**	**31,091.29**	**26,951.19**	**31,167.85**
			A2: Hydel (IPPs)				
Jagran (AJ&K)	Hydel	Hydel	123.00	111.00	93.00	86.92	83.65
Malakand-III (PEDO)	Hydel	Hydel	408.00	425.00	426.00	362.11	399.25
Pehur (PEDO)	Hydel	Hydel	49.00	40.00	45.00	32.61	35.86
Laraib Energy (AJ&K)	Hydel	Hydel	489.00	545.00	424.00	389.66	354.38
Garam Chashma	Hydel	Hydel	0.00	0.00	0.00	0.00	0.00
Marala Hydro (PPDCL)	Hydel	Hydel	-	-	-	0.74	527.45
Patrind Hydro (AJ&K)	Hydel	Hydel	-	-	-	246.20	527.45
Total Hydel (IPPs)			**1,069.00**	**1,121.00**	**988.00**	**1,118.24**	**1,928.04**
Total Hydel (A1+A2)			**32,594.00**	**34,554.33**	**32,079.29**	**28,069.43**	**33,095.89**

Power Station	Primary Fuel	Alternate Fuel	2014-15	2015-16	2016-17	2017-18*	2018-19*
B1: Thermal (GENCOs in PEPCO system)							
TPS Jamshoro	RFO+Gas	RFO	2,655.11	3,246.46	3,253.56	1,792.06	880.09
GTPS Kotri	Gas	HSD	306.11	582.02	338.67	94.92	37.19
TPS Guddu (Unit 1-4)	Gas	RFO	522.00	148.64	227.08	258.11	10.02
TPS Guddu (Unit 5-10)	Gas	-	4,990.00	2,058.19	2,487.81	3,617.95	3,467.30
TPS Guddu (Unit 11-13)	Gas	-		272.26	820.54	1,043.97	837.20
TPS Guddu (Unit 14-16)	Gas	HSD	-	3,551.47	4,543.55	3,855.08	5,069.78
TPS Quetta	Gas	-	98.03	111.29	53.32	0.00	0.00
TPS Muzaffargarh	Gas	RFO	4,306.05	4,644.65	5,160.13	3,040.37	836.73
SPS Faisalabad	Gas	RFO	47.10	85.84	107.68	6.26	0.00
GTPS Faisalabad	Gas	HSD	29.88	275.16	214.62	105.29	149.53
TPS Nandipur	Gas	HSD	244.00	1,267.78	1,379.05	2,381.70	1,729.09
FBC Lakhra	Coal	Coal	102.27	148.16	123.97	3.39	0.00
Total Thermal (GENCOs in PEPCO system)			**13,300.55**	**16,391.91**	**18,709.99**	**16,199.10**	**13,016.93**
B2: Thermal (IPPs connected with PEPCO system)							
Lal Pir Power	RFO	-	1,663.00	1,946.10	1,601.09	1,089.06	613.80
Pak Gen. Power	RFO	-	1,222.00	878.13	1,727.18	1,237.28	495.56
Altern Energy	Gas	-	173.00	184.60	198.30	145.12	22.03
Fauji Kabirwala	Gas	HSD	991.00	1,138.06	1,122.84	1,017.26	563.13
Habibullah Coastal	Gas	HSD	719.00	563.03	785.90	880.33	716.78
Hub Power	RFO	-	6,809.00	7,546.99	6,793.11	5,196.60	814.43
KAPCO	Gas	RFO+HSD	6,933.00	6,757.00	7,524.00	7,436.76	4,959.40
Kohinoor Energy	RFO	-	877.00	877.41	816.83	645.40	387.44
Rousch Power	Gas	HSD	2,465.00	2,970.66	2,459.69	2,591.64	1,035.85
Saba Power	RFO	-	35.00	70.59	510.46	465.88	225.41
TNB Liberty Power	Gas	HSD	1,218.00	1,491.36	1,430.23	1,041.56	1,307.61
Uch Power	Gas	HSD	4,130.91	4,213.96	4,406.44	4,442.99	3,895.85
Attock Gen.	RFO	-	1,209.00	1,179.30	1,135.41	912.45	532.18
Atlas Power	RFO	-	1,462.00	1,320.46	1,336.90	1,246.45	691.30
Engro Powergen. Qadirpur	Gas	HSD	1,429.00	1,222.00	1,731.00	1,668.42	1,385.13
Saif Power	Gas	HSD	770.92	1,088.78	905.44	841.56	828.20
Orient Power	Gas	HSD	1,037.00	1,155.62	944.68	841.39	877.80
Nishat Power	RFO	-	1,410.00	1,272.16	1,239.76	1,171.19	675.10
Nishat Chunian	RFO	-	1,415.31	1,240.16	1,350.33	1,099.67	599.74
Sapphire Electric	Gas	HSD	943.00	1,056.42	989.71	814.96	808.51
Halmore Power	Gas	HSD	713.15	916.00	553.00	871.01	612.91
Narowal Energy	RFO	-	1,418.16	1,161.91	1,334.18	1,199.68	636.13
Liberty Power Tech.	RFO	-	1,514.57	1,277.44	1,369.33	1,175.61	776.26
Foundation Power	Gas	-	1,322.00	1,211.48	1,382.85	1,392.39	1,330.60
Davis Energen.	Gas	-	70.00	74.00	61.05	8.82	0.00
Uch-II Power	Low BTU Gas	-	2,419.00	2,332.81	2,731.34	2,593.04	3,018.37
Huaneng Shandong Ruyi (Sahiwal Imported Coal)	Bituminous Coal		-	-	873.17	8,461.59	8,220.07
QATPL (Bhikki)	RLNG	HSD	-	-	502.77	3,655.62	6,149.75
NPPMCL(HBS)	RLNG	HSD	-	-	155.11	2,856.73	7,027.24
NPPMCL (Balloki)	RLNG	HSD	-	-	-	2,050.62	5,284.19
Port Qasim Electric Power	Bituminous Coal	HSD	-	-	-	3,319.02	7,553.64
Reshma Power	RFO/HSFO	-	-	-	-	60.86	15.11
Gulf Powergen	RFO/HSFO	-	-	-	-	2.78	0.00
China Power Hub	Imported Coal		-	-	-	-	260.82
Thar Energy	Thar Coal		-	-	-	-	277.42
Total Thermal (IPPs/SPPs/CPPs connected with PEPCO system)			**44,369.02**	**45,146.42**	**47,972.10**	**62,433.73**	**62,597.73**
Total Thermal in PEPCO system (B1+B2)			**57,669.57**	**61,538.33**	**66,682.09**	**78,632.82**	**75,614.66**

Power Station	Primary Fuel	Alternate Fuel	2014-15	2015-16	2016-17	2017-18*	2018-19*
			C: Nuclear				
CHASNUPP-I	NUC	NUC	2,455.00	1,486.00	2,118.00	2,433.42	2,141.02
CHASNUPP-II	NUC	NUC	2,541.00	2,368.00	2,315.00	2,301.74	2,262.73
CHASNUPP-III	NUC	NUC	-	-	1,435.00	2,246.55	2,484.34
CHASNUPP-IV	NUC	NUC	-	-	-	1,738.16	2,117.59
KANUPP	NUC	NUC	353.00	362.00	410.00	330.86	129.99
Total Nuclear (C)			**5,349.00**	**4,216.00**	**6,278.00**	**9,050.73**	**9,135.67**
			D: Import				
Import from Iran (Tavanir)			443.00	463.00	496.00	554.74	486.80
Total Import in PEPCO system (D)			**443.00**	**463.00**	**496.00**	**554.74**	**486.80**
			E: Renewable Energy (connected with PEPCO system)				
			E1: Wind Power Projects				
Zorlu Enerji Pakistan	Wind	Wind	156.00	105.00	153.00	142.08	143.96
FFC Energy	Wind	Wind	139.15	125.00	123.00	120.08	115.74
Three Gorges First Wind	Wind	Wind	80.00	135.00	138.00	126.06	129.21
Foundation Wind Energy-I	Wind	Wind	27.00	110.00	109.00	96.35	229.31
Foundation Wind Energy-II	Wind	Wind	56.00	116.00	120.00	112.30	
Sapphire Wind	Wind	Wind	-	100.00	149.00	125.94	135.00
Yunus Energy	Wind	Wind	-	-	101.00	127.40	128.69
Metro Power Company	Wind	Wind	-	-	77.00	136.31	138.46
Gul Ahmad Wind	Wind	Wind	-	-	82.00	121.80	127.74
Master Wind Energy	Wind	Wind	-	-	82.00	127.01	135.82
Tenaga Generasi	Wind	Wind	-	-	65.00	90.18	111.31
HydroChina Dawood	Wind	Wind	-	-	40.00	102.78	115.98
Sachal Energy Development	Wind	Wind	-	-	34.00	127.55	124.49
UEP Wind Power	Wind	Wind	-	-	18.00	227.83	243.99
Artistic Wind Power	Wind	Wind	-	-	96.00	90.30	192.37
Act Wind (formerly Tapal Wind Energy)	Wind	Wind	-	-	-	86.38	89.60
Hawa Energy	Wind	Wind	-	-	-	68.31	167.41
Jhimpir Power	Wind	Wind	-	-	-	72.50	167.06
Three Gorges Second Wind Farm	Wind	Wind	-	-	-	16.48	131.12
Three Gorges Third Wind Farm	Wind	Wind	-	-	-	27.43	134.15
Tricon Boston Consulting-A	Wind	Wind	-	-	-	-	147.35
Tricon Boston Consulting-B	Wind	Wind	-	-	-	-	127.24
Tricon Boston Consulting-C	Wind	Wind	-	-	-	-	131.19
Zephyr Power	Wind	Wind	-	-	-	-	64.44
Total Wind Power Projects			**458.15**	**691.00**	**1,387.00**	**2,145.07**	**3,231.64**
			E2: Solar Power Projects				
Quaid-e-Azam Solar Park	Solar	Solar	26.00	154.00	158.00	163.08	164.34
Appolo Solar	Solar	Solar	-	51.00	145.00	167.93	166.64
Best Green Solar	Solar	Solar	-	10.00	166.00	168.40	165.69
Crest Solar	Solar	Solar	-	10.00	166.00	169.80	167.56
AJ Power	Solar	Solar	-	-	-	11.52	18.66
Harappa Solar	Solar	Solar	-	-	-	21.43	31.63
Total Solar Power Projects			**26.00**	**225.00**	**635.00**	**702.17**	**714.52**
			E3: Bagasse/Biomass Power Projects				
Jamal Din Wali-II	Bagasse + Biomass		163.00	44.00	178.00	180.96	187.80
Jamal Din Wali-III	Bagasse + Biomass		132.00	44.00	166.00	196.59	181.18
RYK Mills	Bagasse	Bagasse	32.00	14.00	122.00	155.61	141.31
Chiniot Power	Bagasse	Bagasse	-	169.00	296.00	346.02	194.67
Fatima Energy	Coal	Bagasse	-	-	143.00	20.87	0.00
Hamza Sugar Mills	Bagasse + Biomass		-	-	23.00	72.75	61.20
The Thal Industries	Bagasse	FO	-	-	-	87.08	65.75
Almoiz Industries	Bagasse	Bagasse	-	-	-	-	48.92
Chanar Energy	Bagasse	Bagasse	-	-	-	-	13.61
Total Bagasse/Biomass Power Projects			**327.00**	**271.00**	**928.00**	**1,059.88**	**894.43**

Power Station	Primary Fuel	Alternate Fuel	2014-15	2015-16	2016-17	2017-18*	2018-19*
Total Renewable Energy (E1+E2+E3) (connected with PEPCO system) (E)			**811.15**	**1,187.00**	**2,950.00**	**3,907.12**	**4,840.59**
F1: Thermal (KE Own)							
Bin Qasim TPS-I	Dual	RLNG	3,925.00	3,958.00	4,329.00	4,764.70	4,646.94
Bin Qasim TPS-II	Dual	RLNG	3,907.00	4,119.00	3,921.00	3,750.79	4,065.71
Korangi Town GTPS-II	Gas	RLNG	435.00	500.00	389.00	323.11	390.33
Site GTPS-II	Gas	RLNG	160.00	382.00	384.00	498.14	368.02
Korangi CCPP	Gas	RLNG	892.00	1,364.00	1,124.00	1,001.01	1,256.68
Total Thermal (KE Own)			**9,319.00**	**10,323.00**	**10,147.00**	**10,337.75**	**10,727.68**
F2: Thermal (IPPs connected with KE system)							
Gul Ahmed	RFO	-	718.00	688.00	788.00	712.71	675.54
Tapal Energy	RFO	-	807.00	733.00	743.00	752.38	645.02
SNPCL-I (IPP-2002)	Gas	-	-	-	-	179.59	410.25
SNPCL-II (IPP-2002)	Gas	-	-	-	-	180.13	400.91
Total Thermal (IPPs connected with KE system)			**1,525.00**	**1,421.00**	**1,531.00**	**1,824.81**	**2,131.72**
F3: Thermal (Others connected with KE system)							
PASMIC (CPP)	Gas	-	21.00	0.00	0.00	0.00	0.00
Anoud Power (IGC)	RFO/Gas	DO	95.00	69.00	55.00	44.00	51.58
Intl. Steel Limited (CPP)	Gas	-	67.00	60.00	57.00	56.00	46.00
Intl. Ind. Limited (CPP)	Gas	-	8.00	10.00	13.00	12.00	12.65
FFBL Power (Dist. Gen.)	Imported/Local Coal		-	-	62.00	438.49	413.51
Total Thermal (Others connected with KE system)			**191.00**	**139.00**	**187.00**	**550.49**	**523.74**
Total Thermal KE (F1+F2+F3)			**11,035.00**	**11,883.00**	**11,865.00**	**12,713.05**	**13,383.14**
F4: Renewable Energy (connected with KE system)							
Oursun Pakistan	Solar	Solar	-	-	-	-	56.92
NTDC - 150 MW (Wind)	Wind	Wind	-	-	-	-	20.00
Total RE (connected with KE system)			**0.00**	**0.00**	**0.00**	**0.00**	**76.92**

G: SPPs/CPPs/N-CPPs connected with PEPCO System

	DISCO	Type	Fuel	Energy Generation (GWh) 2016-17	2017-18	2018-19
Sitara Energy	FESCO	SPP	RFO	-	-	-
Galaxy Textile	FESCO	N-CPP	Gas	-	-	-
Shakarganj Energy	FESCO	CPP	Bagasse	-	-	-
Shakarganj Sugar Mills	FESCO	CPP	Bagasse	1.16	0.00	0.00
Ramzan Sugar Mills	FESCO	CPP	Bagasse	-	-	-
Noon Sugar Mills	FESCO	CPP	Bagasse	0.40	3.32	2.05
Bhone Sugar Mills	FESCO	CPP	Bagasse	0.00	0.00	0.00
Brothers Sugar Mills	LESCO	CPP	Bagasse	-	-	-
Indus Sugar Mills	MEPCO	CPP	Bagasse	5.33	0.00	0.00
Ashraf Sugar Mills	MEPCO	CPP	Bagasse	13.05	-	-
Jamal Din Wali Sugar Mills	MEPCO	CPP	Bagasse	15.52	-	-
Hamza Sugar Mills	MEPCO	CPP	Bagasse	5.57	-	-
Roomi Fabrics	MEPCO	CPP	Gas	0.78	-	-
Roomi Fabrics	MEPCO	N-CPP	Gas	0.17	-	-
Rahim Yar Khan Sugar Mills	MEPCO	CPP	Bagasse	-	-	-
Thal Industries	MEPCO	CPP	Bagasse	0.00	-	-
Layyah Sugar Mills	MEPCO	CPP	Bagasse	22.41	-	-
Thatta Power	HESCO	N-CPP	Gas	13.19	74.70	47.20
Anoud Textile	HESCO	N-CPP	Gas	0.81	1.67	3.85
Agar Textile Mills	HESCO	CPP	Gas	63.70	91.77	75.27
Faran Sugar Mills	HESCO	CPP	Bagasse	4.32	4.10	2.53
Omni Power	HESCO	N-CPP	Gas	10.25	65.46	7.02
Omni-1	HESCO	N-CPP	Gas	-	2.63	7.86
Omni-2	HESCO	N-CPP	Gas	-	2.59	7.61
Chamber Sugar Mills	HESCO	CPP	Bagasse	1.72	1.41	0.02
Sanghar Sugar Mills	HESCO	CPP	Bagasse	5.38	4.01	3.83
Bandhi Sugar Mills	HESCO	CPP	Bagasse	7.85	6.07	5.18

	DISCO	Type	Fuel	2016-17	2017-18	2018-19
Salim Yarn Mills	HESCO	CPP	Gas	-	-	-
Mekotex	HESCO	CPP	Gas	-	-	-
Hi-Tech Pipe & Engineering	HESCO	CPP	Gas	12.20	5.05	3.71
Mehran Sugar Mills	HESCO	CPP	Bagasse	3.45	2.65	0.57
Tando Allahyar Sugar Mills	HESCO	CPP	Bagasse	9.07	8.73	0.64
Lucky Cement Factory	HESCO	N-CPP	Gas	47.85	159.60	143.90
Habib Sugar Mills	HESCO	CPP	Bagasse	-	3.32	2.91
Al Noor Sugar Mills	SEPCO	CPP	Bagasse	13.57	11.53	8.27
Dharaki Sugar Mills	SEPCO	CPP	Bagasse	-	-	-
Ghotki Sugar Mills	SEPCO	CPP	Bagasse	-	-	-
Dadu Energy	SEPCO	N-CPP	Gas	5.89	103.69	39.40
Naudero Energy	SEPCO	N-CPP	Gas	-	-	-
Lodra Power	SEPCO	N-CPP	Gas	5.87	103.54	34.31
Kumhar Wala Powerhouse-I	-	CPP	-	1.64	7.31	-
Kumhar Wala Powerhouse-II	-	CPP	-	0.26	2.39	8.93
Sukkur IBA Sukkur	-	-	-	-	-	0.08
Total SPPs/CPPs/N-CPPs connected with PEPCO System (G)			**1,015.00**	**251.00**	**271.40**	**665.53**	**405.13**
Grand Total (A+B+C+D+E+F+G)			**108,916.72**	**114,092.66**	**120,621.78**	**133,593.42**	**137,038.80**

** Net Electricity Generation during FY 2017-18 and 2018-19.*
Source: WAPDA/GENCOs/KE/IPPs/CPPA-G

TABLE 9
Electricity Generation by Systems and by Sectors (GWh)

As on 30th June	2014-15	2015-16	2016-17	2017-18	2018-19
BY SYSTEM					
Total Electricity Generation in PEPCO System	**97,881.72**	**102,209.66**	**108,756.78**	**120,880.37**	**123,578.74**
% Share (Generation in PEPCO System)	89.87	89.58	90.16	90.48	90.18
Total Electricity Generation in KE System	**11,035.00**	**11,883.00**	**11,865.00**	**12,713.05**	**13,460.06**
% Share (Generation in KE System)	10.13	10.42	9.84	9.52	9.82
BY SECTOR					
Total Electricity Generation in Public Sector	**50,174.55**	**54,041.24**	**56,079.28**	**52,201.02**	**53,320.44**
% Share (Generation in Public Sector)	46.07	47.37	46.49	39.07	38.91
Total Electricity Generation in Private Sector	**58,742.17**	**60,051.42**	**64,542.50**	**81,392.40**	**83,718.35**
% Share (Generation in Private Sector)	53.93	52.63	53.51	60.93	61.09
Total Electricity Generation of the Country	**108,916.72**	**114,092.66**	**120,621.78**	**133,593.42**	**137,038.80**

Note: See tables 7 and 8 for details and explanations.
Source: WAPDA/GENCOs/KE/IPPs/CPPA-G

Figure 9A: Share of Electricity Generation by System (%)

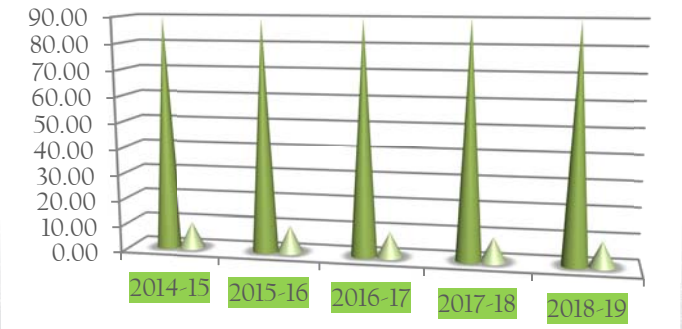


Figure 9B. Share of Electricity Generation by Sector (%)

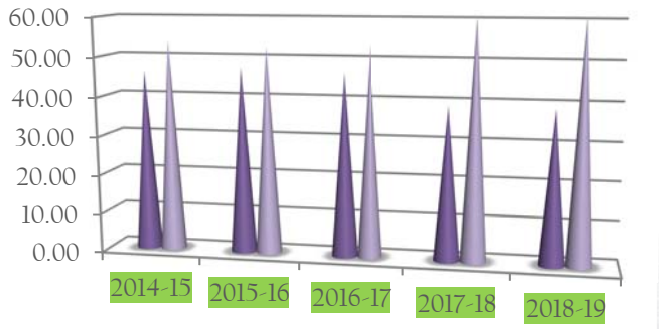


TABLE 10
Electricity Statistics of K-Electric Limited

1 Units Generated by KE Own (GWh)

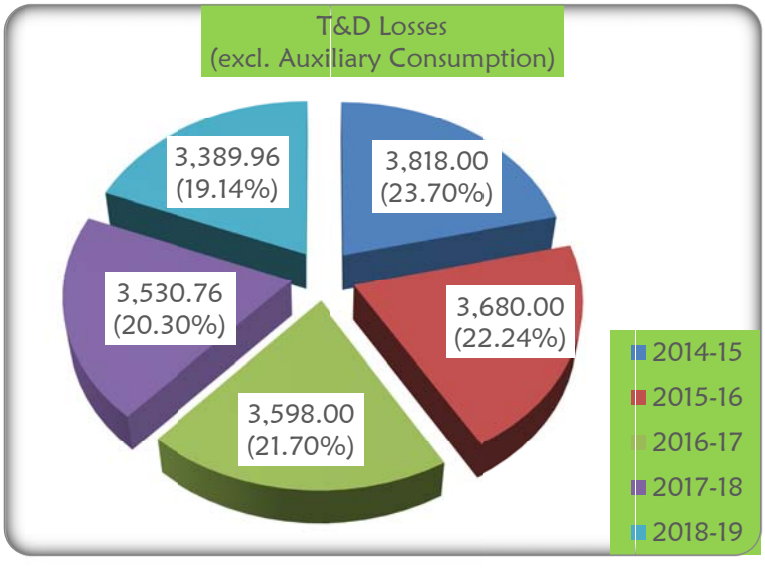
	Name of Plant	Year	Units Generated	Auxiliary Consumption GWh	Auxiliary Consumption %	Units Sent Out
1.1	Bin Qasim Thermal Power Station-I (BQTPS-I)	2014-15	3,925.00	360.00	9.17	3,565.00
		2015-16	3,958.00	372.00	9.40	3,586.00
		2016-17	4,329.00	412.00	9.52	3,917.00
		2017-18	4,764.70	430.58	9.04	4,334.12
		2018-19	4,646.94	429.17	9.24	4,217.77
1.2	Bin Qasim Thermal Power Station-II (BQTPS-II)	2014-15	3,907.00	251.00	6.42	3,656.00
		2015-16	4,119.00	254.00	6.17	3,865.00
		2016-17	3,921.00	243.00	6.20	3,678.00
		2017-18	3,750.79	241.75	6.45	3,509.04
		2018-19	4,065.70	249.75	6.14	3,815.95
1.3	Korangi Town Gas Turbine Power Station-II (KTGTPS-II)	2014-15	435.00	11.00	2.53	424.00
		2015-16	500.00	14.00	2.80	486.00
		2016-17	389.00	14.00	3.60	375.00
		2017-18	323.11	13.21	4.09	309.90
		2018-19	390.33	14.71	3.77	375.62
1.4	Site Gas Turbine Power Station-II (SGTPS-II)	2014-15	160.00	8.00	5.00	152.00
		2015-16	382.00	12.00	3.14	370.00
		2016-17	384.00	13.00	3.39	371.00
		2017-18	498.14	16.28	3.27	481.86
		2018-19	368.02	12.78	3.47	355.24
1.5	Korangi Combined Cycle Power Plant	2014-15	892.00	74.00	8.30	818.00
		2015-16	1,364.00	108.00	7.92	1,256.00
		2016-17	1,124.00	91.00	8.10	1,033.00
		2017-18	1,001.01	78.93	7.88	922.08
		2018-19	1,256.68	92.34	7.35	1,164.34
1.6	**Total Units Generated from KE's Own Power Plants**	**2014-15**	**9,319.00**	**704.00**	**7.55**	**8,615.00**
		2015-16	**10,323.00**	**760.00**	**7.36**	**9,563.00**
		2016-17	**10,147.00**	**773.00**	**7.62**	**9,374.00**
		2017-18	**10,337.75**	**780.76**	**7.55**	**9,556.99**
		2018-19	**10,727.67**	**798.76**	**7.45**	**9,928.91**

2 Units Purchased by KE (GWh)

		2014-15	2015-16	2016-17	2017-18	2018-19
2.1	KANUPP	353.00	362.00	410.00	330.86	129.99
2.2	Gul Ahmed	718.00	688.00	788.00	712.71	675.54
2.3	Tapal Energy	807.00	733.00	743.00	752.38	645.02
2.4	NTDC	5,427.00	5,059.00	5,077.00	5,128.20	4,936.71
2.5	PASMIC	21.00	0.00	0.00	0.00	0.00
2.6	Anoud Power	95.00	69.00	55.00	43.73	51.58
2.7	Intl. Steel Limited	67.00	60.00	57.00	56.00	46.00
2.8	Intl. Ind. Limited	8.00	10.00	13.00	12.00	12.65
2.9	FFBL Power	0.00	0.00	62.00	438.49	413.51
2.10	SNPCL-I	0.00	0.00	0.00	179.59	410.25
2.11	SNPCL-II	0.00	0.00	0.00	180.13	400.91
2.12	Oursun Pakistan	0.00	0.00	0.00	0.00	57.00
2.11	**Total**	**7,496.00**	**6,981.00**	**7,205.00**	**7,834.09**	**7,779.16**

		2014-15	2015-16	2016-17	2017-18	2018-19
3	Total Units Purchased by KE including Own Generation (GWh)	16,815.00	17,304.00	17,352.00	18,171.84	18,506.83
4	Units Available for Distribution (GWh)	16,111.00	16,544.00	16,579.00	17,391.08	17,708.07
5	Units Sold (GWh)	12,293.00	12,864.00	12,981.00	13,860.32	14,318.11
6	T&D Losses (excluding Auxiliary Consumption) GWh %	3,818.00 23.70	3,680.00 22.24	3,598.00 21.70	3,530.76 20.30	3,389.96 19.14
7	Average Fuel Price					
7.1	Gas (Rs./MMBtu)	488.23*	580.34*	511.00*	400.00*	559.00*
7.2	RLNG (Rs./MMBtu)	--	--	--	1,401.30	1,605.70
7.3	Furnace Oil (Rs./M. Ton.)	51,391.00	27,550.00	35,067.00	45,591.00	69,641.62
8	Cost of Fuel in KE Own System					
8.1	Cost of Fuel (Rs. in Million)	59,950.00	57,266.00	61,466.00	71,870.00	120,614.57
8.2	Cost of Fuel (Paisa/kWh)**	690.00	599.00	656.00	752.00	1,214.88

** GIDC pending court case.* *** Based on per unit sent out.*
Source: KE



10.3 COST OF GENERATION, FUEL COST AND FUEL CONSUMPTION

The following tables (table 11 to 13) represent cost of electricity generation, fuel cost and fuel consumption from 2014-15 to 2018-19:

TABLE 11
Fuel Consumption and Cost of Generation Data (GENCOs)

Year	Gen. on Gas (GWh)	Gas Consumption Total (MMCFT)	Gas Consumption Cft/kWh (Average)	Gen. on RFO (GWh)	RFO Consumption (000 M. Ton)	RFO Consumption (Kg/kWh)	Gen. on RLNG (GWh)	RLNG Consumption Total (MMCFT)	RLNG Consumption Cft/kWh (Average)	Cost of Generation (Paisa/kWh)	Overall Fuel Cost of Gen. (Rs. Million)
TPS Jamshoro (GENCO-I)											
2014-15	414.02	5,009.00	12.10	2,241.09	672.00	0.30				1,356.38	n.a.
2015-16	2,413.73	31,095.57	12.88	832.73	252.68	0.30				878.00	28,509.57
2016-17	1,141.37	14,085.16	12.34	2,112.19	619.53	0.29				975.00	31,727.31
2017-18	525.80	8,782.00	12.33	1,088.24	328.59	0.30	178.01	0.00	0.00	1,130.00	20,252.92
2018-19	373.65	6,474.85	12.20	350.30	109.42	0.32	156.14	0.00	0.00	1,572.10	13,812.35
TPS Muzaffargarh (GENCO-III)											
2014-15	0.00	0.00	0.00	4,306.05	1,250.00	0.26				1,501.36	n.a.
2015-16	344.38	4,641.00	12.23	4,300.27	1,285.00	0.27				986.00	45,786.78
2016-17	0.00	11.00	0.00	5,160.13	1,552.16	0.27				1,108.43	59,029.58
2017-18	28.56	384.13	10.62	2,892.01	8,799.58	0.27	119.79	1,575.75	12.44	1,372.18	41,731.74
2018-19	(0.37)	0.00	0.00	836.63	262.18	0.28	0.47	7.15	13.14	2,047.85	16,858.09

Year	Gen. on Gas (GWh)	Gas Consumption Total (MMCFT)	Gas Consumption Cft/kWh (Average)	Gen. on RFO (GWh)	RFO Consumption (000 M. Ton)	RFO Consumption (Kg/kWh)	Cost of Generation (Paisa/kWh)	Overall Fuel Cost of Gen. (Rs. Million)
SPS Faisalabad (GENCO-III)								
2014-15	7.21	176.00	15.27	39.89	14.00	0.33	1,957.00	n.a.
2015-16	85.84	1,328.00	13.79	0.00	0.00	0.00	1,016.00	871.90
2016-17	62.25	971.18	13.77	45.43	15.55	0.30	1,266.80	1,279.21
2017-18	6.26	85.13	11.86	0.00	0.00	0.00	4,094.50	41.29
2018-19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Power Station	Year	Gen. on Gas (GWh)	Gas Consumption Total (MMCFT)	Gas Consumption Cft/kWh (Average)	Cost of Generation (Paisa/kWh)	Overall Fuel Cost of Gen. (Rs. Million)
GTPS Kotri (GENCO-I)	2014-15	306.11	3,702.00	12.09	699.97	n.a.
	2015-16	582.02	7,139.00	12.27	824.00	4,794.77
	2016-17	338.67	4,203.28	12.41	730.00	2,473.40
	2017-18	94.92	1,258.87	13.26	677.60	643.16
	2018-19	37.19	552.03	14.89	936.20	347.06
TPS Guddu (Units 1-4) (GENCO-II)	2014-15	522.00	9,488.00	16.51	758.00	n.a.
	2015-16	148.64	2,501.43	16.34	864.78	1,427.51
	2016-17	227.08	3,395.32	14.95	837.55	1,901.92
	2017-18	258.11	4,209.89	14.81	609.80	1,733.15
	2018-19	10.02	171.43	14.63	599.89	70.29
TPS Guddu (Units 5-10) (GENCO-II)	2015-16	2,058.19	24,331.59	11.82	613.61	12,629.19
	2016-17	2,487.81	29,803.46	11.98	536.72	13,352.60
	2017-18	3,617.95	43,758.57	11.89	461.37	16,980.30
	2018-19	3,467.30	43,384.35	12.28	645.72	22,808.77
TPS Guddu (Units 11-13) (GENCO-II)	2015-16	272.26	4,460.30	16.38	901.88	2,455.43
	2016-17	820.54	11,919.67	14.53	716.82	5,881.82
	2017-18	1,043.97	16,311.50	15.56	605.51	6,348.11
	2018-19	837.20	13,445.69	15.95	806.43	6,799.87
TPS Guddu (Units 14-16) (GENCO-II)	2015-16	3,551.47	32,113.09	9.04	510.55	7,812.35
	2016-17	4,543.55	40,375.55	17.53	446.01	20,264.78
	2017-18	3,855.08	39,464.48	10.04	413.31	16,242.95
	2018-19	5,069.78	44,942.71	8.67	475.07	24,638.39

Power Station	Year	Gen. on Gas (GWh)	Gas Consumption		Cost of Generation (Paisa/kWh)	Overall Fuel Cost of Gen. (Rs. Million)
			Total (MMCFT)	Cft/kWh (Average)		
TPS Quetta (Isolated Generation) (GENCO-II)	2014-15	98.03	1,692.00	16.98	866.89	n.a.
	2015-16	111.29	1,914.49	17.20	1,169.98	1,302.07
	2016-17	53.32	934.52	17.53	1,162.89	620.09
	2017-18	0.00	0.00	0.00	0.00	0.16
	2018-19	0.00	0.00	0.00	0.00	0.00

Year	Gen. on Gas (GWh)	Gas Consumption		Gen. on RLNG (GWh)	RLNG Consumption		Cost of Generation (Paisa/kWh)	Overall Fuel Cost of Gen. (Rs. Million)
		Total (MMCFT)	Cft/kWh (Average)		Total (MMCFT)	Cft/kWh (Average)		
GTPS Faisalabad (GENCO-III)								
2014-15	29.88	394.00	12.46				526.26	n.a.
2015-16	275.16	3,631.00	12.54				858.00	2,360.82
2016-17	214.62	2,718.97	12.04				772.21	1,371.20
2017-18	14.68	1,297.21	11.71	90.607	n.p.	n.p.	1,780.89	1,609.00
2018-19	0.00	0.00	0.00	149.53	1,801.87	11.47	2,027.71	2,805.00

Year	Gen. on Gas (GWh)	Gas Consumption		Gen. on RFO (GWh)	RFO Consumption		Gen. on HSD (GWh)	HSD Consumption		Cost of Gen. (Paisa/kWh)	Overall Fuel Cost of Gen. (Rs. Million)
		Total (MMCFT)	Cft/kWh (Average)		(000 M.Ton)	(Kg/kWh)		(000 Ltrs.)	(Kg/kWh)		
TPS Nandipur (GENCO-III)											
2014-15	0.00	0.00	0.00	0.00	0.00	0.00	244.00	0.00	0.00	n.p.	n.a.
2015-16	0.00	0.00	0.00	1,265.52	296.00	0.22	2.26	711.00	n.p.	825.00	10,458.84
2016-17	550.59	4,822.60	8.47	828.37	181.92	0.21	0.09	0.00	0.39	831.00	11,919.62
2017-18*	2,381.70	2,133.61	8.57	0.00	0.00	0.00	0.00	0.00	0.00	898.00	22,138.18
2018-19*	1,729.09	14,299.31	8.01	0.00	0.00	0.00	0.00	0.00	0.00	1,419.00	20,127.64

FBC Lakhara (GENCO-IV)

Year	Generation on Coal (GWh)	Coal Consumption (000 M. Tons)	Coal Consumption (kg/kWh)	Cost of Gen. (Paisa/kWh)	Overall Fuel Cost of Gen. (Rs. Million)
2014-15	102.27	151.00	1.04	465.98	n.a.
2015-16	148.16	152.22	1.03	1,171.80	612.30
2016-17	123.97	123.90	0.99	1,359.21	500.54
2017-18	3.39	5.30	1.01	2,023.72	22.50
2018-19	0.00	0.00	0.00	0.00	0.00

*Note: Net Electricity Generation during FY 2017-18 and 2018-19. * TPS Nandipur Electricity Generation on RLNG.*
Source: GENCOs

TABLE 12
Fuel Consumption and Cost of Generation Data (K-Electric Limited and their IPPs)
(Gas+RFO+RLNG based Power Plant)

Year	Gen. on Gas (GWh)	Gas Consumption		Residual Furnace Oil		Gen. on RLNG (GWh)	RLNG Consumption		Overall Gen. Cost (Rs./kWh)**
		Total MMCFT	CFT/kWh (Average)	Gen. on RFO (GWh)	Quantity of RFO used (000 M. Tons)		Total MMCFT	CFT/kWh (Average)	
Bin Qasim TPS-I									
2014-15	1,803.00	18,313.00	10.16	2,122.00	568.00				10.73
2015-16	1,630.00	16,353.00	10.03	2,328.00	623.00				7.51
2016-17	880.50	8,867.00	10.07	3,448.50	913.00				9.43
2017-18*	783.18	7,710.67	9.85	3,894.21	1,015.57	87.32	847.74	9.71	11.72
2018-19*	855.00	8,672.23	10.14	3,361.94	3,361.94	430.00	4,362.57	10.15	17.59

(Gas+RLNG based Power Plant)

Power Station	Year	Gen. on Gas (GWh)	Gas Consumption		Gen. on RLNG (GWh)	RLNG Consumption		Overall Gen. Cost (Rs./kWh)**
			Total MMCFT	CFT/kWh (Average)		Total MMCFT	CFT/kWh (Average)	
Bin Qasim TPS-II	2014-15	3,907.00	30,775.00	7.88				4.17
	2015-16	4,119.00	31,577.00	7.67				5.00
	2016-17	3,921.00	30,153.00	7.69				4.38
	2017-18*	3,523.55	25,928.49	7.36	227.24	1,690.91	7.44	3.85
	2018-19*	2,510.24	19,118.21	7.62	1,555.47	11,868.60	7.63	8.17
Korangi Town GTPS-II	2014-15	435.00	4,321.00	9.93				4.76
	2015-16	500.00	4,769.00	9.54				5.54
	2016-17	389.00	3,631.00	9.33				5.01
	2017-18*	286.66	2,699.01	9.42	36.45	336.99	9.25	4.91
	2018-19*	259.12	2,418.98	9.34	131.21	1,222.94	9.32	8.63
Site GTPS-II	2014-15	160.00	1,659.00	10.37				4.90
	2015-16	382.00	3,659.00	9.58				5.73
	2016-17	384.00	3,517.00	9.16				4.97
	2017-18*	456.75	3,953.32	8.66	41.39	353.68	8.55	4.48
	2018-19*	253.70	2,174.20	8.57	114.32	980.14	8.57	7.86
Korangi CCPP	2014-15	892.00	7,453.00	8.36				4.51
	2015-16	1,364.00	10,525.00	7.72				4.94
	2016-17	1,124.00	8,848.00	7.87				4.55
	2017-18*	897.07	6,562.04	7.31	103.94	748.04	7.20	4.22
	2018-19*	823.28	6,325.76	7.68	433.40	3,334.39	7.69	7.92

** Firm quantity of 60 MMCFD RLNG is being supplied to KE on co-mingled basis by SSGC along with supply of indigenous Natural Gas on as and when available basis with effect from April, 2018.*
*** Based on Units Sent Out*

(Residual Furnace Oil based Power Plant)

Power Station	Year	Gen. on RFO (GWh)	Quantity of RFO Used (000 M. Tons)	Average Fuel Cost (Rs./kWh)	Overall Gen. Cost (Rs./kWh)
Gul Ahmed	2014-15	718.00	n.p.	n.p.	14.42
	2015-16	688.00	n.p.	n.p.	9.52
	2016-17	788.00	186.26	7.86	10.38
	2017-18	712.71	170.46	9.88	12.70
	2018-19	675.54	153.18	14.69	18.18
Tapal Energy	2014-15	807.00	n.p.	n.p.	14.35
	2015-16	733.00	n.p.	n.p.	9.62
	2016-17	743.00	164.66	7.57	8.91
	2017-18	752.38	166.70	9.46	10.76
	2018-19	645.02	142.91	14.45	15.91

(Gas based Power Plant)

Power Station	Year	Gen. on Gas (GWh)	Quantity of Gas used (MMBTU)	Average Fuel Cost (Rs./kWh)	Overall Gen. Cost (Rs./kWh)
Sindh Nooriabad-I	2017-18	179.59	1412024	3.91	4.61
	2018-19	410.25	3274096	5.25	6.04
Sindh Nooriabad-II	2017-18	180.13	1426212	3.91	4.61
	2018-19	400.91	3137925	5.25	6.04

Source: KE/IPPs

TABLE 13
Fuel Consumption and Cost of Generation Data (IPPs)
(Residual Furnace Oil based Power Plant)

Power Station	Year	Units Generated (GWh)	Quantity of RFO used (000 M. Tons)	Average Fuel Cost (Rs./kWh)	Overall Gen. Cost (Rs./kWh)
Lal Pir Power	2014-15	1,663.00	391.22	12.00	14.32
	2015-16	1,946.10	438.43	6.79	8.87
	2016-17	1,601.09	364.37	8.42	10.98
	2017-18	1,089.06	269.53	10.16	13.70
	2018-19	613.80	153.27	13.74	20.95
Pak Gen. Power	2014-15	1,222.00	289.60	14.53	17.06
	2015-16	878.13	199.26	5.75	10.17
	2016-17	1,727.18	394.61	8.33	10.72
	2017-18	1,237.28	305.85	10.11	13.25
	2018-19	495.56	125.04	14.14	22.99
Hub Power	2014-15	6,809.00	1,609.46	13.58	15.89
	2015-16	7,546.99	1,803.39	7.06	9.06
	2016-17	6,793.11	1,635.36	8.77	10.99
	2017-18	5,196.60	1,245.89	11.58	16.08
	2018-19	814.43	204.13	16.43	n.p.
Saba Power	2014-15	35.00	8.92	16.46	17.63
	2015-16	70.59	17.16	7.68	9.84
	2016-17	510.46	123.88	10.63	11.85
	2017-18	465.88	120.21	12.59	14.12
	2018-19	225.41	59.82	17.76	22.38
Kohinoor Energy	2014-15	877.00	169.39	12.05	13.36
	2015-16	877.41	164.44	7.23	8.54
	2016-17	816.83	153.15	7.70	9.09
	2017-18	645.40	124.92	9.44	11.35
	2018-19	387.44	75.05	12.98	17.90
Attock Gen.	2014-15	1,209.00	222.89	10.19	18.21
	2015-16	1,179.30	216.41	5.20	9.77
	2016-17	1,135.41	209.54	6.92	10.95
	2017-18	912.45	174.29	8.95	14.25
	2018-19	532.18	97.21	12.89	20.86
Atlas Power	2014-15	1,462.00	283.96	15.92	19.21
	2015-16	1,320.46	261.81	n.p.	n.p.
	2016-17	1,336.90	262.56	n.p.	n.p.
	2017-18	1,246.45	245.18	n.p.	n.p.
	2018-19	691.30	132.07	n.p.	n.p.
Nishat Power	2014-15	1,410.00	277.31	11.07	13.64
	2015-16	1,272.16	250.24	6.52	6.52
	2016-17	1,239.76	243.87	7.55	7.55
	2017-18	1,171.19	230.38	9.29	9.29
	2018-19	675.10	132.80	13.04	13.04
Nishat Chunian	2014-15	1,415.31	278.40	11.05	13.77
	2015-16	1,240.16	243.94	7.44	8.97
	2016-17	1,350.33	265.61	8.71	9.76
	2017-18	1,099.67	221.80	10.41	11.73
	2018-19	599.74	117.97	13.64	19.04
Liberty Power Tech.	2014-15	1,514.57	297.92	15.42	18.57
	2015-16	1,277.44	235.39	n.p.	n.p.
	2016-17	1,369.33	255.20	n.p.	n.p.
	2017-18	1,175.61	224.14	n.p.	n.p.
	2018-19	776.26	148.78	n.p.	n.p.

Power Station	Year	Units Generated (GWh)	Quantity of RFO used (000 M. Tons)	Average Fuel Cost (Rs./kWh)	Overall Gen. Cost (Rs./kWh)
Narowal Energy	2014-15	1,418.16	278.76	11.73	16.26
	2015-16	1,161.91	229.65	6.68	11.75
	2016-17	1,334.18	262.33	7.96	12.78
	2017-18	1,199.68	234.04	9.39	12.88
	2018-19	636.13	125.03	12.90	16.98

(Gas based Power Plant)

Power Station	Year	Units Generated (GWh)	Quantity of Gas used (MMBTU)	Average Fuel Cost (Rs./kWh)	Overall Gen. Cost (Rs./kWh)
Altern Energy	2014-15	173.00	1744940	5.37	7.38
	2015-16	184.60	1736978	6.35	7.56
	2016-17	198.30	1868543	5.91	6.99
	2017-18	145.12	n.p.	n.p.	n.p.
	2018-19	22.03	n.p.	n.p.	n.p.
Fauji Kabirwala	2014-15	991.00	8514108	4.62	6.02
	2015-16	1,138.06	1419944	6.53	7.26
	2016-17	1,122.84	709502	8.34	9.09
	2017-18	1,017.26	404931	9.16	9.94
	2018-19	563.13	259336	12.19	13.10
Habibullah Coastal	2014-15	719.00	6187693	4.63	7.06
	2015-16	563.03	4889875	6.04	9.28
	2016-17	785.90	6533436	n.p.	n.p.
	2017-18	880.33	7416480	3.37	4.48
	2018-19	716.78	6240614	4.93	7.28
Rousch Power	2014-15	2,465.00	19635093	4.49	7.22
	2015-16	2,970.66	23833821	5.94	7.44
	2016-17	2,459.69	19781549	7.61	9.53
	2017-18*	2,591.64	21012425	8.58	10.20
	2018-19	1,035.85	8699965	11.98	15.92
TNB Liberty Power	2014-15	1,218.00	10004282	12.39	14.66
	2015-16	1,491.36	12003012	6.06	7.82
	2016-17	1,430.23	11611024	4.79	5.81
	2017-18	1,041.56	8776938	6.47	8.49
	2018-19	1,307.61	10910993	10.15	12.40
Engro Power Gen. Qadirpur	2014-15	1,429.00	11993204	5.06	5.37
	2015-16	1,222.00	10196067	5.69	8.99
	2016-17	1,731.00	13923051	5.04	10.66
	2017-18	1,668.42	13221041	4.16	9.015
	2018-19	1,385.13	11258742	5.76	9.79
Davis Energen.	2014-15	70.00	655291	6.49	10.10
	2015-16	74.00	691918	6.49	10.10
	2016-17	61.05	516629	8.04	9.11
	2017-18*	8.82	85456	15.46	16.15
	2018-19	Complex stopped due to gas stoppage (non-payment)			

Power Station	Year	Gas		HSD Generation (GWh)	Average Fuel Cost (Rs./kWh)	Overall Gen. Cost (Rs./kWh)
		Units Generated (GWh)	Quantity of Gas used (MMBTU)			
Sapphire Electric	2014-15	289.50	2153880	653.50	14.60	19.24
	2015-16	727.26	5409221	329.17	7.48	7.80
	2016-17	595.64	4414191	394.07	9.18	9.49
	2017-18*	643.89	4883647	171.07	9.70	10.02
	2018-19*	806.02	6252321	2.49	10.76	11.14

Power Station	Year	Gas		HSD Generation (GWh)	Average Fuel Cost (Rs./kWh)	Overall Gen. Cost (Rs./kWh)
		Units Generated (GWh)	Quantity of Gas used (MMBTU)			
Saif Power	2014-15	95.48	744873	675.44	16.01	21.83
	2015-16	845.07	6392115	243.71	7.59	8.09
	2016-17	499.64	3805865	405.81	11.82	13.13
	2017-18*	681.27	5146932	160.28	10.35	15.67
	2018-19*	825.43	6403632	2.77	12.26	17.44
Orient Power	2014-15	311.19	2385081	725.81	14.44	18.14
	2015-16	840.14	6421294	315.48	7.38	8.50
	2016-17	568.57	4366253	376.11	10.21	11.62
	2017-18*	697.51	5270563	143.88	9.98	12.19
	2018-19*	874.43	6795121	3.37	11.10	12.85
Foundation Power	2014-15	1,304.70	10421325	17.30	4.36	7.71
	2015-16	1,211.26	9539800	0.22	5.49	7.98
	2016-17	1,382.65	9830259	0.20	4.69	7.25
	2017-18	1,392.39	10818257	0.00	3.97	4.995
	2018-19	1,330.60	10526917	0.00	n.p.	n.p.
Halmore Power	2014-15	92.91	n.p.	620.24	9.43	13.98
	2015-16	540.00	4087127	376.00	13.34	20.97
	2016-17	274.00	2172844	279.00	13.80	5.53
	2017-18*	624.87	4953062	246.14	10.26	15.24
	2018-19*	609.66	4849884	3.25	11.50	13.54
Uch Power	2014-15	4,126.91	31549804	4.00	2.79	3.83
	2015-16	4,210.83	32101860	3.13	2.94	3.99
	2016-17	4,404.46	33657865	1.98	3.07	4.04
	2017-18	4,442.99	33721523	0.00	3.19	4.09
	2018-19	3,895.85	29954223	0.00	3.38	4.29
Uch-II Power	2014-15	2,409.00	18014780	10.00	2.91	4.28
	2015-16	2,315.84	17423515	16.98	3.83	5.14
	2016-17	2,724.06	20340852	7.28	3.88	5.22
	2017-18	2,593.04	19524716	0.00	3.83	5.23
	2018-19	3,018.37	22553022	0.00	5.12	6.68

Year	Gas		RFO		HSD Generation (GWh)	Average Fuel Cost (Rs./kWh)	Overall Gen. Cost (Rs./kWh)
	Units Generated (GWh)	Quantity of Gas used (MMBTU)	Units Generated (GWh)	Quantity of RFO used (000 M.Tons)			
	KAPCO (Dual Fuel)						
2014-15	845.00	8097993	5,852.00	1,179.96	236.00	13.37	16.39
2015-16	1,069.33	9322082	5,462.31	1,073.38	225.33	6.81	7.71
2016-17	2,571.00	22502701	4,713.00	917.99	240.00	8.46	9.23
2017-18*	4,101.22	36631183	3,272.72	631.95	62.81	9.82	10.56
2018-19*	3,514.06	30440566	1,442.41	285.93	2.92	12.90	14.24

Note: Net Electricity Generation during FY 2017-18 and 2018-19.
** During FY 2017-18 and 2018-19 Electricity Generated on RLNG instead of Gas at Rousch Power, Davis Energen, KAPCO, Sapphire Electric, Saif Power, Orient Power and Halmore Power Plants.*
Source: IPPs

10.4 AUXILIARY CONSUMPTION AND OTHER FACTORS, HEAT RATE AND PLANT EFFICIENCY

The following tables (table 14 to 21) show the auxiliary consumption and other factors such as maximum load, load factor, capacity factor, utilization factor, heat rate and plant efficiency data of power plants from 2014-15 to 2018-19:

TABLE 14
Auxiliary Consumption and other Factors (Hydel Power Stations)

Power Station	Year	Auxiliary Consumption		Maximum Load (MW)	Load Factor (%)	Capacity Factor (%)	Utilization Factor (%)
		(GWh)	(%)				
Tarbela	2014-15	15.94	0.11	3,605	46.89	103.65	48.61
	2015-16	16.79	0.10	3,606	50.48	103.68	52.34
	2016-17	16.16	0.11	3,539	48.41	101.75	49.40
	2017-18	17.33	0.13	3,453	43.47	99.28	43.16
	2018-19	16.32	0.15	3,461	35.03	99.51	34.86
Tarbela 4th Ext.	2018-19	n.p.	0.28	1,276	20.73	90.49	18.76
Ghazi Barotha	2014-15	7.75	0.12	1,450	52.70	100.00	57.94
	2015-16	9.92	0.15	1,450	52.77	100.00	58.25
	2016-17	9.64	0.14	1,450	54.21	100.00	59.61
	2017-18	10.28	0.16	1,450	47.27	100.00	47.27
	2018-19	9.49	0.14	1,450	51.58	100.00	51.58
Mangla	2014-15	11.31	0.17	1,115	66.51	111.50	73.86
	2015-16	11.81	0.26	1,115	52.77	111.50	78.15
	2016-17	90.30	1.69	1,115	54.60	111.50	61.05
	2017-18	11.40	0.28	1,115	42.29	128.75	47.15
	2018-19	58.07	1.50	920	47.91	115.00	55.09
Warsak	2014-15	1.63	0.17	185	60.17	76.14	45.82
	2015-16	1.65	0.18	205	51.33	84.37	43.31
	2016-17	4.73	0.48	213	52.67	87.67	52.67
	2017-18	3.03	0.33	221	47.21	90.96	43.06
	2018-19	1.01	0.10	216	52.97	88.90	47.09
Chashma	2014-15	5.64	0.01	184	61.22	100.00	61.22
	2015-16	6.33	0.70	174	58.70	58.69	55.50
	2016-17	5.74	0.64	158	64.15	85.87	82.23
	2017-18	4.76	0.63	129	66.90	70.11	46.77
	2018-19	5.29	0.69	122	71.78	66.30	69.05
Khan Khwar	2014-15	4.40	1.99	72	40.11	40.11	40.11
	2015-16	0.89	2.36	68	6.32	5.97	5.97
	2016-17	4.01	2.01	72	31.47	31.56	31.56
	2017-18	3.40	1.99	72	27.02	27.02	27.02
	2018-19	4.52	1.90	72	37.69	37.69	37.69
Allai Khwar	2014-15	0.79	0.17	121	44.19	78.32	43.44
	2015-16	0.80	0.14	121	53.33	53.33	53.33
	2016-17	0.86	0.22	121	37.42	37.42	37.42
	2017-18	0.71	0.26	121	25.96	26.03	25.96
	2018-19	0.87	0.19	121	43.59	43.59	43.59
Jinnah	2014-15	2.91	1.50	45	47.95	47.29	22.67
	2015-16	6.67	2.25	66	51.27	68.54	35.14
	2016-17	2.88	0.98	63	52.89	34.71	34.71
	2017-18	2.99	1.30	52	50.41	54.17	27.30
	2018-19	3.37	1.49	64	40.43	26.83	69.00
Duber Khwar	2014-15	0.74	0.12	130	53.59	100.00	53.59
	2015-16	0.73	0.11	130	57.36	100.00	57.36
	2016-17	0.71	0.12	130	51.62	100.00	51.76
	2017-18	3.90	0.76	130	45.08	45.20	45.08
	2018-19	2.41	0.68	130	57.20	51.95	57.20
Golen Gol	2018-19	1.68	1.67	108	110.59	31.75	31.75

Power Station	Year	Auxiliary Consumption (GWh)	Auxiliary Consumption (%)	Maximum Load (MW)	Load Factor (%)	Capacity Factor (%)	Utilization Factor (%)
Dargai	2014-15	0.41	0.39	18	67.59	79.52	60.63
	2015-16	0.42	0.36	18	71.67	78.11	65.22
	2016-17	0.28	0.27	18	67.03	81.50	59.82
	2017-18	0.27	0.28	18	61.22	89.00	54.48
	2018-19	0.30	0.28	18	69.62	89.00	61.96
Rasul	2014-15	2.80	4.18	14	67.27	63.64	36.36
	2015-16	2.59	3.99	18	60.71	62.61	38.15
	2016-17	3.66	4.23	15	65.83	68.18	44.88
	2017-18	1.58	2.41	15	49.74	68.18	33.92
	2018-19	0.68	0.94	15	56.57	65.91	37.28
Shadiwal	2014-15	0.44	1.70	5	60.87	36.30	22.10
	2015-16	0.63	2.25	5	63.24	35.75	21.50
	2016-17	0.46	1.60	6	62.01	34.79	27.81
	2017-18	0.46	1.77	6	53.67	31.84	21.09
	2018-19	0.42	1.47	5	69.41	31.97	24.83
Chichoki Malian	2014-15	0.35	0.89	7	53.88	53.03	28.57
	2015-16	0.58	1.21	7	55.54	56.82	51.99
	2016-17	0.35	0.78	8	48.71	60.61	29.63
	2017-18	0.32	0.82	7	51.11	53.03	27.52
	2018-19	0.35	1.01	7	51.03	49.24	25.13
Nandipur	2014-15	0.81	2.30	9	43.09	66.67	28.72
	2015-16	0.67	1.64	9	58.10	53.08	33.63
	2016-17	0.54	1.25	11	46.35	61.86	38.89
	2017-18	0.55	1.29	9	56.58	66.67	37.18
	2018-19	0.50	1.36	9	45.87	66.67	30.58
Kurram Garhi	2014-15	0.54	2.70	4	56.25	100.00	56.25
	2015-16	0.65	2.81	4	66.61	98.25	61.36
	2016-17	0.36	1.94	4	55.25	95.00	52.63
	2017-18	0.15	0.92	4	51.66	95.00	49.08
	2018-19	0.15	1.02	4	40.62	100.00	40.62
Renala	2014-15	0.04	1.60	1	54.83	43.79	25.67
	2015-16	0.04	1.93	1	54.92	33.94	20.99
	2016-17	0.00	2.11	1	41.82	38.83	24.88
	2017-18	0.05	1.99	1	43.78	37.50	26.27
	2018-19	0.05	2.14	1	60.78	33.86	22.65
Chitral	2014-15	0.01	0.19	1	46.36	102.90	42.09
	2015-16	0.01	0.19	1	49.90	82.03	40.95
	2016-17	0.01	0.20	1	59.83	47.99	69.96
	2017-18	0.01	0.24	1	49.13	39.42	39.30
	2018-19	0.01	0.17	1	50.70	40.05	40.05
Gomal Zam	2014-15	0.18	2.04	17	31.01	66.00	31.00
	2015-16	0.05	0.95	17	9.41	10.03	9.43
	2016-17	0.05	0.91	17	4.04	9.75	4.13
	2017-18	0.00	0.07	8	0.52	0.53	0.24
	2018-19	0.08	0.26	8	43.89	49.30	21.64
Malakand/ Jabban	2014-15	0.92	0.76	22	61.85	81.25	76.12
	2015-16	1.49	0.83	22	71.55	71.36	71.55
	2016-17	1.19	0.96	22	64.41	64.41	64.41
	2017-18	1.18	1.12	22	54.68	54.68	54.68
	2018-19	1.32	0.97	22	70.56	70.56	70.56

Source: WAPDA

TABLE 15
Auxiliary Consumption and other Factors (GENCOs)

Power Station	Year	Auxiliary Consumption (GWh)	Auxiliary Consumption (%)	Maximum Load (MW)	Load Factor (%)	Capacity Factor (%)	Utilization Factor (%)
TPS Jamshoro (GENCO-I)	2014-15	351.51	11.76	670	50.80	78.82	48.62
	2015-16	354.02	9.83	740	79.86	48.22	83.24
	2016-17	356.17	9.87	690	83.22	48.48	58.04
	2017-18	214.07	10.67	650	79.17	26.94	32.25
	2018-19	117.16	11.88	550	91.24	57.38	71.06
GTPS Kotri (GENCO-I)	2014-15	13.46	4.22	126	28.83	72.41	25.94
	2015-16	21.20	3.51	118	58.20	47.82	57.23
	2016-17	13.63	3.87	105	38.30	27.93	33.51
	2017-18	6.89	6.77	102	11.39	59.86	8.07
	2018-19	3.73	9.14	81	5.75	56.20	3.23
TPS Guddu (Units 1-4) (GENCO-II)	2014-15	52.72	9.18	230	28.44	35.94	15.39
	2015-16	12.49	8.42	210	12.05	65.63	54.06
	2016-17	16.06	7.07	150	17.28	60.61	12.34
	2017-18	25.43	8.95	150	21.63	71.43	19.09
	2018-19	1.69	14.45	110	1.22	52.38	0.79
TPS Guddu (Units 5-10) (GENCO-II)	2015-16	50.50	2.45	367	63.84	39.05	65.89
	2016-17	55.41	2.23	608	46.71	100.00	47.33
	2017-18	62.49	1.70	608	69.10	101.33	79.27
	2018-19	64.89	1.84	582	69.28	97.00	76.08
TPS Guddu (Units 11-13) (GENCO-II)	2015-16	0.97	0.36	190	16.31	11.48	70.96
	2016-17	4.41	0.54	272	34.44	65.54	36.03
	2017-18	4.43	0.42	252	47.49	96.92	46.03
	2018-19	6.13	0.73	252	38.20	96.92	37.02
TPS Guddu (Units 14-16) (GENCO-II)	2015-16	72.24	2.03	740	54.64	54.27	80.00
	2016-17	103.93	2.29	765	67.80	100.00	69.43
	2017-18	74.90	1.91	769	58.34	102.95	62.24
	2018-19	116.50	2.25	798	72.52	106.83	80.29
TPS Quetta (Isolated Generation) (GENCO-II)	2014-15	1.52	1.53	25	45.38	71.43	45.38
	2015-16	1.57	1.41	25	50.68	100.00	50.68
	2016-17	0.99	1.85	22	27.67	88.00	24.35
	2017-18	0.37	0.00	0	0.00	0.00	0.00
	2018-19	0.00	0.00	0	0.00	0.00	0.00
TPS Muzaffargarh (GENCO-III)	2014-15	548.09	11.27	1,055	52.48	78.15	48.99
	2015-16	502.85	9.77	1,100	52.94	82.22	43.53
	2016-17	540.74	9.49	1,100	59.16	81.48	48.21
	2017-18	342.22	10.15	1,100	34.99	81.48	28.51
	2018-19	113.75	12.06	1,105	9.74	81.85	7.97
SPS Faisalabad (GENCO-III)	2014-15	6.60	11.69	79	8.14	59.85	6.43
	2015-16	10.90	11.31	45	24.37	34.09	11.42
	2016-17	14.77	12.10	45	30.97	34.09	14.52
	2017-18	0.93	13.00	42	1.95	31.82	0.86
	2018-19	0.00	0.00	0	0.00	0.00	0.00
GTPS Faisalabad (GENCO-III)	2014-15	22.04	69.66	141	2.55	57.79	1.71
	2015-16	15.92	5.52	160	20.60	65.57	15.70
	2016-17	13.10	5.80	160	16.11	65.57	12.27
	2017-18	7.18	6.48	118	10.72	48.36	6.02
	2018-19	9.74	4.86	119	15.08	48.77	15.74
TPS Nandipur (GENCO-III)	2015-16	63.22	4.12	479	31.41	112.71	35.40
	2016-17	55.56	3.87	457	35.82	107.53	38.52
	2017-18	82.30	3.34	526	53.47	114.35	61.15
	2018-19	52.70	2.95	561	36.31	36.05	39.10

Power Station	Year	Auxiliary Consumption (GWh)	Auxiliary Consumption (%)	Maximum Load (MW)	Load Factor (%)	Capacity Factor (%)	Utilization Factor (%)
FBC Lakhra (GENCO-IV)	2014-15	42.41	29.28	54	30.54	108.00	54.97
	2015-16	43.18	29.15	36	46.86	38.46	18.02
	2016-17	35.90	28.96	34	41.63	54.49	22.68
	2017-18	3.90	74.25	32	1.87	51.28	0.96
	2018-19	0.00	0.00	0	0.00	0.00	0.00

Source: GENCOs

TABLE 16
Auxiliary Consumption and other Factors (K-Electric and their IPPs)

Power Station	Year	Auxiliary Consumption (GWh)	Auxiliary Consumption (%)	Maximum Load (MW)	Load Factor (%)	Capacity Factor (%)*	Utilization Factor (%)*
Bin Qasim TPS-I	2014-15	360.00	9.17	915	n.p.	n.p.	72.60
	2015-16	372.00	9.40	985	n.p.	n.p.	78.20
	2016-17	412.00	9.52	960	51.00	64.00	76.00
	2017-18	430.58	9.04	1,005	54.00	73.00	79.76
	2018-19	429.17	9.24	1,015	52.47	65.11	80.56
Bin Qasim TPS-II	2014-15	251.00	6.42	548	n.p.	n.p.	97.90
	2015-16	254.00	6.17	557	n.p.	n.p.	99.50
	2016-17	243.00	6.20	563	82.00	94.00	98.00
	2017-18	241.75	6.45	571	75.00	85.00	99.71
	2018-19	249.75	6.14	555	85.31	95.27	96.91
Korangi Town GTPS-II	2014-15	11.00	2.53	85	n.p.	n.p.	94.40
	2015-16	14.00	2.80	97	n.p.	n.p.	96.70
	2016-17	14.00	3.60	97	48.00	50.00	91.00
	2017-18	13.21	4.09	97	42.00	40.00	90.47
	2018-19	14.71	3.77	97	58.67	47.27	90.47
Site GTPS-II	2014-15	8.00	5.00	85	n.p.	n.p.	94.40
	2015-16	12.00	3.14	88	n.p.	n.p.	97.80
	2016-17	13.00	3.39	97	57.00	49.00	91.00
	2017-18	16.28	3.27	97	60.00	59.00	90.47
	2018-19	12.78	3.47	97	72.61	72.96	90.47
Korangi CCPP	2014-15	74.00	8.30	222	n.p.	n.p.	89.90
	2015-16	108.00	7.92	239	n.p.	n.p.	96.70
	2016-17	91.00	8.10	233	64.00	69.00	94.00
	2017-18	78.93	7.88	230	56.00	54.00	92.95
	2018-19	92.34	7.35	234	70.79	74.24	94.41
Gul Ahmed Energy	2016-17	22.92	1.99	128	97.06	70.89	88.71
	2017-18	21.10	1.83	128	97.50	64.87	84.94
	2018-19	23.63	3.37	128	95.40	60.62	88.32
Tapal Energy	2016-17	12.37	1.64	124	69.84	70.02	66.94
	2017-18	13.07	1.71	124	70.75	70.14	68.46
	2018-19	11.13	1.70	124	60.65	59.62	57.74
Sindh Nooriabad-I	2017-18	2.88	1.60	51	91.64	88.85	100.00
	2018-19	7.18	1.75	51	91.06	91.24	100.00
Sindh Nooriabad-II	2017-18	2.89	1.60	51	91.92	91.92	100.00
	2018-19	6.21	1.55	51	89.17	89.34	100.00

Note: Low Capacity Factors due to gas supply/pressure issues at Korangi Town GTPS-II, SITE GTPS-II and Korangi CCPP.
** Calculations for Capacity and Utilization Factors differ from PEPCO's calculations.*
Source: KE/IPPs

TABLE 17
Auxiliary Consumption and other Factors (IPPs)

Power Station	Year	Auxiliary Consumption		Maximum Load (MW)	Load Factor (%)	Capacity Factor (%)	Utilization Factor (%)
		(GWh)	(%)				
Lal Pir Power	2014-15	123.67	6.92	350	75.66	65.11	65.11
	2015-16	128.27	6.59	350	70.78	60.11	59.30
	2016-17	107.17	6.69	350	63.27	49.40	n.p.
	2017-18	76.29	6.55	350	58.61	35.52	n.p.
	2018-19	42.78	6.52	350	54.25	20.02	n.p.
Pak Gen. Power	2014-15	95.12	7.22	350	75.14	59.87	59.87
	2015-16	54.11	6.16	350	66.72	27.25	26.88
	2016-17	111.56	6.46	350	63.92	53.43	n.p.
	2017-18	86.89	6.56	350	58.95	40.35	n.p.
	2018-19	35.96	6.77	350	50.65	16.16	n.p.
Altern Energy	2014-15	9.04	4.96	30	97.35	96.33	95.04
	2015-16	9.58	5.19	30	94.80	96.40	94.81
	2016-17	10.46	5.27	30	95.30	96.70	94.70
	2017-18	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.
	2018-19	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.
Fauji Kabirwala	2014-15	31.40	2.07	157	94.54	75.91	83.59
	2015-16	30.41	2.67	157	95.60	84.70	88.72
	2016-17	29.72	2.65	155	94.30	83.80	89.71
	2017-18	31.42	3.00	156	92.09	78.16	87.14
	2018-19	18.01	3.10	153	54.71	43.81	44.67
Habibullah Coastal	2014-15	17.88	2.40	126	76.49	63.52	86.76
	2015-16	14.41	2.56	124	65.49	63.34	76.00
	2016-17	19.69	2.51	125	82.19	79.41	84.51
	2017-18	17.81	1.97	126	81.71	79.72	99.42
	2018-19	21.48	2.90	124	74.71	65.15	95.77
Hub Power	2014-15	398.00	5.84	1,200	65.00	76.00	83.00
	2015-16	524.11	6.49	1,200	71.60	71.60	81.88
	2016-17	484.77	6.66	1,200	64.45	64.45	81.81
	2017-18	375.34	6.73	1,200	49.48	49.48	53.28
	2018-19	71.55	8.65	1,200	7.87	7.87	9.45
KAPCO	2014-15	196.00	2.75	1,431	59.00	85.54	69.00
	2015-16	174.00	2.60	1,521	56.00	81.90	68.20
	2016-17	189.00	2.50	1,520	62.40	84.30	74.00
	2017-18	171.00	2.30	1,579	63.30	86.00	73.60
	2018-19	120.00	2.40	1,506	42.20	91.80	46.00
Kohinoor Energy	2014-15	26.35	2.92	124	93.80	80.73	84.80
	2015-16	26.41	3.01	124	93.80	78.12	83.15
	2016-17	24.68	3.02	124	92.60	72.93	78.10
	2017-18	20.45	3.07	124	91.87	59.42	64.31
	2018-19	12.45	3.11	124	85.82	35.67	39.06
Rousch Power	2014-15	44.88	1.78	450	72.04	91.70	78.90
	2015-16	53.16	1.79	461	85.67	97.26	88.09
	2016-17	46.93	1.91	451	83.75	88.86	94.25
	2017-18	49.99	1.93	454	76.81	74.90	85.46
	2018-19	28.41	2.74	418	41.52	29.94	45.32
Saba Power	2014-15	2.55	7.20	126	41.59	2.99	2.99
	2015-16	4.52	6.41	126	61.54	5.99	5.99
	2016-17	34.39	6.74	134	48.30	43.29	43.29
	2017-18	30.75	6.17	134	48.21	42.51	42.51
	2018-19	16.33	6.73	134	23.73	20.57	20.57

Power Station	Year	Auxiliary Consumption (GWh)	Auxiliary Consumption (%)	Maximum Load (MW)	Load Factor (%)	Capacity Factor (%)	Utilization Factor (%)
TNB Liberty Power	2014-15	24.83	2.00	216	67.44	65.91	91.76
	2015-16	25.32	1.67	288	80.51	79.68	96.56
	2016-17	25.15	1.72	224	79.48	76.76	93.32
	2017-18	19.66	1.85	221	58.66	56.00	89.38
	2018-19	31.62	2.35	226	81.04	70.30	85.74
Uch Power	2014-15	67.52	1.60	549	85.93	87.08	96.37
	2015-16	69.10	1.61	548	87.50	88.38	93.95
	2016-17	70.57	1.57	548	91.77	93.26	97.30
	2017-18	71.30	1.57	551	92.05	93.56	96.84
	2018-19	62.84	1.58	549	80.96	82.02	96.79
Attock Gen.	2014-15	27.88	2.31	157	98.00	89.00	100.00
	2015-16	26.36	2.19	157	85.00	86.00	100.00
	2016-17	31.98	2.74	158	82.06	82.99	99.85
	2017-18	23.55	2.52	158	66.03	66.69	91.77
	2018-19	15.51	2.90	158	37.48	37.94	52.93
Atlas Power	2014-15	52.16	3.57	215	78.02	78.02	82.99
	2015-16	47.99	3.63	215	70.29	70.29	75.69
	2016-17	51.06	3.82	214	71.36	71.36	77.76
	2017-18	48.37	3.88	215	66.54	66.54	71.82
	2018-19	24.61	3.68	215	35.66	35.66	39.31
Engro Power Gen. Qadirpur	2014-15	41.00	2.80	217	84.00	91.00	91.00
	2015-16	36.08	2.95	219	67.56	96.98	70.32
	2016-17	47.00	3.00	220	96.00	96.00	100.00
	2017-18	46.00	3.00	220	91.00	93.00	98.00
	2018-19	43.00	3.00	220	79.00	96.00	83.00
Saif Power	2014-15	24.15	3.04	220	47.52	41.86	42.58
	2015-16	31.67	2.83	224	66.08	58.99	60.39
	2016-17	28.95	3.10	220	52.45	48.87	50.36
	2018-19	22.94	2.65	224	50.50	45.98	46.98
	2018-19	23.16	2.72	224	47.90	44.76	45.96
Orient Power	2014-15	29.17	2.81	218	65.45	60.54	55.67
	2015-16	30.59	2.65	218	60.65	62.02	73.95
	2016-17	26.79	2.84	221	48.69	50.70	63.92
	2017-18	22.47	2.67	219	43.86	45.16	56.05
	2018-19	23.81	2.71	218	45.98	47.11	59.48
Nishat Power	2014-15	38.88	2.68	195	90.13	80.47	90.13
	2015-16	35.13	2.69	195	80.83	72.41	80.83
	2016-17	35.57	2.79	195	80.51	70.76	80.51
	2017-18	32.42	2.69	195	77.62	68.70	77.62
	2018-19	18.71	2.70	195	41.88	39.60	41.88
Nishat Chunian	2014-15	27.40	2.36	196	93.05	81.33	85.02
	2015-16	31.53	2.54	196	93.67	70.49	73.84
	2016-17	34.46	2.55	196	95.70	76.60	80.20
	2017-18	27.93	2.47	196	92.90	64.14	79.60
	2018-19	15.69	0.03	196	92.17	34.98	36.95
Sapphire Electric Power	2014-15	29.83	2.91	222	54.36	51.88	53.00
	2015-16	30.78	2.92	223	58.68	55.00	58.76
	2016-17	29.61	2.99	228	55.02	51.00	53.51
	2017-18	33.59	3.97	224	56.77	43.88	45.69
	2018-19	24.44	2.94	222	46.73	43.51	44.70

Power Station	Year	Auxiliary Consumption (GWh)	Auxiliary Consumption (%)	Maximum Load (MW)	Load Factor (%)	Capacity Factor (%)	Utilization Factor (%)
Halmore Power	2015-16	29.70	3.14	218	55.42	54.13	31.30
	2016-17	20.43	3.57	213	39.05	33.06	37.11
	2017-18	26.61	3.05	221	50.49	49.13	51.23
	2018-19	20.68	3.37	214	37.36	37.36	39.09
Narowal Energy	2014-15	25.72	1.81	215	75.55	75.55	86.71
	2015-16	23.75	2.04	215	61.77	61.77	70.81
	2016-17	25.70	1.93	216	71.23	71.15	79.21
	2017-18	22.35	1.83	216	64.05	64.05	68.89
	2018-19	12.95	2.00	217	33.96	33.96	35.75
Liberty Power Tech.	2014-15	32.07	2.07	196	97.80	88.15	90.27
	2015-16	27.53	2.16	196	97.65	72.55	75.93
	2016-17	29.60	2.16	196	98.64	77.97	80.80
	2017-18	25.55	2.13	196	96.50	68.42	71.02
	2018-19	17.33	2.18	196	96.20	45.18	47.11
Foundation Power	2014-15	48.75	3.69	197	96.31	89.97	87.59
	2015-16	32.45	2.67	198	87.00	83.14	81.45
	2016-17	36.10	2.46	195	85.97	89.38	88.11
	2017-18	34.97	2.46	198	94.48	94.10	99.37
	2018-19	34.51	2.51	198	n.p.	90.87	89.70
Davis Energen.	2014-15	1.57	2.24	11	76.10	60.54	60.54
	2015-16	1.65	2.17	11	82.39	65.54	82.39
	2016-17	1.64	2.68	11	76.50	51.24	67.00
	2017-18	0.54	6.00	8	15.10	11.30	59.30
	2018-19	Complex stopped due to gas stoppage (non-payment)					
Uch-II Power	2014-15	59.16	2.38	381	72.56	73.89	79.30
	2015-16	94.30	3.90	381	69.82	71.38	77.41
	2016-17	63.62	2.27	375	83.04	84.62	87.46
	2017-18	60.88	2.28	375	79.13	80.71	87.34
	2018-19	67.81	2.19	367	94.01	94.66	95.60

Source: IPPs

TABLE 18
Heat Rate and Plant Efficiency Data (GENCOs)

Power Station	Year	Heat Rate (Btu/kWh)		Plant Efficiency (%)	
		On Gross Generation	On Net Export to NTDC	On Gross Generation	On Net Export to NTDC
TPS Jamshoro (GENCO-I)	2014-15	10,679.00	12,051.00	31.96	28.32
	2015-16	11,352.00	12,590.00	30.07	27.12
	2016-17	10,823.00	12,008.00	31.53	28.42
	2017-18	11,099.13	12,424.96	30.75	27.46
	2018-19	11,271.12	12,774.07	30.28	26.71
GTPS Kotri (GENCO-I)	2014-15	11,520.00	12,023.00	29.63	28.39
	2015-16	11,682.00	12,107.00	29.21	28.18
	2016-17	12,124.00	12,612.00	28.15	27.06
	2017-18	12,627.00	13,549.00	27.03	25.19
	2018-19	13,405.16	14,752.95	25.46	23.13
TPS Guddu (Units 1-4) (GENCO-II)	2014-15	13,455.00	n.p.	25.36	n.p.
	2015-16	13,728.00	14,975.00	24.86	22.79
	2016-17	12,357.00	13,297.00	27.62	25.67
	2017-18	12,196.00	13,395.00	27.98	25.48
	2018-19	11,998.00	14,023.00	28.45	24.34

Power Station	Year	Heat Rate (Btu/kWh)		Plant Efficiency (%)	
		On Gross Generation	On Net Export to NTDC	On Gross Generation	On Net Export to NTDC
TPS Guddu (Units 5-10) (GENCO-II)	2015-16	9,042.00	9,269.00	37.75	36.82
	2016-17	9,262.00	9,473.00	36.85	36.03
	2017-18	9,227.00	9,387.00	36.99	36.36
	2018-19	9,466.00	9,643.00	36.06	35.39
TPS Guddu (Units 11-13) (GENCO-II)	2015-16	12,763.00	12,808.00	26.74	26.65
	2016-17	11,281.00	11,342.00	30.25	30.09
	2017-18	12,110.00	12,161.00	28.18	28.06
	2018-19	12,301.00	12,391.00	27.75	27.54
TPS Guddu (Units 14-16) (GENCO-II)	2015-16	7,404.00	7,558.00	46.10	45.16
	2016-17	6,848.00	7,008.00	49.84	48.70
	2017-18	7,070.00	7,205.00	48.27	47.37
	2018-19	7,094.00	7,257.00	48.11	47.03
TPS Quetta (Isolated Generation) (GENCO-II)	2014-15	n.p.	n.p.	n.p.	n.p.
	2015-16	16,571.00	16,808.00	20.60	20.31
	2016-17	16,792.00	17,109.00	20.32	19.95
	2017-18	0.00	0.00	0.00	0.00
	2018-19	0.00	0.00	0.00	0.00
TPS Muzaffargarh (GENCO-III)	2014-15	10,467.00	13,723.00	32.61	24.87
	2015-16	11,494.14	12,738.54	29.69	26.79
	2016-17	10,378.41	11,465.99	32.88	29.76
	2017-18	10,584.33	11,780.40	32.24	28.97
	2018-19	10,729.67	12,202.05	31.81	27.97
SPS Faisalabad (GENCO-III)	2014-15	13,137.00	n.p.	25.98	n.p.
	2015-16	12,751.04	14,377.28	26.77	23.74
	2016-17	12,574.45	14,305.59	27.14	23.86
	2017-18	11,442.72	13,152.91	29.83	25.95
	2018-19	0.00	0.00	0.00	0.00
GTPS Faisalabad (GENCO-III)	2014-15	11,431.00	n.p.	29.85	n.p.
	2015-16	11,588.03	12,264.72	29.45	28.00
	2016-17	11,320.61	12,018.19	30.15	28.40
	2017-18	11,412.37	12,202.53	29.91	27.96
	2018-19	11,678.00	11,331.00	30.12	29.02
TPS Nandipur (GENCO-III)	2015-16	9,106.00	9,498.00	37.48	35.93
	2016-17	8,280.00	8,614.00	41.22	39.62
	2017-18	7,505.00	7,764.00	45.47	43.95
	2018-19	7,187.00	7,416.00	47.48	46.02
FBC Lakhra (GENCO-IV)	2014-15	13,537.00	19,202.00	25.21	17.77
	2015-16	13,623.54	19,228.02	25.05	17.75
	2016-17	13,219.06	18,609.02	25.82	18.34
	2017-18	13,424.00	n.p.	25.42	n.p.
	2018-19	0.00	0.00	0.00	0.00

Source: GENCOs

TABLE 19
Heat Rate and Plant Efficiency Data (KE and their IPPs)

Power Station	Year	Heat Rate (Btu/kWh) - HHV		Plant Efficiency (%)	
		On Gross Generation (Gas/FO)	On Net Basis	On Gross Generation (Gas/FO)	On Net Basis
Bin Qasim TPS-I	2016-17	10,675.00	11,799.00	31.96	28.92
	2017-18	10,499.69	11,542.81	32.50	29.56
	2018-19	10,648.18	11,731.88	32.04	29.08
Bin Qasim TPS-II	2016-17	8,130.00	8,668.00	41.97	39.37
	2017-18	7,792.00	8,328.89	43.79	40.97
	2018-19	7,922.14	8,440.65	43.07	40.43
Korangi Town GTPS-II	2016-17	9,301.00	9,638.00	36.69	35.40
	2017-18	9,226.00	9,619.10	36.98	35.47
	2018-19	9,144.70	9,502.92	37.31	35.91
Site GTPS-II	2016-17	9,370.00	9,701.00	36.42	35.17
	2017-18	8,977.00	9,280.52	38.01	36.77
	2018-19	8,821.82	9,139.27	38.68	37.33
Korangi CCPP	2016-17	8,108.00	8,821.00	42.08	38.68
	2017-18	7,721.00	8,382.19	44.19	40.71
	2018-19	8,029.85	8,666.69	42.49	39.37
Gul Ahmed Energy	2016-17	9,289.62	9,606.68	36.72	35.51
	2017-18	9,334.93	9,668.78	36.54	35.29
	2018-19	8,966.59	9,280.32	38.05	36.76
Tapal Energy	2016-17	8,802.15	8,948.70	38.76	38.13
	2017-18	8,795.87	8,948.67	38.79	38.13
	2018-19	8,796.88	8,948.64	38.79	38.13
Sindh Nooriabad-I	2017-18	7,862.68	7,990.77	43.40	42.70
	2018-19	7,980.73	8,122.74	42.75	42.01
Sindh Nooriabad-II	2017-18	7,917.82	8,046.83	43.09	42.40
	2018-19	7,827.01	7,950.09	43.59	42.92

Source: KE/IPPs

TABLE 20
Heat Rate and Plant Efficiency Data (IPPs)

Power Station	Year	Heat Rate (Btu/kWh)		Plant Efficiency (%)	
		On Gross Generation	On Net Export to NTDC	On Gross Generation	On Net Export to NTDC
Lal Pir Power	2014-15	8,373.62	8,996.44	40.75	37.93
	2015-16	8,653.83	9,264.47	39.43	36.83
	2016-17	8,760.34	9,388.78	38.95	36.35
	2017-18	8,945.63	9,572.25	38.15	35.65
	2018-19	9,053.00	9,684.00	37.69	35.24
Pak Gen. Power	2014-15	8,391.67	9,044.83	40.66	37.72
	2015-16	8,694.26	9,265.19	39.25	36.83
	2016-17	8,794.96	9,402.24	38.80	36.29
	2017-18	8,933.40	9,560.79	38.20	35.69
	2018-19	9,124.72	9,786.82	37.40	34.87
Altern Energy	2014-15	9,570.00	10,069.00	35.70	33.90
	2015-16	9,407.00	9,921.70	36.27	34.39
	2016-17	9,422.80	9,947.30	36.20	34.30
	2017-18	n.p.	n.p.	n.p.	n.p.
	2018-19	n.p.	n.p.	n.p.	n.p.
Fauji Kabirwala	2014-15	7,458.00	7,728.00	45.57	44.15
	2015-16	7,533.61	7,763.67	45.29	43.95
	2016-17	7,613.45	7,821.97	44.82	43.62
	2017-18	7,608.51	7,843.99	44.84	43.50
	2018-19	7,608.93	7,852.21	44.84	43.45

Power Station	Year	Heat Rate (Btu/kWh)		Plant Efficiency (%)	
		On Gross Generation	On Net Export to NTDC	On Gross Generation	On Net Export to NTDC
Habibullah Coastal	2014-15	8,371.60	8,579.00	40.77	39.70
	2015-16	8,465.04	8,746.99	40.33	39.03
	2016-17	8,039.25	8,410.80	42.47	40.59
	2017-18	8,035.62	8,394.52	42.47	40.66
	2018-19	8,427.17	8,678.91	40.50	39.33
Hub Power	2014-15	n.p.	8,953.65	n.p.	38.00
	2015-16	8,462.62	9,118.46	40.32	37.42
	2016-17	8,466.82	9,053.14	40.30	37.69
	2017-18	8,382.94	9,152.16	40.70	37.28
	2018-19	8,222.22	9,494.68	41.50	35.94
KAPCO	2014-15	7,916.00	8,075.00	45.48	44.60
	2015-16	7,977.00	8,189.00	45.10	44.00
	2016-17	8,028.00	8,236.00	44.80	43.70
	2017-18	7,997.00	8,181.00	45.00	44.00
	2018-19	7,996.00	8,179.00	45.00	44.00
Kohinoor Energy	2014-15	7,753.80	7,986.80	44.01	42.72
	2015-16	7,745.98	7,986.85	44.05	42.72
	2016-17	7,745.53	7,986.85	44.05	42.72
	2017-18	7,741.54	7,986.85	44.08	42.72
	2018-19	7,738.19	7,986.85	44.08	42.72
Rousch Power	2014-15	7,027.00	7,153.00	48.59	47.73
	2015-16	7,100.91	7,227.99	48.10	47.25
	2016-17	7,109.65	7,245.30	48.04	47.14
	2017-18	7,166.19	7,304.41	47.66	46.76
	2018-19	7,364.59	7,566.55	46.38	45.14
Saba Power	2014-15	10,324.91	11,126.07	33.81	31.37
	2015-16	9,754.00	10,422.00	34.98	32.47
	2016-17	9,737.00	10,441.00	35.04	32.68
	2017-18	9,680.00	10,317.00	35.25	33.07
	2018-19	9,896.00	10,610.00	34.48	32.16
TNB Liberty Power	2014-15	7,643.73	7,799.58	44.64	43.75
	2015-16	7,920.75	8,077.18	43.13	42.29
	2016-17	7,956.73	8,118.30	42.88	42.03
	2017-18	8,288.26	8,467.86	41.17	40.29
	2018-19	8,221.56	8,444.76	41.50	40.40
Uch Power	2014-15	6,758.00	6,893.00	50.49	49.50
	2015-16	6,737.93	6,874.33	50.64	49.63
	2016-17	6,754.82	6,891.14	50.51	49.51
	2017-18	6,712.85	6,847.25	50.83	49.83
	2018-19	6,797.38	6,936.25	50.20	49.19
Attock Gen.	2014-15	7,403.00	7,582.00	46.10	45.00
	2015-16	7,412.00	7,582.00	46.05	45.00
	2016-17	7,368.00	7,582.00	46.32	45.00
	2017-18	7,386.00	7,582.00	46.21	45.00
	2018-19	7,356.00	7,582.00	46.40	45.00
Atlas Power	2014-15	7,400.00	7,584.00	46.10	45.00
	2016-17	n.p.	n.p.	n.p.	n.p.
	2017-18	7,400.00	7,584.00	46.10	45.00
	2018-19	7,400.00	7,584.00	46.10	45.00
Engro Power Gen. Qadirpur	2014-15	n.p.	7,907.00	n.p.	45.53
	2015-16	n.p.	7,710.00	n.p.	44.26
	2016-17	7,260.00	7,625.00	47.00	45.00
	2017-18	7,260.00	7,625.00	47.00	45.00
	2018-19	7,260.00	7,705.00	47.00	44.28

Power Station	Year	Heat Rate (Btu/kWh)		Plant Efficiency (%)	
		On Gross Generation	On Net Export to NTDC	On Gross Generation	On Net Export to NTDC
Nishat Power	2014-15	7,379.00	7,582.00	46.21	45.00
	2015-16	7,378.00	7,582.00	46.21	45.00
	2016-17	7,371.00	7,582.00	46.26	45.00
	2017-18	7,378.00	7,582.00	46.21	45.00
	2018-19	7,378.00	7,582.00	46.21	45.00
Nishat Chunian	2014-15	7,403.00	7,582.00	46.10	45.00
	2015-16	n.p.	7,582.00	n.p.	45.00
	2016-17	n.p.	7,582.00	n.p.	45.00
	2017-18	7,402.00	7,582.00	46.10	45.00
	2018-19	7,402.00	7,582.00	46.10	45.00
Narowal Energy	2016-17	7,344.00	7,584.00	46.46	45.00
	2017-18	7,451.00	7,451.00	46.64	45.80
	2018-19	7,737.44	7,737.44	46.53	45.66
Liberty Power Tech.	2014-15	7,417.70	7,582.54	46.00	45.00
	2015-16	7,417.70	7,582.54	46.00	45.00
	2016-17	7,417.70	7,582.54	46.00	45.00
	2017-18	7,417.70	7,582.54	46.00	45.00
	2018-19	7,417.70	7,582.54	n.p.	45.00
Foundation Power	2014-15	6,950.86	7,210.58	49.08	47.31
	2015-16	6,919.00	7,107.00	49.31	48.00
	2016-17	6,819.95	7,011.71	49.92	48.66
	2017-18	6,834.21	7,005.66	49.91	48.69
	2018-19	6,938.53	7,146.12	49.18	47.75
Davis Energen.	2016-17	8,462.10	9,210.95	25.30	25.00
	2017-18	9,426.00	9,685.00	28.90	28.10
	2018-19	Complex stopped due to gas stoppage (non-payment)			
Uch-II Power	2014-15	6,582.99	6,770.54	51.83	50.39
	2015-16	6,520.58	6,784.16	52.33	50.29
	2016-17	6,554.25	6,739.34	52.06	50.63
	2017-18	6,607.62	6,794.74	51.64	50.22
	2018-19	6,567.20	6,747.54	51.96	50.57

Power Station	Year	Heat Rate (Btu/kWh)				Plant Efficiency (%)			
		On Gross Generation		On Net Export to NTDC		On Gross Generation		On Net Export to NTDC	
		Gas/FO	HSD	Gas/FO	HSD	Gas/FO	HSD	Gas/FO	HSD
Saif Power	2014-15	6,466.00	6,825.00	6,666.00	7,037.00	52.78	50.01	51.20	48.50
	2015-16	6,466.00	6,825.00	6,666.00	7,037.00	52.78	50.01	51.20	48.50
	2016-17	6,466.00	6,825.00	6,666.00	7,037.00	52.78	50.01	51.20	48.50
	2017-18	6,466.00	6,825.00	6,666.00	7,037.00	52.78	50.01	51.20	48.50
	2018-19	6,466.00	6,825.00	6,666.00	7,037.00	52.78	50.01	51.20	48.50
Orient Power	2014-15	6,504.00	6,866.00	6,666.00	7,037.00	52.48	49.71	51.20	48.50
	2015-16	6,504.00	6,866.00	6,666.00	7,037.00	52.48	49.71	51.20	48.50
	2016-17	6,504.00	6,866.00	6,666.00	7,037.00	52.48	49.71	51.20	48.50
	2017-18	6,504.00	6,866.00	6,666.00	7,037.00	52.48	49.71	51.20	48.50
	2018-19	6,504.00	6,866.00	6,666.00	7,037.00	52.48	49.71	51.20	48.50
Sapphire Electric Power	2014-15	6,712.00	7,068.00	6,907.00	7,274.00	50.38	48.27	49.40	46.91
	2015-16	6,477.00	6,837.00	6,666.00	7,037.00	52.68	49.90	51.20	48.50
	2016-17	6,472.00	6,833.00	6,666.00	7,037.00	52.72	49.94	51.20	48.50
	2017-18	6,411.00	6,788.00	6,666.00	7,037.00	53.22	50.41	51.20	48.50
	2018-19	6,470.00	6,830.00	6,666.00	7,037.00	52.74	49.96	51.20	48.50
Halmore Power	2015-16	6,499.00	6,861.00	6,666.00	7,037.00	52.52	49.74	n.p.	n.p.
	2016-17	6,499.00	6,861.00	6,666.00	7,037.00	52.52	49.74	n.p.	n.p.
	2017-18	6,479.00	6,840.00	6,666.00	7,037.00	52.68	49.90	47.54	
	2018-19	6,479.00	6,840.00	6,666.00	7,037.00	52.68	49.90	47.49	

Source: IPPs

TABLE 21
Main Electricity Statistics of the Country

	2014-15	2015-16	2016-17	2017-18	2018-19
1: Maximum Energy Demand (MW)					
PEPCO Area*	23,419	23,267	24,290	25,303	22,875
KE Area	3,056	3,195	3,270	3,527	3,530
Un-diversified Energy Demand of the Country	24,022	26,394	26,782	27,874	n.a.
Diversified Energy Demand of the Country	23,551	25,876	23,733	26,741	n.a.
2: Auxiliary Consumption and System Losses (in percentage)					
PEPCO Area					
Auxiliary Consumption	2.70	n.p.	n.p.	n.p.	n.p.
Transmission Losses	2.63	2.57	2.31	2.43	2.83
Distribution Losses	18.99	18.14	17.93	18.32	16.86
KE Area					
Auxiliary Consumption (KE Own)	7.55	7.36	7.62	7.55	7.45
T&D Losses (excluding Auxiliary Consumption)	23.70	22.24	21.70	20.30	19.14
3: Average Sales Price (Rs./kWh)					
PEPCO Area	10.60	7.61	8.84	n.p.	n.p.
KE Area	12.07	12.97	12.84	15.90	15.38
4: Per Capita Electricity Consumption					
PEPCO system					
Population (Million)	177.54	180.99	184.44	186.05	n.a.
Energy Sale (GWh)	77,636.48	81,489.76	86,634.70	97,030.33	92,442.19
Per Capita Electricity Consumption (kWh)	446	457	475	526	529
Average Sale/ Consumer (kWh)	3,070.23	3,117.50	3,189.36	3,404.22	3,192.95
KE system					
Population (Million)	15.39	15.72	16.05	16.39	n.a.
Energy Sale (GWh)	12,293.00	12,864.00	12,981.00	13,860.32	14,318.11
Per Capita Electricity Consumption (kWh)	523	547	871	863	892
Average Sale/Consumer (kWh)	5,695.71	5,777.22	5,350.79	5,365.07	5,098.92

** Based on un-diversified power demand indicated by DISCOs in Table 42.*

Source: NTDC/DISCOs/KE

10.5 LOAD PATTERN AND PEAK LOAD HOURS

The electrical load pattern in the country varies from season to season; during summer season there is an increase in the inductive load while in winter season increase in resistive load has been observed. The peak hour timing in the system is normally from 5 PM to 8 PM. The hourly load figures for a typical working and non-working day in summer and winter, during 2018, are given hereunder:

TABLE 22
Hourly System Demand (MW) (January - December, 2018)

Hours of the day	Maximum Demand (MW)		System Demand for a Typical day in Summer		System Demand for a Typical Day in Winter	
	Summer (04-06-2018)	Winter (27-12-2018)	Working day (25-07-2018)	Non-working day (30-06-2018)	Working day (25-12-2018)	Non-working day (30-12-2018)
1	23,400	11,834	22,485	18,511	11,075	11,777
2	23,356	11,486	21,881	18,714	10,583	9,948
3	23,128	11,121	21,867	17,996	10,433	9,473
4	22,925	10,922	21,227	17,641	10,418	11,102
5	21,894	11,352	21,404	17,517	10,625	11,504
6	22,286	12,297	21,475	17,142	11,444	12,184
7	22,391	13,220	21,311	16,819	12,214	13,310
8	23,051	13,899	21,120	17,031	12,601	13,401
9	23,924	14,942	21,241	17,377	13,284	13,888
10	24,347	14,877	21,204	17,945	13,826	14,506
11	24,824	14,963	21,487	18,538	14,092	14,540
12	25,534	14,825	21,423	18,491	14,062	14,547
13	25,669	14,440	21,441	19,267	13,919	14,309
14	26,020	14,558	21,659	19,867	13,625	14,153
15	26,150	14,720	21,131	20,049	13,585	13,833
16	26,275	15,003	20,716	20,543	13,486	14,074
17	26,741	14,874	20,133	20,495	13,465	13,975
18	24,875	15,491	19,623	19,762	14,525	14,842
19	24,774	15,394	19,163	18,966	14,442	14,919
20	24,887	15,006	20,730	20,182	13,931	14,509
21	25,313	14,547	21,024	20,642	13,278	13,658
22	25,466	14,019	21,249	20,808	12,691	13,362
23	24,579	13,230	20,996	20,980	11,887	12,486
24	24,238	12,553	20,975	20,915	11,084	11,564

** Highlighted area indicates maximum demand of the day.*
Source: National Power Control Centre, Islamabad

10.6 ENERGY SALES AND CONSUMER-WISE ELECTRICITY CONSUMPTION

The following tables (table 23 to 24) show the energy sales and consumer-wise electricity consumption of the country from 2014-15 to 2018-19:

TABLE 23
Category-wise Energy Sales in PEPCO and K-Electric System

		2014-15	2015-16	2016-17	2017-18	2018-19
PEPCO System						
Domestic	GWh	34,177.90	36,941.29	41,418.48	46,163.74	43,820.29
Percentage share	%	44.02	45.33	47.81	47.58	47.40
Commercial	GWh	4,837.89	5,411.43	6,114.63	6,753.33	6,468.86
Percentage share	%	6.23	6.64	7.06	6.96	7.00
Industrial	GWh	21,073.32	21,147.75	20,066.60	23,274.17	23,785.81
Percentage share	%	27.14	25.95	23.16	23.99	25.73
Agricultural	GWh	7,849.97	8,362.27	9,063.16	9,983.68	6,071.80
Percentage share	%	10.11	10.26	10.46	10.29	6.57
Public Lighting	GWh	391.31	294.64	298.30	318.95	279.93
Percentage share	%	0.50	0.36	0.34	0.33	0.30
Bulk Supply	GWh	3,846.07	3,138.90	3,445.82	5,014.14	4,946.19
Percentage share	%	4.95	3.85	3.98	5.17	5.35
Others	GWh	33.02	1,134.49	1,150.71	394.12	2,132.60
Percentage share	%	0.04	1.39	1.33	0.41	2.31
Supplied to KE	GWh	5,427.00	5,059.00	5,077.00	5,128.20	4,936.71
Percentage share	%	6.99	6.21	5.86	5.29	5.34
Total in PEPCO area	**GWh**	**77,636.48**	**81,489.76**	**86,634.70**	**97,030.33**	**92,442.19**
Percentage share	**%**	**86.33**	**86.37**	**86.97**	**87.50**	**86.59**
KE System						
Domestic	GWh	6,150.00	6,596.00	6,643.00	7,169.68	7,298.83
Percentage share	%	50.03	51.27	51.17	51.73	50.98
Commercial	GWh	1,600.00	1,685.00	1,655.00	1,758.22	1,780.58
Percentage share	%	13.02	13.10	12.75	12.69	12.44
Industrial	GWh	3,844.00	3,830.00	3,885.00	4,123.85	4,402.12
Percentage share	%	31.27	29.77	29.93	29.75	30.75
Agricultural	GWh	166.00	163.00	159.00	151.49	134.30
Percentage share	%	1.35	1.27	1.22	1.09	0.94
Public Lighting	GWh	110.00	163.00	187.00	156.54	160.48
Percentage share	%	0.89	1.27	1.44	1.13	1.12
Bulk Supply	GWh	410.00	412.00	433.00	471.10	477.22
Percentage share	%	3.34	3.20	3.34	3.40	3.33
Others	GWh	13.00	15.00	19.00	29.44	64.58
Percentage share	%	0.11	0.12	0.15	0.21	0.45
Total in KE area	**GWh**	**12,293.00**	**12,864.00**	**12,981.00**	**13,860.32**	**14,318.11**
Percentage share	**%**	**13.67**	**13.63**	**13.03**	**12.50**	**13.41**
Country						
Domestic	GWh	40,327.90	43,537.29	48,061.48	53,333.42	51,119.12
Percentage share	%	44.84	46.14	48.25	48.10	47.88
Commercial	GWh	6,437.89	7,096.43	7,769.63	8,511.55	8,249.44
Percentage share	%	7.16	7.52	7.80	7.68	7.73
Industrial	GWh	24,917.32	24,977.75	23,951.60	27,398.02	28,187.93
Percentage share	%	27.71	26.47	24.04	24.71	26.40
Agricultural	GWh	8,015.97	8,525.27	9,222.16	10,135.17	6,206.10
Percentage share	%	8.91	9.04	9.26	9.14	5.81
Public Lighting	GWh	501.31	457.64	485.30	475.49	440.41
Percentage share	%	0.56	0.49	0.49	0.43	0.41
Bulk Supply	GWh	4,256.07	3,550.90	3,878.82	5,485.24	5,423.41
Percentage share	%	4.73	3.76	3.89	4.95	5.08
Others	GWh	46.02	1,149.49	1,169.71	423.56	2,197.18
Percentage share	%	0.05	1.22	1.17	0.38	2.06
Supplied to KE by PEPCO	GWh	5,427.00	5,059.00	5,077.00	5,128.20	4,936.71
Percentage share	%	6.03	5.36	5.10	4.62	4.62
Total in the Country	**GWh**	**89,929.48**	**94,353.76**	**99,615.70**	**110,890.65**	**106,760.30**
Percentage share	**%**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

TABLE 24
Category-wise Consumers and their Electricity Consumption (%)

		2014-15	2015-16	2016-17	2017-18	2018-19
	PEPCO Area (Consumers and Consumption in percentage to the total)					
Domestic	Consumers	85.67	85.82	86.00	85.94	86.11
	Consumption	44.02	45.33	47.81	47.58	47.40
Commercial	Consumers	11.58	11.48	11.36	11.22	10.93
	Consumption	6.23	6.64	7.06	6.96	7.00
Industrial	Consumers	1.34	1.33	1.31	1.26	1.22
	Consumption	27.14	25.95	23.16	23.99	25.73
Agricultural	Consumers	1.35	1.31	1.27	1.17	1.06
	Consumption	10.11	10.26	10.46	10.29	6.57
Public Lighting	Consumers	0.04	0.04	0.04	0.04	0.04
	Consumption	0.50	0.36	0.34	0.33	0.30
Bulk Supply	Consumers	0.02	0.02	0.02	0.02	0.01
	Consumption	4.95	3.85	3.98	5.17	5.35
Others	Consumers	0.00	0.00	0.00	0.36	0.62
	Consumption	0.04	1.39	1.33	0.41	2.31
Supplied to KE	Consumption	6.99	6.21	5.86	5.29	5.34
	KE Area (Consumers and Consumption in percentage to the total)					
Domestic	Consumers	78.57	78.97	80.20	81.15	81.86
	Consumption	50.03	51.27	51.17	51.73	50.98
Commercial	Consumers	20.35	19.97	18.82	17.95	16.90
	Consumption	13.02	13.10	12.75	12.69	12.44
Industrial	Consumers	0.96	0.93	0.86	0.80	0.74
	Consumption	31.27	29.77	29.93	29.75	30.75
Agricultural	Consumers	0.12	0.12	0.11	0.09	0.08
	Consumption	1.35	1.27	1.22	1.09	0.94
Public Lighting	Consumers	0.00	0.00	0.00	0.00	0.00
	Consumption	0.89	1.27	1.44	1.13	1.12
Bulk Supply	Consumers	0.01	0.01	0.01	0.01	0.01
	Consumption	3.34	3.20	3.34	3.40	3.33
Others	Consumers	0.00	0.00	0.00	0.00	0.41
	Consumption	0.11	0.12	0.15	0.21	0.45
	Country (Consumers and Consumption in percentage to the total)					
Domestic	Consumers	85.07	85.25	85.50	85.52	85.72
	Consumption	44.84	46.14	48.25	48.10	47.88
Commercial	Consumers	12.32	12.19	12.01	11.80	11.48
	Consumption	7.16	7.52	7.80	7.68	7.73
Industrial	Consumers	1.31	1.30	1.27	1.22	1.18
	Consumption	27.71	26.47	24.04	24.71	26.40
Agricultural	Consumers	1.25	1.21	1.16	1.08	0.97
	Consumption	8.91	9.04	9.26	9.14	5.81
Public Lighting	Consumers	0.04	0.04	0.04	0.04	0.03
	Consumption	0.56	0.49	0.49	0.43	0.41
Bulk Supply	Consumers	0.02	0.02	0.02	0.02	0.01
	Consumption	4.73	3.76	3.89	4.95	5.08
Others	Consumers	0.00	0.00	0.00	0.33	0.60
	Consumption	0.05	1.22	1.17	0.38	2.06
Supplied to KE by PEPCO	Consumption	6.03	5.36	5.10	4.62	4.62

Source: DISCOs/KE

10.7 PATTERN OF ELECTRICITY CONSUMPTION

The overall electricity consumption in the country since 2000 was growing steadily. However, during the FY 2018-19 electricity consumption in the country excluding K-Electric area decreased by 4.73%. The sector-wise electricity consumption and their share in total electricity consumption of the country, for the years 2014-15 to 2018-19 are given in the following table:

TABLE 25
Annual Growth Rate of Electricity Consumption

		2014-15	2015-16	2016-17	2017-18	2018-19
			PEPCO Area			
Domestic	GWh	34,177.90	36,941.29	41,418.48	46,163.74	43,820.29
	%	2.57	8.09	12.12	11.46	-5.08
Commercial	GWh	4,837.89	5,411.43	6,114.63	6,753.33	6,468.86
	%	0.95	11.86	12.99	10.45	-4.21
Industrial	GWh	21,073.32	21,147.75	20,066.60	23,274.17	23,785.81
	%	2.54	0.35	-5.11	15.98	2.20
Agricultural	GWh	7,849.97	8,362.27	9,063.16	9,983.68	6,071.80
	%	-3.44	6.53	8.38	10.16	-39.18
Public Lighting	GWh	391.31	294.64	298.30	318.95	279.93
	%	0.36	-24.70	1.24	6.92	-12.23
Bulk Supply	GWh	3,846.07	3,138.90	3,445.82	5,014.14	4,946.19
	%	0.25	-18.39	9.78	45.51	-1.36
Others	GWh	33.02	1,134.49	1,150.71	394.12	2,132.60
	%	5.16	3336.18	1.43	-65.75	441.10
Supplied to KE	GWh	5,427.00	5,059.00	5,077.00	5,128.20	4,936.71
	%	-0.26	-6.78	0.36	1.01	-3.73
Total	**GWh**	**77,636.48**	**81,489.76**	**86,634.70**	**97,030.33**	**92,442.19**
Percentage Change	**%**	**1.49**	**4.96**	**6.31**	**12.00**	**-4.73**
			KE Area			
Domestic	GWh	6,150.00	6,596.00	6,643.00	7,169.68	7,298.83
	%	12.04	7.25	0.71	7.93	1.80
Commercial	GWh	1,600.00	1,685.00	1,655.00	1,758.22	1,780.58
	%	6.17	5.31	-1.78	6.24	1.27
Industrial	GWh	3,844.00	3,830.00	3,885.00	4,123.85	4,402.12
	%	7.74	-0.36	1.44	6.15	6.75
Agricultural	GWh	166.00	163.00	159.00	151.49	134.30
	%	3.75	-1.81	-2.45	-4.72	-11.35
Public Lighting	GWh	110.00	163.00	187.00	156.54	160.48
	%	3.77	48.18	14.72	-16.29	2.52
Bulk Supply	GWh	410.00	412.00	433.00	471.10	477.22
	%	-3.98	0.49	5.10	8.80	1.30
Others	GWh	13.00	15.00	19.00	29.44	64.58
	%	-93.40	15.38	26.67	54.95	119.36
Total	**GWh**	**12,293.00**	**12,864.00**	**12,981.00**	**13,860.32**	**14,318.11**
Percentage Change	**%**	**7.32**	**4.64**	**0.91**	**6.77**	**3.30**
			Country			
Domestic	GWh	40,327.90	43,537.29	48,061.48	53,333.42	51,119.12
	%	3.91	7.96	10.39	10.97	-4.15
Commercial	GWh	6,437.89	7,096.43	7,769.63	8,511.55	8,249.44
	%	2.20	10.23	9.49	9.55	-3.08
Industrial	GWh	24,917.32	24,977.75	23,951.60	27,398.02	28,187.93
	%	3.31	0.24	-4.11	14.39	2.88
Agricultural	GWh	8,015.97	8,525.27	9,222.16	10,135.17	6,206.10
	%	-3.30	6.35	8.17	9.90	-38.77
Public Lighting	GWh	501.31	457.64	485.30	475.49	440.41
	%	1.09	-8.71	6.04	-2.02	-7.38
Bulk Supply	GWh	4,256.07	3,550.90	3,878.82	5,485.24	5,423.41
	%	-0.18	-16.57	9.23	41.42	-1.13
Others	GWh	46.02	1,149.49	1,169.71	423.56	2,197.18
	%	-79.85	2398.02	1.76	-63.79	418.74
Supplied to KE by PEPCO	GWh	5,427.00	5,059.00	5,077.00	5,128.20	4,936.71
	%	-0.26	-6.78	0.36	1.01	-3.73
Total	**GWh**	**89,929.48**	**94,353.76**	**99,615.70**	**110,890.65**	**106,760.30**
Percentage Change	**%**	**2.25**	**4.92**	**5.58**	**11.32**	**-3.72**

10.8 SURPLUS/DEFICIT IN DEMAND AND SUPPLY DURING PEAK HOURS (ACTUAL AND PROJECTED)

The actual position of demand and supply of the electric power during peak hours in the NTDC's and K-Electric's systems have been reproduced in the following tables (table 26-27). Further, the projected figures of planned generation capacity, demand growth rate and surplus/deficit of electric power for the years to come, in the NTDC and K-Electric areas have also been collected through respective companies and are included in these tables:

TABLE 26
Surplus/Deficit in Demand and Supply during NTDC's System Peak Hours

A: Actual Figures

Financial Year ending 30th June	Generation Capability (MW)	Demand During NTDC's System Peak Hours (MW)	Surplus/ (Deficit) (MW)
2015	16,500	21,701	-5,201
2016	17,261	22,559	-5,298
2017	19,020	25,117	-6,097
2018	23,766	26,741	-2,975
2019	24,565	25,627	-1,062

B: Projected Figures

Financial Year ending 30th June	Planned Generation Capability as per NTDC (MW)	NTDC Projected Demand Growth Rate (%)	NTDC's Projected Demand during Peak Hours (MW)	Surplus/ (Deficit) (MW)
2020	28,189	-	28,155	34
2021	30,582	4.2	29,325	1,257
2022	32,989	5.4	30,921	2,068
2023	35,896	3.3	31,953	3,943
2024	37,918	5.5	33,696	4,222
2025	39,157	5.1	35,422	3,735
2026	42,075	2.2	36,206	5,869
2027	40,433	5.6	38,227	2,206
2028	44,639	5.5	40,324	4,315
2029	45,437	5.4	42,519	2,918
2030	47,127	5.7	44,958	2,169

Source: NTDC

TABLE 27
Surplus/Deficit in Demand and Supply during K-Electric's System Peak Hours

A: Actual Figures

Financial Year ending 30th June	Generation Capability (MW) *	Demand During KE's System Peak Hours (MW)	Surplus/ (Deficit) (MW)
2015	2,632	3,056	(424.00)
2016	2,860	3,195	(335.00)
2017	2,920	3,270	(350.00)
2018	3,008	3,527	(519.00)
2019	3,196	3,530	(334.00)

B: Projected Figures

Financial Year ending 30th June	Planned Generation Capability as per KE (MW) [1]	KE's Projected Demand Growth Rate (%) [2]	KE's Projected Demand during Peak hours (MW) [3]	Surplus/ (Deficit) (MW)
2020	3,155 [94]	7.42	3,392	(237.00)
2021	3,380 [134]	7.23	3,816	(436.00)
2022	3,916 [212]	7.67	4,228	(312.00)
2023	4,853 [212]	8.50	4,650	203.00

* *Based on maximum supply achieved in KE's system (including IPPs+NTDC).*

[1] *Including own generation / import from all sources. Further, this includes supply from IPPs which are under planning/approval and accordingly are subject to change. Numbers in [ ] indicate planned supply from renewable sources, however, given the intermittent nature of renewable projects, supply from these have not been accounted in projecting generation capability against peak demand.*

[2] *Growth in peak demand does not include adjustments for AT&C based load-shed.*

[3] *Peak Demand is after adjustment for AT&C based load-shed.*

Source: KE

11

ELECTRICITY GENERATION

ELECTRICITY GENERATION

11.1 GENERAL

Pakistan is facing chronic electricity shortages due to demand growth, high system losses, seasonal reductions in the availability of hydropower and circular debt, etc. rotating power outages ("load shedding") are common and many villages are not yet electrified.

The power sector of Pakistan is a mix of thermal, hydro, nuclear and renewable energy power plants. Originally the ratio of hydel to thermal installed generation capacity, in the country was about 67% to 33% (1985) but with the passage of time, due to different reasons more of thermal generation was added thereby reducing the share of hydel generation. At present, ratio of hydel to thermal installed generation capacity is about 25% to 65%. The dilemma for Pakistan is that its power production is dominated by thermal power plants running on oil and gas.

11.2 THERMAL POWER GENERATION

Majority of Pakistan's power generation is thermal, with furnace oil, natural gas and high-speed diesel as fuels; coal is almost non-existent yet. However, most of the upcoming power projects in the country would be based on coal and gas. The import of oil contributes as one of the major reason for current account deficit. Any strategy to cut current account deficit would require a cut down in the oil imports and for this it is essential to reduce the electricity generation through oil.

11.3 THERMAL POWER GENERATION AND FUEL CONSUMPTION

Gas: During the year 2018-19, the share of electricity generated using gas in the total electricity generation of the country was 31.33% while this share during 2017-18 was 32.24%.

RLNG: During the year 2018-19, the share of electricity generated using RLNG in the total electricity generation of the country was 34.47% while this share during 2017-18 was 23.01%.

Furnace Oil: During the year 2018-19, the share of electricity generated using furnace oil in the total electricity generation of the country was 15.46% while this share during 2017-18 was 30.60%.

High Speed Diesel: During the year 2018-19, the share of electricity generated using high speed diesel in the total electricity generation of the country was 0.03% while this share during 2017-18 was 0.86%.

Coal: During the year 2018-19, the share of electricity generated using coal in the total electricity generation of the country was 18.71% while this share during 2017-18 was 13.29%.

The historical record of thermal electricity generation using different fuels, from the years 2014-15 to 2018-19 is given in the following table:

TABLE 28
Thermal Electricity Generation by Sector and by Fuel (GWh)

		2014-15	2015-16	2016-17	2017-18*	2018-19*
Thermal Generation by:						
GENCOs (I, II, III and IV)		13,300.55	16,391.91	18,709.99	16,199.10	13,016.93
KE Own Power Plants		9,319.00	10,323.00	10,147.00	10,337.75	10,727.68
IPPs	PEPCO Area	44,369.02	45,146.42	47,972.10	62,436.23	62,597.73
	KE Area	1,525.00	1,421.00	1,531.00	1,824.81	2,131.72
Others	PEPCO Area	1,015.00	251.00	271.40	665.53	405.13
(SPPs/CPPs/N-CPPs)	KE Area	191.00	139.00	187.00	550.49	523.74
Total Thermal Generation		**69,719.57**	**73,672.33**	**78,818.50**	**92,013.90**	**89,402.93**

			2014-15	2015-16	2016-17	2017-18*	2018-19*
Thermal Generation using:							
Gas	PEPCO Area**	Generation on Gas (GWh)	23,921.94	29,497.42	31,520.24	23,291.97	22,439.40
		Share of Gas Generation (%)	34.31	40.04	39.99	25.31	25.10
	KE Area‡	Generation on Gas (GWh)	7,293.00	8,065.00	6,768.50	6,374.93	5,571.15
		Share of Gas Generation (%)	10.46	10.95	8.59	6.93	6.23
	Total	**Generation on Gas (GWh)**	**31,214.94**	**37,562.42**	**38,288.74**	**29,666.90**	**28,010.55**
		Share of Gas Generation (%)	**44.77**	**50.99**	**48.58**	**32.24**	**31.33**
RLNG	PEPCO Area	Generation on RLNG (GWh)	0.00	0.00	657.88	20,678.32	28,148.92
		Share of RLNG Generation (%)	0.00	0.00	0.83	22.47	31.49
	KE Area	Generation on RLNG (GWh)	0.00	0.00	0.00	496.34	2,664.40
		Share of RLNG Generation (%)	0.00	0.00	0.00	0.54	2.98
	Total	**Generation on RLNG (GWh)**	**0.00**	**0.00**	**657.88**	**21,174.66**	**30,813.32**
		Share of RLNG Generation (%)	**0.00**	**0.00**	**0.83**	**23.01**	**34.47**
RFO	PEPCO Area	Generation on RFO (GWh)	31,474.07	30,631.47	32,073.70	22,755.88	9,091.79
		Share of RFO Generation (%)	45.14	41.58	40.69	24.73	10.17
	KE Area‡‡	Generation on RFO (GWh)	3,742.00	3,818.00	5,034.50	5,403.30	4,734.08
		Share of RFO Generation (%)	5.37	5.18	6.39	5.87	5.30
	Total	**Generation on RFO (GWh)**	**35,216.07**	**34,449.47**	**37,108.20**	**28,159.18**	**13,825.87**
		Share of RFO Generation (%)	**50.51**	**46.76**	**47.08**	**30.60**	**15.46**
HSD	PEPCO Area	Generation on HSD (GWh)	3,186.29	1,512.28	1,704.54	788.18	27.74
		Share of HSD Generation (%)	4.57	2.05	2.16	0.86	0.03
	KE Area	Generation on HSD (GWh)	0.00	0.00	0.00	0.00	0.00
		Share of HSD Generation (%)	0.00	0.00	0.00	0.00	0.00
	Total	**Generation on HSD (GWh)**	**3,186.29**	**1,512.28**	**1,704.54**	**788.18**	**27.74**
		Share of HSD Generation (%)	**4.57**	**2.05**	**2.16**	**0.86**	**0.03**
Coal	PEPCO Area	Generation on Coal (GWh)	102.27	148.16	997.14	11,786.50	16,311.95
		Share of Coal Generation (%)	0.15	0.20	1.27	12.81	18.25
	KE Area	Generation on Coal (GWh)	0.00	0.00	62.00	438.49	413.51
		Share of Coal Generation (%)	0.00	0.00	5.85	3.59	2.47
	Total	**Generation on Coal (GWh)**	**102.27**	**148.16**	**1,059.14**	**12,224.99**	**16,725.46**
		Share of Coal Generation (%)	**0.15**	**0.20**	**1.34**	**13.29**	**18.71**
Total Thermal Generation			**69,719.57**	**73,672.33**	**78,818.50**	**92,013.90**	**89,402.93**

** Net Electricity Generation during FY 2017-18 and 2018-19. ** Including generation of SPPs/CPPs/N-CPPs in PEPCO system.*
‡ Including generation of IPPs in KE system. ‡‡ Including generation of IPPs/CPPs in KE system.
Source: GENCOs/IPPs/KE

11.4 HYDEL POWER GENERATION

Pakistan has a potential of around 40,000 MW hydropower, whereas the installed hydel power capacity of Pakistan at the end of FY 2018-19 was 9,761 MW. The share of existing hydel power installed capacity to the total installed generation capacity of the country is only 24.94% while this share in year 1985 was around 67%. The share of hydel power generation during FY 2018-19, in the energy mix of Pakistan, was 24.15% as against 21.01% during same period last year. Most of the installed hydel power capacity of the country is owned by public sector (WAPDA) and only 372 MW of installed hydel power capacity is in private sector.

As discussed earlier, the availability of hydel power generation is subject to seasonal variation i.e. it depends upon the reservoir levels, inflow of water and discharge of water from the reservoir. Monthly variation in maximum hydropower generation capability, during past five years, as provided by NPCC is given in the following table:

TABLE 29
Monthly Variation in Maximum Hydel Generating Capability (MW)

Month	Year	Tarbela	Mangla	Ghazi Barotha	Warsak	Chashma Hydel	Jinnah Hydel	Allai Khwar	Khan Khwar	Duber Khwar	Small Hydels	Neelum Jhelum	Tarbela 4th Ext.	Golen Gol	Total
July	2014	3,522	1,115	1,450	180	120	n.p.	n.p.	n.p.	n.p.	80	-	-	-	6,467
	2015	3,352	1,085	981	144	80	13	95	35	127	65	-	-	-	5,977
	2016	3,252	423	989	168	83	29	67	27	125	60	-	-	-	5,223
	2017	3,449	274	1,450	214	130	44	121	72	130	73	-	-	-	5,957
	2018	2,394	418	1,056	186	91	30	65	41	127	60	542	9	-	5,019
August	2014	3,605	1,115	1,450	175	184	n.p.	n.p.	n.p.	n.p.	78	-	-	-	6,607
	2015	3,547	777	972	156	53	16	82	0	121	66	-	-	-	5,790
	2016	3,386	638	998	175	132	28	52	28	118	67	-	-	-	5,622
	2017	3,478	1,105	1,450	213	121	24	140	72	130	69	-	-	-	6,802
	2018	3,445	239	1,038	198	85	22	64	37	113	58	590	-	-	5,889
September	2014	3,605	1,115	1,450	150	184	n.p.	n.p.	n.p.	n.p.	81	-	-	-	6,585
	2015	3,197	943	1,019	141	143	40	40	1	64	64	-	-	-	5,652
	2016	3,191	1,109	1,002	133	142	30	38	17	73	65	-	-	-	5,800
	2017	3,453	1,115	1,450	214	124	32	0	75	130	71	-	-	-	6,664
	2018	3,090	445	1,042	126	104	35	36	19	58	60	301	513	-	5,829
October	2014	3,605	1,000	1,450	150	181	n.p.	n.p.	n.p.	n.p.	82	-	-	-	6,468
	2015	1,156	1,000	721	91	110	51	41	6	40	56	-	-	-	3,272
	2016	1,577	781	900	85	127	34	21	10	36	45	-	-	-	3,616
	2017	3,453	1,115	1,450	177	179	45	121	72	65	71	-	-	-	6,748
	2018	862	402	777	71	86	43	31	16	32	49	234	519	11	3,133
November	2014	2,808	1,115	1,450	150	168	n.p.	n.p.	n.p.	n.p.	80	-	-	-	5,771
	2015	995	987	650	105	125	45	70	0	57	67	-	-	-	3,101
	2016	1,593	978	995	48	132	45	15	6	18	37	-	-	-	3,867
	2017	2,508	1,115	1,160	142	158	46	121	72	65	51	-	-	-	5,438
	2018	774	527	972	59	100	52	26	15	30	48	271	579	15	3,468
December	2014	2,268	1,115	1,160	148	140	n.p.	n.p.	n.p.	n.p.	61	-	-	-	4,892
	2015	828	650	561	85	98	36	29	0	19	47	-	-	-	2,353
	2016	771	537	619	61	86	35	11	5	3	33	-	-	-	2,161
	2017	2,144	822	1,450	178	130	44	100	72	130	45	-	-	-	5,115
	2018	433	387	434	50	68	33	16	8	18	37	155	90	11	1,740
January	2015	1,100	1,018	960	142	126	n.p.	n.p.	n.p.	n.p.	25	-	-	-	3,371
	2016	442	147	296	80	67	6	12	0	20	13	-	-	-	1,083
	2017	208	106	163	73	51	7	7	11	12	19	-	-	-	657
	2018	320	192	0	40	79	12	0	0	0	15	-	-	-	658
	2019	232	38	178	51	44	5	1	10	11	23	16	-	7	616
February	2015	2,049	977	1,450	141	158	n.p.	n.p.	n.p.	n.p.	77	-	-	-	4,852
	2016	1,075	1,005	721	72	96	36	15	0	21	29	-	-	-	3,070
	2017	741	470	598	84	89	28	40	29	27	37	-	-	-	2,143
	2018	1,774	634	1,375	240	117	36	121	72	65	35	-	-	-	4,469
	2019	573	375	632	61	100	20	25	24	18	34	134	178	7	2,181

Month	Year	Tarbela	Mangla	Ghazi Barotha	Warsak	Chashma Hydel	Jinnah Hydel	Allai Khwar	Khan Khwar	Duber Khwar	Small Hydels	Neelum Jhelum	Tarbela 4th Ext.	Golen Gol	Total
March	2015	1,355	803	1,160	140	150	n.p.	n.p.	n.p.	n.p.	73	-	-	-	3,681
	2016	746	684	533	97	103	43	89	0	57	62	-	-	-	2,414
	2017	511	327	466	72	71	31	54	32	41	51	-	-	-	1,656
	2018	1,061	311	1,160	142	91	48	61	72	65	48	-	-	-	3,059
	2019	416	528	384	72	78	26	67	36	30	60	329	-	7	2,033
April	2015	1,395	1,000	1,350	140	183	n.p.	n.p.	n.p.	n.p.	78	-	-	-	4,146
	2016	1,198	785	719	76	115	42	104	0	109	59	-	-	-	3,207
	2017	741	689	646	138	104	44	103	40	103	70	-	-	-	2,678
	2018	1,945	638	1,450	221	122	46	121	72	130	65	-	-	-	4,810
	2019	414	480	389	138	93	24	122	38	115	69	934	55	6	2,877
May	2015	3,290	1,115	1,450	185	181	n.p.	n.p.	n.p.	n.p.	93	-	-	-	6,314
	2016	2,434	664	1,033	76	133	42	114	0	128	69	-	-	-	4,693
	2017	1,914	796	1,037	154	104	49	79	38	120	65	-	-	-	4,356
	2018	2,020	638	1,450	280	122	44	121	130	130	70	-	-	-	5,005
	2019	798	753	1,030	185	106	10	102	44	125	66	954	591	10	4,774
June	2015	3,152	1,115	1,450	185	181	n.p.	n.p.	n.p.	n.p.	88	-	-	-	6,171
	2016	2,858	673	984	139	105	36	84	9	129	69	-	-	-	5,086
	2017	2,681	485	1,016	157	100	42	58	29	129	65	-	-	-	4,762
	2018	3,054	721	1,450	218	127	52	121	72	130	72	-	-	-	6,017
	2019	1,085	705	1,039	171	100	10	76	35	130	72	955	658	35	5,071

Source: National Power Control Centre, Islamabad

11.5 NUCLEAR POWER GENERATION

Pakistan Atomic Energy Commission, interalia, undertakes the projects of nuclear power plants' development, operation and maintenance in the country. The 1st Nuclear Power Plant (NPP) of the country, namely Karachi Nuclear Power Plant (KANUPP), was commissioned in 1971 in Karachi through a turn-key agreement. The total installed capacity of this plant was 137 MW and the useful life of this plant was 30 years. However, after completion of 30 years life, the Pakistan Nuclear Regulatory Authority extended the operational life of this plant, by another 15 year at reduced capacity. The 2nd NPP of the country, namely the Chashma Nuclear Power Plant (CHASNUPP-I) was commissioned in year 2000 also through a turnkey agreement by China National Nuclear Corporation. The installed capacity of this plant is 325 MW. The 3rd NPP namely Chashma Nuclear Power Plant (CHASNUPP-II) was commissioned on May 18, 2011. The installed capacity of this plant is 325 MW. The 4th NPP namely Chashma Nuclear Power Plant (CHASNUPP-III) having installed capacity of 340 MW was commissioned on December 28, 2016. During the reported period, the 5th NPP namely Chashma Nuclear Power Plant (CHASNUPP-IV) having installed capacity of 340 MW has been commissioned on September 19, 2017.

11.6 RENEWABLE ENERGY GENERATION (WIND, SOLAR AND BAGASSE)

Pakistan, like other developing countries of the region, is facing a serious challenge of energy deficit. Hence, Pakistan is working to expand the use of renewable energy to help bridge the gap of energy deficiency in the country. The country is blessed with natural resources that can be utilized to create electricity.

Renewable resources that are technologically viable and have prospects to be exploited commercially in Pakistan include wind energy, geothermal, solar energy, tidal energy, micro/small-hydel, bio-energy and emerging technologies like fuel cell, etc. Pakistan can benefit from these resources and can supplement existing energy resources as well as can use as primary energy source when no other option in available.

The Coastal Belt of Sindh is blessed with a wind corridor that is 60 km wide (Gharo-Kati Bandar) and 180 km long (up to Hyderabad). This corridor has the exploitable potential of 50,000 MW of electricity generation through wind energy. In addition to that there are other wind sites available in Coastal Area of Balochistan and some in Northern Areas. Technically the grid can take up to 30-40% of wind energy. Most of the remote villages in the south can be electrified through micro-wind turbines. At present, the share of renewable energy in the National Grid is non-existent as against a wind power potential of 63,000 MW in the country.

The Government of Pakistan established the Alternative Energy Development Board (AEDB) in 2003 to create an environment in the country that is conducive to investment from the private sector in renewable energy. Besides AEDB, the Irrigation and Power Departments of Punjab and Khyber Pakhtunkhwa are actively involved in development of small hydel power plants. The Provincial/AJ&K Organizations which are involved in development of small hydropower projects are as under:

(a) Pakhtunkhwa Energy Development Organization (PEDO)
(b) Punjab Power Development Board (PPDB)
(c) Energy Department, Sindh
(d) AJK Hydro Electric Board (AJKHEB) and AJK Private Power Cell

11.7 INVESTMENT PLAN FOR POWER GENERATION PROJECTS

The investment plan for power generation projects along with other details, for the years to come, as provided by the NTDC and PPIB are produced in the following tables respectively. Further, the investment plan for power generation projects under K-Electric have also been kept separately.

TABLE 30
Investment Plan for Power Generation Projects (K-Electric Limited) (2019-20 to 2022-23)

S. No.	Name of Project	Proposed Location	Capacity (MW)	Expected Com. Year	Estimated Cost (US$ Million)**
KE's Own Programme					
1	Addition of BQPS-III 900 MW RLNG Plant (Phase-I)	Bin Qasim	450	2020-21	639.00*
2	Addition of BQPS-III 900 MW RLNG Plant (Phase-II)	Bin Qasim	450	2021-22	
Plan to induct IPPs in KE system, if any (with KE's Equity Stake)					
1	Addition of 700 MW Datang Coal IPP	Bin Qasim	700	2021-22	900.00**
2	Addition of 450 MW RLNG Project	Bin Qasim	450	2022-23	392.00
Plan to induct IPPs in KE system, if any (without KE's Equity Stake)					
1	Addition of Gharo Solar Project	Gharo	50	2019-20	41.62
2	Addition of Captive Power Producers	-	11	2019-20	CPPs
3	Addition of Solar Projects (Uthal, Bela and Vinder)	-	100	2020-21	75.00**
4	Addition of Burj Wind	Thatta	50	2021-22	92.00
5	Addition of Multiple Solar Projects	-	150	2021-22	125.00**
6	Addition of Wind Project	Dhabeji	50	2021-22	63.00**
7	Addition of KANUPP-II & III	Karachi West	500	2022-23	-

** Including simultaneous investment in the associated transmission projects. ** These are estimates and are subject to change.*

TABLE 31
Investment Plan for Private Sector Power Generation Projects

S. No.	Name of the Project	Capacity (MW)	Estimated Investment (Million US$)	Achieved/ Expected COD	Latest Status of the Project
A:	HYDEL				
1	Gulpur Hydropower Project	102	317.17	October, 2019	Plant is under construction.
2	Karot Hydel Project	720	1698.26	December, 2021	Plant is under construction.
3	Suki Kinari Hydropower Project	870	1707.00	December, 2022	Plant is under construction.
4	Kohala Hydropower Project	1124	2364.05	June, 2026	LOS issued. Financial close in progress.
5	Azad Pattan Hydel Project	700	1357.16	June, 2026	LOS issued. Financial close in progress.
6	Ashkot Hydel Project	300	450.00	December, 2026	The project has been transferred by Govt. of AJ&K to PPIB for further processing. The project is currently under evaluation.
7	Mahl Hydropower Project	640	1472.00	June, 2028	LOI issued. Financial Study completed and approved by POE. Tariff Review Petition is with NEPRA for consideration.
8	Turtonas-Uzghor Hydropower Project	58	165.00	December, 2028	LOI issued. Feasibility Study of the project has been approved. Tariff Petition has been filed with NEPRA for determination/approval.
9	Athmuqam Hydropower Project	350	900.00	December, 2028	LOI issued. Feasibility Study in final stages of approval after which Tariff Petition will be filed with CPPA-G.
10	Kaigah Hydel Project	548	1260.40	COD will be assessed after issuance of LOI.	Projects will be advertised shortly.
11	Chakothi-Hattian Project	500	1150.00		
12	Rajdhani Hydropower Project	132	303.60		
13	Neckeherdm-Paur HPP	80	184.00		
14	Madian Hydropower Project	157	361.10		
15	Sehra Hydel Project	130	299.00		
B:	COAL				
1	Engro Powergen. Thar Coal Power Project	660	995.40	July, 2019	Plant is partially commissioned. 1st Unit (330 MW) synchronized on 18th March, 2019.
2	HUBCO Imported Coal Power Project	1320	1912.20	August, 2019	Plant is partially commissioned. 1st Unit (660 MW) synchronized on 29th December, 2018.
3	Grange Imported Coal PP	163	331.40	Project is under litigation.	
4	Thal Nova Power Thar Coal PP	330	497.70	March, 2021	LOS issued. Financial closing in progress.
5	Thar Energy Limited (HUBCO Project)	330	497.70	March, 2021	LOS issued. Financial closing in progress. Construction work has also been started.
6	Lucky Electric Thar Coal PP	660	1080.90	March, 2021	Plant is under construction.
7	Gwadar Imported Coal PP	300	435.00	December, 2022	LOI issued. Tariff Determination in progress.
8	Siddiqsons Energy Thar Coal PP	330	410.19	March, 2022	LOS issued. Financial closing in progress.
9	Shanghai Electric Thar Coal PP	1320	1912.20	February, 2023	LOS issued. Financial closing in progress.
10	Oracle Thar Coal Power Project	1320	1640.76	June, 2023	Issuance of NTP & LOI to Phase-I (700 MW) in progress.
C:	PIPELINE QUALITY GAS/DUAL FUEL/RLNG				
1	Punjab Thermal Power Project	1263	707.75	Open Cycle (800 MW) by December, 2019 Combined Cycle (1263 MW) by June, 2020.	Plant is in the process of achieving Financial Close. Construction work is also in progress in parallel.

Source: Private Power and Infrastructure Board, Islamabad

TABLE 32
Status of Renewable Energy Projects

A: Existing Projects (in-operation and under construction)

S. No.	Name of Project	Capacity (MW)	COD/ Expected COD	Estimated Cost (US$ Million)	Latest Status of the Project
Wind Power Projects:					
1	FFC Energy Limited	49.50	May, 2013	133.56	In Operation
2	Zorlu Energy Pakistan Limited	56.40	July, 2013	143.74	
3	Three Gorges First Wind Farm Pakistan (Pvt.) Limited	49.50	November, 2014	124.82	
4	Foundation Wind Energy-II Limited	50.00	December, 2014	124.91	
5	Foundation Wind Energy-I Limited	50.00	April, 2015	125.89	
6	Sapphire Wind Power Company (Pvt.) Limited	52.80	November, 2015	129.36	
7	Metro Power Company (Pvt.) Limited	50.00	September, 2016	125.24	
8	Yunus Energy Limited	50.00	September, 2016	131.00	
9	Tapal Wind Energy (Pvt.) Limited	30.00	October, 2016	78.60	
10	Tenega Generasi Limited	49.50	October, 2016	123.13	
11	Master Wind Energy (Pvt.) Limited	52.80	October, 2016	125.48	
12	Gul Ahmed Wind Power Limited	50.00	October, 2016	131.00	
13	HydroChina Dawood Power (Pvt.) Limited	49.50	April, 2017	121.75	
14	Sachal Energy Development (Pvt.) Limited	49.50	April, 2017	133.92	
15	United Energy Pakistan Limited	99.00	June, 2017	242.55	
16	Hawa Energy (Pvt.) Limited	49.74	March, 2018	107.50	
17	Jhampir Wind Power (Pvt.) Limited	49.74	March, 2018	106.64	
18	Artistic Energy (Pvt.) Limited	49.30	March, 2018	129.16	
19	Three Gorges Second Wind Farm Pakistan (Pvt.) Limited	49.50	June, 2018	106.42	
20	Three Gorges Third Wind Farm Pakistan (Pvt.) Limited	49.50	July, 2018	106.42	
21	Tricon Boston Consulting Corporation (Pvt.) Limited (A)	49.60	September, 2018	106.64	
22	Tricon Boston Consulting Corporation (Pvt.) Limited (B)	49.60	September, 2018	106.64	
23	Tricon Boston Consulting Corporation (Pvt.) Limited (C)	49.60	September, 2018	106.64	
24	Zephyr Power (Pvt.) Limited	48.30	November, 2018	106.50	
25	Master Green Energy Limited	50.00	November, 2020	63.91	Under Construction
Solar Power Projects:					
26	Quaid-e-Azam Solar Power (Pvt.) Limited	100.00	July, 2015	151.40	In Operation
27	Appolo Solar Development Pakistan Limited	100.00	May, 2016	151.40	
28	Best Green Energy Pakistan (Pvt.) Limited	100.00	July, 2016	151.40	
29	Crest Energy Pakistan Limited	100.00	July, 2016	151.40	
30	Harappa Solar (Pvt.) Limited	18.00	October, 2017	19.21	
31	AJ Power (Pvt.) Limited	12.00	December, 2017	12.80	
Bagasse/Biomass Co-Generation Projects:					
32	JDW Sugar Mills Limited (Unit-II)	26.35	June, 2014	26.24	In Operation
33	JDW Sugar Mills Limited (Unit-III)	26.35	October, 2014	26.24	
34	RYK Mills Limited	30.00	March, 2015	29.88	
35	Chiniot Power Limited	62.40	November, 2015	62.15	
36	Hamza Sugar Mills Limited	15.00	March, 2017	14.94	
37	Layyah Sugar Mills	41.00	December, 2017	40.84	
38	Almoiz Industries Limited	36.00	February, 2019	35.86	
39	Chanar Energy Limited	22.00	February, 2019	21.91	
40	Etihad Power Generation Limited	74.40	February, 2019	74.10	Tariff and Gen. Licence Acquired.

B:	Future Upcoming Projects				
S. No.	Name of Project	Capacity (MW)	COD/ Expected COD	Estimated Cost (US$ Million)	Latest Status of the Project
Wind Power Projects:					
1	Tricom Wind Power (Pvt.) Limited	50.00	February, 2021	63.91	Tariff and Generation Licence Acquired.
2	Shaheen Foundation, PAF	51.00	2021	64.15	
3	Western Energy (Pvt.) Limited	50.00	2021	63.12	
4	Trans Atlantic Energy (Pvt.) Limited	50.00	2021	62.87	
5	Lakeside Energy (Pvt.) Limited	50.00	2021	63.91	
6	Artistic Wind Power (Pvt.) Limited	50.00	2021	62.95	
7	Liberty Wind Power-1 (Pvt.) Limited	50.00	2021	63.91	
8	Indus Wind Energy Limited	50.00	2021	64.07	
9	Act 2 Wind (Pvt.) Limited	50.00	2021	62.95	
10	Liberty Wind Power-2 (Pvt.) Limited	50.00	2021	63.91	
11	Metro Wind Power Limited	50.00	2021	73.93	
12	NASDA Green Energy (Pvt.) Limited	50.00	2021	63.91	
13	Din Energy Limited	50.00	2021	63.91	
14	Gul Ahmed Electric Limited	50.00	2021	62.95	
Solar PV Power Projects:					
15	Access Solar (Pvt.) Limited	11.52	2021	12.29	LOS Stage.
16	Buksh Solar (Pvt.) Limited	10.00	2021	10.67	
17	Safe Solar Power (Pvt.) Limited	10.28	2021	10.97	
18	Access Electric (Pvt.) Limited	11.52	2021	12.29	
19	Zorlu Solar Pakistan (Pvt.) Limited	100.00	2021	75.50	Tariff and Generation Licence Acquired.
20	Helios Power (Pvt.) Limited	50.00	2021	40.65	
21	HNDS Energy (Pvt.) Limited	50.00	2021	40.65	
22	Meridian Energy (Pvt.) Limited	50.00	2021	40.65	
23	Zhenfa Pakistan New Energy Company (Pvt.) Limited	100.00	2021	66.13	
Bagasse/Biomass Co-Generation Projects:					
24	Shahtaj Sugar Mills Limited	32.00	2022	31.87	LOS Stage
25	Hunza Power (Pvt.) Limited	49.80	2022	49.60	
26	Bahawalpur Energy Limited	31.20	2022	31.08	
27	Indus Energy Limited	31.00	2022	30.88	
28	Ittefaq Power (Pvt.) Limited	31.20	2022	31.08	
29	Kashmir Power (Pvt.) Limited	40.00	2022	39.84	
30	Alliance Sugar Mills Limited	30.00	2022	29.88	
31	RYK Energy Limited	25.00	2022	24.90	
32	Two Star Industries (Pvt.) Limited	49.80	2022	48.70	
33	Mirpur Khas Energy Limited	26.00	2022	25.90	
34	TAY Powergen Company (Pvt.) Limited	30.00	2022	29.88	
35	Hamza Sugar Mill Limited (Unit-II)	30.00	2022	29.88	
36	Faran Power (Pvt.) Limited	26.50	2022	26.39	
37	Sheikhoo Power Limited	30.00	2022	29.88	
38	Mehran Energy Limited	26.50	2022	26.39	
39	Habib Sugar Mills Limited	26.50	2022	26.39	
40	Sadiqabad Power (Pvt.) Limited	45.00	2022	44.82	Tariff and Gen. Licence Acquired.
41	Gothki Power (Pvt.) Limited	45.00	2022	44.82	

** Expected COD of Bagasse based Power Projects is subject to the outcomes of the Court decision as the projects are sub-judice and subject to review of the Tariff Determination by NEPRA.*
Source: Alternative Energy Development Board, Islamabad

11.8 ECONOMIC LOAD DESPATCH SYSTEM

Based on the variable component (including FCC and variable O&M) of power plants, the National Power Control Centre, Islamabad decides the operation and load despatch of power plants in the country except the power plants operated by K-Electric. Merit Order position of power plants in the area of NTDC and K-Electric, during 2018-19 is given in following two tables:

TABLE 33
Merit Order for Power Generation Plants (PEPCO System)
(Based on the revised fuel prices effective from 19-06-2019)

Order in Merit	Plant Groups	Fuel Type	As on 19th June, 2019			Status in Last Year Merit Order (26-06-2018)
			Fuel Cost (Rs./kWh)	O&M Cost (Rs./kWh)	Specific Cost (Rs./kWh)	
1	Uch (upto 152.375 GWh)	Gas	1.76517	0.30959	2.07307	2
2	Liberty (upto 61.904 GWh)	Gas	1.94476	0.42960	2.37436	1
3	Uch (+ 152.375 GWh)	Gas	4.13110	0.30959	4.43900	3
4	Port Qasim	Coal	4.56200	0.47340	5.03540	15
5	Guddu 747 (CCP)	Gas	5.05710	0.44630	5.50340	4
6	HCPC	Gas	5.12483	0.57919	5.70402	5
7	KAPCO B-I (CC)	Gas	5.79162	0.34476	6.13638	6
8	Foundation Power	Gas	5.63950	0.51010	6.14960	7
9	Guddu B-I (CCP) (Unit 11-13)	Gas	6.22050	0.06890	6.28940	8
10	Uch-II	Gas	6.11512	0.29570	6.41082	13
11	Engro Power Gen.	Gas	6.25998	0.45050	6.71048	9
12	GTPS Faisalabad B-IV (CC) (Unit 5-9)	Gas	6.60860	0.14220	6.75080	10
13	KAPCO B-II (CC)	Gas	6.35243	0.40327	6.75570	11
14	JDW Sugar Mills Limited	Bagasse	6.20890	0.64650	6.85540	--
15	Guddu B-II (CCP) (Unit 5-10)	Gas	6.91140	0.06890	6.98030	12
16	Saihiwal Power	Coal	7.17010	0.16070	7.33080	33
17	KAPCO B-III (CC)	Gas	6.57000	0.77732	7.34732	14
18	GTPS Kotri B-III (CCP) (Unit 3-7)	Gas	7.46280	0.09250	7.55530	16
19	Guddu B-III (Unit 3-4)	Gas	8.29360	0.06890	8.36250	18
20	Muzaffargarh B-II (Unit 4)	Gas	8.29710	0.14220	8.43930	19
21	Muzaffargarh B-I (Unit 3)	Gas	8.30950	0.14220	8.45170	20
22	Jamshoro B-II (Unit 4)	Gas	8.46550	0.09250	8.55800	21
23	Muzaffargarh B-I (Unit 1)	Gas	8.49200	0.14220	8.63420	22
24	Jamshoro B-II (Unit 3)	Gas	8.65130	0.09250	8.74380	23
25	Muzaffargarh B-I (Unit 2)	Gas	8.60710	0.14220	8.74930	24
26	Guddu B-IV (Unit 1-2)	Gas	8.88580	0.06890	8.95470	25
27	Muzaffargarh B-III (Unit 5)	Gas	8.83470	0.14220	8.97690	27
28	Jamshoro B-II (Unit 2)	Gas	8.88750	0.09250	8.98000	26
29	KAPCO B-I (S/Cycle)	Gas	8.68743	0.34476	9.03219	28
30	Muzaffargarh B-III (Unit 6)	Gas	9.07630	0.14220	9.21850	29
31	Guddu B-I (W/O CCP) (Unit 11-13)	Gas	9.33075	0.06890	9.39965	30
32	NPPMC - HBS (CC)	RLNG	9.39114	0.50060	9.89174	37
33	KAPCO B-II (S/Cycle)	Gas	9.52865	0.40327	9.93192	31
34	NPPMC - Baloki (CC)	RLNG	9.51591	0.50019	10.01610	38
35	QATPL - Bhikki (CC)	RLNG	9.52161	0.50420	10.02581	39
36	GTPS Faisalabad B-IV (S/Cycle) (Unit 5-9)	Gas	9.91290	0.14220	10.05510	32
37	Liberty (+ 61.904 GWh)	Gas	9.72379	0.42960	10.15339	17
38	Guddu B-II (W/O CCP) (Unit 5-10)	Gas	10.36710	0.06890	10.43600	34
39	KAPCO B-III (S/Cycle)	Gas	9.85500	0.77732	10.63232	35
40	GTPS Kotri B-IV (W/O CCP) (Unit 3-7)	Gas	11.19420	0.09250	11.28670	36
41	Nandipur (CC)	RLNG	10.80490	0.51170	11.31660	40
42	Orient Power	RLNG	11.45610	0.30300	11.75910	41
43	Sapphire Electric	RLNG	11.45610	0.50980	11.96590	42
44	Saif Power	RLNG	11.45720	0.51560	11.97280	43
45	Halmore Power	RLNG	11.45680	0.51790	11.97470	44
46	Gulf Power Gen	RFO	11.05620	0.94750	12.00560	60
47	Jamshoro B-II (Unit 4)	Mix [5]	12.06450	0.09250	12.15700	63
48	Jamshoro B-II (Unit 3)	Mix [5]	12.32950	0.09250	12.42200	65
49	FKPCL	RLNG	11.67365	0.97473	12.65816	46
50	KAPCO B-I (CC)	RLNG	12.32774	0.34476	12.67250	45

Order in Merit	Plant Groups	Fuel Type	As on 19th June, 2019			Status in Last Year Merit Order (26-06-2018)
			Fuel Cost (Rs./kWh)	O&M Cost (Rs./kWh)	Specific Cost (Rs./kWh)	
51	Jamshoro B-II (Unit 2)	Mix [5]	12.66550	0.09250	12.75800	114
52	Rousch	RLNG	12.99979	0.36299	13.36278	53
53	Engro Power Gen.	Mix [3]	13.32554	0.45520	13.78074	48
54	KAPCO B-II (CC)	RLNG	13.52146	0.40327	13.92473	54
55	KAPCO B-I (CC)	RFO	13.39524	0.59804	13.99328	51
56	GTPS Faisalabad B-IV (Unit 5-9)	RLNG	14.06680	0.14220	14.20900	56
57	Guddu B-III (Unit 3-4)	Mix [2]	14.16550	0.06890	14.23440	50
58	Muzaffargarh B-II (Unit 4)	Mix [2]	14.28930	0.14220	14.43150	47
59	Muzaffargarh B-I (Unit 3)	Mix [2]	14.30960	0.14220	14.45180	49
60	Attock Gen.	RFO	13.24970	1.25810	14.50780	74
61	Narowal Energy	RFO	13.52300	1.13120	14.65420	73
62	Muzaffargarh B-I (Unit 1)	Mix [2]	14.60905	0.14220	14.75125	52
63	KAPCO B-III (CC)	RLNG	13.98457	0.77732	14.76189	62
64	Altern Energy (Phase-II)	RLNG	14.02376	0.88884	14.91260	57
65	Muzaffargarh B-I (Unit 2)	Mix [2]	14.79775	0.14220	14.93995	55
66	Jamshoro B-II (Unit 4)	Mix [2]	14.90230	0.09250	14.99480	78
67	Liberty Power Tech.	RFO	13.72509	1.36760	15.09269	67
68	Atlas Power	RFO	13.94840	1.24010	15.18850	72
69	Muzaffargarh B-III (Unit 5)	Mix [2]	15.17120	0.14220	15.31340	59
70	Kohinoor Energy	RFO	14.53940	0.77549	15.31489	77
71	Jamshoro B-II (Unit 3)	Mix [2]	15.22495	0.09250	15.31745	105
72	KAPCO B-II (CC)	RFO	14.70150	0.84181	15.54331	66
73	Muzaffargarh B-III (Unit 6)	Mix [2]	15.56755	0.14220	15.70975	64
74	Jamshoro B-II (Unit 2)	Mix [2]	15.64515	0.09250	15.73765	70
75	Nishat Power	RFO	14.52350	1.24000	15.76350	68
76	Nishat Chunian	RFO	14.85270	1.23710	16.08980	71
77	Pak Gen. Power	RFO	16.23430	0.22214	16.45644	87
78	Lal Pir Power	RFO	16.48443	0.22214	16.70657	84
79	Jamshoro B-II (Unit 4)	RLNG	16.68880	0.09250	16.78130	98
80	Davis Energen	RLNG	16.20109	0.66663	16.86772	75
81	Saba Power	RFO	16.91376	0.19558	17.10934	89
82	Jamshoro B-II (Unit 3)	RLNG	17.04280	0.09250	17.13530	79
83	Muzaffargarh B-II (Unit 4)	RLNG	17.14480	0.14220	17.28700	80
84	Muzaffargarh B-I (Unit 3)	RLNG	17.16910	0.14220	17.31130	92
85	KAPCO B-I (CC)	HSD	17.03240	0.34668	17.37908	85
86	Jamshoro B-II (Unit 2)	RLNG	17.50040	0.09250	17.59290	83
87	Muzaffargarh B-I (Unit 1)	RLNG	17.53490	0.14220	17.67710	86
88	Muzaffargarh B-I (Unit 2)	RLNG	17.76610	0.14220	17.90830	88
89	Muzaffargarh B-III (Unit 5)	RLNG	18.22150	0.14220	18.36370	93
90	KAPCO B-I (S/Cycle)	RLNG	18.49161	0.34476	18.83637	90
91	Muzaffargarh B-III (Unit 6)	RLNG	18.70350	0.14220	18.84570	96
92	Muzaffargarh B-II (Unit 4)	Mix [4]	18.71315	0.14220	18.85535	91
93	Muzaffargarh B-I (Unit 3)	Mix [4]	18.73940	0.14220	18.88160	101
94	Altern (Phase-I)	RLNG	18.01913	0.88884	18.90797	82
95	Reshma PowerGen	RFO	17.98290	1.04070	19.02070	94
96	HUBCO	RFO	18.86080	0.21498	19.07578	76
97	Jamshoro B-II (Unit 4)	Mix [4]	19.01395	0.09250	19.10645	121
98	KAPCO B-II (CC)	HSD	18.69326	0.46610	19.15936	99
99	Muzaffargarh B-I (Unit 1)	Mix [4]	19.13050	0.14220	19.27270	95
100	Jamshoro B-II (Unit 3)	Mix [4]	19.42070	0.09250	19.51320	123

Order in Merit	Plant Groups	Fuel Type	As on 19th June, 2019			Status in Last Year Merit Order (26-06-2018)
			Fuel Cost (Rs./kWh)	O&M Cost (Rs./kWh)	Specific Cost (Rs./kWh)	
101	Muzaffargarh B-I (Unit 2)	Mix [4]	19.37725	0.14220	19.51945	97
102	Orient Power	HSD	19.06210	0.49680	19.55890	106
103	Halmore Power	HSD	18.89318	0.74760	19.64078	107
104	Sapphire Electric	HSD	18.91340	0.73590	19.64930	108
105	Saif Power	HSD	19.20560	0.74420	19.94980	111
106	Muzaffargarh B-III (Unit 5)	Mix [4]	19.86460	0.14220	20.00680	102
107	Jamshoro B-I (Unit 1)	RFO	19.94840	0.09250	20.04090	115
108	Jamshoro B-II (Unit 2)	Mix [4]	19.95160	0.09250	20.04410	125
109	Guddu B-III (CCP) (Unit 3-4)	RFO	20.03740	0.06890	20.10630	104
110	Muzaffargarh B-II (Unit 4)	RFO	20.28150	0.14220	20.42370	100
111	Muzaffargarh B-I (Unit 3)	RFO	20.30970	0.14220	20.45190	--
112	KAPCO B-III (CC)	HSD	19.33281	1.17702	20.50983	117
113	Muzaffargarh B-III (Unit 6)	Mix [4]	20.38115	0.14220	20.52335	110
114	KAPCO B-II (S/Cycle)	RLNG	20.28219	0.40327	20.68546	112
115	KAPCO B-I (S/Cycle)	HSD	20.09286	0.59804	20.69090	126
116	Engro Power Gen.	HSD	20.39110	0.45990	20.85100	118
117	Muzaffargarh B-I (Unit 1)	RFO	20.72610	0.14220	20.86830	109
118	Muzaffargarh B-I (Unit 2)	RFO	20.98840	0.14220	21.13060	113
119	QATPL - Bhikki (CC)	HSD	20.65729	0.72750	21.38479	--
120	Jamshoro B-II (Unit 4)	RFO	21.33910	0.09250	21.43160	--
121	Muzaffargarh B-III (Unit 5)	RFO	21.50770	0.14220	21.64990	116
122	NPPMC - HBS (CC)	HSD	20.98115	0.72240	21.70355	--
123	KAPCO B-III (S/Cycle)	RLNG	20.97686	0.77732	21.75418	119
124	NPPMC - Baloki (CC)	HSD	21.14197	0.72160	21.86357	--
125	Jamshoro B-II (Unit 3)	RFO	21.79860	0.09250	21.89110	--
126	Muzaffargarh B-III (Unit 6)	RFO	22.05880	0.14220	22.20100	120
127	Jamshoro B-II (Unit 2)	RFO	22.40280	0.09250	22.49530	--
128	KAPCO B-II (S/Cycle)	RFO	22.05225	0.84181	22.89406	122
129	KAPCO B-I (S/Cycle)	HSD	25.54860	0.34668	25.89528	103
130	KAPCO B-II (S/Cycle)	HSD	28.03989	0.46610	28.50599	128
131	KAPCO B-III (S/Cycle)	HSD	28.99922	1.17702	30.17624	129

([2]) Mixed [50% RFO & 50% Gas] *([3]) Mixed [50% HSD & 50% Gas]*
([4]) Mixed [50% RFO & 50% RLNG] *([5]) Mixed [Gas & RLNG]*
Source: National Power Control Centre, Islamabad

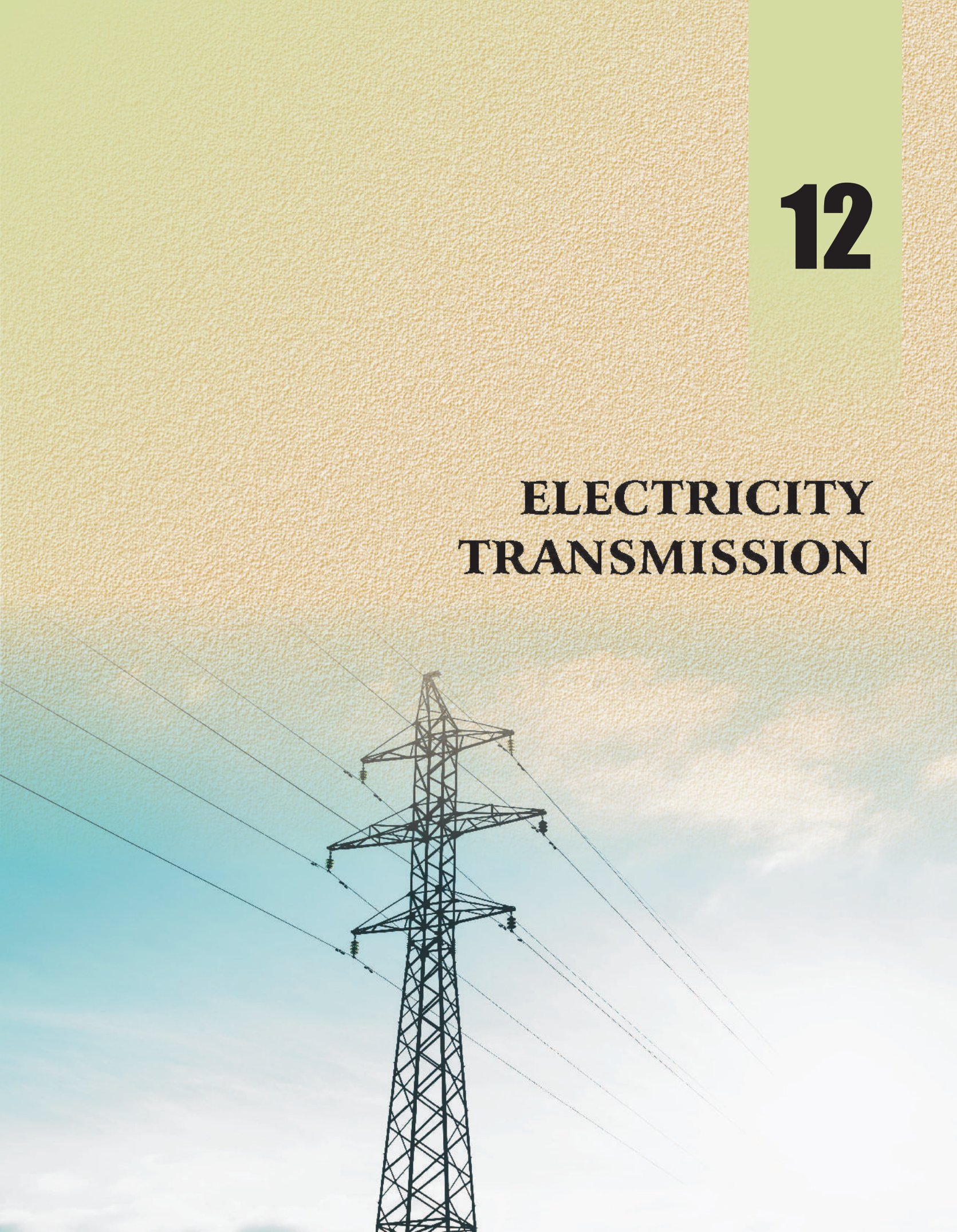
TABLE 34
Merit Order for Power Generation Plants (K-Electric System)
(Based on the Present Net Heat Rate at 100% Plant Factor) (Rs./kWh)

S. No.	Plant Groups	Fuel Type	As on 31st December, 2018			As on 31st March, 2019			As on 30th June, 2019		
			Fuel Cost	O&M Cost	Total Cost	Fuel Cost	O&M Cost	Total Cost	Fuel Cost	O&M Cost	Total Cost
1	BQPS-I	Gas	6,217	2,929	42,554	8,125	4,350	53,174	12,226	5,443	79,637
2	BQPS-I	FO	33,408			40,699			61,968		
1	BQPS-II	Gas	15,537	1,791	17,328	23,167	3,065	26,232	31,167	3,455	34,622
2	Korangi CCPP	Gas	4,772	1,122	5,894	6,181	1,671	7,852	9,220	2,092	11,312
3	SITE GTPS-II	Gas	1,605	673	2,278	1,682	946	2,628	2,791	1,220	4,011
4	Korangi GTPS-II	Gas	1,712	679	2,391	2,113	1,010	3,123	3,243	1,276	4,519

Source: KE

12

ELECTRICITY TRANSMISSION



ELECTRICITY TRANSMISSION

12.1 GENERAL

In Pakistan, there are two companies which are, presently engaged, in the business of electric power transmission under Section 17 of the NEPRA Act. One is NTDC and the other is K-Electric Limited. NTDC is the National Grid Company of Pakistan and is exclusively responsible for construction, operation, maintenance of 500 kV and 220 kV Grid Stations and Power Transmission Lines in the country except for the area served by K-Electric. NTDC is a public sector company and came into existence as a result of restructuring of WAPDA in 1998 and then obtained a transmission licence from NEPRA in 2002. At present, NTDC owns a network of 500 kV, 220 kV and some 132 kV (interconnections at CDPs) transmission lines and grid stations in its network.

Besides NTDC, the other company which is engaged in electric power transmission business is K-Electric. K-Electric is a vertically integrated company operating in private sector since 2005. Earlier the company was in public sector and responsible for generation, transmission and distribution of electric power in its service area. The transmission network of K-Electric is connected to the National Grid (NTDC system) by 220 kV and 132 kV links.

In addition to above, under Section 19 of the NEPRA Act, Special Purpose Transmission Licence was granted to the private companies i.e. Fatima Transmission Company Limited and Sindh Transmission and Dispatch Company (Pvt.) Limited.

12.2 TRANSMISSION LINES AND GRID STATIONS WITH NTDC

The interconnected transmission system of NTDC comprises 500 kV and 220 kV transmission lines and grid stations. The status of transmission lines and grid stations, at the end of fiscal years from 2015 to 2019, owned and operated by NTDC are mentioned in the following table:

TABLE 35
Transmission Lines and Grid Stations with NTDC

A: Transmission Lines

As on 30th June	500 kV		220 kV		Total T/Ls and No. of Circuits	
	No. of Circuits	TL (km)	No. of Circuits	TL (km)	No. of Circuits	Total km
2015	30	5,077	93	9,624	123	14,701
2016	32	5,113	96	9,632	128	14,745
2017	36	5,127	111	10,063	147	15,190
2018	45	5,618	122	10,478	167	16,096
2019	48	6,417	149	11,228	197	17,646

B: Grid Stations

As on 30th June	500/220 kV		220/132 kV		Total No. of Grid Stations and MVA Capacity	
	No. of G/Ss	MVA Capacity	No. of Grid Stations	MVA Capacity	Grid Stations	MVA Capacity
2015	13	16,950	35	22,854	48	39,804
2016	14	18,150	36	24,040	50	42,190
2017	14	18,150	38	25,610	52	43,760
2018	16	20,850	42	28,860	58	49,710
2019	16	24,791	45	29,935	61	54,726

Source: NTDC

12.3 TRANSMISSION LOSSES

The history of transmission losses of NTDC system for the years 2014-15 to 2018-19 is shown in the following table:

TABLE 36
Unit Received, Delivered and Transmission Losses in NTDC System (500/220 kV) (GWh)

	Unit	2014-15	2015-16	2016-17	2017-18	2018-19
Unit Received by NTDC	GWh	97,474.00	101,150.00	106,798.00	120,062.00	122,302.00
Unit Delivered by NTDC	GWh	94,909.00	98,550.00	104,331.00	117,139.00	118,838.00
Unit Losses (Transmission)	GWh	2,565.00	2,600.00	2,467.00	2,923.00	3,464.00
	%	2.63	2.57	2.31	2.43	2.83

Source: NTDC

12.4 UTILIZATION OF TRANSMISSION LINES AND POWER TRANSFORMERS

Optimum utilization of transmission lines and power transformers in any electric power system is important and has a very significant impact both technically as well as financially. The position of utilization of transmission lines in the NTDC's network for the years 2014-15 to 2018-19 is mentioned in following table:

TABLE 37
Loading Position of Transmission Lines and Power Transformers in NTDC System

A: Loading Position of Transmission Lines

		2014-15	2015-16	2016-17	2017-18	2018-19
Overloaded Transmission	500 kV	2	2	2	9	16
Lines/Circuits (Nos.) (>80%)	220 kV	32	16	19	43	52
Underutilized Transmission	500 kV	30	33	34	39	29
Lines/Circuits (Nos.) (<30%)	220 kV	74	96	95	120	95

B: Loading Position of Power Transformers

		2014-15	2015-16	2016-17	2017-18	2018-19
Overloaded Power Transformers	500 kV	5	4	14	22	16
(Nos.) (>80%)	220 kV	47	45	63	60	51
Underutilized Power Transformers	500 kV	22	25	18	17	16
(Nos.) (<30%)	220 kV	43	63	69	64	75

Source: NTDC

12.5 TRANSMISSION LINES TRIPPING IN PEPCO SYSTEM

The tripping records of transmission lines in PEPCO system for fiscal years from 2014-15 to 2018-19 are given in the following table:

TABLE 38
Transmission Lines Tripping in PEPCO System

Year	Description	Planned Outages		Forced Outages	
		500 kV	220 kV	500 kV	220 kV
2014-15	No. of Outages	469	777	76	250
	Total duration in minutes	267263	230783	85656	727395
	Maximum duration of any single outage (Minutes)	3729	1990	12347	244003
2015-16	No. of Outages	559	886	82	287
	Total duration in minutes	275191	406952	1885661	243431
	Maximum duration of any single outage (Minutes)	10289	1057	133045	61028
2016-17	No. of Outages	653	1114	122	336
	Total duration in minutes	286623	498620	29463	141619
	Maximum duration of any single outage (Minutes)	16521	16313	3894	13854
2017-18	No. of Outages	812	1893	145	451
	Total duration in minutes	306551	858850	50551	273037
	Maximum duration of any single outage (Minutes)	25930	29037	7407	43411
2018-19	No. of Outages	704	1577	119	461
	Total duration in minutes	377422	785674	64896	317331
	Maximum duration of any single outage (Minutes)	23740	51258	23063	38542

Source: NTDC

12.6 TRANSMISSION LINES AND GRID STATIONS WITH K-ELECTRIC

The statistics of transmission lines and grid stations in respect of K-Electric for fiscal years from 2014-15 to 2018-19 are given in the following tables:

TABLE 39
Transmission Lines and Grid Stations with K-Electric Limited

		2014-15	2015-16	2016-17	2017-18	2018-19
A.	**Length of Transmission Lines in KE (km)**					
Overhead Lines	220 kV	323	323	323	323	322
	132 kV	611	611	613	614	640
	66 kV	149	149	149	149	149
Underground Lines	220 kV	15	15	15	15	14
	132 kV	151	151	153	153	158
	66 kV	0	1	1	1	1

B. Number of Grid Stations in KE Transmission System

		2014-15		2015-16		2016-17		2017-18		2018-19	
		No.	MVA	No.	MVA	No.	MVA	No.	MVA	No.	MVA
KE's Owned Grid Stations	220 kV	7	3000	7	3000	7	3000	7	3000	9	3500
	132 kV	54	4732	54	5131	54	5196	54	5550	56	6109
	66 kV	3	69	3	69	3	69	3	69	3	69
Consumers Owned Grid Stations	220 kV	1	80	1	80	1	80	1	80	1	80
	132 kV	9	452	9	452	9	452	9	512	10	538
	66 kV	0	0	0	0	0	0	0	0	0	0
Total No. of Grid Stations		74	8333	74	8732	74	8797	74	9211	79	10296

Source: KE

TABLE 40

A. Amount Injected to Reinforce/Expand 220 kV and 132 kV Transmission System of K-Electric Limited (Million Rs.)

Description	2017-18			2018-19		
	FC	LC	Total	FC	LC	Total
Grid Stations	6,810	1,438	8,248	1,410	2,033	3,443
Transmission	5,717	1,420	7,137	3,029	3,714	6,743
SCADA	461	91	552	963	91	1,054
Reinforcement	6,858	2,105	8,963	2,638	3,233	5,871
Total	**19,846**	**5,054**	**24,900**	**8,040**	**9,071**	**17,111**

B. Investment Plan in Transmission Line (220 kV and 132 kV) of K-Electric Limited (Million US$)*

Description	2019-20			2020-21		
	FC	LC	Total	FC	LC	Total
Grid Stations	31	25	56	42	23	65
Transmission	27	40	67	5	14	19
SCADA	4	4	8	31	15	46
Reinforcement	34	26	60	33	17	50
Total	**96**	**95**	**191**	**111**	**69**	**180**

** These are estimates and are subject to change.*
FC: Foreign Currency LC: Local Currency
Source: KE

12.7 TRANSMISSION LINES TRIPPING IN K-ELECTRIC SYSTEM

The tripping records of transmission lines in K-Electric system for fiscal years from 2014-15 to 2018-19 are given in the following table:

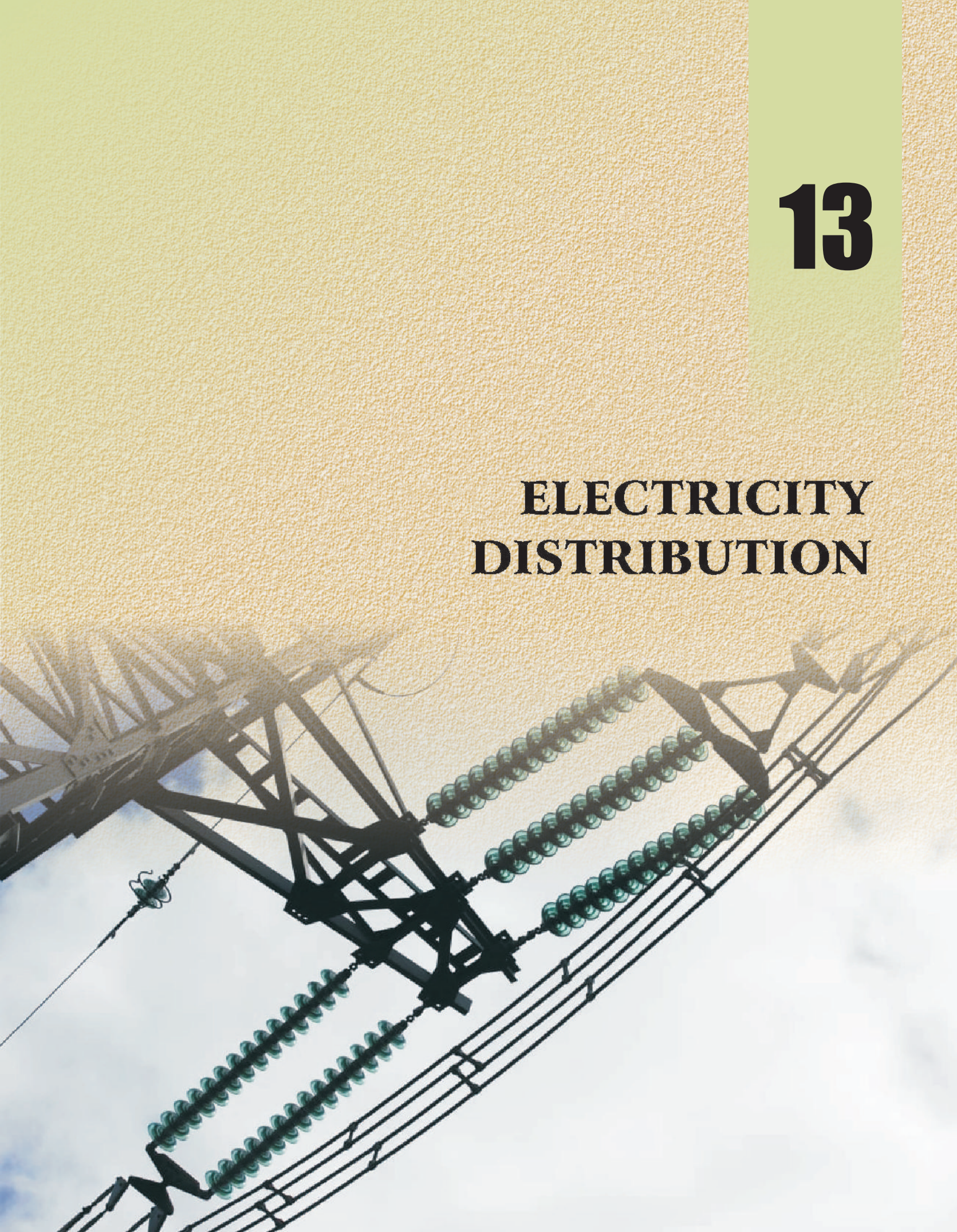
TABLE 41
Transmission Lines Tripping in K-Electric Limited System

Year	Description	Planned Outages		Forced Outages	
		220 kV	132 kV	220 kV	132 kV
2014-15	No. of Outages	0	12	0	39
	Total duration in minutes	0	3662	0	5190
	Maximum duration of any single outage (Minutes)	0	849	0	631
2015-16	No. of Outages	0	5	0	25
	Total duration in minutes	0	1034	0	4125
	Maximum duration of any single outage (Minutes)	0	607	0	730
2016-17	No. of Outages	0	9	0	45
	Total duration in minutes	0	5271	0	8792
	Maximum duration of any single outage (Minutes)	0	1315	0	970
2017-18	No. of Outages	0	7	0	26
	Total duration in minutes	0	4855	0	2451
	Maximum duration of any single outage (Minutes)	0	2320	0	362
2018-19	No. of Outages	0	10	0	46
	Total duration in minutes	0	13049	0	4997
	Maximum duration of any single outage (Minutes)	0	3723	0	469

Source: KE

13

ELECTRICITY DISTRIBUTION



ELECTRICITY DISTRIBUTION

13.1 GENERAL

Presently there are ten distribution companies in public sector, which are distributing electric power to end-consumers in Pakistan except the area served by K-Electric. In the area of Karachi city and its suburbs, K-Electric is solely responsible for distribution of electric power to end-consumers under a separate distribution licence granted by NEPRA. In addition to ten public sector Distribution Companies, one private sector Distribution Company i.e. K-Electric Limited and two distribution licenses to Housing Colonies, NEPRA has granted nine distribution licenses to Small Power Producers and one distribution licence to Captive Power Producer for supply of electric power to designated BPCs.

13.2 ROLE OF DISTRIBUTION COMPANIES

The distribution companies licensed under Section 21 of NEPRA Act are responsible for channeling electricity from the transmission substations below 220 kV to the consumers at different distribution voltages. The distribution network is composed of lines and grid stations of 132 kV and lower voltage levels, and each distribution company is responsible for constructing, operating, and maintaining the power distribution facilities within its dedicated geographic area.

TABLE 42
Peak Demand of Distribution Companies (MW)

DISCO	2014-15	2015-16	2016-17	2017-18	2018-19
PESCO	2,798	2,809	3,110	3,242	3,296
Peak Demand Growth Rate over Last Year	1.89	0.39	10.72	4.24	1.67
TESCO	668	570	609	772	799
Peak Demand Growth Rate over Last Year	2.30	(14.67)	6.84	26.77	3.50
IESCO	2,277	2,297	2,314	2,452	2,348
Peak Demand Growth Rate over Last Year	(11.23)	0.88	0.74	5.96	(4.24)
GEPCO	2,386	2,321	2,413	2,429	2,309
Peak Demand Growth Rate over Last Year	8.95	(2.72)	3.96	0.66	(4.94)
LESCO	5,021	4,404	4,765	4,980	4,616
Peak Demand Growth Rate over Last Year	9.44	(12.29)	8.20	4.51	(7.31)
FESCO	3,091	3,056	3,053	3,036	2,904
Peak Demand Growth Rate over Last Year	4.46	(1.13)	(0.10)	(0.56)	(4.35)
MEPCO	2,892	3,495	3,663	4,018	4,115
Peak Demand Growth Rate over Last Year	(18.99)	20.85	4.81	9.69	2.41
HESCO	1,167	1,172	1,234	1,256	1,209
Peak Demand Growth Rate over Last Year	(4.03)	0.43	5.29	1.78	(3.74)
SEPCO	1,357	1,378	1,359	1,318	1,279
Peak Demand Growth Rate over Last Year	5.36	1.55	(1.38)	(3.02)	(2.96)
QESCO	1,762	1,765	1,770	1,800	n.p.
Peak Demand Growth Rate over Last Year	6.79	0.17	0.28	1.69	---
KE	3,056	3,195	3,270	3,527	3,530
Peak Demand Growth Rate over Last Year	4.34	4.55	2.35	7.86	0.09
Peak Demand in PEPCO System	**23,419**	**23,267**	**24,290**	**25,303**	**22,875**
Peak Demand Growth Rate over Last Year	**(0.03)**	**(0.65)**	**4.40**	**4.17**	**(9.60)**

Source: Distribution Companies / KE

TABLE 43
Category-wise Number of Consumers

DISCO	As on 30th June	Domestic	Comm-ercial	Industrial	Agricultural	Public Lighting	Bulk Supply	Others/ General	Total
PESCO	2015	2602181	298739	30344	23328	1040	888	47	2956567
	2016	2703406	309919	31204	23371	1057	863	76	3069896
	2017	2805422	321802	32023	23289	1088	904	48	3184576
	2018	2908414	337386	29872	23083	1096	925	30131	3330907
	2019	3029784	349985	26582	22896	1083	887	41228	3472445
TESCO	2015	400613	28217	4101	8576	0	55	0	441562
	2016	401234	28277	4142	8031	0	55	0	441739
	2017	402521	28382	4236	6741	0	61	0	441941
	2018	402209	28625	4268	6118	5	57	1119	442401
	2019	402031	28688	4243	6187	5	65	1367	442586
IESCO	2015	2085256	350989	15048	8192	1674	968	40	2462167
	2016	2174389	362837	15480	8293	1713	876	149	2563737
	2017	2270874	374610	15979	8436	1742	892	149	2672682
	2018	2405253	394381	16053	7182	1761	886	11722	2837238
	2019	2528865	411219	16272	7087	1829	960	13758	2979990
GEPCO	2015	2506136	313573	60542	42563	514	149	16	2923493
	2016	2621619	324937	63705	43055	532	153	16	3054017
	2017	2726893	334915	66845	43594	549	157	16	3172969
	2018	2860915	349789	70063	44749	578	164	16	3326274
	2019	3021760	366047	73133	46887	580	152	20393	3528952
LESCO	2015	3228511	542738	77277	58382	2227	490	237	3909862
	2016	3403443	561030	79588	59136	2338	490	241	4106266
	2017	3556800	576691	81640	59664	2424	496	246	4277961
	2018	3848417	602268	84183	60621	2547	499	249	4598784
	2019	4108067	623529	84703	61547	2554	494	8968	4889862
FESCO	2015	3012756	344642	46602	39522	1500	218	117	3445357
	2016	3141713	356032	47909	39995	1566	227	123	3587565
	2017	3280658	368321	49350	40580	1640	229	128	3740906
	2018	3457159	383451	49314	40772	1719	232	20485	3953132
	2019	3651710	399688	50027	42763	1782	223	25216	4171409
MEPCO	2015	4508987	476683	51135	77317	1402	428	120	5116072
	2016	4746997	494523	52845	78399	1448	437	124	5374773
	2017	5050877	514327	54176	79965	1470	451	124	5701390
	2018	5398111	536876	54772	80944	1494	460	126	6072783
	2019	5748493	559213	56121	85977	1501	454	33673	6485432
HESCO	2015	798206	146831	14311	16578	332	533	97	976888
	2016	825409	150786	14784	16786	533	334	99	1008731
	2017	861184	156200	15313	17286	540	335	98	1050956
	2018	877263	159627	14924	13730	540	337	14293	1080714
	2019	907377	163791	15250	14434	540	342	13926	1115660
SEPCO	2015	581305	115574	12094	12484	412	504	19	722392
	2016	590240	117093	12405	12503	414	504	19	733178
	2017	593355	117824	12606	12145	412	507	19	736868
	2018	589884	119384	12674	9221	421	519	13205	745308
	2019	603885	121776	12930	9270	425	527	13319	762132
QESCO	2015	423876	105721	3662	31139	247	238	4	564887
	2016	432262	108797	3754	31504	251	244	4	576816
	2017	442895	112445	3877	31824	254	253	4	591552
	2018	453232	116267	3730	29580	265	261	5669	609004
	2019	463332	120311	3688	29608	268	266	7128	624601

DISCO	As on 30th June	Domestic	Comm-ercial	Industrial	Agricultural	Public Lighting	Bulk Supply	Others/ General	Total
Total in PEPCO System	2015	20147827	2723707	315116	318081	9348	4471	697	23519247
	2016	21040712	2814231	325816	321073	9852	4183	851	24516718
	2017	21991479	2905517	336045	323524	10119	4285	832	25571801
	2018	23200857	3028054	339853	316000	10426	4340	97015	26996545
	2019	24465304	3144247	342949	326656	10567	4370	178976	28473069
KE	2015	1695782	439130	20614	2488	77	198	1	2158290
	2016	1758467	444687	20626	2623	72	201	1	2226677
	2017	1945721	456517	20868	2619	73	199	1	2425998
	2018	2096451	463670	20647	2398	74	194	1	2583435
	2019	2298616	474626	20842	2329	93	188	11375	2808069

Source: Distribution Companies / KE

TABLE 44

Number of Circles, Divisions, Sub-Divisions, 11 kV Feeders and Loading Position of 11 kV Feeders

DISCO	As on 30th June	Circles	Divisions	Sub-Divisions	11 kV Feeders	Loading Position of 11 kV Feeders (Nos.)				%age
						80-90%	91-100%	Above 100%	Total	
PESCO	2015	6	34	149	877	97	137	183	417	47.55
	2016	7	34	158	907	103	126	167	396	43.66
	2017	8	39	172	946	84	183	218	485	51.27
	2018	8	39	187	1,012	155	139	118	412	40.71
	2019	8	39	187	1,056	82	110	147	339	32.10
TESCO	2015	1	6	18	183	41	42	-	83	45.36
	2016	1	6	18	195	71	103	-	174	89.23
	2017	1	7	20	199	14	185	-	199	100.00
	2018	1	7	20	207	17	190	-	207	100.00
	2019	1	9	18	215	21	128	-	149	69.30
IESCO	2015	5	19	108	965	63	40	12	115	11.92
	2016	5	19	108	1,036	41	19	12	72	6.95
	2017	5	19	108	1,058	11	12	4	27	2.55
	2018	5	19	109	1,068	17	8	0	25	2.34
	2019	5	19	109	1,116	5	13	9	27	2.42
GEPCO	2015	5	24	115	745	206	116	36	358	48.05
	2016	5	24	115	779	111	50	6	167	21.44
	2017	5	24	118	805	49	32	7	88	10.93
	2018	5	24	118	835	32	23	4	59	7.07
	2019	5	24	118	864	29	13	2	44	5.09
LESCO	2015	7	33	164	1,540	395	234	70	699	45.39
	2016	7	33	192	1,580	123	189	38	350	22.15
	2017	7	33	192	1,650	133	315	100	548	33.21
	2018	8	36	196	1,741	197	259	85	541	31.07
	2019	8	39	199	1,821	226	206	69	501	27.51
FESCO	2015	4	24	130	901	91	65	13	169	18.76
	2016	4	24	130	936	91	83	15	189	20.19
	2017	4	24	130	998	94	63	2	159	15.93
	2018	4	25	138	1023	105	43	1	149	14.57
	2019	4	26	140	1,054	74	48	6	128	12.14
MEPCO	2015	8	35	160	1,139	114	304	9	427	37.49
	2016	9	37	170	1,165	194	130	104	428	36.74
	2017	9	37	174	1,241	210	142	81	433	34.89
	2018	9	37	174	1,324	156	157	60	373	28.17
	2019	9	37	179	1,392	139	105	13	257	18.46

DISCO	As on 30th June	Circles	Divisions	Sub-Divisions	11 kV Feeders	Loading Position of 11 kV Feeders (Nos.)				%age
						80-90%	91-100%	Above 100%	Total	
HESCO	2015	4	15	67	425	15	47	24	86	20.24
	2016	4	15	67	435	21	61	21	103	23.68
	2017	4	15	68	479	33	54	34	121	25.26
	2018	4	15	68	502	18	38	13	69	13.75
	2019	4	15	69	533	26	32	10	68	12.76
SEPCO	2015	7	29	96	433	73	51	76	200	46.19
	2016	7	29	96	453	64	46	69	179	39.51
	2017	7	29	96	462	47	41	79	167	36.15
	2018	7	29	96	490	56	45	56	157	32.04
	2019	7	29	96	531	52	28	38	118	22.22
QESCO	2015	4	14	46	570	23	17	45	85	14.91
	2016	6	14	54	613	47	67	107	221	36.05
	2017	6	14	55	628	51	71	111	233	37.10
	2018	6	14	55	641	56	74	81	211	32.92
	2019	6	14	55	642	56	74	70	200	31.15
Total in PEPCO System	2015	51	233	1,053	7,778	1,118	1,053	468	2,639	33.93
	2016	55	235	1,108	8,099	866	874	539	2,279	28.14
	2017	56	241	1,133	8,466	726	1,098	636	2,460	29.06
	2018	57	245	1,161	8,843	809	976	418	2,203	24.91
	2019	57	251	1,170	9,224	710	757	364	1,831	19.85

	As on 30th June	IBCs	11 kV Feeders	Loading Position of 11 kV Feeders (Nos.)				%age
				80-90%	91-100%	Above 100%	Total	
KE	2015	28	1,431	156	69	40	265	18.52
	2016	29	1,524	76	20	8	104	6.82
	2017	29	1,653	70	15	6	91	5.51
	2018	29	1,729	22	6	1	29	1.68
	2019	30	1,807	28	10	10	48	2.66

Source: Distribution Companies / KE

TABLE 45
Category-wise Sanctioned Load (MW)

DISCO	As on 30th June	Domestic	Commercial	Industrial	Agricultural	Public Lighting	Bulk Supply	Others	Total
PESCO	2015	3427.01	658.62	1327.97	169.88	55.11	244.47	3.88	5886.94
	2016	3649.69	690.88	1377.96	170.92	52.78	198.62	55.07	6195.92
	2017	3870.45	726.79	1460.72	169.04	52.90	256.27	3.62	6539.79
	2018	4015.16	766.87	1510.76	166.92	53.12	282.78	208.33	7003.94
	2019	4228.14	782.35	1563.31	163.48	50.59	282.84	402.83	7473.54
TESCO	2015	754.00	35.00	96.00	93.00	0.00	4.00	0.00	982.00
	2016	758.00	35.00	102.00	90.00	0.00	4.00	0.00	989.00
	2017	795.00	45.00	132.00	100.00	0.00	5.00	0.00	1077.00
	2018	801.00	65.00	156.00	200.00	0.00	8.00	0.00	1230.00
	2019	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.	0.00
IESCO	2015	3723.28	1043.20	971.22	88.68	99.37	483.05	289.01	6697.81
	2016	3889.96	1078.30	995.53	90.48	99.70	502.30	290.14	6946.41
	2017	4083.11	1115.34	1034.46	93.29	100.01	554.40	290.27	7270.88
	2018	4258.00	1170.00	1065.00	69.00	100.00	543.00	481.00	7686.00
	2019	4471.00	1200.00	1090.00	63.00	101.00	825.00	340.00	8090.00

DISCO	As on 30th June	Domestic	Comm-ercial	Industrial	Agricultural	Public Lighting	Bulk Supply	Others	Total
GEPCO	2015	3542.88	646.61	1528.06	297.27	33.73	88.76	0.74	6138.05
	2016	3761.73	680.89	1605.40	301.12	33.11	89.20	0.74	6472.20
	2017	3968.27	717.26	1685.37	305.40	32.40	91.26	1.22	6801.18
	2018	4215.95	774.77	1769.90	317.48	32.73	98.99	93.04	7302.86
	2019	4531.07	827.30	1860.78	336.79	22.22	77.08	153.97	7809.21
LESCO	2015	4912.00	1482.00	3915.00	596.00	112.00	179.00	42.00	11238.00
	2016	5225.00	1558.00	4112.00	607.00	113.00	200.00	41.00	11856.00
	2017	5525.57	1638.61	4294.52	615.92	113.11	217.88	42.25	12447.86
	2018	6074.75	1735.78	4521.90	637.46	115.45	253.24	42.36	13380.95
	2019	6456.77	1766.64	4691.43	612.69	113.45	259.37	366.92	14267.26
FESCO	2015	7290.00	768.00	1901.00	451.00	11.00	187.00	7.00	10615.00
	2016	7638.00	805.00	2006.00	454.00	11.00	199.00	7.00	11120.00
	2017	8024.00	856.00	2118.00	462.00	10.00	204.00	7.00	11681.00
	2018	8492.00	916.00	2221.00	459.00	11.00	216.00	149.00	12464.00
	2019	9041.00	988.00	2290.00	487.00	11.00	218.00	224.00	13259.00
MEPCO	2015	6292.03	917.43	2194.31	1195.08	15.19	105.09	23.74	10742.87
	2016	6657.42	959.06	2251.58	1193.60	14.33	112.96	24.02	11212.97
	2017	7124.70	1003.99	2291.82	1210.08	14.20	117.80	23.69	11786.28
	2018	7895.99	1095.65	2494.57	1253.41	14.99	136.42	24.38	12915.41
	2019	8343.12	1162.52	2585.25	1372.99	15.08	140.19	302.33	13921.48
HESCO	2015	1065.48	269.34	777.41	229.41	44.77	25.56	8.21	2420.18
	2016	1104.19	281.22	816.79	233.02	23.93	47.76	8.29	2515.20
	2017	1161.14	298.80	854.15	236.85	24.02	47.29	8.46	2630.71
	2018	1151.18	302.40	863.55	182.26	24.02	57.50	154.50	2735.41
	2019	1201.10	318.95	902.73	194.71	24.08	61.37	157.41	2860.35
SEPCO	2015	655.01	192.22	362.59	178.80	12.30	52.09	2.20	1455.20
	2016	661.68	196.44	379.85	171.75	12.57	70.02	2.75	1495.06
	2017	667.88	200.42	409.58	167.65	12.56	61.40	2.24	1521.73
	2018	625.26	206.91	426.26	109.72	12.67	68.67	119.68	1569.17
	2019	644.62	213.97	446.66	109.65	12.72	74.21	119.37	1621.20
QESCO	2015	629.99	174.02	158.28	864.48	5.47	52.44	0.02	1884.68
	2016	642.31	178.40	163.17	875.75	5.49	53.18	0.02	1918.32
	2017	656.20	184.81	171.74	885.65	5.54	54.49	0.02	1958.46
	2018	657.65	191.68	176.26	826.34	5.72	60.59	87.27	2005.52
	2019	674.34	198.78	180.43	957.54	5.76	69.46	103.54	2189.86
Total in PEPCO System	2015	32291.67	6186.43	13231.84	4163.60	388.94	1421.45	376.79	58060.73
	2016	33987.98	6463.19	13810.28	4187.65	365.90	1477.04	429.04	60721.07
	2017	35876.32	6787.02	14452.37	4245.88	364.75	1609.79	378.77	63714.89
	2018	38186.95	7225.06	15205.21	4221.59	369.70	1725.19	1359.56	68293.25
	2019	39591.16	7458.50	15610.59	4297.86	355.90	2007.53	2170.36	71491.90
KE	2015	4008.00	1579.00	1674.00	40.00	1.00	135.00	0.00	7437.00
	2016	4450.00	1625.00	1751.00	43.00	1.00	147.00	0.00	8017.00
	2017	5047.00	1709.00	1847.00	43.00	1.00	189.00	0.00	8836.00
	2018	5659.16	1831.01	2035.40	44.00	1.43	190.10	0.00	9761.10
	2019	6297.76	1888.21	2169.88	44.06	1.60	191.20	135.73	10728.44

Source: Distribution Companies / KE

TABLE 46
Category-wise Electricity Sold (GWh)

DISCO	Year	Domestic	Comm-ercial	Industrial	Agricultural	Public Lighting	Bulk Supply	Others	Total
PESCO	2014-15	4296.71	653.63	2019.91	92.61	14.17	519.50	2.38	7598.91
	2015-16	4481.63	702.62	1955.74	82.43	12.87	279.85	267.77	7782.91
	2016-17	4882.80	739.50	2131.50	83.10	13.24	579.70	2.19	8432.03
	2017-18	4928.26	769.93	2321.87	78.90	13.47	642.50	40.60	8795.53
	2018-19	4828.51	791.78	2342.93	66.66	13.03	667.90	362.75	9073.56
TESCO	2014-15	972.43	6.43	62.96	51.90	0.00	7.47	0.00	1101.19
	2015-16	881.16	7.49	88.16	44.17	0.00	7.50	0.00	1028.48
	2016-17	1017.69	6.86	145.26	49.72	0.00	7.60	0.00	1227.13
	2017-18	1195.16	5.93	227.68	42.01	0.00	8.59	2.48	1481.85
	2018-19	1212.94	5.13	326.86	36.49	0.00	9.30	12.34	1603.06
IESCO	2014-15	3704.00	844.00	1671.00	93.00	76.00	1755.00	4.00	8147.00
	2015-16	4093.00	932.00	1663.00	98.00	71.00	1078.00	839.00	8774.00
	2016-17	4557.10	1073.10	1744.10	106.10	72.10	951.05	1124.00	9627.55
	2017-18	5035.44	1200.07	1861.61	96.35	72.58	2283.58	56.31	10605.94
	2018-19	4991.00	1202.00	1811.00	47.00	74.00	2359.00	305.00	10789.00
GEPCO	2014-15	3987.39	404.96	2076.92	285.38	6.30	293.12	1.13	7055.20
	2015-16	4563.95	478.00	2371.17	341.80	6.64	326.16	1.12	8088.83
	2016-17	5081.33	544.74	2424.36	363.50	7.50	355.46	0.89	8777.78
	2017-18	5757.44	615.06	2696.34	400.60	7.91	381.88	27.61	9886.84
	2018-19	5804.60	602.68	2596.87	449.10	6.45	399.33	145.31	10004.34
LESCO	2014-15	6550.28	1235.28	6887.75	1084.09	94.36	468.99	7.61	16328.36
	2015-16	7219.80	1402.25	6896.16	1203.48	97.59	514.39	8.31	17341.98
	2016-17	8159.96	1578.03	6173.45	1196.52	95.18	572.30	7.37	17782.81
	2017-18	9021.27	1792.33	7587.38	1259.50	119.05	660.91	8.06	20448.50
	2018-19	9043.00	1685.00	8153.00	1147.00	110.00	667.00	327.00	21132.00
FESCO	2014-15	4426.20	492.06	3971.81	787.81	7.44	316.56	4.36	10006.24
	2015-16	5037.06	562.72	3938.90	790.02	8.06	358.80	4.73	10700.29
	2016-17	5709.59	657.89	3844.79	929.97	11.09	341.21	4.22	11498.76
	2017-18	6506.58	737.86	4220.72	1066.69	12.39	338.75	41.58	12924.57
	2018-19	6486.18	737.08	4697.54	1107.98	10.35	268.36	192.19	13499.68
MEPCO	2014-15	6013.54	657.39	3070.54	1745.20	16.16	200.22	8.20	11711.25
	2015-16	6626.63	730.06	2855.18	1880.00	16.37	224.10	8.33	12340.67
	2016-17	7567.44	846.06	2289.66	2271.17	19.72	252.38	6.77	13253.20
	2017-18	8945.73	967.10	2960.58	2659.32	20.37	293.19	6.93	15853.22
	2018-19	8914.59	945.93	3011.39	2879.97	18.20	294.95	244.58	16309.61
HESCO	2014-15	2421.06	270.51	760.25	416.24	105.12	42.77	3.61	4019.56
	2015-16	2094.92	279.54	812.63	420.38	35.73	92.32	3.65	3739.17
	2016-17	2155.02	307.88	721.33	400.33	35.31	94.45	3.81	3718.13
	2017-18	2342.17	315.19	759.07	372.78	37.64	104.59	95.52	4026.96
	2018-19	2155.74	294.88	753.18	264.20	27.70	112.58	308.40	3916.68
SEPCO	2014-15	1233.13	164.70	412.18	226.00	68.85	141.44	1.67	2247.97
	2015-16	1349.54	201.99	430.72	238.62	42.54	149.67	1.51	2414.59
	2016-17	1650.48	235.63	439.06	245.32	39.24	176.65	1.35	2787.73
	2017-18	1759.45	218.81	465.88	245.18	27.29	177.99	68.21	2962.81
	2018-19	1596.67	209.51	419.90	109.89	20.20	177.07	247.37	2780.61
QESCO	2014-15	573.16	108.93	140.00	3067.74	2.91	101.00	0.06	3993.80
	2015-16	593.60	114.76	136.09	3263.37	3.84	108.11	0.07	4219.84
	2016-17	637.07	124.94	153.09	3417.43	4.92	115.02	0.11	4452.58
	2017-18	672.30	131.05	173.04	3762.35	8.25	122.16	46.82	4915.97
	2018-19	557.50	127.40	171.70	3567.40	9.10	126.70	218.90	4778.70

DISCO	Year	Domestic	Comm-ercial	Industrial	Agricultural	Public Lighting	Bulk Supply	Others	Total
Total in PEPCO System	2014-15	34177.90	4837.89	21073.32	7849.97	391.31	3846.07	33.02	72209.48
	2015-16	36941.29	5411.43	21147.75	8362.27	294.64	3138.90	1134.49	76430.76
	2016-17	41418.48	6114.63	20066.60	9063.16	298.30	3445.82	1150.71	81557.70
	2017-18	46163.80	6753.33	23274.17	9983.68	318.95	5014.14	394.12	91902.19
	2018-19	45590.73	6601.39	24284.37	9675.69	289.03	5082.19	2363.84	93887.24
KE	2014-15	6150.00	1600.00	3844.00	166.00	110.00	410.00	13.00	12293.00
	2015-16	6596.00	1685.00	3830.00	163.00	163.00	412.00	15.00	12864.00
	2016-17	6643.00	1655.00	3885.00	159.00	187.00	433.00	19.00	12981.00
	2017-18	7169.68	1758.22	4123.85	151.49	156.54	471.10	29.44	13860.32
	2018-19	7298.83	1780.58	4402.12	134.30	160.48	477.22	64.58	14318.11

Source: Distribution Companies / KE

TABLE 47
Total Units Purchased, Sold and Losses

DISCO	Year	Unit Purchased (GWh)			Unit Sold (GWh)	Losses	
		Through NTDC	Through CPPs, SPPs etc.	Total Unit Purchased		GWh	%age
PESCO	2014-15	11657.30	0.00	11657.30	7598.91	4058.39	34.81
	2015-16	11751.00	0.00	11751.00	7782.91	3968.09	33.77
	2016-17	12510.96	0.00	12510.96	8432.03	4078.93	32.60
	2017-18	14220.30	0.00	14220.30	8795.53	5424.77	38.15
	2018-19	14301.80	0.00	14301.80	9073.56	5228.24	36.56
TESCO	2014-15	1425.00	0.00	1425.00	1101.19	323.81	22.72
	2015-16	1269.00	0.00	1269.00	1028.48	240.52	18.95
	2016-17	1450.58	0.00	1450.58	1227.13	223.45	15.40
	2017-18	1692.82	0.00	1692.82	1481.85	210.97	12.46
	2018-19	1790.00	0.00	1790.00	1603.06	186.94	10.44
IESCO	2014-15	8993.00	0.00	8993.00	8147.00	846.00	9.41
	2015-16	9652.00	0.00	9652.00	8774.00	878.00	9.10
	2016-17	10582.64	0.00	10582.64	9627.55	955.09	9.03
	2017-18	11672.97	0.00	11672.97	10605.94	1067.03	9.14
	2018-19	10838.00	0.00	11838.00	10789.00	1049.00	8.86
GEPCO	2014-15	7902.19	0.00	7902.19	7055.20	846.99	10.72
	2015-16	9045.48	0.00	9045.48	8088.83	956.65	10.58
	2016-17	9778.56	0.00	9778.56	8777.78	1000.78	10.23
	2017-18	10986.45	0.00	10986.45	9886.84	1099.61	10.01
	2018-19	11099.96	0.00	11099.96	10004.34	1095.62	9.87
LESCO	2014-15	19009.00	0.00	19009.00	16328.36	2680.64	14.10
	2015-16	20151.92	0.00	20151.92	17341.98	2809.94	13.94
	2016-17	20621.54	0.00	20621.54	17782.81	2838.73	13.77
	2017-18	23731.24	0.00	23731.24	20448.50	3282.74	13.83
	2018-19	24338.45	0.00	24338.45	21132.00	3206.45	13.17
FESCO	2014-15	11243.37	0.00	11243.37	10006.24	1237.13	11.00
	2015-16	11920.35	0.00	11920.35	10700.29	1220.06	10.24
	2016-17	12857.80	0.00	12857.80	11498.76	1359.04	10.57
	2017-18	12548.87	1897.54	14446.41	12924.57	1521.84	10.53
	2018-19	13889.66	1079.09	14968.75	13499.68	1469.07	9.81
MEPCO	2014-15	13819.83	39.12	13858.95	11711.25	2147.70	15.50
	2015-16	13328.75	1441.50	14770.25	12340.67	2429.58	16.45
	2016-17	12156.93	3794.65	15951.58	13253.20	2698.38	16.92
	2017-18	14928.56	4077.41	19005.97	15853.22	3152.75	16.59
	2018-19	13494.60	5872.05	19366.65	16309.61	3057.04	15.79

DISCO	Year	Unit Purchased (GWh)			Unit Sold (GWh)	Losses	
		Through NTDC	Through CPPs, SPPs etc.	Total Unit Purchased		GWh	%age
HESCO	2014-15	4965.00	547.00	5512.00	4019.56	1492.44	27.08
	2015-16	3245.50	1839.86	5085.36	3739.17	1346.19	26.47
	2016-17	3298.98	2057.46	5356.44	3718.13	1638.31	30.59
	2017-18	3815.59	1927.43	5743.02	4026.96	1716.06	29.88
	2018-19	3568.00	1986.00	5554.00	3916.68	1637.32	29.48
SEPCO	2014-15	4114.41	231.47	4345.88	2247.97	2097.91	48.27
	2015-16	4168.17	20.24	4188.41	2414.59	1773.82	42.35
	2016-17	4457.32	25.33	4482.65	2787.73	1694.92	37.81
	2017-18	4653.40	25.33	4678.73	2962.81	1715.92	36.67
	2018-19	4386.30	25.33	4411.63	2780.61	1631.02	36.97
QESCO	2014-15	5193.50	0.00	5193.50	3993.80	1199.70	23.10
	2015-16	5538.01	0.00	5538.01	4219.84	1318.17	23.80
	2016-17	5788.76	0.00	5788.76	4452.58	1336.18	23.08
	2017-18	6338.40	0.00	6338.40	4915.97	1422.43	22.44
	2018-19	6251.40	0.00	6251.40	4778.70	1472.70	23.56
Total in PEPCO System	2014-15	88322.60	817.59	89140.19	72209.48	16930.72	18.99
	2015-16	90070.18	3301.60	93371.78	76430.76	16941.02	18.14
	2016-17	93504.07	5877.44	99381.51	81557.70	17823.81	17.93
	2017-18	104588.60	7927.71	112516.31	91902.19	20614.12	18.32
	2018-19	103958.17	8962.47	112920.64	93887.24	19033.40	16.86

KE	As on 30th June	Unit Purchased (GWh)				Unit Sold (GWh)	Losses	
		KE Own	Through NTDC	Through CPPs + Others	Total Unit Purchased		GWh	%age
	2014-15	9319.00	5427.00	2069.00	16815.00	12293.00	4522.00	26.89
	2015-16	10323.00	5059.00	1922.00	17304.00	12864.00	4440.00	25.66
	2016-17	10147.00	5077.00	2128.00	17352.00	12981.00	4371.00	25.19
	2017-18	10337.75	5128.20	2705.89	18171.84	13860.32	4311.52	23.73
	2018-19	10727.67	4936.71	2842.45	18506.83	14318.11	4188.72	22.63

Source: Distribution Companies / KE

TABLE 48
Units Billed and Amount Realized in DISCOs (2018-19)

DISCO		Unit	Domestic	Comm-ercial	Industrial	Agric-ultural	Public Lighting	Bulk Supply	Others	Total
PESCO	*	GWh	4828.51	791.78	2342.93	66.66	13.03	667.90	362.75	9073.56
	**	Rs. Mln.	59224.40	19685.60	35748.04	770.40	299.57	12241.72	7448.32	135418.05
	***	Rs. Mln.	50682.00	19338.48	35506.22	754.66	296.42	6187.03	7238.07	120002.88
		%	85.58	98.24	99.32	97.96	98.95	50.54	97.18	88.62
TESCO	*	GWh	1212.94	5.13	326.86	36.49	0.00	9.30	12.34	1603.06
	**	Rs. Mln.	17071.30	171.50	6434.63	617.55	0.03	219.80	264.86	24779.67
	***	Rs. Mln.	11340.66	54.25	4141.35	359.10	0.03	145.46	143.60	16184.45
		%	66.43	31.63	64.36	58.15	100.00	66.18	54.22	65.31
IESCO	*	GWh	4991.00	1202.00	1811.00	47.00	74.00	2359.00	305.00	10789.00
	**	Rs. Mln.	66394.00	30633.00	27943.00	59.00	1710.00	42498.00	6347.00	175584.00
	***	Rs. Mln.	65277.00	30437.00	28022.00	566.00	1616.00	22075.00	6300.00	154293.00
		%	98.32	99.36	100.28	959.32	94.50	51.94	99.26	87.87
GEPCO	*	GWh	5804.60	602.68	2596.87	449.10	6.45	399.33	145.31	10004.34
	**	Rs. Mln.	73350.84	16861.91	40433.75	3407.03	173.26	7305.32	2476.10	144008.21
	***	Rs. Mln.	72485.02	16727.09	39969.09	3379.49	396.45	2016.70	3806.51	138780.35
		%	98.82	99.20	98.85	99.19	228.82	27.61	153.73	96.37
LESCO	*	GWh	9043.00	1685.00	8153.00	1147.00	110.00	667.00	327.00	21132.00
	**	Rs. Mln.	127787.00	44726.00	119257.00	10894.00	2464.00	13648.00	6935.00	325711.00
	***	Rs. Mln.	125702.00	43900.00	116915.00	9853.00	2525.00	12516.00	6631.00	318042.00
		%	98.37	98.15	98.04	90.44	102.48	91.71	95.62	97.65
FESCO	*	GWh	6486.18	737.08	4697.54	1107.98	10.35	268.36	192.19	13499.68
	**	Rs. Mln.	81031.86	19590.67	82922.31	9070.52	254.75	5296.76	4094.46	202261.33
	***	Rs. Mln.	80671.71	19321.12	66033.82	8490.62	268.73	5198.68	4127.17	184111.85
		%	99.56	98.62	79.63	93.61	105.49	98.15	100.80	91.03
MEPCO	*	GWh	8914.59	945.93	3011.39	2879.97	18.20	294.95	244.58	16309.61
	**	Rs. Mln.	108403.17	25043.91	55569.60	23114.82	411.23	5933.39	5074.69	223550.81
	***	Rs. Mln.	107671.52	24625.45	45870.12	19707.87	422.63	5638.65	5209.87	209146.11
		%	99.33	98.33	82.55	85.26	102.77	95.03	102.66	93.56
HESCO	*	GWh	2155.74	294.88	753.18	264.20	27.70	112.58	308.40	3916.68
	**	Rs. Mln.	26536.62	7687.36	14864.37	2813.87	612.17	2436.19	6427.89	61378.47
	***	Rs. Mln.	14741.63	7392.19	12565.46	2498.09	451.91	1974.23	4911.36	44534.87
		%	55.55	96.16	84.53	88.78	73.82	81.04	76.41	72.56
SEPCO	*	GWh	1596.67	209.51	419.90	109.89	20.20	177.07	247.37	2780.61
	**	Rs. Mln.	19107.02	5330.45	7322.96	1264.10	472.70	3724.53	5318.89	42540.65
	***	Rs. Mln.	6780.44	5092.22	7046.47	1105.89	233.70	2765.90	3897.95	26922.57
		%	35.49	95.53	96.22	87.48	49.44	74.26	73.29	63.29
QESCO	*	GWh	557.50	127.40	171.70	3567.40	9.10	126.70	218.90	4778.70
	**	Rs. Mln.	7416.28	3390.64	3415.87	54668.78	209.99	2629.16	4687.02	76417.74
	***	Rs. Mln.	4528.72	3247.94	2895.63	4408.40	35.63	2148.89	1385.34	18650.55
		%	61.06	95.79	84.77	8.06	16.97	81.73	29.56	24.41
Total in PEPCO System	*	GWh	61449.09	6767.76	30392.14	10256.75	289.06	5292.69	2616.36	93887.24
	**	Rs. Mln.	586322.49	173121.04	393911.53	106680.07	6607.70	95932.87	49074.23	1411649.93
	***	Rs. Mln.	539880.70	170135.74	358965.16	51123.12	6246.50	60666.54	43650.87	1230668.63
		%	92.08	98.28	91.13	47.92	94.53	63.24	88.95	87.18
KE	*	GWh	7298.83	1780.58	4402.12	134.30	160.48	477.22	64.58	14318.11
	**	Rs. Mln.	104293.27	45235.67	65079.61	1070.98	2783.60	9077.72	1097.86	228638.71
	***	Rs. Mln.	92482.71	44138.00	64998.32	315.99	266.31	8515.50	1040.64	211757.47
		%	88.68	97.57	99.88	29.50	9.57	93.81	94.79	92.62

** Units Billed ** Amount of Units Billed *** Amount Realized and %age Recovery to Billed Amount*

Source: Distribution Companies / KE

TABLE 49
Average Annual Electricity Consumption per Connection (kWh)

DISCO	Year	Dom-estic	Comm-ercial	Industrial	Agric-ultural	Public Lighting	Bulk Supply	Others	Overall
PESCO	2014-15	1651.20	2187.96	66567.03	3969.91	13625.00	585022.52	50638.30	2570.18
	2015-16	1657.77	2267.11	62675.94	3527.02	12175.97	324275.78	3523289.47	2535.24
	2016-17	1740.49	2298.00	66561.53	3568.21	12169.12	641261.06	45625.00	2647.77
	2017-18	1694.48	2282.04	77727.30	3418.10	12290.15	694594.59	1347.45	2640.58
	2018-19	1593.68	2262.33	88139.72	2911.43	12031.39	752987.60	8798.63	2613.02
TESCO	2014-15	2427.36	227.88	15352.35	6051.77	0.00	135818.18	0.00	2493.85
	2015-16	2196.12	264.88	21284.40	5499.94	0.00	136363.64	0.00	2328.25
	2016-17	2528.29	241.70	34291.78	7375.76	0.00	124590.16	0.00	2776.68
	2017-18	2971.49	207.16	53345.83	6866.62	0.00	150701.75	2216.26	3349.56
	2018-19	3017.03	178.82	77035.12	5897.85	0.00	143076.92	9027.07	3622.03
IESCO	2014-15	1776.28	2404.63	111044.66	11352.54	45400.24	1813016.53	100000.00	3308.87
	2015-16	1882.37	2568.65	107428.94	11817.20	41447.75	1230593.61	5630872.48	3422.35
	2016-17	2006.76	2864.58	109149.51	12577.05	41389.21	1066199.55	7543624.16	3602.21
	2017-18	2093.52	3042.92	115966.49	13415.48	41215.22	2577404.06	4803.79	3738.12
	2018-19	1973.61	2923.02	111295.48	6631.86	40459.27	2457291.67	22168.92	3620.48
GEPCO	2014-15	1591.05	1291.43	34305.44	6704.98	12256.81	1967221.48	70375.00	2413.28
	2015-16	1740.89	1471.04	37221.13	7938.68	12479.32	2131732.03	69937.50	2648.59
	2016-17	1863.41	1626.50	36268.38	8338.30	13661.20	2264076.43	55625.00	2766.42
	2017-18	2012.45	1758.37	38484.51	8952.16	13685.12	2328536.59	1725625.00	2972.35
	2018-19	1920.93	1646.46	35508.87	9578.35	11120.69	2627171.05	7125.48	2834.93
LESCO	2014-15	2028.89	2276.02	89130.66	18568.91	42370.90	957122.45	32109.70	4176.20
	2015-16	2121.32	2499.42	86648.24	20351.06	41740.80	1049775.51	34481.33	4223.30
	2016-17	2294.19	2736.35	75617.96	20054.30	39265.68	1153830.65	29959.35	4156.84
	2017-18	2344.15	2975.97	90129.60	20776.63	46741.26	1324468.94	32369.48	4446.50
	2017-19	2201.28	2702.36	96253.97	18636.16	43069.69	1350202.43	36462.98	4321.59
FESCO	2014-15	1469.15	1427.74	85228.32	19933.45	4960.00	1452110.09	37264.96	2904.27
	2015-16	1603.28	1580.53	82216.29	19752.97	5146.87	1580616.74	38455.28	2982.61
	2016-17	1740.38	1786.19	77908.61	22916.95	6762.20	1490000.00	32968.75	3073.79
	2017-18	1882.06	1924.26	85588.68	26162.32	7207.68	1460129.31	2029.78	3269.45
	2018-19	1776.20	1844.14	93900.09	25909.78	5808.08	1203408.07	7621.75	3236.24
MEPCO	2014-15	1333.68	1379.09	60047.72	22572.01	11526.39	467803.74	68333.33	2289.11
	2015-16	1395.96	1476.29	54029.33	23979.90	11305.25	512814.65	67177.42	2296.04
	2016-17	1498.24	1644.98	42263.36	28402.05	13414.97	559600.89	54596.77	2324.56
	2017-18	1657.20	1801.35	54052.80	32853.82	13634.54	637369.57	55000.00	2610.54
	2018-19	1550.77	1691.54	53658.88	33496.98	12125.25	649669.60	7263.39	2514.81
HESCO	2014-15	3033.13	1842.32	53123.47	25107.97	316626.51	80243.90	37216.49	4114.66
	2015-16	2538.04	1853.89	54966.86	25043.49	67035.65	276407.19	36868.69	3706.81
	2016-17	2502.39	1971.06	47105.73	23159.20	65388.89	281940.30	38877.55	3537.86
	2017-18	2669.86	1974.54	50862.37	27150.76	69703.70	310356.08	6682.99	3726.20
	2018-19	2375.79	1800.34	49388.85	18304.00	51296.30	329181.29	22145.63	3510.64
SEPCO	2014-15	2121.31	1425.06	34081.36	18103.17	167111.65	280634.92	87894.74	3111.84
	2015-16	2286.43	1725.04	34721.48	19085.02	102753.62	296964.29	79473.68	3293.32
	2016-17	2781.61	1999.85	34829.45	20199.26	95242.72	348422.09	71052.63	3783.21
	2017-18	2982.71	1832.83	36758.72	26589.31	64821.85	342947.98	5165.47	3975.28
	2018-19	2644.00	1720.45	32474.86	11854.37	47529.41	335996.20	18572.72	3648.46
QESCO	2014-15	1352.19	1030.35	38230.48	98517.61	11781.38	424369.75	15000.00	7070.09
	2015-16	1373.24	1054.81	36252.00	103585.89	15298.80	443073.77	17500.00	7315.75
	2016-17	1438.42	1111.12	39486.72	107385.31	19370.08	454624.51	27500.00	7526.95
	2017-18	1483.35	1127.15	46391.42	127192.36	31132.08	468045.98	8258.95	8072.15
	2018-19	1203.24	1058.92	46556.40	120487.71	33955.22	476315.79	30709.88	7650.80

DISCO	Year	Dom-estic	Comm-ercial	Industrial	Agric-ultural	Public Lighting	Bulk Supply	Others	Overall
Total in PEPCO System	2014-15	1696.36	1776.21	66874.80	24679.17	41860.29	860225.01	47368.72	3070.23
	2015-16	1755.71	1922.88	64907.04	26044.76	29906.52	750393.26	1333124.56	3117.50
	2016-17	1883.39	2104.49	59714.03	28013.87	29479.20	804158.69	1383064.90	3189.36
	2017-18	1989.75	2230.25	68483.05	31593.92	30591.79	1155331.80	4062.46	3404.22
	2018-19	1863.49	2099.51	70810.44	29620.43	27352.13	1162972.54	13207.58	3297.40
KE	2014-15	3626.65	3643.57	186475.21	66720.26	1428571.43	2070707.07	13000000.0	5695.71
	2015-16	3750.99	3789.18	185687.97	62142.58	2263888.89	2049751.24	15000000.0	5777.22
	2016-17	3414.16	3625.28	186170.21	60710.19	2561643.84	2175879.40	19000000.0	5350.79
	2017-18	3419.91	3791.96	199731.20	63173.48	2115405.41	2428350.52	29440000.0	5365.07
	2018-19	3175.32	3751.54	211213.90	57664.23	1725591.40	2538404.26	5677.36	5098.92

Source: Distribution Companies / KE

TABLE 50
Distribution Losses (voltage category-wise)

DISCO	Losses of	2014-15		2015-16		2016-17		2017-18		2018-19	
		GWh	%	GWh	%	GWh	%	GWh	%	GWh	%
PESCO	132 kV system (including 66 & 33 kV)	379.50	3.26	431.70	3.70	385.00	3.10	393.00	2.80	221.80	1.60
	11 kV and below system	3681.10	31.58	3536.40	31.20	3693.50	30.50	5031.80	36.40	5006.40	35.60
	Overall system	4058.39	34.81	3968.09	33.77	4078.93	32.60	5424.77	38.15	5228.24	36.56
TESCO	132 kV system (including 66 & 33 kV)	65.98	4.63	48.86	3.85	44.95	3.10	45.00	2.66	40.10	2.24
	11 kV and below system	240.55	17.70	191.62	15.10	177.92	12.27	166.03	10.07	173.24	9.90
	Overall system	323.81	22.72	240.52	18.95	223.45	15.40	210.97	12.46	186.94	10.44
IESCO	132 kV system (including 66 & 33 kV)	177.00	1.96	162.15	1.68	201.00	1.90	215.00	1.84	212.00	1.79
	11 kV and below system	669.00	7.59	715.53	7.54	754.00	7.26	850.00	7.42	837.00	7.20
	Overall system	846.00	9.41	878.00	9.10	955.09	9.03	1067.03	9.14	1049.00	8.86
GEPCO	132 kV system (including 66 & 33 kV)	127.46	1.61	141.65	1.57	147.55	1.51	142.10	1.29	138.17	1.24
	11 kV and below system	719.53	9.25	814.99	9.15	853.38	8.86	957.50	8.83	957.50	8.73
	Overall system	846.99	10.72	956.65	10.58	1000.78	10.23	1099.61	10.01	1095.62	9.87
LESCO	132 kV system (including 66 & 33 kV)	273.80	1.14	275.54	1.37	233.93	1.10	236.66	1.00	228.67	0.90
	11 kV and below system	2407.10	12.80	2534.41	12.80	2604.85	12.80	3046.04	13.00	2977.77	12.40
	Overall system	2680.64	14.10	2809.94	13.94	2838.73	13.77	3282.74	13.83	3206.45	13.17
FESCO	132 kV system (including 66 & 33 kV)	219.90	2.00	178.80	1.48	244.28	1.90	285.83	1.98	254.47	1.70
	11 kV and below system	1017.24	9.20	1044.97	8.82	1109.92	8.80	1235.87	8.73	1214.76	8.26
	Overall system	1237.13	11.00	1220.06	10.24	1359.04	10.57	1521.84	10.53	1469.07	9.81
MEPCO	132 kV system (including 66 & 33 kV)	417.14	3.01	436.05	2.91	433.15	2.70	443.91	2.30	352.88	1.80
	11 kV and below system	1740.71	12.95	1993.54	13.90	2265.24	14.60	2708.85	14.60	2704.17	14.20
	Overall system	2147.70	15.50	2429.58	16.45	2698.38	16.92	3152.75	16.59	3057.04	15.79
HESCO	132 kV system (including 66 & 33 kV)	244.83	4.44	177.74	3.60	206.10	3.70	213.00	3.71	212.90	3.83
	11 kV and below system	1248.32	23.70	1168.45	23.80	1448.90	27.20	1502.90	27.18	1425.90	26.69
	Overall system	1492.44	27.08	1346.19	26.47	1638.31	30.59	1716.06	29.88	1637.32	29.48
SEPCO	132 kV system (including 66 & 33 kV)	113.82	2.62	130.38	3.11	147.64	3.29	115.21	2.46	104.89	1.28
	11 kV and below system	1506.19	35.59	1436.84	35.53	1518.95	35.27	1518.95	35.27	1485.99	34.83
	Overall system	2097.91	48.27	1773.82	42.35	1694.92	37.81	1715.92	36.67	1631.02	36.97

DISCO	Losses of	2014-15		2015-16		2016-17		2017-18		2018-19	
		GWh	%	GWh	%	GWh	%	GWh	%	GWh	%
QESCO	132 kV system (including 66 & 33 kV)	72.71	1.40	104.59	1.89	114.96	1.99	117.09	1.85	100.02	1.60
	11 kV and below system	1131.69	22.10	1213.60	22.30	1220.70	21.50	1301.21	20.90	1371.76	22.30
	Overall system	1199.70	23.10	1318.17	23.80	1336.18	23.08	1422.43	22.44	1472.70	23.56
KE	132 kV system (including 66 & 33 kV)	226.00	1.34	218.41	1.32	250.00	1.51	159.48	0.92	214.93	1.21
	11 kV and below system	3749.11	22.60	3462.00	21.20	3349.00	20.51	3398.88	19.69	3163.78	18.10
	Overall system	4522.00	26.89	4440.00	25.66	4371.00	25.19	4311.52	23.73	4188.72	22.63
Total Distribution Losses in PEPCO System		**16930.72**	**18.99**	**16941.02**	**18.14**	**17823.81**	**17.93**	**20614.12**	**18.32**	**20033.40**	**17.59**

Source: Distribution Companies / KE

Figure 50: Distribution Losses (%) (2018-19)

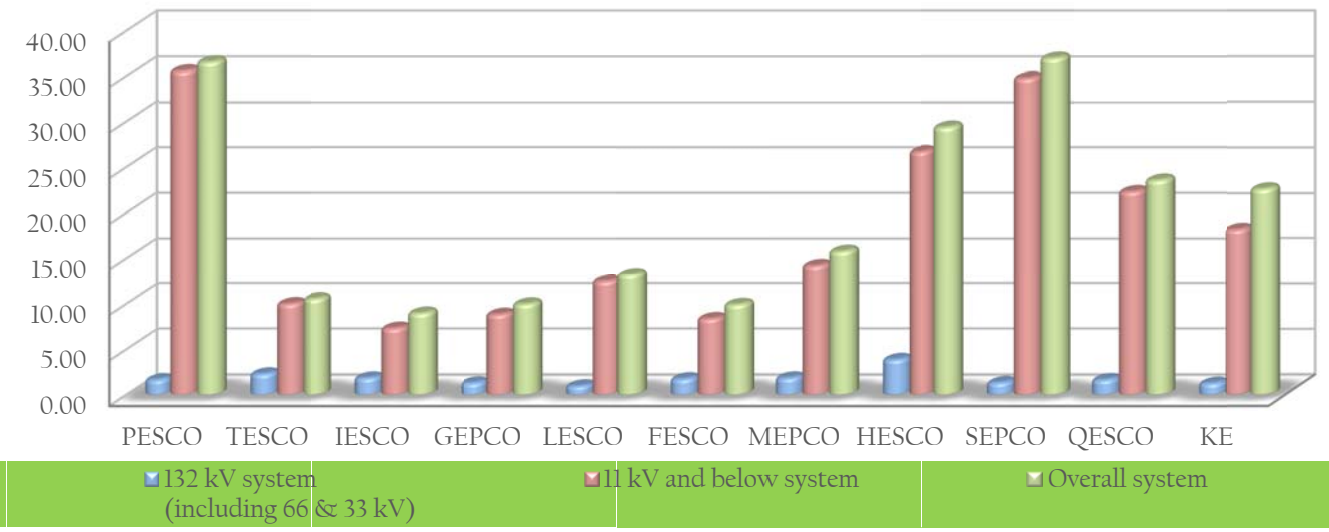


TABLE 51
Status of Grid Stations (Nos.)

DISCO	As on 30th June	132 kV			66 kV			33 kV			Total
		DISCO Owned	Cons. Owned	Sub-Total	DISCO Owned	Cons. Owned	Sub-Total	DISCO Owned	Cons. Owned	Sub-Total	
PESCO	2015	67	9	76	17	0	17	4	0	4	97
	2016	67	9	76	17	0	17	5	0	5	98
	2017	69	9	78	16	0	16	7	0	7	101
	2018	73	9	82	16	0	16	6	0	6	104
	2019	78	10	88	14	0	14	6	0	6	108
TESCO	2015	7	0	7	8	0	8	0	0	0	15
	2016	8	0	8	8	0	8	0	0	0	16
	2017	8	0	8	8	0	8	0	0	0	16
	2018	9	0	9	9	0	9	0	0	0	18
	2019	10	0	10	9	0	9	0	0	0	19
IESCO	2015	77	22	99	5	1	6	3	0	3	108
	2016	77	22	99	4	1	5	3	0	3	107
	2017	77	24	101	4	1	5	3	0	3	109
	2018	78	25	103	4	1	5	2	0	2	110
	2019	78	26	104	3	1	4	2	0	2	110

DISCO	As on 30th June	132 kV			66 kV			33 kV			Total
		DISCO Owned	Cons. Owned	Sub-Total	DISCO Owned	Cons. Owned	Sub-Total	DISCO Owned	Cons. Owned	Sub-Total	
GEPCO	2015	52	0	52	4	0	4	0	0	0	56
	2016	54	0	54	4	0	4	0	0	0	58
	2017	55	0	55	4	0	4	0	0	0	59
	2018	59	0	59	1	0	1	0	0	0	60
	2019	59	0	59	1	0	1	0	0	0	60
LESCO	2015	88	34	122	7	0	7	0	0	0	129
	2016	93	35	128	7	0	7	0	0	0	135
	2017	98	38	136	5	0	5	0	0	0	141
	2018	108	42	150	0	0	0	0	0	0	150
	2019	110	44	154	0	0	0	0	0	0	154
FESCO	2015	62	18	80	23	0	23	0	0	0	103
	2016	64	18	82	22	0	22	0	0	0	104
	2017	67	18	85	21	0	21	0	0	0	106
	2018	74	19	93	14	0	14	0	0	0	107
	2019	77	19	96	14	0	14	0	0	0	110
MEPCO	2015	96	8	104	21	0	21	0	0	0	125
	2016	98	8	106	20	0	20	0	0	0	126
	2017	104	9	113	16	0	16	0	0	0	129
	2018	104	9	113	16	0	16	0	0	0	129
	2019	114	9	123	10	0	10	0	0	0	133
HESCO	2015	53	6	59	18	0	18	0	0	0	77
	2016	54	6	60	18	0	18	0	0	0	78
	2017	59	6	65	15	0	15	0	0	0	80
	2018	61	7	68	15	0	15	0	0	0	83
	2019	61	8	69	15	0	15	0	0	0	84
SEPCO	2015	53	1	54	11	1	12	0	0	0	66
	2016	54	1	55	11	1	12	0	0	0	67
	2017	54	1	55	12	1	13	0	0	0	68
	2018	55	1	56	9	1	10	0	0	0	66
	2019	55	1	56	9	1	10	0	0	0	66
QESCO	2015	58	0	58	10	0	10	25	0	25	93
	2016	64	0	64	8	0	8	23	0	23	95
	2017	65	0	65	9	0	9	30	0	30	104
	2018	69	0	69	5	0	5	32	0	32	106
	2019	69	0	69	5	0	5	32	0	32	106
Total in PEPCO System	2015	613	98	711	124	2	126	32	0	32	869
	2016	633	99	732	119	2	121	31	0	31	884
	2017	656	105	761	110	2	112	40	0	40	913
	2018	690	112	802	89	2	91	40	0	40	933
	2019	711	117	828	80	2	82	40	0	40	950
KE	2015	54	9	63	3	0	3	0	0	0	66
	2016	54	9	63	3	0	3	0	0	0	66
	2017	54	9	63	3	0	3	0	0	0	66
	2018	54	9	63	3	0	3	0	0	0	66
	2019	56	10	66	3	0	3	0	0	0	69

Source: Distribution Companies / KE

TABLE 52
DISCOs' Power Transformers, Capacities and Loading Positions of Power Transformers

DISCO	As on 30th June	No. of Power Transformers				Capacity of Power Transformers (MVA)				No. of Over-Loaded Power Transformers (above 80%)				
		132 kV	66 kV	33 kV	Total	132 kV	66 kV	33 kV	Total	132 kV	66 kV	33 kV	Total	% age
PESCO	2015	173	32	7	212	4,556.80	305.95	25.50	4,888.25	94	17	4	115	54.25
	2016	180	32	8	220	4,929.80	305.95	29.50	5,265.25	104	16	4	124	56.36
	2017	189	31	10	230	5,449.50	286.25	37.50	5,773.25	93	16	4	113	49.13
	2018	198	30	8	236	5,768.50	286.25	32.00	6,086.75	107	12	6	125	52.97
	2019	206	29	8	243	6,029.50	265.75	32.00	6,327.25	93	12	5	110	45.27
TESCO	2015	21	17	0	38	422.30	190.80	0.00	613.10	8	10	0	18	47.37
	2016	18	17	0	35	500.30	205.40	0.00	705.70	8	6	0	14	40.00
	2017	17	18	1	36	391.00	208.00	6.90	605.90	10	3	1	14	38.89
	2018	25	20	0	45	501.30	242.80	0.00	744.10	8	8	0	16	35.56
	2019	27	21	0	48	540.30	670.02	0.00	1,210.32	8	9	0	17	35.42
IESCO	2015	172	14	7	193	4,192.80	133.60	30.00	4,356.40	20	1	3	24	12.44
	2016	173	14	7	194	4,218.80	133.60	30.00	4,382.40	34	2	1	37	19.07
	2017	185	9	8	202	4,663.10	91.30	33.00	4,787.40	24	0	0	24	11.88
	2018	232	11	5	248	5,832.00	150.00	20.00	6,002.00	14	0	2	16	6.45
	2019	242	9	6	257	6,162.00	125.00	24.00	6,311.00	7	0	1	8	3.11
GEPCO	2015	137	9	0	146	3,598.80	103.00	0.00	3,701.80	62	6	0	68	46.58
	2016	145	9	0	154	4,016.80	103.00	0.00	4,119.80	55	8	0	63	40.91
	2017	150	10	0	160	4,330.80	103.00	0.00	4,433.80	26	8	0	34	21.25
	2018	172	2	0	174	4,820.80	26.00	0.00	4,846.80	50	1	0	51	29.31
	2019	174	2	0	176	4,925.80	26.00	0.00	4,951.80	24	1	0	25	14.20
LESCO	2015	293	17	0	310	8,005.00	215.30	0.00	8,220.30	160	13	0	173	55.81
	2016	316	17	0	333	8,972.00	215.30	0.00	9,187.30	139	12	0	151	45.35
	2017	337	14	0	351	9,673.00	176.30	0.00	9,849.30	117	10	0	14	3.99
	2018	370	3	0	373	11,053.50	39.00	0.00	11,092.50	60	0	0	60	16.09
	2019	388	3	0	391	11,674.50	39.00	0.00	11,713.50	78	0	0	78	19.95
FESCO	2015	142	41	0	183	3,755.00	450.45	0.00	4,205.45	90	20	0	110	60.11
	2016	150	38	0	188	4,033.00	425.60	0.00	4,458.60	85	22	0	107	56.91
	2017	160	35	0	195	4,506.00	401.10	0.00	4,907.10	82	18	0	100	51.28
	2018	200	25	0	225	5,318.00	278.70	0.00	5,596.70	35	7	0	42	18.67
	2019	210	25	0	235	5,648.00	282.50	0.00	5,930.50	36	6	0	42	17.87
MEPCO	2015	213	34	0	247	5,539.00	373.00	0.00	5,912.00	97	22	0	119	48.18
	2016	234	35	0	269	6,210.80	378.34	0.00	6,589.14	97	21	0	118	43.87
	2017	253	29	0	282	7,179.30	292.84	0.00	7,472.14	65	10	0	75	26.60
	2018	262	30	0	292	7,514.91	322.91	0.00	7,837.82	64	1	0	65	22.26
	2019	274	19	0	293	7,969.00	219.00	0.00	8,188.00	33	1	0	34	11.60

DISCO	As on 30th June	No. of Power Transformers				Capacity of Power Transformers (MVA)				No. of Over-Loaded Power Transformers (above 80%)				
		132 kV	66 kV	33 kV	Total	132 kV	66 kV	33 kV	Total	132 kV	66 kV	33 kV	Total	% age
HESCO	2015	85	24	0	109	1,753.40	237.10	0.00	1,990.50	62	10	0	72	66.06
	2016	87	22	0	109	1,833.40	211.10	0.00	2,044.50	67	7	0	74	67.89
	2017	102	17	0	119	2,264.90	146.10	0.00	2,411.00	54	5	0	59	49.58
	2018	105	16	0	121	2,430.40	133.10	0.00	2,563.50	45	4	0	49	40.50
	2019	105	16	0	121	2,561.40	133.10	0.00	2,694.50	31	3	0	34	28.10
SEPCO	2015	89	27	1	117	1,950.80	269.80	6.30	2,226.90	24	8	0	32	27.35
	2016	91	24	1	116	1,989.30	237.40	6.30	2,233.00	28	5	0	33	28.45
	2017	90	27	1	118	2,073.80	269.80	6.30	2,349.90	41	12	0	53	44.92
	2018	106	19	1	126	2,534.30	215.40	6.30	2,756.00	42	7	0	49	38.89
	2019	107	22	1	130	2,558.80	228.40	6.30	2,793.50	17	7	0	24	18.46
QESCO	2015	118	14	0	132	2,596.60	109.50	0.00	2,706.10	63	9	0	72	54.55
	2016	102	14	9	125	2,294.00	85.00	114.00	2,493.00	57	9	0	66	52.80
	2017	110	14	36	160	2,631.00	122.00	144.00	2,897.00	65	10	0	75	46.88
	2018	126	9	40	175	3,092.00	78.00	160.00	3,330.00	50	5	0	55	31.43
	2019	131	9	40	180	3,158.60	78.00	160.00	3,396.60	60	2	4	66	36.67
Total in PEPCO System	2015	1,443	229	15	1,687	36,370.50	2,388.50	61.80	38,820.80	680	116	7	803	47.60
	2016	1,496	222	25	1,743	38,998.20	2,300.69	179.80	41,478.69	674	108	5	787	45.15
	2017	1,593	204	56	1,853	43,162.4	2,096.69	227.70	45,486.79	577	92	5	561	30.28
	2018	1,796	165	54	2,015	48,865.7	1,772.16	218.30	50,856.2	475	45	8	528	26.20
	2019	1,864	155	55	2,074	51,227.9	2,066.77	222.30	53,5176.0	387	41	10	438	21.12
KE	2015	126	3	0	129	4,651.50	69.00	0.00	4,720.50	42	0	0	42	32.56
	2016	132	3	0	135	5,053.50	69.00	0.00	5,122.50	31	0	0	31	22.96
	2017	135	3	0	138	5,195.50	69.00	0.00	5,264.50	56	1	0	57	41.30
	2018	144	3	0	147	5,449.50	69.00	0.00	5,518.50	47	1	0	48	32.65
	2019	157	3	0	160	6,008.50	69.00	0.00	6,077.50	45	0	0	45	28.13

Source: Distribution Companies / KE

TABLE 53
Status of Distribution Lines (km)

DISCO	As on 30th June	132 kV	66 kV	33 kV	11 kV	Total HT Lines	Total LT Lines (0.4 kV)
PESCO	2015	2,164	841	312	33,464	36,781	43,999
	2016	2,209	841	312	33,785	37,147	44,330
	2017	2,245	802	312	35,751	39,110	44,574
	2018	2,318	802	312	36,227	39,659	44,954
	2019	2,661	714	312	36,679	40,365	45,120
TESCO	2015	259	383	-	7,746	8,388	6,532
	2016	359	383	-	7,765	8,507	6,532
	2017	359	402	-	7,768	8,529	6,532
	2018	359	402	-	8,023	8,784	6,590
	2019	382	442	-	9,705	10,529	6,590
IESCO	2015	2,772	581	153	24,272	27,778	26,145
	2016	2,897	581	153	24,607	28,238	26,286
	2017	2,897	581	69	24,833	28,380	26,499
	2018	2,897	581	69	25,156	28,703	26,775
	2019	2,897	581	69	25,457	29,004	27,041
GEPCO	2015	2,233	447	-	22,468	25,148	18,227
	2016	2,349	447	-	22,604	25,400	18,320
	2017	2,354	447	-	22,718	25,519	18,446
	2018	2,425	179	-	23,458	26,062	18,410
	2019	2,425	179	-	23,743	26,347	18,410
LESCO	2015	2,252	429	-	27,095	29,776	14,808
	2016	2,425	429	-	27,921	30,775	14,819
	2017	2,554	410	-	28,079	31,043	14,819
	2018	2,864	410	-	28,775	32,049	14,952
	2019	2,879	410	-	29,309	32,598	15,000
FESCO	2015	1,865	1,260	-	38,614	41,739	25,965
	2016	2,014	1,260	-	39,266	42,540	28,036
	2017	2,242	1,280	-	42,083	45,605	29,702
	2018	2,402	1,174	-	42,773	46,349	30,203
	2019	2,402	1,174	-	43,896	47,472	30,583
MEPCO	2015	3,286	1,154	-	71,102	75,542	46,866
	2016	3,305	1,048	-	71,971	76,324	47,204
	2017	3,538	977	-	72,899	77,414	47,723
	2018	3,749	935	-	74,061	78,745	48,560
	2019	3,929	872	-	76,057	80,858	49,992
HESCO	2015	2,133	975	-	26,914	30,022	14,690
	2016	2,158	957	-	27,850	30,965	14,833
	2017	2,445	899	-	28,055	31,399	14,892
	2018	2,496	687	-	28,154	31,337	14,959
	2019	2,709	687	-	28,306	31,702	15,005
SEPCO	2015	1,995	753	-	24,192	26,940	13,471
	2016	2,017	733	-	23,880	26,630	13,348
	2017	2,135	733	-	24,449	27,317	13,497
	2018	2,137	733	-	25,140	28,010	13,492
	2019	2,232	637	-	25,400	28,269	13,341
QESCO	2015	4,299	491	985	34,179	39,954	14,654
	2016	4,299	502	985	35,086	40,872	14,958
	2017	4,963	472	1,981	36,088	43,504	15,577
	2018	5,200	260	1,981	37,779	45,220	16,155
	2019	5,413	106	1,981	38,679	46,179	16,404

DISCO	As on 30th June	132 kV	66 kV	33 kV	11 kV	Total HT Lines	Total LT Lines (0.4 kV)
Total in PEPCO System	2015	23,258	7,314	1,450	310,046	342,068	225,357
	2016	24,032	7,181	1,450	314,735	347,398	228,666
	2017	25,732	7,003	2,362	322,723	357,820	232,261
	2018	26,847	6,163	2,362	329,546	364,918	235,050
	2019	27,929	5,802	2,362	337,231	373,324	237,486
KE	2015	762	149	-	8,834	9,745	17,645
	2016	762	149	-	9,247	10,158	18,000
	2017	766	149	-	9,363	10,278	19,962
	2018	767	149	-	9,549	10,465	19,098
	2019	798	149	-	9,876	10,823	19,751

Source: Distribution Companies / KE

TABLE 54
Feeders Outages Statistics of DISCOs (2018-19)

DISCO	Nature of Tripping	132 kV Feeders		66 kV Feeders		33 kV Feeders		11 kV Feeders		All Feeders	
		No. of Tripping	Duration (Min.)	No. of Tripping	Duration (Min.)	No. of Tripping	Duration (Min.)	No. of Tripping	Duration (Min.)	No. of Tripping	Duration (Min.)
PESCO	Planned	325	124055	70	263226	14	4070	15746	1630763	16155	2022114
	Forced	339	41641	159	19049	1	900	27492	2019614	27991	2081204
	Total	664	165696	229	282275	15	4970	43238	3650377	44146	4103318
TESCO	Planned	8	300	38	1340	5	140	3782	55780	3833	57560
	Forced	70	5120	76	5708	103	1200	2852	32000	3101	44028
	Total	78	5420	114	7048	108	1340	6634	87780	6934	101588
IESCO	Planned	492	274240	15	8361	26	12480	150153	11024095	150686	11037082
	Forced	0	0	0	0	0	0	8014	186171	8014	186171
	Total	492	274240	15	8361	26	12480	158167	11210266	158700	11223253
GEPCO	Planned	35	9160	1	420	0	0	1563	102626	1599	102662
	Forced	153	30233	2	15	0	0	1247	47087	1402	77335
	Total	188	39393	3	435	0	0	2810	149713	3001	179997
LESCO	Planned	374	121904	4	2172	0	0	23541	7063123	23919	7187199
	Forced	5484	159835	29	1366	0	0	26792	829016	32305	990217
	Total	5858	281739	33	3538	0	0	50333	7892139	56224	8177416
FESCO	Planned	259	59066	115	28228	0	0	10290	2005192	10664	2092486
	Forced	66	7172	44	4289	0	0	59381	692873	59491	704334
	Total	325	66238	159	32517	0	0	69671	2698065	70155	2796820
MEPCO	Planned	1066	278976	112	25215	0	0	6578	1552272	7756	1856463
	Forced	385	53206	84	8623	0	0	118371	2950684	118840	3012513
	Total	1451	332182	196	33838	0	0	124949	4502956	126596	4868976
HESCO	Planned	68	21780	40	12487	0	0	0	0	108	34267
	Forced	701	214606	43	17801	0	0	59170	572978	59914	805385
	Total	769	236386	83	30288	0	0	59170	572978	60022	839652
SEPCO	Planned	622	233337	65	22545	0	0	2511	9390040	3198	9645922
	Forced	68	17512	44	20166	0	0	65604	22316883	65716	22354561
	Total	690	250849	109	42711	0	0	68115	31706923	68914	32000483
QESCO	Planned	170	56040	45	28680	348	12300	717	184080	1280	281100
	Forced	179	51480	77	5940	694	147120	29088	2955720	30038	3160260
	Total	349	107520	122	34620	1042	159420	29805	3139800	31318	3441360
KE	Planned	10	13049	0	0	0	0	125925	6412821	125935	6425870
	Forced	46	4997	0	0	0	0	38836	3940546	38882	3945543
	Total	56	18046	0	0	0	0	164761	10353367	164817	10371413

Source: Distribution Companies / KE

TABLE 55
Overloaded and Underutilized Distribution Feeders

DISCO	Year	Number of Overloaded Feeders (Above Designed Capacity)				Number of Underutilized Feeders (10% Below Designed Capacity)			
		132 kV	66 kV	33 kV	11 kV	132 kV	66 kV	33 kV	11 kV
PESCO	2014-15	2	0	0	56	6	2	0	111
	2015-16	2	0	0	65	7	0	0	90
	2016-17	3	0	0	36	6	0	1	108
	2017-18	5	0	0	38	7	0	1	113
	2018-19	7	0	0	32	6	0	0	102
TESCO	2014-15	2	2	0	0	2	2	0	17
	2015-16	2	2	0	0	2	1	0	20
	2016-17	2	2	0	0	2	1	0	20
	2017-18	2	3	0	0	2	1	0	23
	2018-19	3	4	0	0	2	1	0	27
IESCO	2014-15	1	0	0	39	5	0	0	310
	2015-16	20	0	0	12	4	1	0	41
	2016-17	14	1	0	4	0	0	0	12
	2017-18	0	0	0	0	0	0	0	8
	2018-19	0	0	0	9	0	0	0	13
GEPCO	2014-15	2	0	0	3	3	0	0	81
	2015-16	0	0	0	6	4	0	0	50
	2016-17	1	0	0	1	2	0	0	52
	2017-18	1	0	0	0	12	0	0	50
	2018-19	0	0	0	0	9	0	0	51
LESCO	2014-15	83	5	0	0	13	0	0	0
	2015-16	77	7	0	38	99	6	0	230
	2016-17	86	4	0	100	116	0	0	315
	2017-18	103	2	0	0	20	0	0	0
	2018-19	82	0	0	0	26	0	0	0
FESCO	2014-15	1	0	0	7	12	0	0	41
	2015-16	2	1	0	8	15	0	0	63
	2016-17	2	1	0	2	16	0	0	64
	2017-18	0	0	0	1	13	0	0	15
	2018-19	0	0	0	0	131	36	0	23
MEPCO	2014-15	5	1	0	371	15	0	0	76
	2015-16	7	2	0	472	9	1	0	81
	2016-17	4	1	0	491	1	1	0	86
	2017-18	3	0	0	442	5	0	0	78
	2018-19	1	0	0	257	1	0	0	190
HESCO	2014-15	4	0	0	24	8	0	0	47
	2015-16	4	0	0	22	17	2	0	36
	2016-17	1	0	0	34	7	0	0	54
	2017-18	2	0	0	0	7	0	0	40
	2018-19	9	0	0	68	0	0	0	49
SEPCO	2014-15	4	1	0	125	4	0	0	21
	2015-16	5	0	0	71	3	0	0	42
	2016-17	1	1	0	79	9	1	0	41
	2017-18	0	1	0	86	3	0	0	33
	2018-19	0	0	0	38	1	0	0	28
QESCO	2014-15	0	0	0	0	0	0	0	0
	2015-16	0	0	0	0	0	0	0	0
	2016-17	0	0	0	0	0	0	0	0
	2017-18	0	0	0	0	0	0	0	0
	2018-19	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.

DISCO	Year	Number of Overloaded Feeders (Above Designed Capacity)				Number of Underutilized Feeders (10% Below Designed Capacity)			
		132 kV	66 kV	33 kV	11 kV	132 kV	66 kV	33 kV	11 kV
KE	2014-15	0	0	0	25	0	0	0	69
	2015-16	0	0	0	1	0	0	0	20
	2016-17	0	0	0	1	0	0	0	15
	2017-18	0	0	0	1	0	0	0	6
	2018-19	0	0	0	10	0	0	0	10

Source: Distribution Companies / KE

TABLE 56
DISCOs' Number of Distribution Transformers, Capacities & Loading Positions of Distribution Transformers

DISCO	As on 30th June	No. of Distribution Transformers	Capacity of Distribution Transformers (kVA)	Loading Position of Distribution Transformers (Nos.)				
				80-90%	91-100%	Above 100%	Total	%age
PESCO	2015	58,458	4,461,200	16,343		4,358	20,701	35.41
	2016	60,365	5,219,525	15,221		4,090	19,311	31.99
	2017	72,078	5,594,115	11,235	5,321	4,477	21,033	29.18
	2018	74,104	5,741,775	3,183	924	2,076	6,183	8.34
	2019	76,126	5,998,755	1,732	1,175	1,163	4,070	5.35
TESCO	2015	15,634	1,200,000	-	-	-	-	-
	2016	15,634	1,200,000	71	103	-	174	1.11
	2017	18,198	1,214,960	0	0	0	0	0.00
	2018	18,475	1,259,110	2,738	1,643	103	4,484	24.27
	2019	18,730	n.p.	2,333	1,431	213	3,977	21.23
IESCO	2015	44,811	3,707,000	1,441	958	34	2,433	5.43
	2016	45,438	3,754,000	1,990	1,051	64	3,105	6.83
	2017	46,359	3,832,000	1,830	990	48	2,868	6.19
	2018	47,830	3,934,000	2,516	996	258	3,770	7.88
	2019	49,109	4,032,000	181	188	417	786	1.60
GEPCO	2015	58,193	3,587,000	2,597	2,308	1,731	6,636	11.40
	2016	60,080	3,730,820	905	428	215	1,548	2.58
	2017	61,661	3,828,990	863	410	202	1,475	2.39
	2018	64,344	4,087,000	908	606	227	1,741	2.71
	2019	67,587	4,219,000	1,037	690	232	1,959	2.90
LESCO	2015	96,268	7,501,615	19,254	9,627	9,627	38,508	40.00
	2016	97,048	7,476,000	16,426	9,240	16,286	41,952	43.23
	2017	100,718	7,796,585	14,649	9,448	6,253	30,350	30.13
	2018	105,185	8,230,625	13,674	9,471	5,259	28,404	27.00
	2019	110,092	8,516,090	13,211	9,358	3,963	26,532	24.10
FESCO	2015	93,376	6,143,420	1,882	1,288	236	3,406	3.65
	2016	97,761	6,493,910	1,478	1,183	624	3,285	3.36
	2017	100,276	6,626,000	1,176	540	127	1,843	1.84
	2018	104,058	6,874,000	199	165	28	392	0.38
	2019	108,652	7,084,000	497	99	18	614	0.57
MEPCO	2015	149,368	7,392,855	3,965	1,652	991	6,608	4.42
	2016	152,806	7,587,225	2,984	1,990	2,131	7,105	4.65
	2017	156,460	7,799,800	3,540	2,530	2,058	8,128	5.19
	2018	161,197	8,034,290	2,337	1,630	1,877	5,844	3.63
	2019	169,938	8,383,000	2,269	1,588	1,816	5,673	3.34
HESCO	2015	34,443	1,687,795	3,986	2,029	1,207	7,222	20.97
	2016	35,334	1,729,350	3,540	3,438	1,358	8,336	23.59
	2017	35,996	1,761,620	2,004	1,336	0	3,340	9.28
	2018	36,670	1,807,275	711	447	224	1,382	3.77
	2019	37,305	1,854,070	594	355	131	1,080	2.90

DISCO	As on 30th June	No. of Distribution Transformers	Capacity of Distribution Transformers (kVA)	Loading Position of Distribution Transformers (Nos.)				
				80-90%	91-100%	Above 100%	Total	%age
SEPCO	2015	34,856	1,932,340	2,559	1,679	784	5,022	14.41
	2016	35,029	1,947,465	3,707	1,814	922	6,443	18.39
	2017	35,875	2,004,370	3,885	1,942	1,597	7,424	20.69
	2018	37,562	2,097,125	1,980	993	763	3,736	9.95
	2019	38,196	2,151,140	1,351	696	541	2,588	6.78
QESCO	2015	51,886	2,571,468	4,125	2,350	1,807	8,282	15.96
	2016	53,646	2,643,795	4,081	2,725	1,937	8,743	16.30
	2017	55,770	2,752,000	4,191	2,735	1,947	8,873	15.91
	2018	59,336	3,049,830	4,042	2,193	859	7,094	11.96
	2019	60,870	3,132,630	6,235	2,789	799	9,823	16.14
Total in PEPCO System	2015	637,293	40,184,693	56,152	21,891	20,775	98,818	15.51
	2016	653,141	41,782,090	50,403	21,972	27,627	100,002	15.31
	2017	683,391	43,210,440	43,373	25,252	16,709	85,334	12.49
	2018	708,761	45,115,030	32,288	19,068	11,674	63,030	8.89
	2019	736,605	45,370,685	29,440	18,369	9,293	57,102	7.75
KE	2015	20,979	6,047,850	468	185	76	729	3.47
	2016	23,321	6,302,340	416	165	67	648	2.78
	2017	25,667	7,230,425	354	140	57	551	2.15
	2018	27,388	7,463,855	318	126	34	478	1.75
	2019	28,183	7,702,245	432	203	173	808	2.87

Source: Distribution Companies / KE

TABLE 57
Village Electrification in all Distribution Companies

DISCO	As on 30th June	Total Number of Villages in DISCO	Total Villages Electrified in DISCO	Remaining Villages in DISCO	Percentage of Total Electrified Villages in DISCO
PESCO	2015	27,817	20,961	6,856	75.35
	2016	28,844	22,202	6,642	76.97
	2017	30,098	23,664	6,434	78.62
	2018	31,559	24,688	6,871	78.23
	2019	31,689	25,789	5,900	81.38
TESCO	2015	397	19	378	4.79
	2016	397	30	367	7.56
	2017	452	200	252	44.25
	2018	452	250	202	55.31
	2019	463	257	206	55.51
IESCO	2015	537	270	267	50.28
	2016	700	266	434	38.00
	2017	586	271	315	46.25
	2018	1,863	941	922	50.51
	2019	922	387	535	41.97
GEPCO	2015	6,977	6,886	91	98.70
	2016	7,070	7,013	57	99.19
	2017	7,070	7,013	57	99.19
	2018	7,550	7,508	42	99.44
	2019	7,600	7,579	21	99.72
LESCO	2015	3,913	2,859	1,054	73.06
	2016	4,159	2,976	1,183	71.56
	2017	4,159	2,976	1,183	71.56
	2018	246	195	51	79.27
	2019	246	207	39	84.15

DISCO	As on 30th June	Total Number of Villages in DISCO	Total Villages Electrified in DISCO	Remaining Villages in DISCO	Percentage of Total Electrified Villages in DISCO
FESCO	2015	23,277	21,831	1,446	93.79
	2016	25,325	22,499	2,826	88.84
	2017	26,069	22,890	3,179	87.81
	2018	26,213	25,465	748	97.15
	2019	26,830	25,770	1,060	96.05
MEPCO	2015	26,310	22,287	4,023	84.71
	2016	28,618	24,595	4,023	85.94
	2017	31,651	26,315	5,336	83.14
	2018	37,400	30,364	7,036	81.19
	2019	39,518	30,660	8,858	77.58
HESCO	2015	23,803	17,010	6,793	71.46
	2016	23,803	17,643	6,160	74.12
	2017	23,803	18,147	5,656	76.24
	2018	23,803	18,634	5,169	78.28
	2019	23,803	18,940	4,863	79.57
SEPCO	2015	23,263	16,515	6,748	70.99
	2016	23,263	16,949	6,314	72.86
	2017	23,263	17,365	5,898	74.65
	2018	23,263	17,961	5,302	77.21
	2019	23,263	18,280	4,983	78.58
QESCO	2015	23,819	18,017	5,802	75.64
	2016	23,819	19,559	4,260	82.12
	2017	23,819	21,586	2,233	90.63
	2018	26,243	24,806	1,437	94.52
	2019	n.p.	n.p.	n.p.	n.p.
Total in PEPCO System	2015	160,113	126,655	33,458	79.10
	2016	165,998	133,732	32,266	80.56
	2017	170,970	140,427	30,543	82.14
	2018	178,592	150,812	27,780	84.44
	2019	154,334	127,869	26,465	82.85
KE	2015	889	702	187	78.97
	2016	889	747	142	84.03
	2017	889	821	68	92.35
	2018	889	883	6	99.33
	2019	913	912	1	99.89

Source: Distribution Companies / KE

TABLE 58
Applications of New Connections Received, Energized and Pending

DISCO	Year	Applications Received (Nos.)	Connection		Applications Pending (Nos.)
			Sanctioned (Nos.)	Load (kW)	
PESCO	2014-15	126,970	103,848	217,731	23,122
	2015-16	127,476	109,693	260,302	17,783
	2016-17	132,615	113,460	286,783	19,155
	2017-18	145,351	136,322	322,728	9,029
	2018-19	177,557	154,946	362,637	22,611
TESCO	2014-15	641	162	285	479
	2015-16	722	722	793	0
	2016-17	322	24	702	298
	2017-18	685	685	7,520	0
	2018-19	701	601	8,025	100

DISCO	Year	Applications Received (Nos.)	Connection		Applications Pending (Nos.)
			Sanctioned (Nos.)	Load (kW)	
IESCO	2014-15	113,855	81,831	232,254	32,024
	2015-16	131,842	106,462	215,332	25,380
	2016-17	139,665	109,675	266,940	29,990
	2017-18	170,522	158,303	379,853	12,219
	2018-19	203,221	146,873	406,000	56,348
GEPCO	2014-15	126,534	99,735	241,546	26,799
	2015-16	155,317	130,749	295,808	24,568
	2016-17	157,741	119,443	265,263	38,298
	2017-18	197,055	178,431	471,122	18,624
	2018-19	240,045	186,313	441,455	53,732
LESCO	2014-15	244,111	187,150	531,864	56,961
	2015-16	262,030	202,715	617,966	59,315
	2016-17	269,096	175,820	535,978	93,276
	2017-18	373,934	315,557	961,958	58,377
	2018-19	380,128	301,210	886,319	78,918
FESCO	2014-15	125,998	146,683	500,790	-20,685
	2015-16	146,262	129,310	411,525	16,952
	2016-17	237,548	136,309	474,474	101,239
	2017-18	330,695	261,795	714,631	68,900
	2018-19	269,017	231,178	695,740	37,839
MEPCO	2014-15	271,874	249,632	517,342	22,242
	2015-16	274,755	271,735	625,712	3,020
	2016-17	303,128	297,447	682,824	5,681
	2017-18	432,931	372,907	1,129,124	60,024
	2018-19	425,683	355,023	1,006,082	70,660
HESCO	2014-15	21,445	24,625	83,803	-3,180
	2015-16	27,915	31,825	94,710	-3,910
	2016-17	28,595	28,504	115,520	91
	2017-18	28,412	28,377	104,687	35
	2018-19	31,766	34,946	124,898	-3,180
SEPCO	2014-15	11,832	10,196	32,819	1,636
	2015-16	13,484	10,786	36,254	2,698
	2016-17	9,316	7,511	25,982	1,805
	2017-18	8,818	8,440	47,439	378
	2018-19	17,976	16,824	52,030	1,152
QESCO	2014-15	16,455	13,762	15,524	2,693
	2015-16	14,939	11,929	1,832	3,010
	2016-17	17,321	13,739	1,952	3,582
	2017-18	18,417	17,452	26,198	965
	2018-19	16,780	15,597	32,124	1,183
KE	2014-15	25,242	22,266	348,310	2,976
	2015-16	17,956	14,075	300,391	3,881
	2016-17	26,532	25,497	319,913	1,035
	2017-18	162,658	237,779	667,475	21,200
	2018-19	193,125	252,483	881,408	29,493

Source: Distribution Companies / KE

TABLE 59
Province-wise Electricity Consumption by Economic Groups of the Country (GWh)

Category	Year	Punjab*	Sindh**	Khyber Pakhtunkhwa#	Balochistan##	K-Electric Limited	Total
Domestic	2014-15	24681.41	3654.19	5269.14	573.16	6150.00	40327.90
	2015-16	27540.44	3444.46	5362.79	593.60	6596.00	43537.29
	2016-17	31075.42	3805.50	5900.49	637.07	6643.00	48061.48
	2017-18	35266.46	4101.62	6123.42	672.30	7169.68	53333.48
	2018-19	35239.37	3752.41	6041.45	557.50	7298.83	52889.56
Commercial	2014-15	3633.69	435.21	660.06	108.93	1600.00	6437.89
	2015-16	4105.03	481.53	710.11	114.76	1685.00	7096.43
	2016-17	4699.82	543.51	746.36	124.94	1655.00	7769.63
	2017-18	5312.42	534.00	775.86	131.05	1758.22	8511.55
	2018-19	5172.69	504.39	796.91	127.40	1780.58	8381.97
Industrial	2014-15	17678.02	1172.43	2082.87	140.00	3844.00	24917.32
	2015-16	17724.41	1243.35	2043.90	136.09	3830.00	24977.75
	2016-17	16476.36	1160.39	2276.76	153.09	3885.00	23951.60
	2017-18	19326.63	1224.95	2549.55	173.04	4123.85	27398.02
	2018-19	20269.80	1173.08	2669.79	171.70	4402.12	28686.49
Agricultural	2014-15	3995.48	642.24	144.51	3067.74	166.00	8015.97
	2015-16	4313.30	659.00	126.60	3263.37	163.00	8525.27
	2016-17	4867.26	645.65	132.82	3417.43	159.00	9222.16
	2017-18	5482.46	617.96	120.91	3762.35	151.49	10135.17
	2018-19	5631.05	374.09	103.15	3567.40	134.30	9809.99
Public Lighting	2014-15	200.26	173.97	14.17	2.91	110.00	501.31
	2015-16	199.66	78.27	12.87	3.84	163.00	457.64
	2016-17	205.59	74.55	13.24	4.92	187.00	485.30
	2017-18	232.30	64.93	13.47	8.25	156.54	475.49
	2018-19	219.00	47.90	13.03	9.10	160.48	449.51
Bulk Supply	2014-15	3033.89	184.21	526.97	101.00	410.00	4256.07
	2015-16	2501.45	241.99	287.35	108.11	412.00	3550.90
	2016-17	2472.40	271.10	587.30	115.02	433.00	3878.82
	2017-18	3958.31	282.58	651.09	122.16	471.10	5485.24
	2018-19	3988.64	289.65	677.20	126.70	477.22	5559.41
Others	2014-15	25.30	5.28	2.38	0.06	13.00	46.02
	2015-16	861.49	5.16	267.77	0.07	15.00	1149.49
	2016-17	1143.25	5.16	2.19	0.11	19.00	1169.71
	2017-18	140.49	163.73	43.08	46.82	29.44	423.56
	2018-19	1214.08	555.77	375.09	218.90	64.58	2428.42
Total	2014-15	53248.05	6267.53	8700.10	3993.80	12293.00	84502.48
	2015-16	57245.77	6153.76	8811.39	4219.84	12864.00	89294.76
	2016-17	60940.10	6505.86	9659.16	4452.58	12981.00	94538.70
	2017-18	69719.07	6989.77	10277.38	4915.97	13860.32	105762.51
	2018-19	71734.63	6697.29	10676.62	4778.70	14318.11	108205.35

** Islamabad Capital Territory is included* *** Consumption in KE Area is not included* *# FATA is included*
Area served by KE is excluded *Source: National Electric Power Regulatory Authority*

TABLE 60
Province-wise Electricity Consumption by Economic Groups of the Country (%)

Category	Year	Punjab*	Sindh**	Khyber Pakhtunkhwa#	Balochistan##	K-Electric Limited	Total
Domestic	2014-15	46.35	58.30	60.56	14.35	50.03	47.72
	2015-16	48.11	55.97	60.86	14.07	51.27	48.76
	2016-17	50.99	58.49	61.09	14.31	51.17	50.84
	2017-18	50.58	58.68	59.58	13.68	51.73	50.43
	2018-19	49.12	56.03	56.59	11.67	50.98	48.88
Commercial	2014-15	6.82	6.94	7.59	2.73	13.02	7.62
	2015-16	7.17	7.82	8.06	2.72	13.10	7.95
	2016-17	7.71	8.35	7.73	2.81	12.75	8.22
	2017-18	7.62	7.64	7.55	2.67	12.69	8.05
	2018-19	7.21	7.53	7.46	2.67	12.44	7.75
Industrial	2014-15	33.20	18.71	23.94	3.51	31.27	29.49
	2015-16	30.96	20.20	23.20	3.23	29.77	27.97
	2016-17	27.04	17.84	23.57	3.44	29.93	25.34
	2017-18	27.72	17.52	24.81	3.52	29.75	25.91
	2018-19	28.26	17.52	25.01	3.59	30.75	26.51
Agricultural	2014-15	7.50	10.25	1.66	76.81	1.35	9.49
	2015-16	7.53	10.71	1.44	77.33	1.27	9.55
	2016-17	7.99	9.92	1.38	76.75	1.22	9.75
	2017-18	7.86	8.84	1.18	76.53	1.09	9.58
	2018-19	7.85	5.59	0.97	74.65	0.94	9.07
Public Lighting	2014-15	0.38	2.78	0.16	0.07	0.89	0.59
	2015-16	0.35	1.27	0.15	0.09	1.27	0.51
	2016-17	0.34	1.15	0.14	0.11	1.44	0.51
	2017-18	0.33	0.93	0.13	0.17	1.13	0.45
	2018-19	0.31	0.72	0.12	0.19	1.12	0.42
Bulk Supply	2014-15	5.70	2.94	6.06	2.53	3.34	5.04
	2015-16	4.37	3.93	3.26	2.56	3.20	3.98
	2016-17	4.06	4.17	6.08	2.58	3.34	4.10
	2017-18	5.68	4.04	6.34	2.48	3.40	5.19
	2018-19	5.56	4.32	6.34	2.65	3.33	5.14
Others	2014-15	0.05	0.08	0.03	0.00	0.11	0.05
	2015-16	1.50	0.08	3.04	0.00	0.12	1.29
	2016-17	1.88	0.08	0.02	0.00	0.15	1.24
	2017-18	0.20	2.34	0.42	0.95	0.21	0.40
	2018-19	1.69	8.30	3.51	4.58	0.45	2.24
Total	2014-15	100.00	100.00	100.00	100.00	100.00	100.00
	2015-16	100.00	100.00	100.00	100.00	100.00	100.00
	2016-17	100.00	100.00	100.00	100.00	100.00	100.00
	2017-18	100.00	100.00	100.00	100.00	100.00	100.00
	2018-19	100.00	100.00	100.00	100.00	100.00	100.00

** Islamabad Capital Territory is included*
*** Consumption in KE Area is not included*
 # FATA is included
Area served by KE is excluded
Source: National Electric Power Regulatory Authority

14

ELECTRICITY TARIFF

ELECTRICITY TARIFF

14.1 GENERAL

The determination of tariff for electric power services is one of the primary responsibilities of NEPRA. NEPRA determines electricity tariff, keeping in view the principles of economic efficiency and service quality according to the prescribed Tariff (Standards and Procedure) Rules, 1998. Under Section 7 (3) of the NEPRA Act, NEPRA has been expressly conferred the power to determine tariff, rates, charges and other terms and conditions for the supply of electric power services by generation, transmission and distribution companies and to recommend these to the Federal Government for notification.

14.2 TARIFF SETTING

The procedures and standards in accordance with which tariffs are required to be determined, modified or revised are prescribed in the NEPRA Tariff (Standards and Procedure) Rules, 1998.

14.3 TARIFF STANDARDS

(a) Tariffs should allow licensees the recovery of any and all costs prudently incurred to meet the demonstrated needs of their customers, provided that assessments of licensees' prudence may not be required where tariffs are set on other than cost-of-service basis, such as formula-based tariffs that are designed to be in place for more than one year;

(b) Tariffs should generally be calculated by including a depreciation charge and a rate of return on the capital investment of each licensees commensurate to the earned by other investments of comparable risk;

(c) Tariffs should allow licensees a rate of return which promotes continued reasonable investment in equipment and facilities for improved and efficient service;

(d) Tariffs should include a mechanism to allow licensees a benefit from, and penalties for failure to achieve, the efficiencies in the cost of providing the service and the quality of service;

(e) Tariffs should reflect marginal cost principles to the extent feasible, keeping in view the financial stability of the sector;

(f) The Authority shall have a preference for competition rather than regulation and shall adopt policies and establish tariffs towards that end;

(g) The tariff regime should clearly identify interclass and inter-region subsides and shall provide such subsides transparently if found essential, with a view to minimizing if not eliminating them keeping in view the need for an adequate transition period;

(h) Tariffs may be set below the level of cost of providing the service to consumers consuming electric power below the consumption levels determined for the purpose from time to time by the Authority, as long as such tariffs are financially sustainable;

(i) Tariffs should, to the extent feasible, reflect the full cost of service to consumer groups with similar service requirements;

(j) Tariff should take into account Government subsidies or the need for adjustment to finance rural electrification in accordance with the policies of the Government;

(k) The application of the tariffs should allow reasonable transition periods for the adjustments of tariffs to meet the standards and other requirements pursuant to the NEPRA Act including the performance standards, industry standards and the uniform codes of conduct;

(l) Tariffs should seek to provide stability and predictability for customers; and

(m) Tariffs should be comprehensible, free of misinterpretation and shall state explicitly each component thereof.

NEPRA is required to determine electricity tariff so as to protect the interest of the consumers as well as electric power producers/suppliers. Any raise in tariff requested by the producers/ suppliers of electricity has to be allowed or rejected by NEPRA after analyzing all the costs involved in the proposed sale price. For any

determination of tariff, the following points are generally considered by NEPRA in addition to other points on a case-to-case basis:

(a) Utility should be able to recover its costs with some surplus for capacity expansion or return on equity.
(b) The average sale rate should provide for reasonable rate of return.

TABLE 61
NEPRA's Monthly Fuel Price Adjustments in respect of DISCOs

Month	PESCO	TESCO	IESCO	GEPCO	LESCO	FESCO	MEPCO	HESCO	SEPCO	QESCO
	Increase/(Decrease) Rs./kWh									
July, 2018	0.3525	0.3525	0.3525	0.3525	0.3525	0.3525	0.3525	0.3525	0.3525	0.3525
August, 2018	1.1635	1.1635	1.1635	1.1635	1.1635	1.1635	1.1635	1.1635	1.1635	1.1635
Sept., 2018	0.1999	0.1999	0.1999	0.1999	0.1999	0.1999	0.1999	0.1999	0.1999	0.1999
Oct., 2018	0.4741	0.4741	0.4741	0.4741	0.4741	0.4741	0.4741	0.4741	0.4741	0.4741
Nov., 2018	(0.3396)	(0.3396)	(0.3396)	(0.3396)	(0.3396)	(0.3396)	(0.3396)	(0.3396)	(0.3396)	(0.3396)
Dec., 2018	0.5688	0.5688	0.5688	0.5688	0.5688	0.5688	0.5688	0.5688	0.5688	0.5688
Jan., 2019	1.7197	1.7197	1.7197	1.7197	1.7197	1.7197	1.7197	1.7197	1.7197	1.7197
Feb., 2019	0.8090	0.8090	0.8090	0.8090	0.8090	0.8090	0.8090	0.8090	0.8090	0.8090
March, 2019	(0.0429)	(0.0429)	(0.0429)	(0.0429)	(0.0429)	(0.0429)	(0.0429)	(0.0429)	(0.0429)	(0.0429)
April, 2019	0.5508	0.5508	0.5508	0.5508	0.5508	0.5508	0.5508	0.5508	0.5508	0.5508
May, 2019	0.0999	0.0999	0.0999	0.0999	0.0999	0.0999	0.0999	0.0999	0.0999	0.0999
June, 2019	(0.1308)	(0.1308)	(0.1308)	(0.1308)	(0.1308)	(0.1308)	(0.1308)	(0.1308)	(0.1308)	(0.1308)

TABLE 62
National Average Uniform Tariff with PYA 2018

Description	Fixed Charge	PESCO	TESCO	IESCO	GEPCO	LESCO	FESCO	MEPCO	HESCO	SEPCO	QESCO	Uniform Tariff	
		Variable Charges	Variable Charges	Variable Charges	Variable Charges	Variable Charges	Variable Charges	Variable Charges	Variable Charges	Variable Charges	Variable Charges	Fixed Charge	Variable Charges
		(Rs./kW/Month)										(Rs./kW/Month)	
Residential													
Up to 50 Units		4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00		4.00
For peak load requirement less than 5 kW													
001-100 Units		17.25	11.18	10.87	11.19	12.09	13.35	15.45	18.80	14.37	17.13		13.85
101-200 Units		20.44	13.34	14.00	13.15	13.54	16.72	16.00	20.45	16.51	19.58		15.86
201-300 Units		20.95	14.36	15.58	14.60	15.27	17.47	17.07	21.85	19.21	20.03		16.83
301-700 Units		22.29	14.60	16.85	17.54	16.91	18.03	19.81	23.10	21.06	21.03		18.54
Above 700 Units		24.05	15.68	18.95	18.67	19.24	19.47	20.79	24.75	23.45	24.27		20.94
For peak load requirement exceeding 5 kW													
Time of Use (TOU) - Peak		23.32	15.68	17.59	18.14	18.81	19.10	20.76	24.75	23.46	24.48		19.33
Time of Use (TOU) - Off-Peak		15.89	11.18	10.11	11.64	12.50	13.30	15.08	19.25	17.51	18.10		12.80
Temporary Supply		23.33	15.68	22.68	18.14	18.15	20.12	20.17	24.65	21.11	24.50		20.84
Commercial - A2													
For peak load requirement less than 5 kW		23.32	15.75	17.00	17.14	19.08	18.12	19.23	23.65	23.36	15.20		19.26
For peak load requirement exceeding 5 kW													
Regular	400	18.79	13.75	14.00	13.64	16.81	17.87	17.59	21.65	21.36	15.05	400	18.01
Time of Use (TOU) - Peak		24.33	15.75	17.90	18.14	19.18	19.12	20.40	24.75	23.46	19.10		20.09
Time of Use (TOU) - Off-Peak	400	18.09	11.25	10.50	11.64	12.26	13.32	14.47	19.29	17.51	12.68	400	13.48
Temporary Supply		23.33	15.75	17.00	17.11	18.47	19.12	20.07	23.65	23.36	19.10		18.39
General Services - A3		20.99	14.28	18.90	13.94	17.60	16.97	18.72	21.30	19.00	16.37		17.56
Industrial													
B1		20.85	13.68	16.00	14.64	17.59	18.14	19.07	21.15	22.86	15.88		18.32
B1 Peak		23.33	15.68	17.90	18.14	19.68	19.64	20.17	24.74	23.47	19.06		20.14
B1 Off Peak		17.78	11.18	10.20	12.05	12.03	12.03	14.47	19.25	17.51	12.64		13.46
B2	400	18.34	11.18	13.50	12.14	14.95	14.64	16.58	20.65	20.36	14.03	400	15.79
B2 - TOU (Peak)		23.33	15.68	17.90	18.14	19.35	19.57	20.17	24.75	23.46	19.03		19.93
B2 - TOU (Off-peak)	400	117.58	10.98	10.30	9.33	12.64	13.20	14.27	19.05	17.31	12.48	400	13.23
B3 - TOU (Peak)		22.89	15.68	17.90	18.14	20.58	19.33	20.64	24.75	23.47	19.08		20.39
B3 - TOU (Off-peak)	380	17.48	10.88	10.10	11.74	11.61	13.12	13.17	18.85	16.21	12.38	380	12.61
B4 - TOU (Peak)		23.33	15.68	18.20	16.14	20.25	19.12	20.17	24.75	23.46	19.08		20.27
B4 - TOU (Off-peak)	360	17.85	10.78	10.50	11.24	12.00	13.02	14.07	18.75	17.11	12.28	360	13.25
Temporary Supply		18.83	11.68	18.20	16.14	14.70	17.60	16.92	25.15	20.66	19.08		16.36

Description	Fixed Charge	PESCO	TESCO	IESCO	GEPCO	LESCO	FESCO	MEPCO	HESCO	SEPCO	QESCO	Uniform Tariff	
		Variable Charges	Variable Charges	Variable Charges	Variable Charges	Variable Charges	Variable Charges	Variable Charges	Variable Charges	Variable Charges	Variable Charges	Fixed Charge	Variable Charges
Single Point Supply for further Distribution													
C1(a) Supply at 400 Volts-less than 5 kW		21.34	13.18	17.50	17.14	16.20	18.14	16.57	22.67	23.76	16.08		21.32
C1(b) Supply at 400 Volts-exceeding 5 kW	400	20.84	12.68	17.00	16.64	15.70	17.64	18.07	22.15	22.21	15.58	400	20.13
Time of Use (TOU) - Peak		23.33	15.68	19.98	21.14	19.00	20.62	21.10	24.75	23.46	20.08		21.52
Time of Use (TOU) - Off-Peak	400	20.09	11.18	10.50	14.64	12.50	14.72	12.91	19.25	17.51	12.66	400	14.99
C2 Supply at 11 kV	380	18.64	11.48	13.83	15.44	15.21	18.44	16.02	20.95	20.66	14.39	380	15.61
Time of Use (TOU) - Peak		24.27	15.68	18.04	21.14	19.00	20.62	18.15	24.75	23.46	19.08		19.73
Time of Use (TOU) - Off-Peak	380	17.58	10.98	8.27	14.44	12.10	14.52	14.12	19.05	17.31	12.46	380	12.57
C3 Supply above 11 kV	360	18.54	11.36	13.70	15.34	13.97	18.34	15.92	20.85	20.56	14.28	360	14.42
Time of Use (TOU) - Peak		23.33	15.68	16.21	21.14	19.00	18.24	20.17	24.75	23.46	19.08		18.49
Time of Use (TOU) - Off-Peak	360	17.48	10.88	10.38	14.34	12.00	12.49	14.07	18.85	17.21	12.38	360	11.59
Agricultural Tube-wells - Tariff D													
SCARP		17.39	11.68	17.90	16.44	19.10	15.89	16.12	25.34	22.40	14.83		23.17
Time of Use (TOU) - Peak		23.33	15.66	22.26	20.94	22.00	20.07	20.67	24.75	23.31	19.64		20.87
Time of Use (TOU) - Off-Peak	200	16.63	10.88	13.10	14.14	12.02	11.27	14.64	18.85	17.06	12.88	200	14.03
Agricultural Tube-wells	200	17.49	11.18	15.85	15.44	19.10	15.89	16.52	20.65	19.36	14.21	200	14.56
Time of Use (TOU) - Peak		23.33	15.86	17.90	20.94	20.50	20.12	19.75	24.75	23.31	19.08		20.27
Time of Use (TOU) - Off-Peak	200	16.63	10.88	13.10	14.10	13.46	13.21	12.22	18.85	15.96	12.68	200	13.04
Public Lighting - Tariff G		19.14	11.68	15.95	12.50	19.78	15.32	17.47	222.60	20.46	14.18		18.78
Residential Colonies (industrial premises)		19.14	11.68	15.18	12.64	20.39	15.47	17.90	22.60	20.46	14.18		18.42
Railway Traction						17.90							17.90
AJK - Tariff K	380	18.62		13.55	15.21							360	13.55
Time of Use (TOU) - Peak		23.37		17.28	18.12								18.56
Time of Use (TOU) - Off-Peak	360	17.57		9.84	12.87							360	12.20
Tariff K - Rawat Lab				16.24									16.24
Special Contract - Tariff J													
J-1 For Supply at 66 kV & above	380	19.24	11.73	14.16	10.48	11.77	14.79	17.65	25.15	22.69	13.75	360	16.14
Time of Use (TOU) - Peak		24.04	16.03	16.36	18.28	18.60	19.07	21.05	29.05	25.59	18.55		20.66
Time of Use (TOU) - Off-Peak	380	18.19	11.23	10.51	9.48	11.62	12.97	14.95	23.14	19.34	11.65	360	14.33
J-2 (a) For Supply at 11, 33 kV	380	19.34	11.83	14.26	10.56	14.10	14.89	17.75	25.25	22.79	13.85	380	16.46
Time of Use (TOU) – Peak		24.04	16.03	18.36	16.28	18.60	19.07	21.05	29.05	25.59	18.55		20.86
Time of Use (TOU) - Off-Peak	380	18.29	11.33	10.63	9.58	11.72	13.07	15.05	23.34	19.44	11.95	380	14.44
J-2 (b) For Supply at 66 kV & above	360	19.24	11.73	14.16	10.48	14.00	14.79	17.65	25.15	22.69	13.75	360	16.36
Time of Use (TOU) - Peak		24.04	16.03	18.36	16.28	18.60	19.07	21.05	29.05	25.59	18.55		20.66
Time of Use (TOU) - Off-Peak	360	18.19	11.23	10.51	9.48	11.62	12.97	14.95	23.14	19.34	11.85	360	14.33
J-3 (a) For Supply at 11, 33 kV	380	19.34	11.83	14.26	10.58	14.10	14.89	17.75	25.25	22.79	13.85	380	16.46
Time of Use (TOU) - Peak		24.04	16.03	18.36	16.28	18.60	19.07	21.05	29.05	25.59	18.55		20.66
Time of Use (TOU) - Off-Peak	380	18.29	11.33	10.63	9.58	11.72	13.07	15.05	23.34	19.44	11.95	380	14.44
J-3 (b) For Supply at 66 kV & above	360	19.24	11.73	14.16	10.48	14.00	14.79	17.65	25.15	22.89	13.75	360	16.36
Time of Use (TOU) - Peak		24.04	16.03	18.36	15.28	18.60	19.07	21.05	29.05	25.59	18.55		20.66
Time of Use (TOU) - Off-Peak	360	18.19	11.23	10.51	19.34	11.62	12.97	14.95	23.14	19.34	11.85	360	14.33

TABLE 63
Monthly Source-wise Power Sent Out and Fuel Cost (2018-19)

		July	August	Sept.	October	Nov.	Dec.	January	February	March	April	May	June	Total
Hydel														
Generation	GWh	3891.51	4478.41	4279.50	2389.95	2563.97	1334.49	477.62	1522.60	1601.12	2229.41	3747.21	3840.01	**32355.78**
	%	28.30	31.95	34.09	24.96	33.98	17.29	6.15	22.77	20.74	22.94	29.73	29.19	**26.35**
Fuel Cost	Mln. Rs.	-	-	-	-	-	-	-	-	-	-	-	-	**-**
	Rs./kWh	-	-	-	-	-	-	-	-	-	-	-	-	**-**
Coal														
Generation	GWh	1736.77	1343.77	1149.17	1115.77	1043.72	1563.13	1451.80	1167.69	1068.76	1005.04	1628.88	2037.45	**16311.95**
	%	12.63	9.59	9.16	11.65	13.83	20.25	18.70	17.46	13.84	10.34	12.92	15.49	**13.28**
Fuel Cost	Mln. Rs.	10476.73	8630.52	7452.35	7120.87	6868.33	10636.45	9861.24	7762.65	7454.43	6823.12	9255.93	11826.62	**104169.23**
	Rs./kWh	6.03	6.42	6.48	6.38	6.58	6.80	6.79	6.65	6.97	6.79	5.68	5.80	**6.39**
HSD														
Generation	GWh	10.74	6.07	1.93	-	-	-	12.26	-	-	-	-	-	**31.01**
	%	0.08	0.04	0.02	-	-	-	0.16	-	-	-	-	-	**0.03**
Fuel Cost	Mln. Rs.	82.35	100.37	23.24	-	-	-	226.96	-	-	-	-	-	**432.92**
	Rs./kWh	7.67	16.53	12.05	-	-	-	18.51	-	-	-	-	-	**13.96**
RFO														
Generation	GWh	1283.76	1643.75	1024.88	754.35	5.75	930.78	1722.06	112.35	40.29	481.05	397.92	694.84	**9091.79**
	%	9.34	11.73	8.17	7.88	0.08	12.06	22.18	1.68	0.52	4.95	3.16	5.28	**7.40**
Fuel Cost	Mln. Rs.	17399.04	23778.88	15948.21	10884.82	95.00	14192.45	23974.32	1337.91	457.63	5936.47	5033.05	9469.00	**128506.77**
	Rs./kWh	13.55	14.47	15.56	14.43	16.53	15.25	13.92	11.91	11.36	12.34	12.65	13.63	**14.13**
Gas														
Generation	GWh	2045.43	2039.67	1980.34	1913.10	1511.98	1679.26	1709.42	1595.08	1832.86	1789.50	2056.55	1880.77	**22033.97**
	%	14.87	14.55	15.78	19.98	20.04	21.76	22.02	23.85	23.74	18.42	16.32	14.29	**17.94**
Fuel Cost	Mln. Rs.	10277.58	10170.03	9611.78	10325.71	7838.96	8343.56	8680.92	9239.85	10565.10	10858.60	12358.03	11611.23	**119881.35**
	Rs./kWh	5.02	4.99	4.85	5.40	5.18	4.97	5.08	5.79	5.76	6.07	6.01	6.17	**5.44**
RLNG														
Generation	GWh	3370.24	3187.48	2847.33	2194.68	1299.75	960.54	1138.25	1129.23	1883.76	2995.81	3624.86	3613.71	**28245.65**
	%	24.51	22.74	22.68	22.92	17.23	12.44	14.66	16.89	24.40	30.83	28.76	27.47	**23.00**
Fuel Cost	Mln. Rs.	32426.22	33060.15	27807.70	21640.39	13174.68	9717.44	11721.71	10129.03	16860.54	28161.59	34417.36	36864.04	**275980.85**
	Rs./kWh	9.62	10.37	9.77	9.86	10.14	10.12	10.30	8.97	8.95	9.40	9.49	10.20	**9.77**
Nuclear														
Generation	GWh	735.65	628.27	681.93	887.67	821.05	896.59	905.62	744.03	877.65	745.20	543.61	538.43	**9005.68**
	%	5.35	4.48	5.43	9.27	10.88	11.62	11.66	11.13	11.37	7.67	4.31	4.09	**7.33**
Fuel Cost	Mln. Rs.	700.57	601.00	661.00	865.46	783.00	855.26	862.99	707.69	891.22	754.90	586.79	600.20	**8870.07**
	Rs./kWh	0.95	0.96	0.97	0.97	0.95	0.95	0.95	0.95	1.02	1.01	1.08	1.11	**0.98**
Import Iran														
Generation	GWh	28.39	48.83	47.07	45.95	39.16	36.11	35.04	28.38	34.21	42.43	52.43	48.79	**486.80**
	%	0.21	0.35	0.38	0.48	0.52	0.47	0.45	0.42	0.44	0.44	0.42	0.37	**0.40**
Fuel Cost	Mln. Rs.	328.51	564.96	544.68	531.65	453.13	417.87	405.41	328.34	395.90	490.95	606.68	564.59	**5632.68**
	Rs./kWh	11.57	11.57	11.57	11.57	11.57	11.57	11.57	11.57	11.57	11.57	11.57	11.57	**11.57**

		July	August	Sept.	October	Nov.	Dec.	January	February	March	April	May	June	Total
Mixed														
Generation	GWh	58.02	58.00	53.21	48.34	25.65	23.76	25.62	23.49	33.66	28.57	15.27	11.53	**405.13**
	%	0.42	0.41	0.42	0.50	0.34	0.31	0.33	0.35	0.44	0.29	0.12	0.09	**0.33**
Fuel Cost	Mln. Rs.	398.18	397.22	364.26	333.02	177.20	153.69	170.09	150.95	226.42	197.35	103.66	81.04	**2753.08**
	Rs./kWh	6.86	6.85	6.85	6.89	6.91	6.47	6.64	6.43	6.73	6.91	6.79	7.03	**6.80**
Wind Power														
Generation	GWh	428.92	439.30	342.35	94.05	126.87	170.66	156.27	212.51	186.82	267.44	413.31	393.14	**3231.64**
	%	3.12	3.13	2.73	0.98	1.68	2.21	2.01	3.18	2.42	2.75	3.28	2.99	**2.63**
Fuel Cost	Mln. Rs.	-	-	-	-	-	-	-	-	-	-	-	-	**-**
	Rs./kWh	-	-	-	-	-	-	-	-	-	-	-	-	**-**
Solar Power														
Generation	GWh	61.52	63.67	64.38	61.44	48.03	52.93	43.20	52.94	66.90	66.50	69.08	63.92	**714.52**
	%	0.45	0.45	0.51	0.64	0.64	0.69	0.56	0.79	0.87	0.68	0.55	0.49	**0.58**
Fuel Cost	Mln. Rs.	-	-	-	-	-	-	-	-	-	-	-	-	**-**
	Rs./kWh	-	-	-	-	-	-	-	-	-	-	-	-	**-**
Bagasse														
Generation	GWh	99.86	80.27	79.97	68.56	59.70	70.39	86.42	98.53	95.28	66.43	54.47	34.55	**894.43**
	%	0.73	0.57	0.64	0.72	0.79	0.91	1.11	1.47	1.23	0.68	0.43	0.26	**0.73**
Fuel Cost	Mln. Rs.	617.44	498.37	496.52	425.70	367.57	436.54	534.71	605.33	537.69	406.55	336.09	214.53	**5477.05**
	Rs./kWh	6.18	6.21	6.21	6.21	6.16	6.20	6.19	6.14	5.64	6.12	6.17	6.21	**6.12**
Total														
Generation	GWh	13750.83	14017.47	12552.07	9573.87	7545.63	7718.65	7763.57	6686.81	7721.31	9717.38	12603.59	13157.15	**122808.34**
	%	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	**100.00**
Fuel Cost	Mln. Rs.	72706.64	77801.51	62909.75	52127.61	29757.87	44753.25	56438.33	30261.74	37388.91	53629.55	62697.58	71231.26	**651704.01**
	Rs./kWh	5.29	5.55	5.01	5.44	3.94	5.80	7.27	4.53	4.84	5.52	4.97	5.41	**5.31**

Note: As per data provided by CPPA-G

TABLE 64
K-Electric (Source-wise Own Generation and Fuel Cost Adjustments) (2018-19)

Description	July	August	Sept.	October	Nov.	Dec.	January	February	March	April	May	June
Fuel Cost - Gas (Rs./MMBTU)	400.00	400.00	423.28	629.00	629.00	629.00	629.00	629.00	629.00	629.00	629.00	629.00
Fuel Cost - Furnace Oil (Rs./M.ton)	63727.39	67639.54	68668.02	71669.55	77712.39	72925.86	63540.43	63331.08	67464.79	69312.25	73478.83	70129.10
Fuel Cost - RLNG (Rs./MMBTU)	1655.35	1615.99	1562.31	1685.19	1753.96	1760.68	1582.04	1514.76	1431.50	1490.91	1514.22	1691.20
Bin Qasim Thermal Power Station - I												
No. of Units Sent Out (Mln kWh)	477.80	421.53	454.48	471.56	322.18	155.83	132.67	182.02	227.99	408.26	512.18	509.06
Fuel Cost (Rs./kWh)	14.96	14.59	14.51	17.54	16.86	17.53	15.27	15.87	15.45	15.24	16.79	16.50
Fuel Cost (Mln Rs.)	7148.87	6149.09	6595.78	8272.55	5431.90	2732.20	2026.26	2888.33	3521.67	6221.61	8597.75	8401.87
Bin Qasim Thermal Power Station - II												
No. of Units Sent Out (Mln kWh)	353.24	300.14	247.19	340.41	340.23	363.62	194.07	265.59	364.94	349.51	359.05	339.31
Fuel Cost (Rs./kWh)	6.61	6.52	6.51	8.38	8.63	10.32	10.00	9.39	8.32	7.42	7.43	7.91
Fuel Cost (Mln Rs.)	2336.33	1957.30	1610.21	2853.02	2937.64	3753.88	1940.25	2495.13	3036.39	2592.94	2666.11	2682.62
Korangi Town Gas Turbine Power Station - II												
No. of Units Sent Out (Mln kWh)	43.50	45.48	37.88	32.07	40.48	8.17	13.52	8.00	17.08	27.24	51.53	55.63
Fuel Cost (Rs./kWh)	6.92	6.78	6.80	8.68	8.89	10.01	11.37	9.84	7.95	7.72	7.77	8.26
Fuel Cost (Mln Rs.)	300.80	308.54	257.75	278.23	359.76	81.75	153.73	78.73	135.75	210.41	400.22	459.26
Site Gas Turbine Power Station - II												
No. of Units Sent Out (Mln kWh)	56.20	59.77	56.26	42.31	0.00	0.00	0.00	0.00	8.88	30.84	48.59	55.96
Fuel Cost (Rs./kWh)	6.92	6.81	6.82	8.67	0.00	0.00	0.00	0.00	7.99	7.77	7.76	8.26
Fuel Cost (Mln Rs.)	388.97	407.07	383.42	366.87	0.00	0.00	0.00	0.00	70.95	239.59	377.04	462.34
Korangi Combined Cycle Power Plant												
No. of Units Sent Out (Mln kWh)	146.31	130.12	117.72	99.37	94.84	26.00	78.44	16.86	54.29	135.75	142.21	127.81
Fuel Cost (Rs./kWh)	6.72	6.62	6.62	8.52	8.65	9.80	10.49	9.66	7.89	7.54	7.56	8.03
Fuel Cost (Mln Rs.)	983.75	861.70	779.71	847.09	820.60	254.79	822.80	162.91	428.29	1023.60	1074.69	1026.22
Total												
No. of Units Sent Out (Mln kWh)	1077.05	957.04	913.52	985.72	797.73	553.62	418.70	472.46	673.17	951.59	1113.57	1087.78
Fuel Cost (Rs./kWh)	10.36	10.12	10.54	12.80	11.97	12.32	11.81	11.91	10.69	10.81	11.78	11.98
Fuel Cost (Mln Rs.)	11158.72	9683.70	9626.88	12617.77	9549.90	6822.62	4943.03	5625.10	7193.04	10288.14	13115.81	13032.32
Power Purchases												
Units Purchased (Mln kWh)	751.47	680.37	654.80	677.78	581.00	536.85	596.34	486.05	585.77	663.34	759.16	795.76
Weighted Ave. Fuel Cost (Rs./kWh)Actual	7.18	7.42	7.35	7.98	6.87	7.42	8.52	6.13	6.38	7.24	7.66	7.73
Fuel Cost (Mln Rs.)	5395.67	5047.01	4812.40	5408.07	3990.97	3983.67	5078.47	2979.59	3739.12	4800.62	5818.50	6154.87
Summary												
Total Units Sent Out (Own Gen.+ Power Purchased) (Mln kWh)	1828.52	1637.41	1568.32	1663.49	1378.72	1090.47	1015.05	958.51	1258.94	1614.94	1872.74	1883.54
Total Fuel Cost (Own Gen.+ Power Purchased) (Mln Rs.)	16554.40	14730.71	14439.28	18025.84	13540.87	10806.29	10021.50	8604.68	10932.16	15088.76	18934.32	19187.18
Reference Fuel Cost (Rs./kWh)	8.43	8.43	8.43	9.21	9.21	9.21	9.91	9.91	9.91	8.68	8.68	8.68
Actual Fuel Cost (Rs./kWh)	9.05	9.00	9.21	10.84	9.82	9.91	9.87	8.98	8.68	9.34	10.11	10.19
Difference (Rs./kWh)	0.62	0.57	0.78	1.63	0.61	0.70	-0.04	-0.93	-1.23	0.66	1.43	1.50
Fuel Cost Variation of Own & Power Purchase (Mln Rs.)	1139.25	926.75	1217.74	2710.31	847.17	766.53	-37.38	-893.94	-1543.70	1065.29	2672.23	2831.30

TABLE 65
K-Electric (Source-wise Power Purchase and Fuel Costs) (2018-19)

		July	August	Sept.	October	Nov.	Dec.	January	February	March	April	May	June
CPPA-G													
Generation	GWh	459.05	430.01	427.53	410.99	373.20	373.73	380.38	322.29	386.35	444.52	462.03	466.63
	%	61.09	63.20	65.29	60.64	64.23	69.62	63.79	66.31	65.96	67.01	60.86	58.64
Fuel Cost	Mil Rs.	2448.41	2545.03	2275.16	2347.02	1764.07	2403.22	2876.96	1540.53	1917.75	2572.32	2377.42	2401.09
	Rs./kWh	5.33	5.92	5.32	5.71	4.73	6.43	7.56	4.78	4.96	5.79	5.15	5.15
Tapal Energy (Pvt.) Limited													
Generation	GWh	67.44	49.01	60.74	75.65	49.35	25.33	57.77	41.87	36.06	37.06	70.19	74.54
	%	8.97	7.20	9.28	11.16	8.49	4.72	9.69	8.61	6.16	5.59	9.25	9.37
Fuel Cost	Mil Rs.	894.19	679.08	888.81	1094.70	741.39	425.46	814.85	481.65	493.46	542.21	1094.25	1157.46
	Rs./kWh	13.26	13.86	14.63	14.47	15.02	16.79	14.10	11.50	13.69	14.63	15.59	15.53
Gul Ahmed Energy Limited													
Generation	GWh	72.30	54.50	68.99	80.64	42.03	22.02	40.51	35.78	36.81	56.84	81.61	83.49
	%	9.62	8.01	10.54	11.90	7.23	4.10	6.79	7.36	6.28	8.57	10.75	10.49
Fuel Cost	Mil Rs.	1021.06	804.95	1053.98	1214.46	697.20	378.35	610.89	428.82	521.94	875.77	1311.28	1354.13
	Rs./kWh	14.12	14.77	15.28	15.06	16.59	17.18	15.08	11.98	14.18	15.41	16.07	16.22
KANUPP													
Generation	GWh	37.47	31.76	18.70	0.00	0.00	0.00	0.00	0.00	0.00	0.12	16.45	25.48
	%	4.99	4.67	2.86	0.00	0.00	0.00	0.00	0.00	0.00	0.02	2.17	3.20
Fuel Cost	Mil Rs.	409.51	346.99	215.91	0.00	0.00	0.00	0.00	0.00	0.00	1.34	205.73	324.57
	Rs./kWh	10.93	10.92	11.54	0.00	0.00	0.00	0.00	0.00	0.00	11.55	12.50	12.74
Anoud Power Generation Limited													
Generation	GWh	4.43	5.64	3.91	4.14	3.98	4.40	4.70	3.21	3.37	5.31	3.93	4.55
	%	0.59	0.83	0.60	0.61	0.68	0.82	0.79	0.66	0.58	0.80	0.52	0.57
Fuel Cost	Mil Rs.	50.79	67.16	45.02	54.07	53.88	52.12	47.03	37.53	42.60	68.13	51.07	56.75
	Rs./kWh	11.48	11.91	11.51	13.05	13.54	11.85	10.00	11.69	12.62	12.82	12.99	12.47
International Industries Limited & International Steel Limited													
Generation	GWh	5.38	5.74	5.13	4.79	4.55	5.43	5.53	3.03	2.87	4.53	5.87	5.73
	%	0.72	0.84	0.78	0.71	0.78	1.01	0.93	0.62	0.49	0.68	0.77	0.72
Fuel Cost	Mil Rs.	31.68	33.81	30.22	36.68	34.78	41.55	42.29	23.15	21.93	34.69	44.88	43.88
	Rs./kWh	5.88	5.88	5.89	7.65	7.65	7.65	7.65	7.65	7.65	7.65	7.65	7.65
Sindh Nooriabad Power Company Limited (I & II)													
Generation	GWh	65.07	64.08	63.19	67.86	66.94	58.55	62.62	55.13	71.41	67.56	70.07	68.02
	%	8.66	9.42	9.65	10.01	11.52	10.91	10.50	11.34	12.19	10.19	9.23	8.55
Fuel Cost	Mil Rs.	258.22	254.31	250.79	392.64	387.39	338.78	362.31	318.96	413.17	390.92	405.44	393.60
	Rs./kWh	3.97	3.97	3.97	5.79	5.79	5.79	5.79	5.79	5.79	5.79	5.79	5.79
FFBL Power Company Limited													
Generation	GWh	40.33	39.62	6.59	33.70	38.59	40.47	38.11	17.52	40.33	38.75	40.38	39.13
	%	5.37	5.82	1.01	4.97	6.64	7.54	6.39	3.60	6.88	5.84	5.32	4.92
Fuel Cost	Mil Rs.	281.81	315.67	52.50	268.51	312.26	344.18	324.14	148.97	328.27	315.24	328.44	318.28
	Rs./kWh	6.99	7.97	7.97	7.97	8.09	8.50	8.50	8.50	8.14	8.13	8.13	8.13

		July	August	Sept.	October	Nov.	Dec.	January	February	March	April	May	June
Oursun Pakistan Limited													
Generation	GWh	0.00	0.00	0.00	0.00	2.36	6.91	6.72	7.23	8.58	8.64	8.63	7.76
	%	0.00	0.00	0.00	0.00	0.41	1.29	1.13	1.49	1.47	1.30	1.14	0.98
Fuel Cost	Mil Rs.												
	Rs./kWh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPPA-G 150 MW													
Generation	GWh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.43
	%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.57
Fuel Cost	Mil Rs.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	105.11
	Rs./kWh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.15
Total Generation													
Generation	GWh	751.47	680.37	654.80	677.78	581.00	536.85	596.34	486.05	585.77	663.34	759.16	795.76
	%	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Fuel Cost	Mil Rs.	5395.67	5047.01	4812.40	5408.07	3990.97	3983.67	5078.47	2979.59	3739.12	4800.62	5818.50	6154.87
	Rs./kWh	7.18	7.42	7.35	7.98	6.87	7.42	8.52	6.13	6.38	7.24	7.66	7.73

TABLE 66

K-Electric (Fuel-wise Own Generation and Fuel Costs) (2018-19)

		July	August	Sept.	October	Nov.	Dec.	January	February	March	April	May	June
Gas													
Generation	GWh	484.72	467.24	430.28	381.70	385.69	202.46	129.20	142.44	290.46	483.56	522.72	489.74
	%	45.00	48.82	47.10	38.72	48.35	36.57	30.86	30.15	43.15	50.82	46.94	45.02
Fuel Cost	Mil Rs.	1698.50	1662.93	1641.55	2092.25	2150.45	1086.43	706.17	769.68	1591.09	2702.62	2904.59	2709.42
	Rs./kWh	3.50	3.56	3.82	5.48	5.58	5.37	5.47	5.40	5.48	5.59	5.56	5.53
RFO													
Generation	GWh	372.82	279.19	288.18	397.70	207.94	125.27	78.62	148.81	162.92	263.68	376.63	390.97
	%	34.62	29.17	31.55	40.35	26.07	22.63	18.78	31.50	24.20	27.71	33.82	35.94
Fuel Cost	Mil Rs.	6277.19	4996.38	5240.07	7500.83	4252.67	2350.66	1313.82	2496.78	2888.38	4885.10	7352.18	7245.06
	Rs./kWh	16.84	17.90	18.18	18.86	20.45	18.76	16.71	16.78	17.73	18.53	19.52	18.53
RLNG													
Generation	GWh	219.51	210.60	195.06	206.32	204.10	225.89	210.88	181.22	219.79	204.35	214.22	207.06
	%	20.38	22.01	21.35	20.93	25.58	40.80	50.37	38.36	32.65	21.47	19.24	19.04
Fuel Cost	Mil Rs.	3183.04	3024.39	2745.25	3024.69	3146.77	3385.53	2923.04	2358.64	2713.57	2700.43	2859.04	3077.84
	Rs./kWh	14.50	14.36	14.07	14.66	15.42	14.99	13.86	13.02	12.35	13.21	13.35	14.86
Total Generation													
Generation	GWh	1077.05	957.04	913.52	985.72	797.73	553.62	418.70	472.46	673.17	951.59	1113.57	1087.78
	%	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Fuel Cost	Mil Rs.	11158.72	9683.70	9626.88	12617.77	9549.90	6822.62	4943.03	5625.10	7193.04	10288.14	13115.81	13032.32
	Rs./kWh	10.36	10.12	10.54	12.80	11.97	12.32	11.81	11.91	10.69	10.81	11.78	11.98

TABLE 67
K-Electric (Fuel-wise Power Purchase and Fuel Costs) (2018-19)

		July	August	Sept.	October	Nov.	Dec.	January	February	March	April	May	June
CPPA-G													
Generation	GWh	459.05	430.01	427.53	410.99	373.20	373.73	380.38	322.29	386.35	444.52	462.03	466.63
	%	61.09	63.20	65.29	60.64	64.23	69.62	63.79	66.31	65.96	67.01	60.86	58.64
Fuel Cost	Mil Rs.	2448.41	2545.03	2275.16	2347.02	1764.07	2403.22	2876.96	1540.53	1917.75	2572.32	2377.42	2401.09
	Rs./kWh	5.33	5.92	5.32	5.71	4.73	6.43	7.56	4.78	4.96	5.79	5.15	5.15
Coal													
Generation	GWh	40.33	39.62	6.59	33.70	38.59	40.47	38.11	17.52	40.33	38.75	40.38	39.13
	%	5.37	5.82	1.01	4.97	6.64	7.54	6.39	3.60	6.88	5.84	5.32	4.92
Fuel Cost	Mil Rs.	281.81	315.67	52.50	268.51	312.26	344.18	324.14	148.97	328.27	315.24	328.44	318.28
	Rs./kWh	6.99	7.97	7.97	7.97	8.09	8.50	8.50	8.50	8.14	8.13	8.13	8.13
RFO													
Generation	GWh	140.95	105.05	130.80	157.43	92.47	48.56	99.56	78.53	73.79	95.36	152.88	159.27
	%	18.76	15.44	19.98	23.23	15.92	9.04	16.70	16.16	12.60	14.37	20.14	20.01
Fuel Cost	Mil Rs.	1958.84	1542.01	1981.45	2354.46	1484.06	846.63	1462.82	941.20	1050.86	1474.88	2448.28	2558.71
	Rs./kWh	13.90	14.68	15.15	14.96	16.05	17.44	14.69	11.99	14.24	15.47	16.01	16.07
Gas													
Generation	GWh	73.67	73.93	71.17	75.66	74.38	67.18	71.57	60.49	76.73	75.96	78.79	77.07
	%	9.80	10.87	10.87	11.16	12.80	12.51	12.00	12.44	13.10	11.45	10.38	9.68
Fuel Cost	Mil Rs.	297.10	297.30	287.38	438.08	430.58	389.65	414.55	348.89	442.23	436.85	458.63	447.11
	Rs./kWh	4.03	4.02	4.04	5.79	5.79	5.80	5.79	5.77	5.76	5.75	5.82	5.80
Nuclear													
Generation	GWh	37.47	31.76	18.70	0.00	0.00	0.00	0.00	0.00	0.00	0.12	16.45	25.48
	%	4.99	4.67	2.86	0.00	0.00	0.00	0.00	0.00	0.00	0.02	2.17	3.20
Fuel Cost	Mil Rs.	409.51	346.99	215.91	0.00	0.00	0.00	0.00	0.00	0.00	1.34	205.73	324.57
	Rs./kWh	10.93	10.92	11.54	0.00	0.00	0.00	0.00	0.00	0.00	11.55	12.50	12.74
CPPA-G 150 MW													
Generation	GWh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.43
	%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.57
Fuel Cost	Mil Rs.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	105.11
	Rs./kWh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.15
Solar													
Generation	GWh	0.00	0.00	0.00	0.00	2.36	6.91	6.72	7.23	8.58	8.64	8.63	7.76
	%	0.00	0.00	0.00	0.00	0.41	1.29	1.13	1.49	1.47	1.30	1.14	0.98
Fuel Cost	Mil Rs.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Rs./kWh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Generation													
Generation	GWh	751.47	680.37	654.80	677.78	581.00	536.85	596.34	486.05	585.77	663.34	759.16	795.76
	%	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Fuel Cost	Mil Rs.	5395.68	5047.01	4812.40	5408.07	3990.97	3983.67	5078.47	2979.59	3739.12	4800.62	5818.50	6154.87
	Rs./kWh	7.18	7.42	7.35	7.98	6.87	7.42	8.52	6.13	6.38	7.24	7.66	7.73

LIST OF TABLES

ACRONYMS AND ABBREVIATIONS

ADB	Asian Development Bank
AEDB	Alternative Energy Development Board
AJKHEB	Azad Jammu and Kashmir Hydel Electricity Board
AMRS	Automated Meter Reading System
BPC	Bulk Power Consumer
BQTPS	Bin Qasim Thermal Power Station
BTPL	Bahria Town (Pvt.) Limited
CCPP	Combined Cycle Power Plant
CDP	Common Delivery Point
CHASNUPP	Chashma Nuclear Power Plant
COD	Commercial Operation Date
CPGCL	Central Power Generation Company Limited
CPI	Consumer Price Index
CPP	Captive Power Plant
CPPA-G	Central Power Purchasing Agency-Guarantee
DISCO	Distribution Company
DOP	Development of Power
EHV	Extra High Voltage
ELR	Energy Loss Reduction
FBC	Fluidized Bed Combustion
FDI	Foreign Direct Investment
FESCO	Faisalabad Electric Supply Company Limited
GDP	Gross Domestic Product
GENCO	Generation Company
GEPCO	Gujranwala Electric Power Company Limited
GOP	Government of Pakistan
GTPS	Gas Thermal Power Station
GWh	Giga Watt hour
HDIP	Hydrocarbon Development Institute of Pakistan
HESCO	Hyderabad Electric Supply Company Limited
HPP	Hydropower Project
HVDC	High Voltage Direct Current
IA	Implementation Agreement
IBC	Integrated Business Centre
ICB	International Competitive Bidding
IESCO	Islamabad Electric Supply Company Limited
IPP	Independent Power Producer
IRR	Internal Rate of Return
JPCL	Jamshoro Power Company Limited
KANUPP	Karachi Nuclear Power Plant
KCCPP	Korangi Combined Cycle Power Plant
KE	K-Electric Limited
kV	Kilo Volt
KVA	Kilovolt Ampere
kWh	Kilowatt hours
LESCO	Lahore Electric Supply Company Limited
LPGCL	Lakhra Power Generation Company Limited
MEPCO	Multan Electric Power Company Limited
MMBTU	Million British Thermal Unit

MMCFT	Million Cubic Feet
MTOE	Million Tonees of Oil Equivalent
MVA	Megavolt Ampere
MW	Megawatt
MWh	Megawatt hour
n.a. & n.p.	Not available and not provided
NPCC	National Power Control Centre
NPGCL	Northern Power Generation Company Limited
NTDC	National Transmission and Despatch Company Limited
O&M	Operation and Maintenance
OCPP	Open Cycle Power Plant
PAEC	Pakistan Atomic Energy Commission
PASMIC	Pakistan Steel Mills Corporation
PEDO	Pakhtunkhwa Energy Development Organization
PEPCO	Pakistan Electric Power Company Limited
PESCO	Peshawar Electric Supply Company Limited
PPA	Power Purchase Agreement
PPDB	Punjab Power Development Board
PPIB	Private Power and Infrastructure Board
QESCO	Quetta Electric Supply Company Limited
SCADA	Supervisory Control and Data Acquisition
SCARP	Salinity Control and Reclamation Project
SEPCO	Sukkur Electric Power Company Limited
SPP	Small Power Producer
STG	Secondary Transmission and Grid
T&D	Transmission and Distribution
TCEB	Thar Coal and Energy Board
TESCO	Tribal Area Electricity Supply Company Limited
TOD & TOU	Time of Day & Time of Use
WAPDA	Water and Power Development Authority

SOURCE OF INFORMATION

The following sources of information have been used in the compilation of this State of Industry Report 2019:

(a) K-Electric Limited
(b) Distribution Companies
(c) All Independent Power Producers
(d) Public Sector Generation Companies
(e) National Power Control Centre, NTDC
(f) Water and Power Development Authority
(g) National Transmission and Despatch Company Limited
(h) Pakistan Energy Yearbook, Hydrocarbon Development Institute of Pakistan
(i) Tariff Petitions submitted to NEPRA by Distribution Companies
(j) Private Power and Infrastructure Board
(k) Alternative Energy Development Board
(l) Punjab Power Development Board
(m) Pakhtunkhwa Energy Development Organization
(n) Energy Department, Government of Sindh
(o) Others

National Electric Power Regulatory Authority

NEPRA Tower, Attaturk Avenue (East), G-5/1, Islamabad
Ph: +92 51 2013200, Fax: +92 51 9210215
E-mail: info@nepra.org.pk, Web: www.nepra.org.pk