

POWER

April, 2020



Global Energy Consumption Per Capita

Primary Energy Consumption per Capita (Giga Joules)	2015	2016	2017	2018
Pakistan	15.6	16.6	17.2	17.7
India	22.1	22.7	23.5	25.0
Sri Lanka	14.2	15.0	15.7	16.2
Bangladesh	8.1	8.2	8.4	9.0
China	89.6	90.9	93.2	96.9
USA	289.6	287.5	286.8	294.8
Singapore	609.7	624.3	634.3	633.0
World	74.0	74.2	74.7	76.0

Primary energy comprises commercially-traded fuels, including modern renewables used to generate electricity.

- Global primary energy consumption grew rapidly in 2018, led by natural gas and renewables.
- Primary energy consumption grew at a rate of 2.9% last year, almost double its 10-year average of 1.5% per year, and the fastest since 2010.
- By fuel, energy consumption growth was driven by natural gas, which contributed more than 40% of the increase.
- China, the US and India together accounted for more than two thirds of the global increase in energy demand, with US consumption expanding at its fastest rate for 30 years.

Global Energy Generation

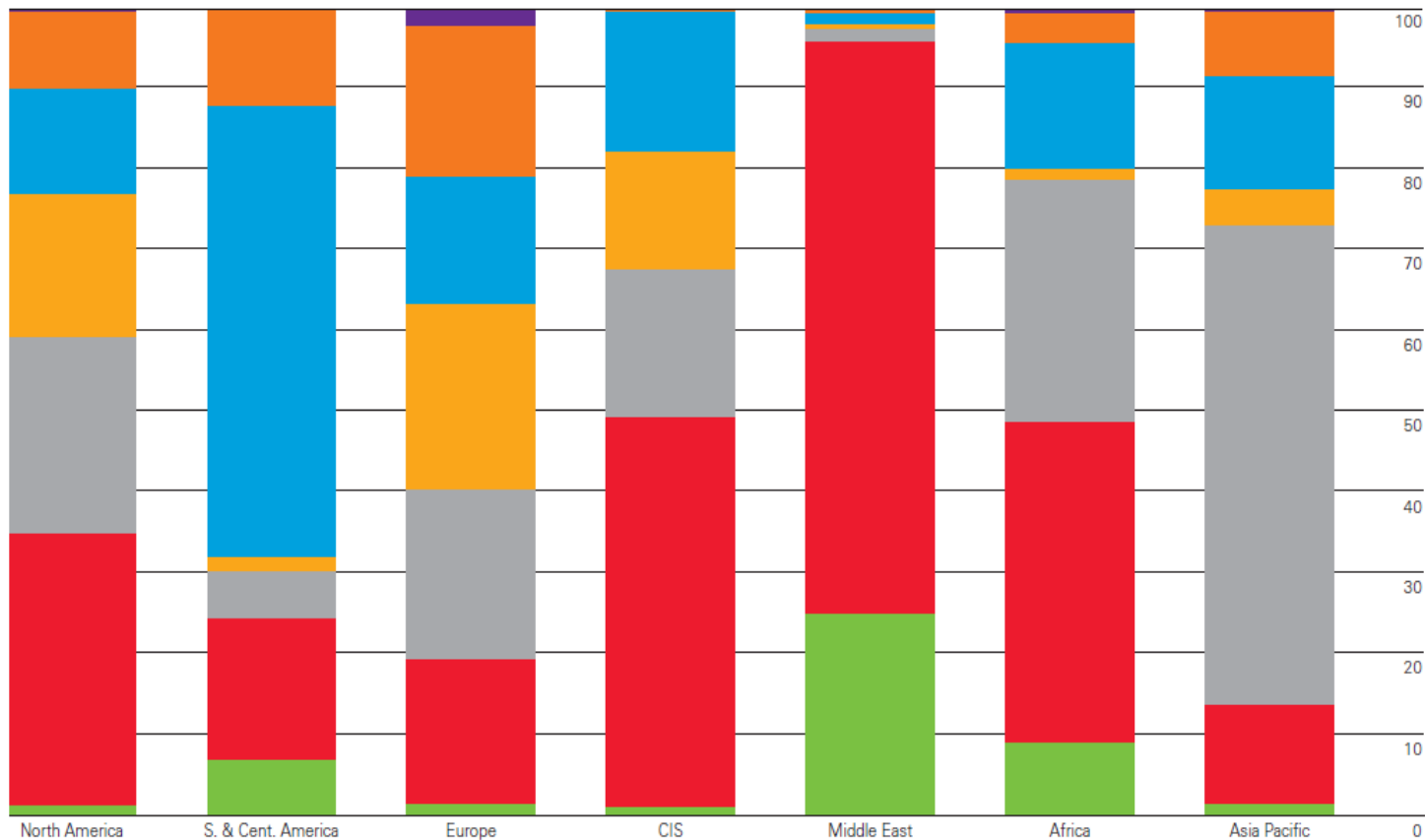
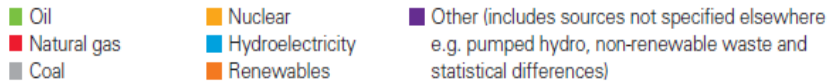
Electricity Generation (Tetrawatt hours)	2015	2016	2017	2018
Pakistan	110.5	122.9	126.6	140.6
India	1,317.3	1,401.7	1,470.3	1,561.1
Sri Lanka	13.2	14.4	14.9	15.5
Bangladesh	61.8	70.0	74.4	79.1
China	5,814.6	6,133.2	6,604.5	7,111.8
Singapore	50.3	51.6	52.2	52.9
World	24,286.9	24,956.9	25,676.6	26,614.8

- Electricity generation rose by an average of 3.7%, led by China (which accounted for more than half of the growth), India and the US.
- Renewables accounted for 33% of net increase in generation, followed by coal and natural gas reporting an increase of 31% and 25% respectively.
- The share of renewables in power generation increased from 8.4% to 9.3%.
- Coal continued to account for the largest share of power generation at 38%.

Regional Power Generation by Fuel

Regional electricity generation by fuel 2018

Percentage



- In North America, natural gas is the dominant fuel followed by coal
- In South & Central America, hydro contributes more than 50% of power generation
- In Europe, nuclear, coal, renewables and gas play an important role
- In CIS and Middle East, natural gas is the prominent fuel
- In Africa, coal and gas account for more than 70% of power generation
- In Asia Pacific, coal plays a dominant role
- Share of oil and nuclear has declined substantially with renewables share going up from 3% (10 years ago) to 9.3%
- Europe has the highest renewable penetration at 18% followed by South & Central America at 12%

Global Renewables Consumption & Generation

Renewables Consumption (MT Oil Equivalent)	2015	2016	2017	2018
Bangladesh	NA	0.1	0.1	0.1
China	64.1	81.7	111.4	1.5
India	14.7	18.1	21.7	0.1
Pakistan	0.5	0.7	0.9	1.2
Singapore	0.2	0.2	0.2	0.3
Sri Lanka	0.1	0.1	0.1	0.1
Total World	368.5	416.8	490.2	561.3
<p><i>Based on gross generation from renewable sources including wind, geothermal, solar, biomass and waste, and not accounting for cross-border electricity supply. Converted on the basis of thermal equivalence assuming 38% conversion efficiency in a thermal power station.</i></p>				

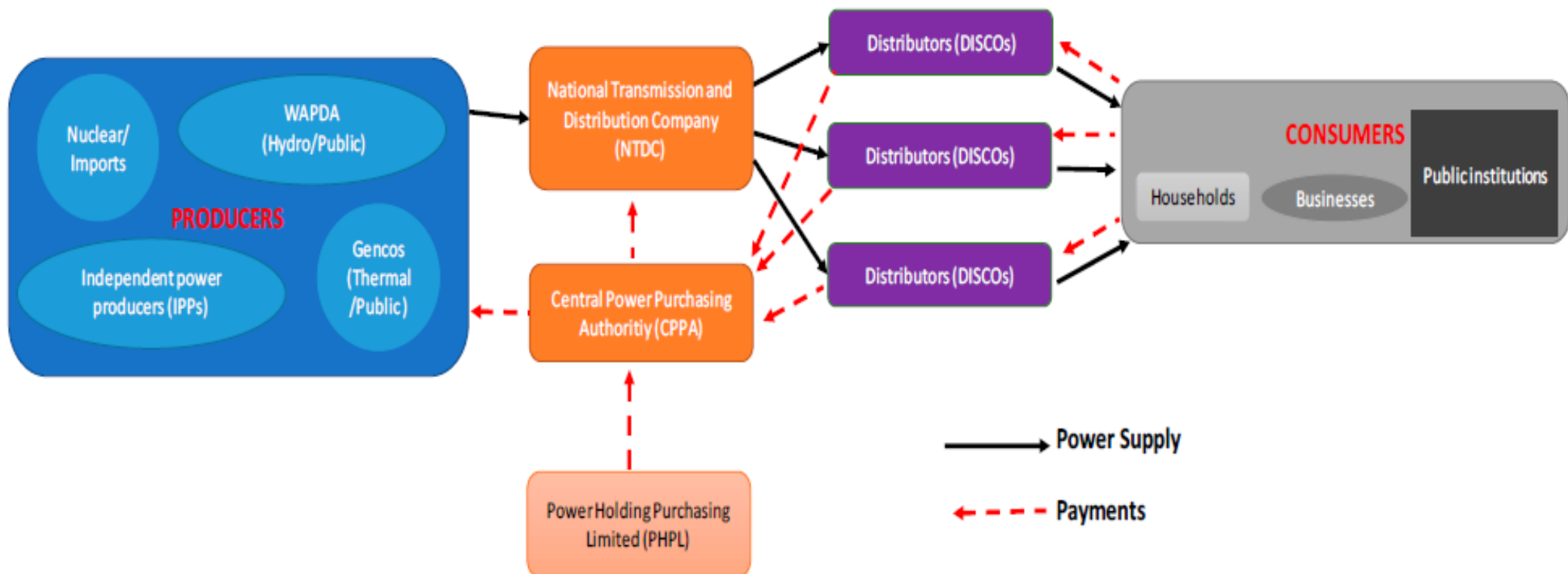
Wind Generation (Terawatt hours)	2017	2018
Bangladesh	<0.05	<0.05
China	295.0	366.0
India	52.6	60.3
Pakistan	1.2	1.7
Sri Lanka	0.4	0.3
Total World	1,128.0	1,270.0

- Renewable power grew by 14.5% in 2018
- By country, China was again the largest contributor to renewables growth on an average basis
- Hydroelectric generation increased by an average of 3.1%, with European generation increasing by 9.8% in 2018
- Nuclear generation rose by 2.4%, its fastest growth since 2010



Structure of Pakistan's Power Sector

Pakistan Power Sector Structure



Sources: Ministry of Energy, IMF staff calculations.

Pakistan's Installed Generation Capacity

Installed Generation Capacity (MW)	FY17	%	FY18	%
PEPCO/NTDC SYSTEM				
HYDEL				
WAPDA Hydel	6,902	24.0%	8,341	23.2%
IPPs Hydel	214	0.7%	372	1.0%
TOTAL HYDEL	7,116	24.8%	8,713	24.2%
THERMAL and NUCLEAR				
GENCOs with PEPCO	5,897	20.5%	5,637	15.7%
IPPs	10,566	36.8%	15,297	42.5%
SPPs/CPPs	340	1.2%	340	0.9%
CHASNUPP (I, II, III & IV)	1,005	3.5%	1,330	3.7%
TOTAL THERMAL AND NUCLEAR	17,808	62.0%	22,604	62.8%
A.3 RENEWABLE ENERGY (WIND, SOLAR AND BAGASSE)				
RE Power Plants connected with PEPCO	1,465	5.1%	1,809	5.0%
B. K-ELECTRIC SYSTEM				
KEL Own	1,874	6.5%	2,294	6.4%
IPPs Connected with KEL	252	0.9%	366	1.0%
SPPs/CPPs connected with KEL	87	0.3%	87	0.2%
KANUPP	137	0.5%	137	0.4%
TOTAL KEL	2,350	8.2%	2,884	8.0%
Total Installed Capacity of the Country	28,739		36,010	

Pakistan's Installed Generation Capacity

- More than 10,000 MW of new generation capacity has been added over the past 10 years with slight improvement noted in the transmission capacity and no improvement witnessed on the distribution front.
- Around 60% of the energy produced during FY18 was through thermal sources.
- Government envisages renewables sector's energy mix share to increase going forward.

Demand and Supply (NTDC+KEL)			
Financial Year ending 30th June	Generation Capability (MW)	Demand During NTDC's System Peak Hours (MW)	Surplus/ (Deficit) (MW)
Actual Figures			
2014	18,771	23,505	(4,734)
2015	19,132	24,757	(5,625)
2016	20,121	25,754	(5,633)
2017	21,940	28,387	(6,447)
2018	26,793	29,558	(2,765)
Projections			
2019	30,034	31,097	(1,063)
2020	32,253	32,242	11
2021	35,822	33,701	2,121
2022	41,239	35,589	5,650
2023	43,142	36,905	6,237

Year wise Capacity Additions (MW)	
FY19	3,345
FY20	1,964
FY21	4,244
FY22	8,774
FY23	3,680
FY24	3,786
FY25	1,865
	27,658

Energy Supply

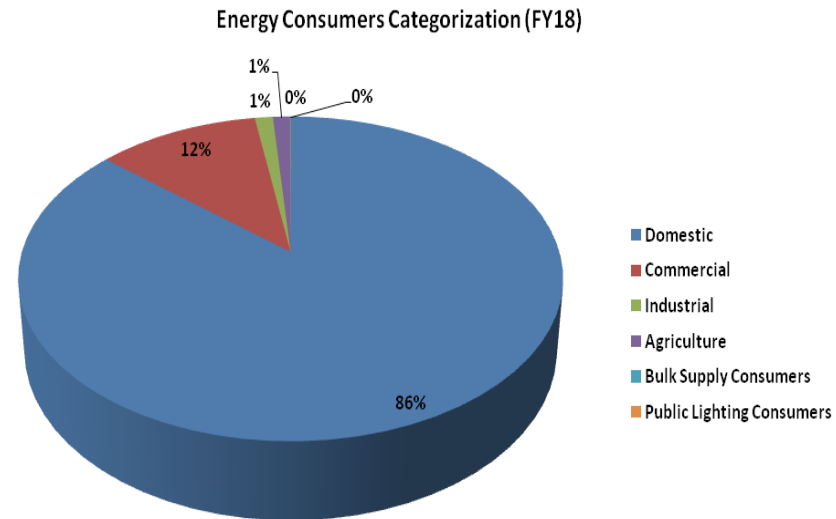
Fuel Wise Supply Dynamics (GWH)	FY16	%	FY17	%	FY18	%	FY19	%
Supply								
Hydel	34,272	33.9%	31,786	29.7%	28,238	23.4%	32,356	26.3%
Coal	105	0.1%	961	0.9%	11,786	9.8%	16,306	13.3%
HSD	1,428	1.4%	1,648	1.5%	788	0.7%	31	0.0%
RFO	30,156	29.9%	32,180	30.1%	22,770	18.9%	9,092	7.4%
Gas	29,024	28.7%	27,143	25.4%	22,611	18.7%	22,034	17.9%
RLNG	-	0.0%	3,768	3.5%	20,678	17.1%	28,245	23.0%
Nuclear	3,854	3.8%	5,868	5.5%	8,719	7.2%	9,006	7.3%
Import	463	0.5%	496	0.5%	554	0.5%	487	0.4%
Wind	691	0.7%	1,386	1.3%	2,145	1.8%	3,232	2.6%
Solar	174	0.2%	635	0.6%	702	0.6%	715	0.6%
Mixed	251	0.2%	271	0.3%	665	0.6%	405	0.3%
Bagasse	556	0.6%	928	0.9%	1,057	0.9%	894	0.7%
Total	100,974		107,070		120,713		122,803	

- Change in energy mix witnessed with share of RLNG and Coal increasing substantially over the years. Share of coal in generation mix is expected to increase further with new plants coming online
- Share of renewable sources is increasing on a timeline basis given cheapest forms of energy production (wind, solar and hydel)
- Share of RFO has declined considerably

Energy Demand and Supply Match

Demand And Supply Dynamics (GWH)	FY16	FY17	FY18	FY19
Supply	100,974	107,070	120,713	122,803
Demand	98,550	104,603	117,804	119,245
Surplus/ (Deficit)	2,424	2,467	2,909	3,558

Energy Consumers Categorization



Capacity Factor-Industry

Industry	FY14	FY15	FY16	FY17	FY18
Capacity Factor	51.15%	49.01%	50.16%	47.41%	41.52%

- Capacity factor measures percentage of installed capacity that is utilized. It measures how close the supply system is to be overloaded.
- A high capacity factor indicates higher efficiency of the system usage.
- Capacity factor of the industry is on the lower side in PEPCO system and the same needs to be improved through enhancement of operational efficiencies.



POWER SECTOR CHALLENGES

Impact of Power Sector on Pakistan's Economy

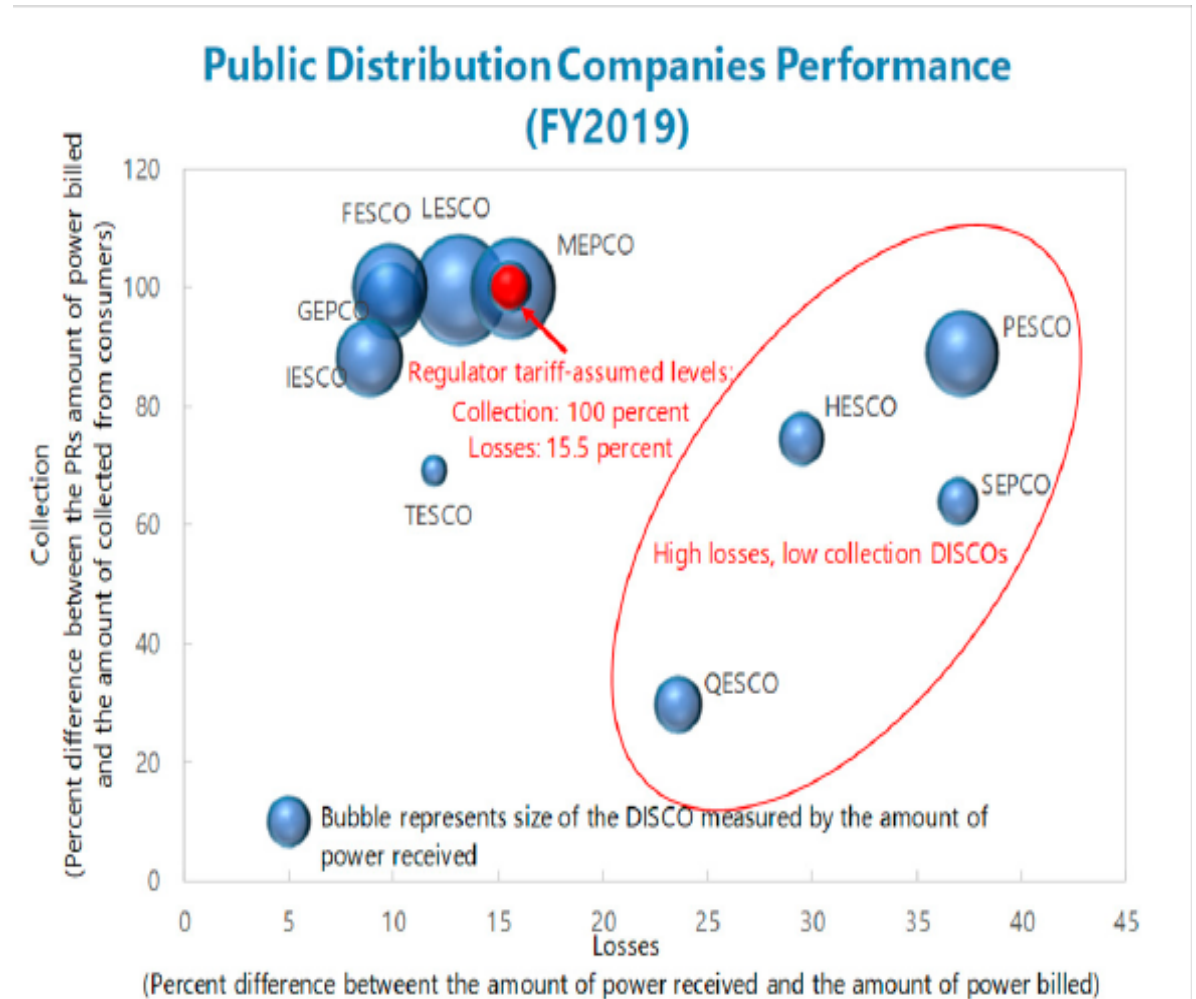
- **Significant fiscal implications**
 - Government has paid Rs. 3.2tr in subsidies during last 12 years (FY07-19) resulting in an average budgetary allocation of Rs. 246b
 - Government has paid Rs 1.6tr for circular debt clearance during last 12 years (FY07-19) resulting in an average budgetary allocation of Rs. 133b
 - Aggregate annual drag of power sector on the fiscal deficit has been Rs. 379b
- **Industry has lost competitiveness**
 - Higher tariffs has resulted in loss of competitiveness vis-à-vis regional peers

Problem in Tariff determination

- In tariff determination by NEPRA (the regulating authority), 100% recovery rate and T&D losses of 15.5% are assumed
- However the DISCOs report a significantly higher number of T&D losses and lower recovery rates.
- Consequently, set tariff is under priced than cost recovery generating revenue shortfall in the energy system

Weak Operational and Commercial performance of the distribution companies (DISCOs)

- There are a total of 10 DISCOs operating in Pakistan
- The ones situated in urban areas follow adequate law and order provisions in place
- However, the DISCOs operating in farther areas that have weak infrastructure and poor law and order situations cause problems in the total energy system of Pakistan
- Moreover, weak corporate governance framework of DISCOs with the same being evident from political interference and inadequate management structures cause operational shortcomings which are technically termed as Transmission and Distribution Losses (T&D) that range between 20-40% of the energy received.
- Furthermore, recovery ratio of many DISCOs is also on the lower side.

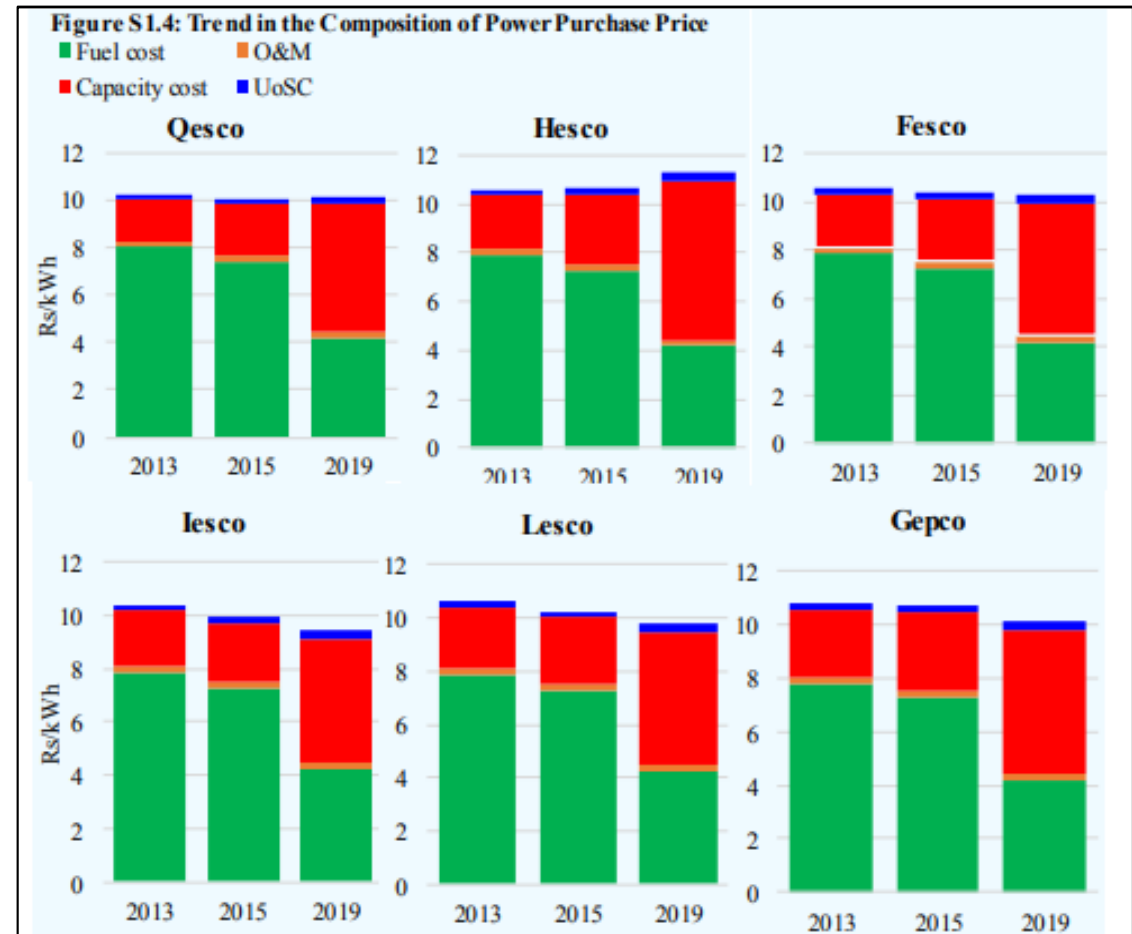


Piling Circular Debt

- The power sector circular debt has jumped to Rs. 1.9tr at end-December'19
- Power sector payables have been recorded at Rs. 990b with loans and liabilities in Power Holding Private Limited (PHPL) standing at Rs. 800b
- Circular debt arises from the following inefficiencies:
 - Set tariff being under priced than cost recovery generating revenue shortfall in the energy system
 - Delayed or non-payment of subsidies by government
 - Annual circular debt pile-up amounted Rs. 465b in FY19 one-third of which emanated from DISCOs inefficiencies
 - Accumulation of circular debt also stems from sizeable financial cost (KIBOR+4%) incurred on late payments made to producers
 - Electricity theft is also a cause of non-recovery from consumers

Elevated capacity payments leading to consistently high tariffs in Pakistan as compared to regional countries

- Sharp increase in capacity payments over the years has offset gains emanating from decreasing fuel costs.
- Annual capacity payments are expected to inflate to Rs. 1.5tr in FY25 from Rs. 640b in FY19 (FY20E: Rs. 900b; FY16:Rs. 280b).
- Planned increase in generation capacities are expected to further push tariffs upwards.



Phasing out of FO plants

- Share of RFO in the energy mix has declined considerably over the years
- However, Furnace Oil based power generation is expected to sustain at 1,000MW to ensure Furnace Oil off-takes from refineries
 - The oil refiners have approached the standing committee and petroleum division to have a separate merit order for fuel oil, and run efficient plants of about 2,000MW to ensure 7,000 to 9,000 tons per day of local Furnace Oil production off-take from the refineries in the interim period.
 - If FO off-take remains at current levels, availability of jet fuels may be an inevitable issue

Gas Crisis- An emerging challenge

- Gas supply glut prevails in the winter season given low heating demand. Consequently, high merit order plants (coal and hydel) meet the power demand during this season
- However, the country continues to import RLNG given long-term take or pay contracts
- Furthermore, Pakistan is tied up with expensive LNG contracts given current spot price is significantly lower than being paid for through long-term LNG contracts
- Although recent sharp reduction in crude oil prices is expected to result in lowering of imported LNG cost

Energy Demand Projections

Fiscal Year	Low GDP 4.5%		Normal GDP 5.5%		High GDP 7.0%	
	Generation	Peak Demand	Generation	Peak Demand	Generation	Peak Demand
	GWh	MW	GWh	MW	GWh	MW
2017-18*	120,791	26,741	120,791	26,741	120,791	26,741
2018-19	144,665	27,072	145,674	27,261	147,188	27,545
2019-20	151,062	27,814	152,914	28,155	155,718	28,671
2020-21	158,842	28,782	161,841	29,325	166,429	30,157
2021-22	166,267	30,127	170,645	30,921	177,416	32,147
ACGR (2019-22)	8.32%	3.03%	9.02%	3.70%	10.09%	4.71%
2022-23	173,178	30,889	179,142	31,953	188,476	33,618
2023-24	181,051	32,294	188,914	33,696	201,374	35,919
2024-25	188,749	33,640	198,744	35,422	214,788	38,281

Upcoming Capacities

Upcoming Capacities		
Hydel-IPPs	6,550.1	25%
Hydel-WAPDA	11,586.4	44%
RLNG	1,263.0	5%
Coal	4,753.0	18%
Wind	825.0	3%
Solar	524.0	2%
Bagasse	791.0	3%
	26,292.5	

Upcoming Hydel Projects

Upcoming IPPs	Capacity (MW)	Expected COD
Hydel-IPPs		
Gulpur Hydropower project	102.0	Feb'2020
Riali-II Hydropower Project	7.1	Mar'2021
Karot Hydropower Project	720.0	Dec'2021
Suki Kinari Hydropower Project	870.0	Dec'2022
Kathai-II Hydropower Project	8.0	April'2024
Azad Pattan Hydropower Project	700.0	June'2026
Kohala Hydropower Project	1,124.0	June'2026
Ashkot Hydropower Project	300.0	Dec'2026
Mahl Hydropower Project	640.0	June'2028
Athmuqam Hydropower Project	450.0	Dec'2028
Turtonas-Uzghor Hydropower Project	82.0	Dec'2028
Kaigah Hydropower Project	548.0	After 2028
Chakothe-Hattian Hydropower Project	500.0	After 2028
Rajdhani Hydropower Project	132.0	After 2028
Neckeherdim-Paur Hydropower Project	80.0	After 2028
Madian Hydropower Project	157.0	After 2028
Sehra Hydropower Project	130.0	After 2028
	6,550.1	
Hydel-WAPDA		
Keyal Khwar Hydropower Project	128.0	2020
Dasu Hydropower Project	4,320.0	2023
Kurram Tangi Dam	83.4	2021
Tarbela 5th Extension	1,410.0	2021
Mangla Dam Up-gradation	310.0	2023
Harpo	35.0	2025
Mohmand Dam	800.0	2024
Diamer Basha	4,500.0	2024
	11,586.4	

Upcoming RLNG and Coal Projects

Upcoming IPPs	Capacity (MW)	Expected COD
RLNG		
1263 MW RLNG based Project	1,263.0	2020
	1,263.0	
Coal		
Thar Energy Limited	330.0	Mar'2021
Thal Nova Power Thar (Pvt) Ltd	330.0	Mar'2021
Lucky Electric Power Company Ltd.	660.0	Mar'2021
Siddiqsons Energy Limited	330.0	Mar'2022
Thar Coal Block-I Power Generation Co. Ltd.	660.0	Aug'2022
China Communication Construction Co.	300.0	4Q2020
Thar Coal Block-I Power Generation Co. Ltd.	660.0	February'2023
Oracle Coal Fields PLC England	1,320.0	June'2023
Grange Power Limited	163.0	After 2028
	4,753.0	

Upcoming Wind Projects

Upcoming IPPs	Capacity (MW)	Expected COD
Wind		
Western Energy (Pvt) Limited	50.0	2020
Zephyr Power Pvt. Limited	50.0	2020
Burj Wind Energy Pvt. Ltd	14.0	2020
Trans Atlantic Energy Pvt. Ltd	50.0	2020
Shaheen Renewable Energy - 1 Pvt. Ltd	51.0	2020
ACT2 Wind (Pvt) Limited	50.0	2021
Artistic Wind Power (Pvt) Limited	50.0	2021
Din Energy Limited	50.0	2021
Gul Ahmed Electric	50.0	2021
Indus Wind Energy Limited	50.0	2021
Lakeside Energy (Pvt) Limited	50.0	2021
Liberty Wind Power-1 (Pvt) Limited	50.0	2021
Liberty Wind Power-2 (Pvt) Limited	50.0	2021
Master Green Energy Limited	50.0	2020
Metro Wind Power Limited	60.0	2021
NASDA Green Energy (Pvt) Limited	50.0	2021
Tricon Wind Power (Pvt) Limited	50.0	2021
	825.0	

Upcoming Solar and Bagasse Projects

Upcoming IPPs	Capacity (MW)
Solar	
Bukhsh Solar (Pvt.) Ltd.	10.0
Safe Solar Power Pvt. Ltd	10.0
Access Solar Pvt. Ltd	11.0
Integrated Power Solution	50.0
Jafri & Associates	50.0
Solar Blue Pvt. Ltd.	50.0
Access Electric Pvt. Ltd.	10.0
R.E. Solar I Pvt. Ltd.	20.0
R.E. Solar II Pvt. Ltd.	20.0
Janpur Energy Limited SPV: Jan Solar (Pvt.) Ltd	12.0
Lalpir Solar Power (Pvt.) Ltd.	12.0
Siddiqsons Solar Ltd	50.0
Adamjee Power Generation Pvt. Ltd.	10.0
ET Solar (Pvt.) Ltd.	50.0
ET Solar (Pvt.) Ltd.	25.0
ACT Solar (Pvt.) Ltd.	50.0
Asia Petroleum Limited	30.0
First Solar (Pvt.) Ltd.	2.0
Forshine (Pakistan)	50.0
Crystal Energy (Pvt.) Ltd	2.0
	524.0

Upcoming IPPs	Capacity (MW)
Bagasse	
M/s Alliance Power (Pvt.) Ltd	30.0
Safina Sugar Mills Ltd.	20.0
Etihad Power Generation Limited.	30.0
Shahtaj Sugar Mills Ltd	30.0
Sheikhoo Power Ltd.	30.0
M/s Indus Energy Limited.	30.0
M/s Hamza Sugar Mill Ltd (Unit-II)	30.0
M/s Hunza Power (Pvt.) Ltd.	50.0
M/s Bahawalpur Energy Ltd.	30.0
M/s Faran Power Ltd.	27.0
M/s Ittefaq Power (Pvt.) Ltd.	30.0
M/s Mehran Energy Ltd.	27.0
M/s Alman Seyyam (Pvt.) Ltd	35.0
M/s Sadiqabad Power (Pvt) Ltd.	45.0
M/s Gotki Power (Pvt) Ltd.	45.0
M/s Al-Mughnee Industries (Pvt.) Ltd	40.0
M/s Digri Gen Limited	25.0
M/s Ranipur Energy (Pvt.) Ltd	60.0
M/s Kashmir Power (Pvt) Ltd.	40.0
M/s TAY Powergen Company (Pvt.) Ltd	30.0
M/s Two Star Industries Pvt Ltd.	50.0
M/s HSM Energy Limited	27.0
M/s Popular Energy (Private) Limited	30.0
	791.0

Recommendation & Solutions under consideration by GoP

- **Improve efficiencies of DISCOs rather than only increasing the tariff. Higher tariff will result in**
 - Customers switching away from the grid
 - Erode industrial competitiveness
- **Renegotiate the contracts with IPPs**
 - Transferring the debt repayment towards the end of contracts
 - To renegotiate on interest rates (from K+4 to K+2) on delayed payments
 - Renegotiate on inflated cost of design and construction
 - Renegotiate ROEs
- Reduce capacity charge by transferring power from NTDC network (where supply is higher than demand) to KE network (where demand is greater than supply).
- Focus on industrialization through special economic zones to increase demand & reduce capacity charge
- Expedite Privatization of DISCOs to reduce transmission losses and improve recoveries
- Renegotiate existing LNG contracts
- Gradually reduce allocation of gas to industries given the declining gas reserves and shift towards grid

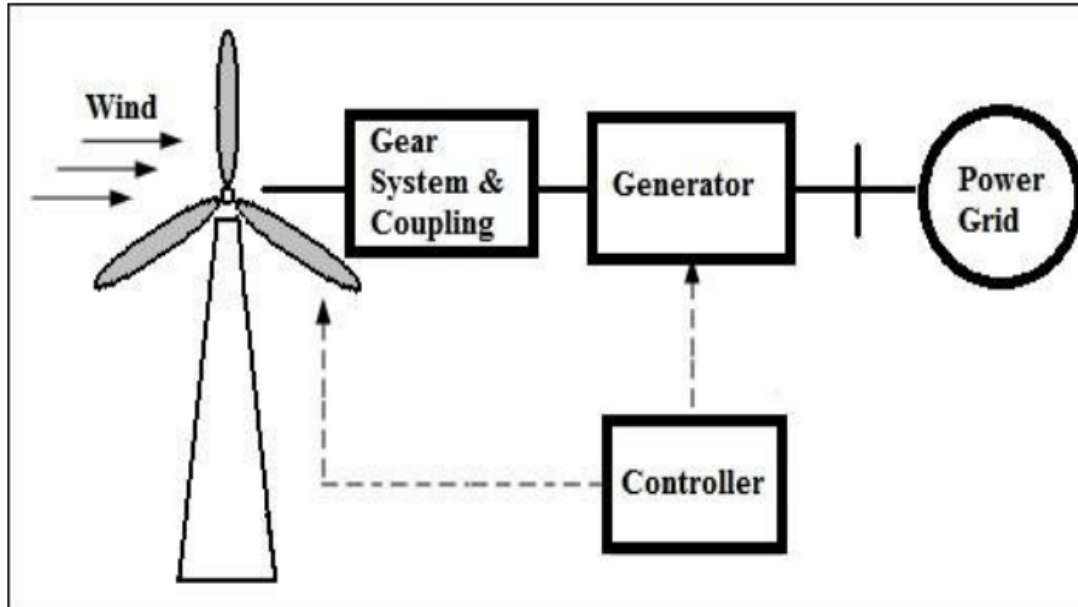


RENEWABLES ENERGY SECTOR

Renewables Energy Sector- Pakistan

- Historic energy demand supply gap had primarily been a function of imported oil in energy mix with the same putting burden on the external account of the country
- Consequently, the Government's focus diverted towards cheaper and renewable sources of energy which includes wind, solar, bagasse and hydro.
- Power division has finalized the Draft Renewable Energy Policy 2019 envisaging 30% of total generation capacity from Alternative and Renewable Energy Technologies (ARET) by 2030.
- The technologies covered under this policy are both conventional renewable energy including solar, wind, geothermal, biomass, as well as alternative technologies like biogas, syngas, Waste to Energy (WtE), storage systems, ocean/tidal waves, as well as all kinds of hybrids.
- Hydel projects are not covered in this policy which itself is projected to contribute around 30% in the energy mix

Wind Power Generation Process

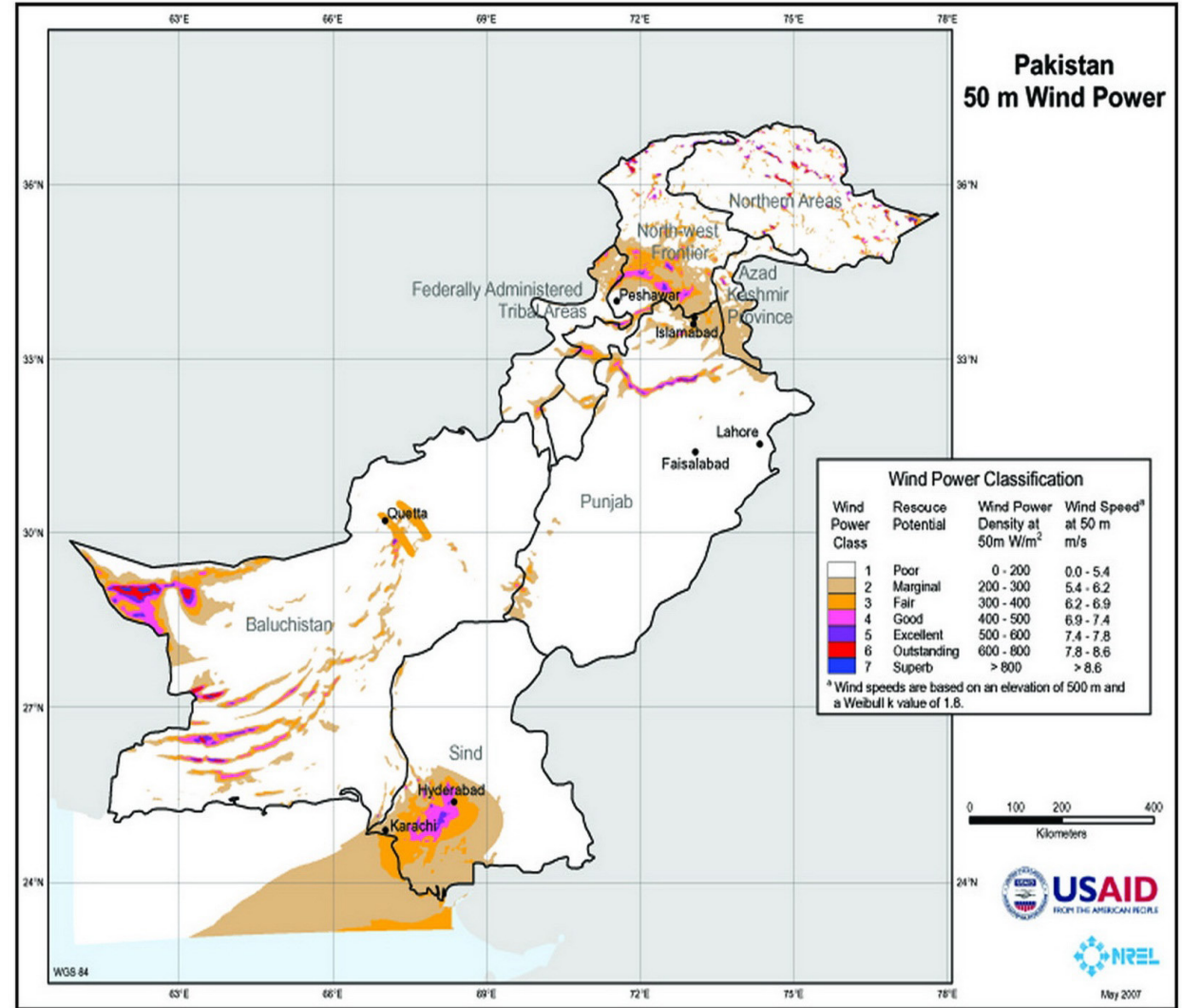


- **Wind Turbine:** Converts wind energy into rotational (mechanical) energy
- **Gear system and coupling:** It steps up the speed and transmits it to the generator rotor
- **Generator:** Converts rotational energy into electrical energy
- **Controller:** Senses wind direction, wind speed, generator output and temperature and initiates appropriate control signals to take control action.

Wind Power Sector- Pakistan

Wind Generation (Terawatt hours)	2017	2018
Bangladesh	<0.05	<0.05
China	295.0	366.0
India	52.6	60.3
Pakistan	1.2	1.7
Sri Lanka	0.4	0.3
Total World	1,128.0	1,270.0

- Zorlu Enerji was the first ever wind power plant of Pakistan and was inaugurated in April 2009 at Jhimpir, Sindh.
- Wind Power Generation potential is 50,000 MW
- Current wind power generation capacity stands at 1,185.7 MW
- Additional 825 MW wind power capacity is in pipeline raising the country's total wind generation capacity to 2,010.7 MW



Existing Wind Power Projects

CURRENT STATUS-WIND POWER PROJECTS							
S.No.	Name of Project	Capacity MW	Location	Tariff Regime	EPA / IA	Current Status	Remarks
1	FFC Energy Limited	49.50	Jhampir	Cost Plus	Signed EPA with CPPA/NTDCL and IA with GOP (AEDB)	Operational	Achieved COD on 16-May-2013
2	Zorlu Enerji Pakistan (Pvt.) Limited	56.40	Jhampir	Cost Plus	Signed EPA with CPPA/NTDCL and IA with GOP (AEDB)	Operational	Achieved COD on 26-July-2013
3	Three Gorges Pakistan First Wind Farm (Pvt.) Limited	49.50	Jhampir	Cost Plus	Signed EPA with CPPA/NTDCL and IA with GOP (AEDB)	Operational	Achieved COD on 25-Nov-2014
4	Foundation Wind Energy II (Pvt.) Limited	50.00	Gharo	Cost Plus	Signed EPA with CPPA/NTDCL and IA with GOP (AEDB)	Operational	Achieved COD on 10 Dec-2014
5	Foundation Wind Energy –I Limited	50.00	Gharo	Cost Plus	Signed EPA with CPPA/NTDCL and IA with GOP (AEDB)	Operational	Achieved COD on 11-Apr-2015
6	Sapphire Wind Power Company Limited	52.80	Jhampir	Upfront	Signed EPA with CPPA/NTDCL and IA with GOP (AEDB)	Operational	Achieved COD on 22 Nov-2015
7	Metro Power Company Limited	50.00	Jhampir	Cost Plus	Signed EPA with CPPA/NTDCL and IA with GOP (AEDB)	Operational	Achieved COD on 16-Sep-2016
8	Yunus Energy Limited	50.00	Jhampir	Upfront	Signed EPA with CPPA/NTDCL and IA with GOP (AEDB)	Operational	Achieved COD on 16-Sep-2016
9	Master Wind Energy Pvt. Limited	52.80	Jhampir	Upfront	Signed EPA with CPPA/NTDCL and IA with GOP (AEDB)	Operational	Achieved COD on 14-Oct-2016
10	Tapal Wind Energy Pvt. Limited	30.00	Jhampir	Upfront	Signed EPA with CPPA/NTDCL and IA with GOP (AEDB)	Operational	Achieved COD on 8-Oct-2016
11	Gul Ahmed Wind Power Ltd	50.00	Jhampir	Upfront	Signed EPA with CPPA/NTDCL and IA with GOP (AEDB)	Operational	Achieved COD on 18-Oct-2016
12	Tenega Generasi Limited	49.50	Gharo	Upfront	Signed EPA with CPPA/NTDCL and IA with GOP (AEDB)	Operational	Achieved COD on 11-Oct-2016
13	Hydro China Dawood Power Pvt. Limited	49.50	Gharo	Upfront	Signed EPA with CPPA/NTDCL and IA with GOP (AEDB)	Operational	Achieved COD on 4-Apr-2017
14	Sachal Energy Development Pvt. Limited	50.00	Jhampir	Cost Plus	Signed EPA with CPPA/NTDCL and IA with GOP (AEDB)	Operational	Achieved COD on 11-Apr-2017
15	UEP Wind Power Pvt. Limited	99.00	Jhampir	Upfront	Signed EPA with CPPA/NTDCL and IA with GOP (AEDB)	Operational	Achieved COD on 16-Jun-2017
16	Jhampir Wind Power Limited	50.00	Jhampir	Upfront	Signed EPA with CPPA-G and IA with GOP (AEDB)	Operational	Achieved COD on 16-Mar-2018
17	Hawa Energy Pvt. Limited	49.60	Jhampir	Upfront	Signed EPA with CPPA-G and IA with GOP (AEDB)	Operational	Achieved COD on 15-Mar-2018
18	Artistic Energy (Pvt) Limited	49.30	Jhampir	Upfront	Signed EPA with CPPA-G and IA with GOP (AEDB)	Operational	Achieved COD on 16-Mar-2018
19	Three Gorges Pakistan Second Wind Farm Pakistan Limited	49.50	Jhampir	Upfront	Signed EPA with CPPA-G and IA with GOP (AEDB)	Operational	Achieved COD on 20-Jun-2018
20	Three Gorges Pakistan Third Wind Farm Pakistan (Pvt.) Limited	49.50	Jhampir	Upfront	Signed EPA with CPPA-G and IA with GOP (AEDB)	Operational	Achieved COD on 9-Jun-2018
21	Tricon Boston Consulting Corporation Pvt. Limited - A	49.60	Jhampir	Upfront	Signed EPA with CPPA-G and IA with GOP (AEDB)	Operational	Achieved COD on 16-Aug-2018
22	Tricon Boston Consulting Corporation Pvt. Limited - B	49.60	Jhampir	Upfront	Signed EPA with CPPA-G and IA with GOP (AEDB)	Operational	Achieved COD on 14-Sep-2018
23	Tricon Boston Consulting Corporation Pvt. Limited - C	49.60	Jhampir	Upfront	Signed EPA with CPPA-G and IA with GOP (AEDB)	Operational	Achieved COD on 11-Sep-2018
		1,185.70					

Upcoming Wind Power Capacity

UPCOMING WIND POWER PROJECTS

S.No.	Name of Project	Capacity MW	Location	Current Status	Expected Completion
1	Western Energy (Pvt) Limited	50.00	Jhampir	LOI Stage	2020
2	Zephyr Power Pvt. Limited	50.00	Gharo	Under Construction	2020
3	Burj Wind Energy Pvt. Ltd	14.00	Gujju	LOI Stage	2020
4	Trans Atlantic Energy Pvt. Ltd	50.00	Jhampir	LOI Stage	2020
5	Shaheen Renewable Energy - 1 Pvt. Ltd	51.00	Jhampir	LOI Stage	2020
6	ACT2 Wind (Pvt) Limited	50.00	Jhampir	FC in Process	2021
7	Artistic Wind Power (Pvt) Limited	50.00	Jhampir	Under Construction	2021
8	Din Energy Limited	50.00	Jhampir	FC in Process	2021
9	Gul Ahmed Electric	50.00	Jhampir	FC in Process	2021
10	Indus Wind Energy Limited	50.00	Jhampir	FC in Process	2021
11	Lakeside Energy (Pvt) Limited	50.00	Jhampir	FC in Process	2021
12	Liberty Wind Power-1 (Pvt) Limited	50.00	Jhampir	FC in Process	2021
13	Liberty Wind Power-2 (Pvt) Limited	50.00	Jhampir	FC in Process	2021
14	Master Green Energy Limited	50.00	Jhampir	FC in Process	2020
15	Metro Wind Power Limited	60.00	Jhampir	FC in Process	2021
16	NASDA Green Energy (Pvt) Limited	50.00	Jhampir	FC in Process	2021
17	Tricon Wind Power (Pvt) Limited	50.00	Jhampir	FC in Process	2021
		825.00			

Tariff Variation in Old and New Wind Power Projects (Some Examples)

Wind Power Producers	Tariff Awarded (Rs./Kwh)	Policy
Artistic Energy Limited	12.71	Old
Yunus Energy Limited	14.92	Old
Zephyr Power	11.63	Old
Foundation Wind Energy I	12.19	Old
Foundation Wind Energy II	12.17	Old
Master Wind Energy	14.75	Old
Act 2 Wind	5.67	New
Lakeside	5.66	New
Artistic Wind Power	5.67	New
Master Green Energy	4.96	New

- Tariff of new wind power projects is on the lower side owing to the following two main reasons:
 - Lower EPC Cost
 - Higher efficiency of new wind power plants having lesser O&M costs
 - Availability of concessionary rate financing from SBP at the rate of 6%.
 - Lower ROEs

Power Curtailment from Wind Clusters

- The transmission constraints in HESCO network are leading to generation curtailment of Wind Power Plants in the HESCO area resulting in heavy payment against NPMV (Non-Project Missed Volumes).
- Presently out of 783.9 MW total installed capacity of wind energy, approximately 485 MW can be evacuated and remaining 298.9 MW was forced to be curtailed during high wind period.
- During winters of current year, which is a low demand season, wind power curtailment was on the higher side during 1HFY20 because Government prefers RLNG and imported coal sources due to their 'must run' condition.
- Consequently, wind power producers with an upfront tariff (where wind risk is on the producers), they are to be compensated at an average of 30% of NPMV.

Rated Wind Sector Companies in VIS Universe

Rs. in m	FY16	FY17	FY18	FY19	FY16	FY17	FY18	FY19
Company	Artistic Energy (Pvt) Limited				Yunus Energy Limited			
Rating	A/A-1 (VIS)				A+/A-1 (VIS)			
Net Sales	NA	-	1,161	3,101	-	1,865	2,601	2,940
Gross Margin	NA	0.0%	79.9%	69.7%	0.0%	75.9%	76.5%	77.5%
Net Profit Margin	NA	0.0%	67.7%	54.7%	0.0%	38.6%	46.4%	48.3%
FFO	NA	-	797	1,651	(41)	913	1,673	1,862
Total Debt	NA	2,726	11,023	9,321	7,422	8,467	7,885	7,322
FFO/Total Debt	NA	0%	7%	18%	-1%	11%	21%	25%
FFO/Long term debt	NA	0%	7%	16%	-1%	11%	21%	25%
Leverage	NA	2.92	3.03	3.28	2.93	2.57	2.01	1.70
Gearing	NA	2.88	2.99	2.63	2.58	2.35	1.91	1.59
DSCR	NA	-	5.32	1.81	(40.27)	2.12	1.72	1.76
Total Liabilities	NA	2,765	11,172	11,628	8,427	9,236	8,273	7,851
Total Equity	NA	946	3,692	3,550	2,880	3,600	4,119	4,616
Trade Debts	NA	-	955	1,520	-	942	1,419	1,844
Trade Debts/Sales	NA	NA	82%	49%	NA	50%	55%	63%
Current ratio	NA	7.53	3.10	1.80	0.29	1.52	2.05	2.29

Rs. in m	FY16	FY17	FY18	9MFY19	FY16	FY17	FY18	9MFY19
Company	Foundation Wind Energy I				Foundation Wind Energy II			
Rating	A+/A-1 (VIS)				A+/A-1 (VIS)			
Net Sales	NA	2,584	2,499	1,683	NA	2,215	2,467	1,672
Gross Margin	NA	70.0%	63.1%	54.4%	NA	64.8%	62.2%	56.1%
Net Profit Margin	NA	44.4%	37.5%	27.3%	NA	37.5%	38.1%	28.2%
FFO	NA	1,595	1,413	1,046	NA	1,278	1,356	1,075
Total Debt	NA	7,249	6,729	6,972	NA	2,047	1,870	1,754
FFO/Total Debt	NA	22%	21%	15%	NA	19%	20%	21%
FFO/Long term debt	NA	22%	21%	15%	NA	21%	20%	21%
Leverage	NA	1.48	1.21	1.18	NA	1.36	1.13	1.15
Gearing	NA	1.43	1.13	1.10	NA	1.30	1.07	1.09
DSCR	NA	1.08	1.28	1.61	NA	1.00	1.30	1.37
Total Liabilities	NA	7,502	7,269	7,455	NA	7,136	6,970	7,234
Total Equity	NA	5,069	6,008	6,318	NA	5,247	6,168	6,290
Trade Debts	NA	1,193	1,778	1,368	NA	1,204	1,723	1,395
Trade Debts/Sales	NA	46%	71%	81%	NA	54%	70%	83%
Current ratio	NA	1.18	1.43	1.44	NA	NA	NA	NA

Financial Analysis- Profitability

- Profitability of wind power producers have witnessed an improving trend primarily due to currency devaluation
- Average capacity and availability factors of wind power companies has generally remained compliant with NEPRA benchmarks
- However, capacity factor was on the lower side during 1HFY20 due to power curtailment by the GoP
- ROE of old plants was allowed at 17% with the new plants having an ROE of 14%
- In PKR, ROE of wind power producers is on the higher side (2 year average of 30%) led by sizeable currency devaluation

Liquidity & Capitalization

- Owing to improving profitability profile, cash flows generation (before working capital changes) of wind power producers has improved
- However, pressure arising from rising circular debt is a drag on liquidity profile
- Given debt servicing being a built-in component of the tariff and commitment of the government for timely release of fund for debt payments, debt servicing is expected to remain satisfactory
- Equity growth in wind power companies is limited given sizeable profits paid out as dividends
- Given sizeable debt levels for funding of projects, leverage and gearing indicators are on the higher side.
- Leverage indicators are expected to improve overtime due to debt repayments

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