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An Overview of Electricity Sector

In Pakistan

ISLAMABAD CHAMBER OF COMMERCE & INDUSTRY
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Executive Summery

The power sector in Pakistan is a mix of hydel and thermal units dominated by two vertically integrated public sector utilities that are Water and Power Development Authority (WAPDA) for all of Pakistan except Karachi, and the Karachi Electric Supply Corporation (KESC) for the City of Karachi and its surrounding areas. There are a number of independent power producers that contributes significantly in electricity generation in Pakistan.

For years, the matter of balancing Pakistan's supply against the demand for electricity has remained a largely unresolved matter. Pakistan faces a significant challenge in revamping its network responsible for the supply of electricity.

Due to an unrealistic power tariff, high inefficiencies, low payment recovery and the inability of the government to manage its subsidies mechanism that lead to a serious “circular debt” issue which is becoming a barrier for future energy sector investment.

The economy is badly affected by electricity crisis with loss of huge capital. The solution to the current crisis lies in energy conservation at all level in the country. The use of alternate energy such as wind and solar power could be utilized to immediately reduce the shortages, while electricity projects from coal and large dam could provide a long-term solution to the electricity shortage.

However, China, Iran, India and Tajikistan, Germany, Qatar, Kuwait and some other countries have been offering to export electricity to Pakistan to overcome the growing electricity crisis.

Abbreviations

WAPDA	Water and Power Development Authority
KESC	Karachi Electric Supply Company
PEPCO	Pakistan Electric Power Company
LESCO	Lahore Electric Supply Company
GEPCO	Gujranwala Electric Supply Company
FESCO	Faisalabad Electricity Supply Company
IESCO	Islamabad Electricity Supply Company
MEPCO	Manpower Export Placement Corporation
PESCO	Peshawar Electric Supply Company
HESCO	Hyderabad Electric Supply Company
QESCO	Quetta Electric Supply Company
TESCO	Tribal Electric Supply Company
SEPCO	Southern Electric Power Company
GENCO	Central Power Generation Company
NTDC	National Transmission & Despatch Company
IPP	Independent Power producers
AEDB	Alternative Energy Development Board
PAEC	Pakistan Atomic Energy Commission
PEPCO	Pakistan Electric Power Company
NEPRA	National Electric Power Regulatory Authority
PPA	Power Purchase Agreement
PSO	Pakistan State Oil
RPP	Rental Power Plants
DISCO	Power Distribution Companies
CPP	Capacity Purchase Price
EPP	Energy Purchase Price
JEWG	Joint Energy Working Group
CTGPC	China Three Gorges Project Corporation
NesPAK	National Engineering Services Pakistan
CASA	Central Asia South Asia
HVDC	High Voltage Direct Current

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CHAPTER # 01. Electricity in Pakistan

1.1. Background:

Electricity is considered to be life line of any economy and most vital instrument of socioeconomic development of a country. Electricity is pivotal in running machinery in factories and industrial units, for lighting our cities and powering our vehicles. The challenge of ensuring electricity access for industries and providing increased access to the poor parts of the population is the key issue for any government.

There has been an enormous increase in the demand of energy as a result of industrial development and population growth, in comparison to enhancement in energy production. Supply of energy is, therefore, far less than the actual demand, resultantly crisis has emerged.

Pakistan's energy infrastructure is not well developed, rather it is considered to be underdeveloped and poorly managed. Currently the country is facing severe energy crisis. Despite of strong economic growth and rising energy demand during past decade, no serious efforts have been made to install new capacity of generation. Moreover, rapid demand growth, transmission losses due to outdated infrastructure, power theft, and seasonal reductions in the availability of hydropower have worsened the situation. Consequently, the demand exceeds supply and hence load-shedding is a common phenomenon through power shutdown.

At the time of independence, Pakistan inherited 60MW of power generation capability for a population of 31.5 million, yielding 4.5 units per capita consumption. Twelve years later, when WAPDA was created in 1959, the generation capacity had increased to 119 MW.

In 1964-65, the electricity generation capability rose to 636 MW from 119 in 1959, and power generation to about 2,500 MKWH from 781 MKWH. The rapid progress witnessed a new life to the social, technical and economic structures of the country, mechanized agriculture started, industrialization picked up and general living standards improved.

The task of accelerating the pace of power development picked up speed and by 1970, in another five years the generating capability rose from 636 MW to 1331 MW with installation of a number of thermal and hydel power units. In the year 1980 the system capacity touched 3000 MW which rapidly rose to over 7000 MW in 1990-91.

A rapid growth of the Karachi was witnessed in 1990s as big industrial and commercial houses were set up leading to sudden increase in demand for electricity. Therefore, KESC has been granted the license to generate, transmit and distribute power in its licensed area. In 2000s, annual consumption of electricity in the residential sector has increased per customer, while annual consumption by each industrial customer has also reached at peak and widened the demand-supply gap. In 2006, the Asian Development Bank has estimated that 45 percent of Pakistan's population lacked access to electricity.

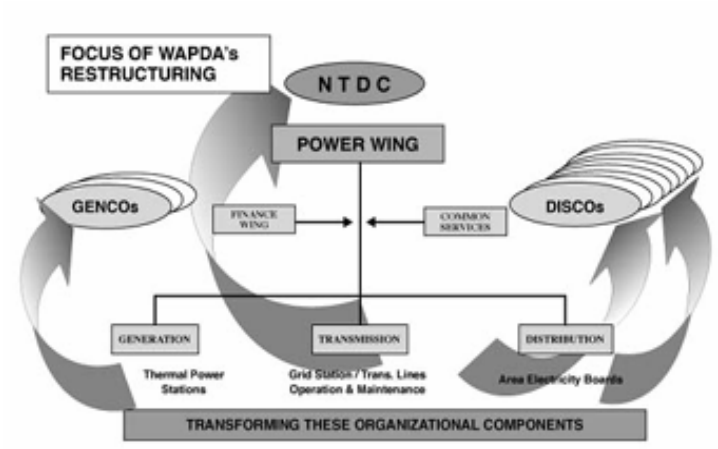
Electricity crisis worsens in Pakistan in 2008 as shortage of Electricity has increased up to 4000MV. Pakistan's industrial consumers were facing an electric power deficit due to low water levels at hydroelectric dams.

Year 2011 started with electricity shortages and worst load shedding of all time and ending with the same situation.

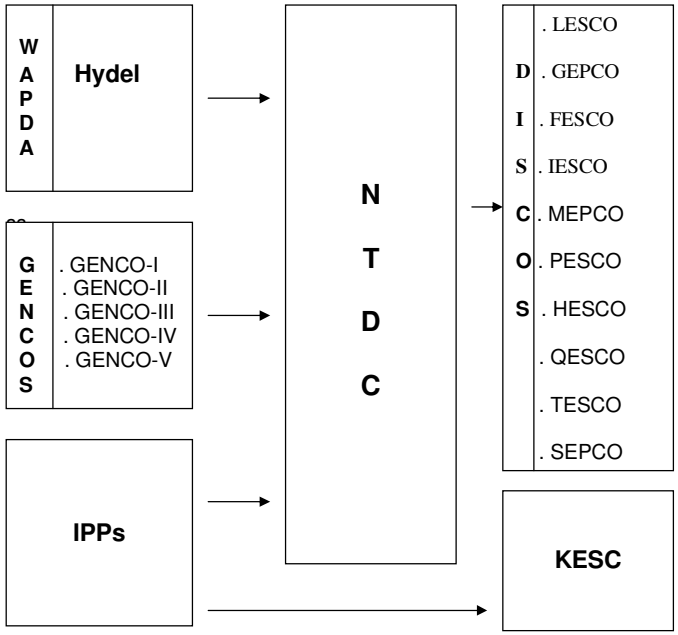
Summers were worst period for Pakistan people where in some areas load shedding of even 16 to 18 hours were witnessed but the winters were also worst of all with up 8 hours of load shedding. Prices of electricity were also kept increasing. Electricity shortages caused losses to industry, in turn causing many closures and loss of jobs for people of Pakistan.

1.2. Pakistan Electricity Sector Structure:

The Power sector was restructured in 1998 with the creation of PEPCO (Pakistan Electric Power Company. Prior to 1998, there were two vertically integrated utilities, i.e, KESC, which served the Karachi area and WAPDA which served the rest of the country. Later on, WAPDA's power wing has been structured into distinct corporate entities comprising of 4 GENCOs, 10 DISCOs and one TransCO (NTDC).

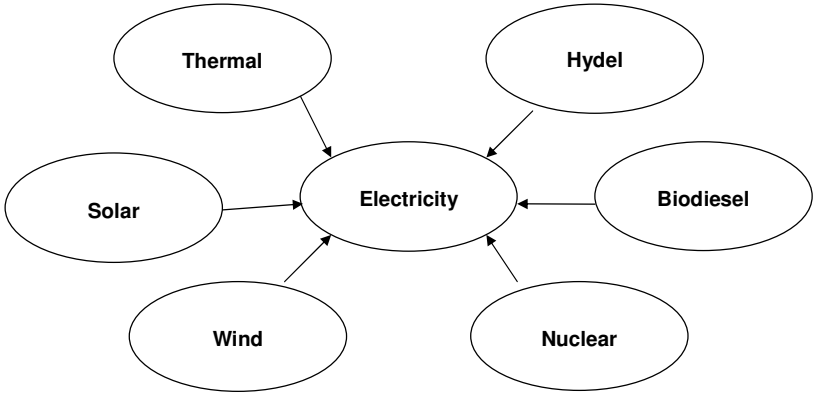


These 10 DISCOs are responsible for distribution to the end users. KESC meet its overall demand with its own generation plus purchase from NTDC, IPPs and from Karachi Nuclear Power Plant. The Current structure pf the power sector is shown below.



1.3. Sources of Electricity in Pakistan:

Electric power in Pakistan comes from a variety of sources;



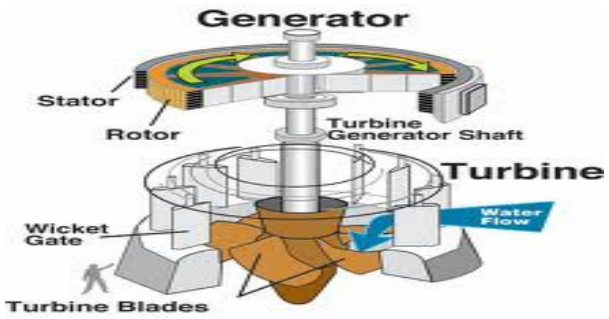
a) Thermal:

At present, thermal power generation stood at 8,300MW but these plants have low conversion efficiencies and are expensive to maintain and operate. Most of the thermal power plants installed by IPPs, use furnace oil which has become very expensive over the recent past.

The furnace oil has to be imported and consumes our foreign reserves. Some of these plants can also use natural gas as fuel but the country has started feeling the pinch of short supplies of gas as well.

b) Hydro power:

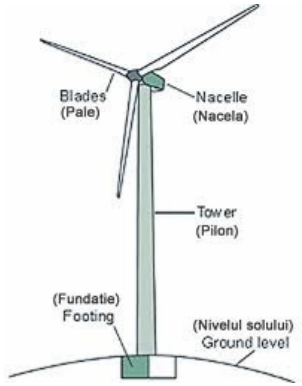
Hydro power is generated by using electricity generators to extract energy from moving water. Pakistan is having rich resource of energy in hydel power, however, only 34 % of total electricity generation is coming from hydro power. Currently we are having 6555 MW against the potential of 41000 to 45000 MW.



C) Wind:

Wind power harnesses the power of the wind to propel the blades of wind turbines. These turbines cause the rotation of magnets, which creates electricity.

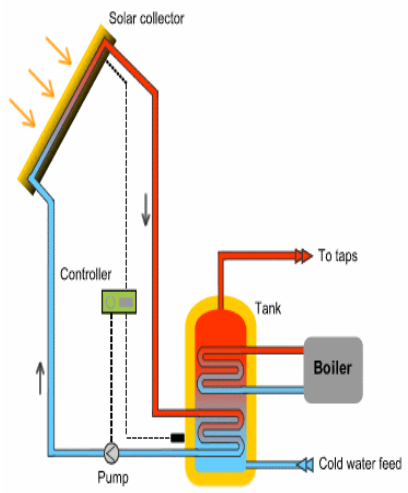
Though Pakistan has potentials of wind energy ranging from 10000 MW to 50000 MW, yet power generation through wind is in initial stages in Pakistan and currently 06 MW has been installed in first phase in Jhampir through a Turkish company and 50 MW will be installed shortly. More wind power plants will be built in Jhampir, Gharo, Keti Bandar and Bin Qasim Karachi.



d) Solar:

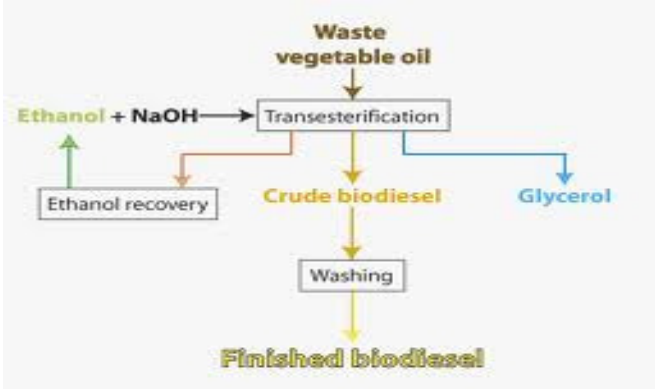
Solar power involves using solar cells to convert sunlight into electricity, using sunlight hitting solar thermal panels to convert sunlight to heat water or air. Pakistan has potential of more than 100,000 MW from solar energy. Building of solar power plants is underway in Kashmir, Punjab, Sindh and Balochistan.

However, private vendors are importing panels / solar water heaters for consumption in the market. Alternative Energy Development Board (AEDB) is working for 20,000 solar water heaters in Gilgit Baltistan. Mobile companies have been asked by the government to shift supply of energy to their transmission towers from petroleum to solar energy panels.



e) Agricultural biomass /Biodiesel:

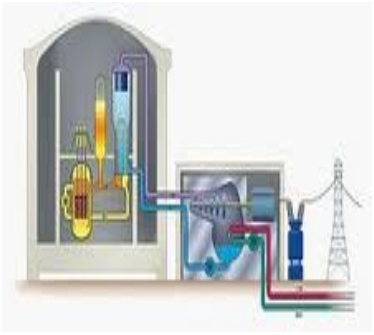
Biomass production involves using garbage or other renewable resources such as sugarcane, corn or other vegetation to generate electricity. When garbage decomposes, methane is produced and captured in pipes and later burned to produce electricity. Vegetation and wood can be burned directly to generate energy, like fossil fuels, or processed to form alcohols. Brazil has one of the largest renewable energy programs from biomass/biodiesel in the world, followed by USA. AEDB of Pakistan has planned to generate 10 MW of electricity from municipal waste in Karachi followed by similar projects in twenty cities of country.



f) Nuclear:

Nuclear power stations use nuclear fission reaction to generate energy by the reaction of uranium inside a nuclear reactor. Pakistan has a small nuclear power program, with 425 MW capacity, but there are plans to increase this capacity substantially.

Since Pakistan is outside the Nuclear Non-Proliferation Treaty, it is excluded from trade in nuclear plant or materials, which hinders its development of civil nuclear energy. Remaining issues in development of nuclear energy are enrichment of uranium from U235 to U238, controlling chain reaction and dumping of solid waste.



1.4. Total Install Capacity:

There are four major power producers in the country, which include:

a) Water and Power Development Authority (WAPDA)

b) Karachi Electric Supply Company (KESC)

c) Independent power producers (IPPs)

d) Pakistan Atomic Energy Commission (PAEC).

a) WAPDA:

In March 2010-11, the electricity generation from hydro has increased by 14.4 percent while thermal decreased by 2.4 percent as compared to the same period last year, Furthermore, the share in total energy generation by hydro generation remained at 36 percent while thermal generation stood at 64 percent during the period under review.

Table 1.1: Electricity Generation by WAPDA (GWh)

Year	Hydro	Share (%)	Thermal	Share (%)	Total
2001-02	19,056	31.3	41,804	68.7	60,860
2002-03	22,350	34.9	41,690	65.1	64,040
2003-04	27,477	39.8	41,617	60.2	69,094
2004-05	25,671	34.9	47,849	65	73,520
2005-06	30,855	37.5	51,370	62.5	82,225
2006-07	31,942	36.4	55,895	63.6	87,837
2007-08	28,667	33.23	57,602	66.77	86,269
2008-09	27,763	32.90	56,614	67.10	84,377
2009-10	28,492	31.90	60,746	68.10	89,238
July-March					
2009-10	21,072	32.45	43,862	67.55	64,935
2010-11	24,105	36.02	42,823	63.90	66,928
Total generation includes purchase from IPPs and imports					
Source PEPCO, NTDC					

b) KESC thermal power capacity:

Thermal Power Station Korangi 316MW, Gas Turbine Power Station Korangi 80MW, Gas Turbine Power Station SITE 100MW, Thermal Power Station Bin Qasim 1260MW. KESC's total installed capacity: 1,756MW.

c) IPPs thermal power capacity:

Hub Power Project 1,292 MW, AES Lalpir Ltd Mahmood Kot Muzaffargarh 362 MW, AES Pak Gen Mahmood Kot Muzaffargarh 365 MW, Altern Energy Ltd Attock 29 MW, Fauji KabirWala Power Company Khanewal 157 MW, Gul Ahmad Energy Ltd Korangi 136 MW, Habibullah Coastal Power Ltd 140 MW, Japan Power Generation Lahore 120 MW, Kohinoor Energy Ltd Lahore 131 MW, Liberty Power Limited Ghotki 232 MW, Rousch Power Khanewal 412 MW, Saba Power Company Sheikhupura 114 MW, Southern Electric Power Company Ltd Raiwind 135 MW, Tapal Energy Limited Karachi 126 MW, Uch Power Ltd Dera Murad Jamali Nasirabad 586 MW, Attock Gen Ltd Morgah Rawalpindi165 MW, Atlas Power Sheikhupura 225 MW, Engro Energy Ltd Karachi 217 MW, Kot Addu Power Company Limited 1,638 MW. IPPs' total installed capacity: 6,365MW.

4) PAEC's nuclear power capacity:

KANUPP 137 MW, CHASNUPP-1 325 MW. PAEC's total capacity: 462 MW.

1.5. Electricity Consumption:

1.5.1. Annual Electricity Consumption:

During the period 2001-02 to 2009-10, the consumption of electricity has increased at an average of 4.9 percent per annum while in July-March 2010-11, electricity consumption has increased by 2.8 percent.

Table 1.2: Annual Electricity Consumption

Fiscal Year	Consumption (GWh)	Change (%)
2001-02	50,622	4.2
2002-03	52,656	4.0
2003-04	57,491	9.2
2004-05	61,327	6.7
2005-06	67,603	10.2
2006-07	72,712	7.6
2007-08	73,400	0.9
2008-09	70,371	-4.1
2009-10	74,348	5.65
Avg.9 years		4.9
July-March		
2009-10	54,653	-
2010-11	56,194	2.8
Source: Hydrocarbon Development Institute of Pakistan		

1.5.2. Sectoral Consumption of Electricity:

The consumption of electricity indicates some revival in economic activities as the increase mainly emanates from industrial sector where an increase of 7.3 percent, has been witnessed. With the exception of agriculture and street lighting sectors, all remaining sectors witnessed a positive growth during July-March 2010-11.

Table 1.3: Consumption of electricity by Sectors

Year	House hold		Commercial		Industrial		Agriculture		Street Light		Other Govt.		Total
	GWh	Change (%)	GWh (000)	Change (%)	GWh (000)	Change (%)	GWh (000)	Change (%)	GWh	Change (%)	GWh (000)	Change (%)	
2001-02	23.2	1.8	3	7.1	15.1	5.6	5.6	14.3	212	-0.5	3.5	0	50,622
2002-03	23.7	2.2	3.2	6.7	16.2	7.3	6	7.1	244	15.1	3.4	-2.9	52,656
2003-04	25.8	8.9	3.7	15.6	17.4	7.4	6.7	11.7	262	7.4	3.7	8.8	57,491
2004-05	27.6	7.0	4.1	10.8	18.6	6.9	7	4.5	305	16.4	3.8	2.7	61,327
2005-06	30.7	11.2	4.7	14.6	19.8	6.5	7.9	12.9	353	15.7	4	5.3	67,603
2006-07	33.3	8.5	5.4	14.9	21.1	6.6	8.2	3.8	387	9.6	4.4	10.0	72,712
2007-08	33.7	1.2	5.6	3.7	20.7	-1.9	8.5	3.7	415	7.2	4.5	2.3	73,400
2008-09	32.3	-4.2	5.3	-6.2	19.3	-6.6	8.8	3.5	430	3.6	4.3	-5.0	70,371
2009-10	34.2	5.9	5.6	5.7	19.8	2.6	9.7	10.2	548	6.51	4.5	4.7	74,348
July-March													
2009-10	24.9	-	4.1	-	14.7	-	7.2	-	364	-	3.3	-	54,653
2010-11	25.8	3.8	4.2	1.9	15.8	7.3	6.6	-9.0	321	-11.8	3.5	4.1	56,194

Source: Hydrocarbon Development Institute of Pakistan

CHAPTER # 02. The role of Independent Power Producers (IPPs)

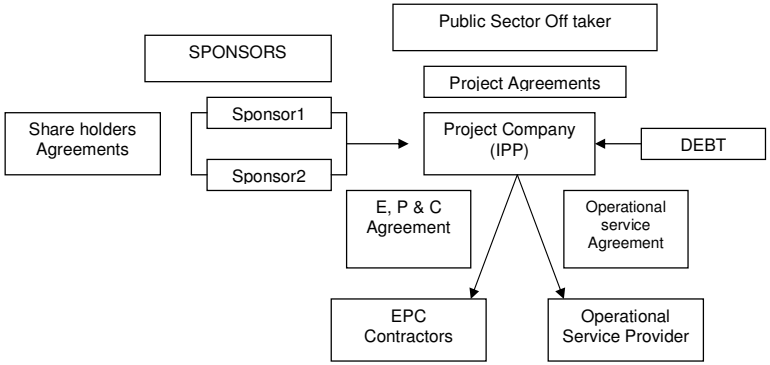
2.1 IPP industry in Pakistan:

The IPP is an entity, which is not a public utility, but that owns facilities to generate electric power for sale to utilities end users. In Pakistan, private power producers control about 30 percent of the total generation capacity, the electricity market was opened to IPPs in 1990. Subssequently, 15 IPPs achieved commercial operations under Pakistan's first power policy 1994.

For several years afterwards, the IPP program remained stagnant, only to be revived as a huge power shortage hit the country in 2006-07. In a regional context, Pakistan offers a relatively sophisticated operational and regulatory framework for the IPPs.

Independent Power producers contribute significantly in electricity generation in Pakistan but unfortunately, IPPs are producing below capacity as a result of working capital shortage caused due to outstanding amount of receivables from PEPCO.

2.2 Contractual framework of IPPs:



Like most other countries, here, IPPs face single buyer market. Water and Power Development Authority is the key buyer of IPP power. IPPs negotiate a tariff with the regulatory authority, NEPRA, under a transparent competitive bidding process. Investors are generally insulated from underlying economic risks through tightly written, long-term PPAs with underlying take-or-pay contracts, supported by explicit government guarantees and credit enhancements.

The fundamental principle underlying the contractual framework is to limit, as far as possible, the risks borne by the Project Company. A fundamental assumption is that all parties abide by the terms of their contracts.

2.3 List of IPPs:

- AES Pakistan (Pvt.) Limited
- Atlas Power Limited
- Attock Gen Limited
- Bestway Power Limited
- Blue Star Energy
- Cavlalier Energy Corporation (Pvt.) Limited (CECPL)
- Dawood Power (Pvt.) Ltd. (DPPL)
- Eastern Power Company Ltd. (EPCO)
- Engro Powergen Qadirpur Ltd. (EPQL)
- Foundation Power Company (Daharki) Limited
- Gujranwala Energy Ltd (GEL.)
- Grange Power Limited (GPL)
- Green Electric (Pvt.) Limited (GPL)
- Green Power (Pvt.) Ltd.
- Halmore Power Generation Company (Pvt.) Limited (HPGCL)
- Hub Power Company Ltd. (HUBCO)
- JDW Power (Pvt.) Ltd. (JDW)
- Japan Power Generation Ltd. (JPGL)
- Kohinoor Energy Limited (KEL)
- Laraib Energy Limited (LEL)
- Liberty Power Tech Ltd. (LPTL)
- Milergo Pakistan Ltd. (MPL)
- Nishat Chunian Power Limited (NCPL)
- Nishat Power Limited (NPL)
- Orient Power Company (Pvt.) Limited (OPCL)
- Pakistan Suger Mills Association
- Progas Power Bin Qasim Ltd. (PPBQL)
- Radian Energy Power Generation (Pvt.) Ltd.(REPGL)
- RUBA Energy Pakistan (Pvt.) Limited (REL)
- Sapphire Electric Company Ltd (SECL)
- Saif Power Limited (SPL)
- Star Power Generation Ltd
- Tapal Energy Limited (TEL)
- UCH-II Power (Pvt.) Ltd
- Warda Power Generation (Pvt) Ltd

2.4 Risks faced by IPPs:

The risks faced by IPPs are:

a) Economic Risk:

Any change in exchange rates, inflation or costs of finance are considered economic risk factor.

b) Market Risk:

As per the PPA, IPP can sell power only to one single customer, WAPDA. This contractual arrangement exposes IPPs to the single customer risk. While the Government has given a guarantee to compensate the IPPs for WAPDA's defaults on its contractual payments, the recent IPP crises has shown that Government is not willing to honour such guarantees on the plea that WAPDA could not afford to pay the exorbitant IPP dues.

c) Political Risk:

This largely refers to the government guarantees to IPPs through the Implementation Agreement. Foreign investors were reluctant to invest due to wars, nationalizations and prolonged military rule.

d) Completion and Cost Overrun Risk:

The greatest period of risk in a power plant project occurs during the construction phase with the financial providers putting up most of the capital before construction starts and supporting this exposure till the plants is complete.

e) Performance Risk:

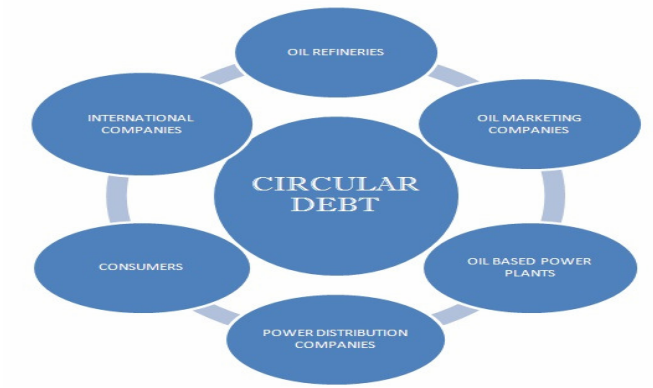
The IPP should ensure that its Power Plant generates electricity according to technical specifications and deliver the required power to WAPDA. This risk is borne by the Project Company and the lenders financing the project. To ensure performance, the company incurs maintenance expenses which are passed through in the tariff.

2.5 Problems of IPPs:

IPPs are mainly facing two problems which are as follows:

i) IPPs are primarily facing the issue of paucity of short-term liquidity. A number of proposals were presented by independent power producers advisory council to the banks for addressing the issues including allocation of working capital limits.

ii) Since IPP's purchase furnace oil and diesel from the Pakistan State Oil (PSO) to produce electricity, but due to shortage of working capital it has become exceedingly difficult for them to do so. The PSO is also in limelight in connection with the inter-corporate circular debt as it either imports or procures furnace oil and diesel from domestic refineries to supply the same onward to IPP's and other state-owned thermal electricity generation companies.



Therefore, the problem of not making recoveries from many regions has translated into denial of the utility of electricity to those parts of the country where people borne the entire cost of availing with the facility of electricity from a supply chain predominantly owned by state enterprises.

Chapter # 03: HYDRO ELECTRIC POWER PLANTS

3.1 Hydro power Potential in Pakistan:

Pakistan has been blessed with ample water resources but could store only 13 percent of the annual flow of its rivers. The hydropower potential in Pakistan is over 100,000 MW with identified sites of 59000 MW.

Hydropower generation is dependent on hydrological variations and irrigation release requirements. In early summer, the reservoir levels are generally low and the turbines operate at relatively low heads with consequently low power output. In flood season, the reservoir levels are high and large discharge can be passed through the turbines for maximum power generation. In winter, the irrigation requirements are low and the discharge for power generation is limited resulting in lower power output.

Table 3.1: Hydro power Potential River-wise

Sr.No	River/Tributary	Power (MW)
A	Hydropower Projects above 50 MW	
1	Indus River	38608
2	Tributaries of Indus in Gilgit-Baltistan	1698
3	Tributaries of Indus in Khyber-Pakhtunkhwa	4028
	Sub Total (1-3)	44334
4	Jhelum River	4341
5	Kunhar River	1455
6	Neelum River and its tributaries	1769
7	Poonch River	462
	Sub Total (4-7)	8027
8	Swat River and its tributaries	2297
9	Chitral river and its tributaries	2285
	Sub Total (8-9)	4582
	Total A	56943
B	Hydropower projects below 50MW	
1	On tributaries	1591
2	On Canals	674
	Total B	2265
	Total (A+B)	59208
		Source: WAPDA , November 2011-Report

Table 3.2: Hydel Stations in operation

Sr.No.	Power Station	Installed Capacity (MW)	Energy Generation (MW)
1	Tarbela	3478	15801
2	Ghazi Barotha	1450	7037
3	Mangla	1000	5443
4	warsak	243	1009
5	Chashma	184	959
6	Rasul	22	63
7	Dargai	20	162
8	Nandipur	14	32
9	Chichoki	13.2	23
10	Shadiwal	13.5	38
11	Other Small Hydel	6	29
12	Khan Khwar	72	306
Total		6516	30900
			Source: WAPDA , November 2011-Report

3.2 Hydro power Projects:

- Transmission Scheme for Dispersal of Power from Diamer-Basha
- Hydropower Project to Major Load Centres in the National Grid
- Transmission Scheme for Dispersal of Power from Tarbela 4th Ext Hydropower Project to Gatti Faisalabad
- Transmission Scheme for Dispersal of Power from Kohala Hydropower Project to Gujranwala
- Transmission Scheme for Dispersal of Power from Munda Dam Project to Peshawar.
- Diamer Basha Dam Project
- Kurram Tangi Dam Multipurpose Project

- Rehabilitation of Mangla, Tarbela & Warsak Hydel Power Stations.

- Kotli Hydropower Project
- Dasu Hydropower Project
- Akhori Dam Project
- Thakot Hydropower Project
- Pattan Hydropower Project
- Phandar Hydropower Project
- Basho Hydropower Project
- Lawi Hydropower Project
- Harpo Hydropower Project
- Yulbo Hydropower Project
- Shyok Dam Project
- Tungus Hydropower Project
- Skardu Dam Project
- Dudhnial Hydropower Project
- Suki Kinari Hydropower Project
- Kundal Shahi Hydropower Project
- Trappi Hydropower Project
- Rajdhani Hydropower Project
- Matiltan Hydropower Project
- Mahl Hydropower Project
- Gulpur Hydropower Project
- Golen Gol Hydropower

- Tarbela 4th Extension
- Kohala Hydropower Project
- Munda Dam Project
- Bunji Hydropower Project
- Keyal Khwar Hydropower Project
- Transmission Scheme for Dispersal of Power from Bunji Hydropower Project to Major Load Centres in the National Grid
- Lower Spat Gah Hydropower Project
- Lower Palas Valley Hydropower Project
- Transmission Scheme for dispersal of power from Neelum-Jhelum Hydroelectric Project to 500 kV Gakhar Grid Gujranwala
- Ultra Mega Power Project/Park

3.3 Advantages and disadvantages of hydroelectric power:

The advantages include:

- The constant production of electricity using this method, the easy stoppage and remittance of electricity for times of high demand of power
- The usage of lake water for irrigation purposes, and finally the electricity when in use does not emit greenhouse gases. Pakistan has been able to satisfy most of these requisites which has helped in satisfying its electricity requirements to some level.

Some of the primary disadvantages include:

- The high cost of constructing dams
- The eminent flooding of natural land and destruction of property
- Forcible movement of people from these areas
- Possibility of geological damage when the dams are constructed.

Pakistan has kept a close eye on the advantages and disadvantages of hydro-electric power and has been trying to find out methods to reduce the latter.

3.4 Non-Functional hydroelectric power units:

There are more than 30 non-functional micro hydro power plants. However, 21 units were under construction and few were damaged during the floods. For the remaining units, there is no explanation by the concerned authorities that why they are not operational.

Under the Power Policy 2002, the government had planned run-of-rivers hydropower projects for adding 4,325MW of electricity, and funds were provided accordingly during the last 11 years. However, only two major projects were completed. Delay in all these projects has intensified the energy crisis in the country. The government has never bothered to look into causes of delay for these projects even though funds were regularly released.

During 2000 to 2011 period, WAPDA managed construction of only run of the river 1,450MW Ghazi Barotha Hydropower Project, Mangla dam upraising project which is estimated to provide 2.8MAF additional storage and 655GWh additional power generation, but is not being utilized for the last two years due to the land resettlement issues. WAPDA only managed construction of 72MW Khan Khawar and non grid 17.3MW Satpara dam project in Sakurdu.

Whenever the question about hydroelectricity is raised, the concerned authorities has always come up with the response that hydropower projects take a long time to build and need huge capital investment. But this is a rather weak argument in view of modern hydropower project management.

In our own neighbourhood, Indian policymakers are working towards adding 50,000 MW of clean and renewable hydropower to their energy mix and have resultantly set some significant records in this regard. Many public-sector hydropower projects, for instance, the 520 MW Omkareshwar project on the Narmada River has been completed in four years. Small hydropower projects are taking 20 to 22 months for completion.

CHAPTER # 04: RENTAL POWER PLANTS

Rental power is a technology that is intended to provide the solution for the short term needs of electricity around a rental period of 5 to 7 years while work on long term solutions is carried out. A time of four to six months is required to set up a RPP these power generating units can be bought up in the form of a kit and then installed. Rental power plants work on the standard of simple cycle which ingests marginally more fuel and costs of fuel are very high and keep on increasing.

4.1 Status of RPPs:

Government owned power generation companies are the buyers of the power generated by Rental Power Plants (RPPs). Currently, a total of 19 projects with a total capacity of 2734 MW are in different stages of processing. Of these, 8 projects with a capacity of 1156 MW are more advanced in contractual commitments by the buyer, while another 6 projects with a capacity of 738 MW have been signed but have made their down payments. Five projects are without signed contacts at the moments.

Table 4.1: Rental Power Project Status

No.	RPP Name	Net capacity (MW)	Fuel Type	Contracts status
1	Pakistan Power Resources, Guddu	110	Low BTU gas	effective
2	Pakistan Power Resources, Piranghaib, Multan	192	Residual Fuel Oil	signed
3	Techno Rental Power Project-1, Summundri, Faisalabad	150	Residual Fuel Oil	effective
4	Techno Rental Power Project-2, Sahuwal, Sialkot	150	Residual Fuel Oil	effective
5	Young Gen Power, Faisalabad	200	Residual Fuel Oil	effective
6	Gulf Rental Power, Gujranwala	62	Residual Fuel Oil	effective
7	Independent power Limited	200	Residual Fuel Oil	Under Process
8	Kamoki Energy Limited	70	Residual Fuel Oil	Signed
9	Karkey Karadeniz, Karachi (Karkey)	232	Residual Fuel Oil	Effective

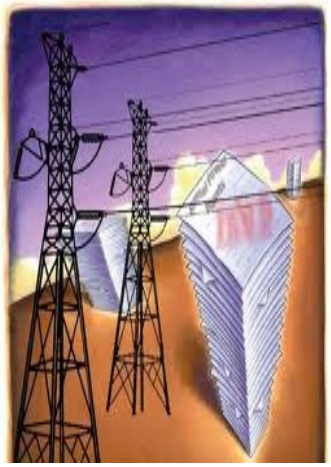
No.	RPP Name	Net capacity (MW)	Fuel Type	Contracts status
10	Premier Energy	58	Residual Fuel Oil	Under Process
11	Reshma Power Generation, Manga-Raiwind Road	201	Residual Fuel Oil	effective
12	Ruba Power Generation, Manga-Riawind	156	Residual Fuel Oil	Signed
13	Sialkot Rental Power, Eminabad	65	Residual Fuel Oil	Signed
14	Walter Power International, Karachi	205	Residual Fuel Oil	Signed
15	Abbas Steel	100	Residual Fuel Oil	Under Process
16	Karkey Karadeniz, Karachi (Karkey 1)	222	Residual Fuel Oil	Under Process
17	Techno-E-Power (Pvt.) Limited, Faisalabad	150	Residual Fuel Oil	Signed
18	Walter Power International, Naudero-I	51	Gas	Effective
19	Walter Power International, Naudero-II	50	Gas	Under Process
				Source: PPIB and PEPCO

4.2 Government expenditures on RPPs:

The Government has selected the RPPs as a major strategic tool for bridging the electricity Demand-Supply gap in the short-term but these plants have no significant impact on reducing load shedding so far. Rental power plants which include Reshma, Karkey, Gulf and Naudero plants are producing only 270 MWs in total which is only 5% of the amount IPPs are producing.

Reportedly, all the 19 RPPs are cost- and fuel- intensive, inefficient and obsolete. Initiation of RPPs as a suitable way to end load shedding in short term has proved to be a futile exercise, in terms of availability, reliability and affordability of electricity.

Without getting a single unit of electricity from out-of-fuel Karkey Karadeniz Elektrik Uretim, the Turkish company's rental power ship, the government has to pay Rs 28.31 million per day as rent money to the plant. The plant needs around 1,200 tons of furnace oil, while in the case of failure in supply, PEPCO would have to pay capacity charges to Karkey. This is horrible for a government and also for a nation already begging money from all the international lending agencies.



The 201MW Reshma Power plant is the second most expensive plant after Karachi's ship-mounted which will cost the country 4.97 cent per unit, excluding oil price.

The supply of electricity from the Rental power plant would meet the electricity needs on makeshift basis but it was not the long terms solution of growing demands of electricity in the country, thus government along with building dams, should see other options to generate electricity.

For the fiscal year ending June 30, 2011, the government had paid Rs16.6 billion to RPPs in advance payments and had created a liability of $1.7 billion for itself through the contracts that it had signed with several rental power companies.

Government had asked ADB to analyze prospects of Rental Power Plant projects sponsored by the water and power ministry. According to reports, the ADB said is of the opinion that the government should execute only eight RPPs with a total generation capacity of about 1200MW.

4.3 Reasons behind non-operational RPPs:

According to the report of Auditor-General of Pakistan, many power projects have installed old equipment having a very low efficiency rate when it comes to power production. The technological differences account for much of the delay in achieving commercial operations targets by most RPPs.

Pakistan has the capacity to produce electricity on its own but it does not have enough financial resources to purchase fuel to meet the present production capacity yet the government went out of the way and took massive loans to provide for the fuel to these RPPs in the process dumping billions of hard earned rupees of people of this unfortunate country. Yet these power plants failed to be functional on dates mentioned in the rental contracts.

According to the respective contracts Karkay power project was supposed to produce 232MW electricity where as it produces only 60MW only similarly the total generation capacity of Reshma was 201MW, which was later reduced to 90MWand the reason of it was that out of 21 machines only 9 machines arrived in Pakistan.

Performance of Gulf and Walter power project is not any different where the intended production capacity is 62MW of Gulf and 51MW for Walter but is producing 53MW and 3MW respectively. Yet payments are made for the capacities mentioned in the contracts not for the units produced.

The rental contract pose strict conditions on Pakistan such as in case of termination of the contracts Pakistan will still have to pay the mobilization advance fees. These RPPs are totally in favour of the producers not the people of Pakistan.

CHAPTER#05: ELECTRICITY TARIFF MECHANISM

5.1 Tariff determination among DISCOS:

The government has directed the National Electric Power Regulatory Authority (Nepra) to adopt a mechanism for power tariff determination among the Discos so that consumer of an efficient Disco should not have to bear the burden of inefficient one.

Some of the distribution companies are facing up to 35 percent line losses due to multiple reasons, but electricity theft and non-payments by the consumers are two main issues. At present line losses in Islamabad Electric Supply Company (Iesco), Lahore Electric Supply Company (Lesco), Gujranwala Electric Supply Company (Gepco) and Multan Electric Supply Company (Mepco) are 10 percent while line losses in the system of Hyderabad Electric Supply Company (Hesco) and Peshawar Electric Supply Company (Pesco) are up to 35 percent.

The DISCOs incurred huge losses as they could not pass on the cost of electricity purchased to the end customer and defaulted on their payment obligations to the Gencos, Wapda and IPPs. The Gencos and IPPs then defaulted on their payments to the fuel suppliers (PSO, Shell, SSGC, SNGPL), who in turn have defaulted on their payment obligations to refineries, E&P companies, and international fuel suppliers. An alarming 'circular debt crisis' has emerged, that in May 2010 stood at Rs. 500bn ($5.85bn.).

Other factors hampering the profitability of the DISCOs include their continued inability to recover dues especially from the public sector and provincial governmental departments, a legacy of bureaucratic mindset in governance, and high losses in the distribution systems. GENCOs are running on average at only 67-90 per cent of their net available capacities due to not having conducted maintenance and scheduled outages over the years as per standard industry practices. Finally, the required contracts between Gencos and NTDC, NTDC and DISCOs, and Gencos and DISCOs are still not in place. These are essential if these entities are to be ready for privatisation. Since NTDC operates on a Single-Buyer basis, the direct contractual link between Gencos and DISCOs is not present. Gencos sell electricity at regulated prices which is supplied by NTDC to DISCOs at an average equalised tariff across the country, adding to the payment burdens of the DISCOs.

Table 5.1: Energy Purchase Price

Source	Reference		Actual	
	August 2011			
	Mlns.	Rs./kWh	Mlns.	Rs./kWh
Hydel	264.82	0.0622	495.95	0.1356
Coal	-		39.63	3.1209
HSD	37.800	15.0258	2,502.85	17.5175
RFO	22,565.96	10,2557	50,245.65	14.9883
Gas	7,794.13	3.5504	7,797.39	3.7101
Nuclear	109.53	0.5095	178.63	0.9694
Import from Iran	117.76	4.9894	194.82	8.6698
Mixed	503.82	10.5	396.95	10.0
Wind	-		3.94	9.1213
Total	31,393.82	3.5113	61,855.82	6.5013
Supplemental Charges	-	-	179.83	0.0189
Sale to IPPs	-	-	57.52	20.5252
Grand Total	31,393.82	3.5113	61,618.48	6.4764
Transmission Losses	-	.0900		0.1855
Net Total	31,393.82	3.6013	61,618.48	6.6618

5.2 The IPP Electricity Tariff:

The tariff charged to WAPDA by IPPs is not a number, rather it is computed from a formula. The formula includes in it the components of the fixed and variable costs.

The total tariff is the sum of the Capacity Purchase Price (CPP) which is the fixed component and the Energy Purchase Price (EPP) which is the variable cost.

The CPP comprises:

i) Project Debt payments (inclusive of interest principal)

ii) Return on Equity (Real Rate of Return over the project life)

iii) Fixed element of the operating and maintenance cost.

iv) Insurance cost for the plant

v) Foreign Exchange Risk Insurance Cost which is the cost of hedging the loans against foreign exchange risk.

The EPP comprises:

i) Fuel Cost which is set by the Government and above the world oil prices by an amount of a surcharge.

ii) Variable element of the operating and maintenance cost.

The tariff paid by WAPDA also depends on the total hours purchased or the installed capacity utilized.

5.2.1 Tariff Options for IPPs:

If an IPP wishes to submit an unsolicited proposal and wants to settle tariff through negotiations, NEPRA will determine the tariff in consultation with the IPP, the power purchaser (s), and other stakeholders. Projects opting for up-front tariff determined by NEPRA will not require any further negotiations, approvals, or clearances with respect to the purchase price of the electricity produced.

In the determination of an acceptable negotiation tariff for the IPP, the following parameters shall be taken in to account:

a) Technical Parameters: The net energy available for the sale will be determined after taking into account electrical efficiency, auxiliary loads, transformation efficiency and plant availability. Plant availability factor should be determined judiciously, taking into account suitable provisions for anticipated maintenance and forced outages.

b) Financial Parameters: It is proposed that the following parameters, principles, and assumptions may be adopted for calculation of the up-front or indicative wind and hydroelectric IPP tariff:

i. debit: Equity Ratio

ii. Internal Rate of Return? Return on equity

iii. Interest on Loan

Whenever a floating interest rate regime is adopted, local loans may be indexed to change in relevant benchmark interest rates, such as KIBOR. Likewise, foreign loans may be indexed to changes in relevant benchmark interest rates, such as LIBOR and variation in Pakistan rupees to the US dollar. Loans will be arranged by IPPs without Government guarantee.

iv. Capital Cost.

v. The operation and malignance cost

5.3 Schedule of electricity tariff for IESCO:

For Islamabad Electricity Supply Company (IESCO), the schedule of electricity tariff is as follows:

A-1 GENERAL SUPPLY TARIFF- RESIDENTIAL

Sr.No.	TARIFF CATEGORY/PARTICULARS	FIXED CHARGES	VARIABLE CHARGES	
		Rs/kW/M	Rs/kWh	
a)	For sanctioned load up to 5kW			
i	Up to 50 units	-		1.87
	For consumption exceeding 50 units			
ii	1-100 units	-		4.54
iii	101-300 units	-		6.86
iv	301-700 units	-		13.29
b)	For sanctioned load exceeding 5 kW	-		

			Peak	**Off-Peak**
	Time of use	-	12.25	6.7
Under this tariff, there shall be minimum monthly customer charge at the following rates even if no energy is consumed				
a) Single Phase Connection		Rs.75/- per consumer per month		
b) Three Phase Connection		Rs.150/- per consumer per month		
A-2 GENERAL SUPPLY TARIFF – COMERCIAL				
a)	For sanctioned load upto 5kW			13.00
b)	For sanctioned load exceeding 5kW	367.00		8.14
			Peak	**Off-Peak**
c)	**Time of use**	367.00	11.49	6.50
Under this tariff, there shall be minimum monthly charges at the following rates even if no energy is consumed.				
a) Single Phase Connection		Rs.175/- per consumer per month		
b) Three Phase Connection		Rs.350/- per consumer per month		
B - INDUSTRIAL				
B1	Up to 5 kW (at 400/230 Volts)	-		8.90
B2 (a)	6-500 kW (at 400 Volts)	367.00		7.59
	Time of Use		**Peak**	**Off-Peak**
B2 (b)	6-500 kW (at 400 Volts)	367.00	11.08	6.50
B3	For all loads up to 5000 kW (at 11,33 kW)	356.00	10.99	6.25
B4	For all loads (at 66,132 kV & above)	343.00	10.69	5.97
For B1 consumers there shall be a fixed minimum charges of Rs.350 per month.				
For B2 consumers there shall be a fixed minimum charges of Rs.2,000 per month.				
For B3 consumers there shall be a fixed minimum charges of Rs.50,000 per month.				
For B4 consumers there shall be a fixed minimum charges of Rs.500,000 per month.				
C – SINGLE-POINT SUPPLY FOR PURCHASE IN BULKY BY A DISTRIBUTION LICENSEE AND MIXED LOAD CONSUMERS NOT FALLING IN ANY OTHER CONSUMER CLASS				
C-1	For supply at 400/230 Volts			
a)	Sanctioned load up to 5kW	-		9.90
b)	Sanctioned load above 5kW & up to 500kW	367.00		8.75
C-3(a)	For supply at 11,33 kV up to & including 5000kw	356.00		8.65
C-3(b)	For supply at 66 kV & above and sanctioned load above 5000 kW	343.00		8.51
	Time of Use (optional)		**Peak**	**Off-Peak**
C-1(a)	For supply at 400/230 volts above 5 kW & up to 500 kW	367.00	11.31	6.50
C-2(b)	For supply at 11,33 kV up to and including 5000 kW	356.00	10.91	6.25
C-(c)	For supply at 66 kV & above and sanctioned load above 5000 kW	343.00	10.51	5.87
D – AGRICULTURE TARIFF				
D-1(a)	SCARP less than 5 kW	-		8.47
D-2	Agricultural tube Wells	105.00		5.31
			Peak	**Off-Peak**
D-1(b)	SCARP and Agricultural more than 5 kW	200.00	10.11	4.55
The consumers having sanctioned load less than 20 kW san opt for TOU metering				
E – TEMPORARY SUPPLY TARIFFS				
E-1 (i)	Residential Supply	-		11.20
E-1(ii)	Commercial Supply	-		11.77
E-2	Industrial Supply	-		8.39
For the categories				
F – SEASONAL INDUSTRIAL SUPPLY TARIFF				
	125 % of relevant industrial tariff			
	Tariff-F consumers will have the opinion to convert to regular tariff and vice versa. This option can be exercised at time of a new connection or at the beginning of the season. Once exercised, the option remains in force for at least one year.			
G – PUBLIC LIGHTING				
G	Street Lighting	-		12.00
There shall be a minimum monthly charge of Rs.500/- per month per kW of lamp capacity installed.				
H – RESIDENTIAL COLONIES ATTACHED TO INDUSTRIAL PREMISES				
H	Residential Colonies attached to industrial premises	-		11.22
K – SPECIAL CONTRACTS				
1	Azad Jammu & Kashmir (AJK)	343.00		4.21
			Peak	**Off-Peak**
	Time of use	343.00	11.59	6.41
2	Rawat Lab			8.75

CHAPTER# 06: SOLUTIONS TO END ELECTRICITY SHORTAGE

In view of existing ground realities, it is impossible to overcome the crises by short measures, however, we implement short term measures to reduce the crises. In order to address this crises a two dimensional implementation measures are required. These are:

a) Short term measures
b) Long term measures

6.1 Short term measures:

The following short term measures can be taken immediately in order to reduce the intensity of existing power crises:

- With power needed immediately, wind turbines look suitable because they are relatively fast to install whereas dams and nuclear plants take five to six years to complete and thermal power plants need two years at least. Wind power can play a big part of solving Pakistan's energy shortages, and now that comprehensive wind maps already been researched in the country.
- Government authorities should ensure overhauling all of the countries existing power plants to achieve maximum generation as well as prevent it from overloading which has been a source of power outages.
- The private sector should be allowed to set up power plants with their own equity and loans based on project feasibility with the government's role limited to determining a fair price of power through an independent commission of representatives of the government, citizens, industry, power producers and experts by consensus.
- There are some non-operating power stations in the country which only require a little investment and technical improvements to revive them. Such power units should be made effective to pull the economy out of complete doom. Resultantly, these projects will maintain the smooth flow of energy and will at least prevent any further widening in the demand-supply gap.
- The markets and shopping centers should be strictly enforced to close their business till 10 pm at night. This save power in different parts of each city can be diverted towards the domestic consumers by means of an effective administrative local system.
- The theft of electricity must be considered and declared a heinous crime and any violations by domestic or industrial users should be liable to legal penalties and complete power cut off for such consumers.
- Educating the stakeholders and workers in the industrial and agricultural sectors on adoption of new and efficient practices of water and energy consumption will tend to reduce the wastage of energy.

6.2 Long term measures:

The following long term measures should be taken keeping in view the projected increase in power consumption in the future.

- Pakistan has estimated as the world's third-largest known coal reserves of 33.0 trillion tons in the south-eastern part of the country i.e. Thar. The answer to long term solution of power crisis in Pakistan lies in using local coal for power generation. The electricity production from coal is also cheaper than thermal generation as 2 percent usage of Thar coal could produce 20,000 Megawatts electricity.
- In the long-term, Pakistan should also build more nuclear plants and dams. Government could benefit from the technical expertise

of the Norwegian and Chinese companies in the field of dam construction and producing hydro electricity. Construction of new water reservoirs and dams assumes additional significance to overcome the rising water shortages problem.

- Rehabilitation and replacement of the outdated transmission and distribution systems is also a long term measure through which the country can overcome the perennial problem of line losses and thefts by unscrupulous consumers.
- Power generation by natural gas is about Rs6 KWh as compared to Rs14.5 KWh by furnace oil. In the last five years natural gas allocation for power has been reduced from 53 per cent to 27 per cent and furnace oil use in power generation has increased from 17 per cent to 38 per cent. This has increased the cost of generation by Rs130bn in 2010, raising circular debt leading to higher power rates. The power crisis can be alleviated by reallocating gas towards power production as power production must take precedence over other sectors.
- Most important in the long term planning and goals must be to streamline the foreign policy of the country according to its economic and energy needs. Improving and increasing ties with future energy rich countries must not be neglected.

CHAPTER# 07: ELECTRICITY AGREEMENTS OF PAKISTAN WITH OTHER COUNTRIES

7.1 Pakistan-China electricity agreement:

To overcome the acute power crisis in Pakistan, the first Pakistan-China Joint Energy Working Group (JEWG) meeting was held in 2011.

Given the significance of renewable energy, China tries to dominate the renewable energy technologies from solar panels to wind turbines to constructing huge hydro-projects. Pakistan has considerable renewable energy potential such as hydro, wind and solar but this resource potential has not been utilized fully due to resource constraints and politicization of projects of national interests such as Kalabagh Dam that depicts the real picture of political uncertainties in Pakistan.

Due consideration is being given to hydropower plants that produce about 24 percent of the world's electricity and supply more than one billion people with power. Indus River system alone has 35,000 MW power potential. The prospects for Pak-China cooperation in hydro-power projects are bright as the Chairman of China Three Gorges Project Corporation (CTGPC) a state owned enterprise and China's largest hydropower developer had already offered financial and technical assistance to develop hydro and wind power projects in Pakistan.

These ongoing projects include Karot, Taunsa, Kohala and Bunji hydro-power projects. Bunji dam will be constructed some 83km from Gilgit on Skardu Road. After completion it will generate 7200 MW electricity. The government of Pakistan has signed an agreement with China for the construction of the dam in 2009.

Second important project has been Taunsa hydroelectric project in Punjab that will generate 120MW electricity. Another proposed project is Kohala hydro-power project in district Muzaffarabad that will have capability to generate 1100 MW electricity. Karot hydro-power project that will generate 720MW electricity will be completed in four years time. In addition to above mentioned hydro projects deliberations have been continued on some other hydro projects. Pakistan has been currently facing 6,000 megawatts power deficit which may grow further but the investment in hydro-power projects could add 10,000 MW to Pakistan's main grid over the next 10 years. China has developed expertise in coal energy and nearly 80 % of its electricity comes from coal. India is generating 75 percent of its electricity by using coal while Pakistan is generating 0.3 percent electricity from coal. Pakistan is among some of the states having large coal reserves in the world and has potential to generate electricity from coal. Pakistan has potential to develop wind power. The wind corridor in the coastal area of Sindh has the capacity to generate 50,000MW electricity. India presents a good example of a country that is utilizing wind energy and has added its electricity generation capacity. China has become the world's largest maker of wind turbines. China has offered help in the construction of 50 MW wind power project in Jhampir (Sindh) that is to be completed in 2012. Moreover, China has planned to invest in 300 MW solar power projects in Pakistan.

7.2 Pakistan-India electricity agreement:

India has offered to provide Pakistan with 5,000 megawatt electricity to fulfill its energy requirements on an urgent basis regularly which could be transmitted through Punjab.

Initially Pakistan may import up to 500 MW from India which may be supplied with the construction of small transmission lines. Pakistan and India will construct 45 kilometer 220 kv transmission lines within six months after formal agreement in this respect. The agreement will be for five years which will be negotiable for extension for another five years or more.

The government aimed to finalize the modalities, tariffs and terms and conditions for the import of power as soon as possible.

On contrary, the gap between demand and supply in India has increased to 10.2 percent last month, from 7.7 percent a year earlier. In some states like Andhra Pradesh and Tamil Nadu, power cuts have become so common that many factories report getting more electricity from diesel generators than they do from the power grid, at much higher cost. Thus, India do not have enough electricity for their own people how they will export us, there is 20 hours loadshedding in the 70 percent of the villages in India. Our Government should sign electricity agreements with those countries, who have abundance of electric power in all terms by all sources, so that we can get electricity at much cheaper rates.

7.3 Pakistan-Iran electricity agreement:

Iran is currently exchanging electricity with Afghanistan, Armenia, Azerbaijan, Iraq, Pakistan, Turkey and Turkmenistan. According to the Iranian Energy Ministry statistics, the country will be exporting up to USD 1 billion of electricity by March 2012. Iran's total power generation capacity stands at 63,403 MW while total length of the power grid exceeds 780,000 km.

Import of 35 MW from Iran will be enhanced later to 70 MW, while all the matters of 100 MW import project have been finalized and are ready for groundbreaking. Pakistan and Iran would move forward on import of 1,000 MW power project from Iran.

Iran wants to install 1400 MW power project in Zahidan near Pakistan border from where the electricity to be transmitted to national grid of Pakistan, not on the basis of local Iranian oil price but on international fuel cost price.

With a view to importing the 1000 MW of electricity, 7500 kilometers long 500 KV transmission line is needed to be laid down. On behalf of Pakistan, NesPAK (National Engineering Services Pakistan) and from Iran SUNIR are appointed as consultants to make the feasibility for laying down the said transmission line to materialize the project.

Iran is rich in electricity in other parts of the country and if the electricity is importing from other parts of Iran which is far away from area bordering Pakistan, the line losses would increase manifold and the rate of the electricity would also be unaffordable. So Iran needs to install the power plant near Pakistan border to materialize the project to import 1000 MW of electricity.

7.4 Pakistan-Tajikistan electricity agreement:

Central Asia South Asia (CASA-1000) is one of the biggest regional projects through which Tajikistan would export up to 1000 MW of electricity to Pakistan. The project is a regional effort to construct high voltage electricity transmission lines for electricity exports from Kyrgyzstan and Tajikistan to Pakistan via Afghanistan.

An estimated $950 million is still required to fund the project. About 25 percent of that amount ($251 million) is needed to build power transmission lines in Tajikistan.

Tajik plans to sell electricity to Pakistan from Roghun hydroelectric dam, which has faced decades of delay. The dam is being built on the Amu Darya River, which also runs through Uzbekistan and benefits Turkmenistan. The project will provide cheapest power that costs around five cents per unit. It envisages a 750-kilometre long High Voltage Direct Current (HVDC) power line to Pakistan through Afghanistan.

In the years ahead, Kyrgyzstan will use the transmission line to sell 300MW to Pakistan and Afghanistan. It is for this reason that Pakistan, Afghanistan, the Kyrgyz Republic and Tajikistan have agreed to set up a special purpose vehicle to lay the line through Sangtuda (Tajikistan), Kabul (Afghanistan) and Peshawar (Pakistan).

7.5 Power agreements with other countries:

Bilateral relations with Russia, Central Asian, East African states needs to be strengthened. These countries are the new energy hubs of the world, and being mostly land locked (C.A. states) can make use of Gwadar port and in return assist Pakistan as well.

Germany plans to lend its hand to Pakistan in energy production sector by assisting solar energy projects in Pakistan financially so that ,Pakistan could overcome its severe shortfall of energy. Last year in January, AZUR energy group of Germany planned to setup 50MWAtt solar project in Pakistan, for which a feasibility report and site surveys of Multan and Bahawalpur were conducted.

Pakistan is also interested in importing 500 million cubic feet per day of LNG from Qatar that produces 77 million tones per annum of LNG. The imported LNG will be initially provided to the power houses in the country to generate 2,500 mega watt of electricity.

Norway has an expertise in Hydro-power sector, therefore, it would willingly help Pakistan in construction of hydro-power projects to meet its energy deficit. Norwegian company NBT has expressed interest in establishing a 500-megawatt wind power project in Pakistan, by investing about $1 billion in alternative energy.

Kuwait has extended $40 million to Pakistan for the construction of the de-sander, a vital part of the strategic $333.3 billion Neelum-Jhelum hydropower project. The Neelum Jhelum Hydropower Project is located at Muzaffarabad district of Azad Jammu and Kashmir and upon its completion it will generate approximately 1,000 MW of electricity.

Conclusion:

It is clear that, both Wapda and KESC had been plagued with inefficiencies, poor governance, red-tape, and political interferences since their inception. Transmission & Distribution losses amounted to 30-40 per cent. This was as much a result of a lack of adequate investment in the strained transmission network as of the power thefts by various groups and individuals. On average, about 20 per cent of dues were not recovered, most of them owed by other public sector entities.

As a result of these inefficiencies, successive governments injected significant subsidies into them to keep the end consumer tariff manageable so as to minimize political damage. To counter these chronic problems and encouraged by the donor agencies like World Bank and Asian Development Bank, the government embarked on an ambitious power-sector restructuring with an eventual aim of privatizing the loss-making entities and moving towards a market-driven electricity sector.

Pakistan is a suitable country for the installation of Hydro, solar and wind power plants and can become an Asian leader in renewable energy due to its strategic endowments. Rehabilitation and replacement of the outdated transmission and distribution systems is also necessary to bridge the gap between supply and demand of electricity across the country. Improving and increasing ties with future energy rich countries must not be neglected.

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