Islamic Republic of Pakistan

DATA COLLECTION SURVEY ON ENERGY SECTOR REFORM IN THE ISLAMIC REPUBLIC OF PAKISTAN

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List of Abbreviations

Abbreviation	Full Spelling
AC	Alternating Current
ACE	Associated Consulting Engineers
ADB	Asian Development Bank
AEB	Area Electricity Board Islamabad
AEDB	Alternative Energy Development Board
AFD	Agence Francaise de Développement
AJK	Azad Jammu and Kashmir
AJKHEB	Azad Jammu & Kashmir Hydro Electric Board
AP	Accounts Payable
AR	Accounts Receivable
ARMS	Automatic Meter Reading System
B&C	Budget & Consolidation
BBC	Brown, Boveri & Cie
BEEGIL	Bright Eagle Enterprises Group Investments Limited
BGL	Barsan Global Logistics
BHP	BHP Petroleum (Pakistan) Pty Ltd.
BOD	Board of Direction
BOI	Board of Investment
BOO	Build, Own, and Operate
BOOT	Build, Own, Operate and Transfer
BOT	Building-Operate-Transfer
BPC	Bulk Purchase Consumer
BS	Balance Sheet
BVQI	Bureau Veritas Quality International
CAD	Consumer Affairs Division
CAPM	Capital Assets Pricing Model
CASA	Central Asia South Asia
CC	Combined Cycle
CCC	Central Contract Cell
CCI	Council of Common Interests
CCGT	Combined Cycle Gas Turbines
CCPP	Combined Cycle Power Plant
CDM	Clean Development Mechanism

CDP	Customer Data Processing
CE	Chief Engineer
CEO	Chief Executive Officer
CER	Certified Emissions Reduction
CERA	Certified Emissions Reduction Agreement
CFL	Compact Fluorescent Lamp
CFO	Chief Financial Officer
CHASHUNUPP	Chashma Nuclear Power Plant
CMLA	Chief Martial Law Administrator
COD	Commercial Operations Date
CPCC	Corporate Planning & Control Cell
CPP	Capacity Purchase Price
CPPA	Central Power Purchasing Agency
CRM	Customer Relationship Management
CRPEA	Contracts Registrar and Central Power Exchange Administrator
DC	Direct Current
DEDE	Department of Alternative Energy Development and Efficiency
DF/R	Draft Report
DG	Director General
DISCOs	Distribution Companies
DOP	Development of Power
DSM	Demand Side Management
EAD	Economic Affairs Division
ECC	Economic Coordination Committee
ECF	Energy Conservation Fund
ED	Excise Duty
EDL	Electricite du Laos
EFF	Extended Fund Facility
EGAT	Electricity Generating Authority of Thailand
EHT	Extra High Tention
EIA	Environmental Impact Assessment
ELR	Energy Loss Reduction
ENERCON	Enercon Services, Inc.
ENI	Ente Nazionale Idrocarburi
EPA	Environmental Protection Agency, or Energy Purchase Agreement

EPC	Engineering Procurement Construction
EPP	Energy Purchase Price
EPS	Earnings per share
ESCO	Energy Service Company
ESE	European Stock Exchange
ESMAP	Energy Sector Management Assistance Program
EVN	Electricity Vietnam
FAS	Fuel adjustment Surcharge
FATA	Federally Administered Tribal Areas
FBS	Federal Bureau of Statistics
FERI	Foreign Exchange Risk Insurance
FESCO	Faisalabad Electric Supply Company
FIP	Financial Improvement Plan
FIT	Feed-In Tariff
FO	Fuel Oil
FODP	Friends of Democratic Pakistan
F/R	Final Report
FS	Fusibility Study
FPA	Fuel Price Adjustment
FSA	Fuel Supply Agreement
GB	Gilgit-Baltistan
GBHP	Ghazi-Barotha Hydropower Project
GCISC	Global Change Impact Studies Centre
GDP	Gross Domestic Product
GEC	CDG over current / Ef relay
GENCO	Generation Company
GEPCO	Gujranwala Electric Power Company
GESCO	Gujranwala Electric Supply Company
GHG	Greenhouse Gas
GM	General Manager
GOP	Government of Pakistan
GST	General sales tax
GTs	Gas Turbines
GW	Gigawatt
GWh	Gigawatt-hour

HDIP	Hydrocarbon Development Institute of Pakistan
HEPS	High Energy Performance Standard
HESCO	Hyderabad Electric Supply Company
HH	House Hold
HPC	HAB Power Complex
HUBCO	HUB Power Company Limited
HP	Home Page
HPP	Hydro Power Project
HSD	High Speed Diesel
HVDC	High-Voltage Direct Current
HVTL	High Voltage Transmission Line
I&P Dept.	Irrigation and Power Department
IA	Implementation Agreement
IBRD	International Bank for Reconstruction and Development
IBT	incremental block tariff
ICC	International Cooperation Center
IC/R	Inception Report
IDA	International Development Association
IEC	International Electro-technical Commission
IEEE	Institute of Electrical and Electronics Engineers
IESCO	Islamabad Electric Supply Company
IFC	International Finance Corporation
IMF	International Monetary Fund
IPP	Independent Power Producer
IRR	Internal Rate of Return
IRP	Islamic Republic of Pakistan
IsDB	Islamic Development Bank
ISO	International Organization of Standardization
JEPIC	Japan Electric Power Information Center
JICA	Japan International Cooperation Agency
JPCL	Jamshoro Power Company Limited
JPGL	Japan Power Generation Ltd.
JV	Joint Venture
KANUPP	Karachi Nuclear Power Plant
KAPCO	Kot Addu Power Company Limited

KES(power)	Holding company of KESC
KESC	Karachi Electric Supply Company
KfW	Keditanstalt for Wiederaufbau
KIBOR	Karachi Interbank Offered Rate
Km	Kilo Meter
KPK(KP)	Khyber Pakhtunkhwa
KPI	Key Performance Indicators
kV(KVA)	Kilovolt Ampere
kWh	Kilowatt hours
L&W	Land & Water
LD	Liquidated Damage
LED	Light-Emitting Diode
LESCO	Lahore Electric Supply Company
LoI	Letter of Intent
LoS	Letter of Support
MD	Managing Director
MEPCO	Multan Electric Power Company
MEPE	Myanmar Electric Power Enterprise
MEPS	Minimum Energy Performance Standard
MFF	Multitranche Financing Facility
MG	Merlin Gerin Circuit Breakers
MGCL	Mari Gas Company Limited
MMCFD	Millions of Cubic Feet per Day
MOE	Ministry of Energy
MOF	Ministry of Finance
MOODY	Moody International Certification Limited
MOST	Ministry of Science and Technology
MOU	Memorandum of Understanding
MOWP	Ministry of Water and Power
MVA	Million Volt Amperes
MPNR	Ministry of Petroleum and Natural Resources
MW	Megawatt
MWh	Megawatt-hour
MWP	Megawatt-peak
MYT	Multi Year Tariff

NA	Northern Areas
NAPWD	Northern Areas Public Works Department
NEPRA	National Electric Power Regulatory Authority
NEQS	National Environmental Quality Standards
NEQC	National Environmental Quality Center
NESPAK	National Engineering Services Pakistan (Pvt) Limited
NGO	Non-Governmental Organization
NIC	National Insurance Company
NIG	National Industries Holding of Kuwait
NLC	National Logistics Cell
NOx	Nitrogen Oxides
NPCC	National Power Control Center
NPSEP	National Power System Expansion Plan
NREL	National Renewable Energy Laboratory
NTDC	National Transmission and Dispatch Company
NWFP	North-West Frontier Province
NYSE	New York Stock Exchange
O&M	Operations and Maintenance
OeKB AG	Oesterreichische Kontrollbank Aktiengesellschaft
OGDCL	Oil and Gas Development Company Limite
OGRA	Oil and Gas Regulatory Authority
OIML	International Organization of Legal Metrology
OMV	Österreichische Mineralölverwaltung
OPII	Orient Petroleum International Inc.
P&L	Profit and Loss
PACRA	Pakistan Credit Rating Agency
PAEC	Pakistan Atomic Energy Commission
Pak EPA	Pakistan Environmental Protection Agency
PC	Planning Commission
PCRET	Pakistan Council for Renewable Energy Technologies
PCSIR	Pakistan Council of Scientific and Industrial Research
PEC	Pakistan Engineering Council
PEPCO	Pakistan Electric Power Company
PESCO	Peshawar, Electric Supply Company
PIB	Pakistan Investment Bond

PIDE	Pakistan Institute of Development Economics
PL	Profit and Loss
PLN	Perusahaan Listrik Negara
PM	Prime Minister
PMD	Pakistan Meteorological Department
PMO	Project Management Office
PMU	Project Management Unit
PNAC	Pakistan National Accreditation Council
PNRA	Pakistan Nuclear Regulatory Authority
PO	Planned Outages
POE	Panel of Experts
POL	Pakistan Oilfields Limited
PPA	Pakistan Power Agency or Power Purchase Agreement
PPIB	Private Power Infrastructure Board
PPL	Pakistan Petroleum Limited
PPP	Private Public Partnership
PPPMC	Pakistan Power Park Management Company
PQD	Prequalification Document
PRMPR	Poverty Reduction & Equity Group
PSIA	Poverty and Social Impact Analysis
PSE	Public Sector Enterprises
PSEDF	Private Sector Energy Development Fund
PSO	Pakistan State Oil
PSQCA	Pakistan Standards and Quality Control Authority
PSRP	Power Sector Restructuring Program
PSTR	Performance Standards (Transmission)Rules
PV	Photovoltaic
QESCO	Quetta Electric Supply Company
QCC	Quality Control Center
RCC	Roller Compacted Concrete
RE	Renewable Energy
RET	Renewable Energy Technology
RFO	Residual Fuel Oil
RFP	Request for Proposals
ROA	Return on Assets

ROE	Return on Equity, Rate of Return on Equity
ROI	Return on Investment
RORB	Return on Rate Base
ROW	Right-of-Way
RPS	Renewable Portfolio Standard
Rs.	Rupee
SASDE	South Asia Sustainable Development Energy
SCARP	Salinity Control and Reclamation Project
SCC	System Certification Center
SDC	Standards Development Center
SDPI	Sustainable Development Policy Institute
SECP	Securities and Exchange Commission of Pakistan
SEPCO	Sukkur Electric Power Company
SHS	Solar Home System
SIR	Safeguards Implementation Report
SOx	Sulphur Oxides
SOQ	Statement of Qualification
SPC	Special Purpose Company
SPV	Special Purpose Vehicle
SQM	Square Meter
SRO	Statutory Regulatory Order
STG	Secondary Transmission Grid
SVC	Static Var Compensator
SW	Switching Station
T&D	(Power)Transmission and Distribution
TCEB	Thar Coal & Energy Board
TDS	Tariff Differential Subsidy
TESCO	Tribal Electric Supply Company
T/Fs	Transformer
TMU	Technical Memorandum of Understanding
TNB	Tenaga Nasional Berhad
TNO	Transmission Network Operator
TOD	Time of Day
TOE	Tons of Oil Equivalent
TOU	Time of Use

TPS	Thermal Power Station
TRF	Technical Resource Facility
tWh	terawatt hours
UEPL	United Energy Pakistan Limited
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
USCPI	U.S. Consumer Price Index
USD	United State Dollar
VAT	Value-Added Tax
WAPDA	Water and Power Development Authority
WB	the World Bank
WDI	World Development Indicators
WEA	WAPDA Engineering Academy
WMC	Water Maintenance and Conservation
WPI	Wholesale Price Index
WPPO	WAPDA Power Privatization Organization
WTE	Waste to Energy
YESB	Yangon Electricity Supply Board

Exchange Rate (as of October, 2013)

1 US dollar = 106.5 Pakistan Rupee

1 Japanese Yen = 1.08 Pakistan Rupee

Summary

Summary

Chapter 1 Refer to the text of this report

Chapter 2 Energy Condition in Pakistan

2.1 History, Structure and Organization of the Energy Sector

2.1.1 History of the Energy Sector in Pakistan

The Electricity Act 1910[1] was enacted in 1910 under the British Rule in Pakistan. KESC was founded in 1913. The Electricity Rules (administrative instruction of the Electricity Act 1910) was established in 1922 and in 1937, respectively.

Thereafter, Pakistan attained independence in 1947, and power companies, each responsible for generation, transmission and/or distribution, existed in each region in the timeframe between 1947 and 1958.

The WAPDA Bill in 1958 enabled to establish WAPDA consisting of three wings: hydropower (development of water resources), electric power and service administration. In respect of structural reform, decentralization and a disintegration/privatization program for WAPDA have commenced since 1990, aiming at making energy supply more competitive market-oriented and pursuing efficient management. At the same time, the Energy Policy 1994 (Policy Framework and Package of Incentives for Private Sector Power Generation Projects in Pakistan) was announced to deal with shortage of energy supply.

The revision of the WAPDA Bill in 1998, aiming at atracting private capital through disintegration of generation, transmission and distribution, enabled to disintegrate WAPDA at the same time as founding PEPCO (Pakistan Electric Power Company), resulting in, from the Power Wing of WAPDA, three GENCOs responsible for thermal power (including eleven generation plants of WAPDA, eventually leading to four GENCOs due to foundation of one more GENCO as it stands), WAPDA for hydropower and management of water resources, NTDC for transmission and eight DISCOs for distribution.

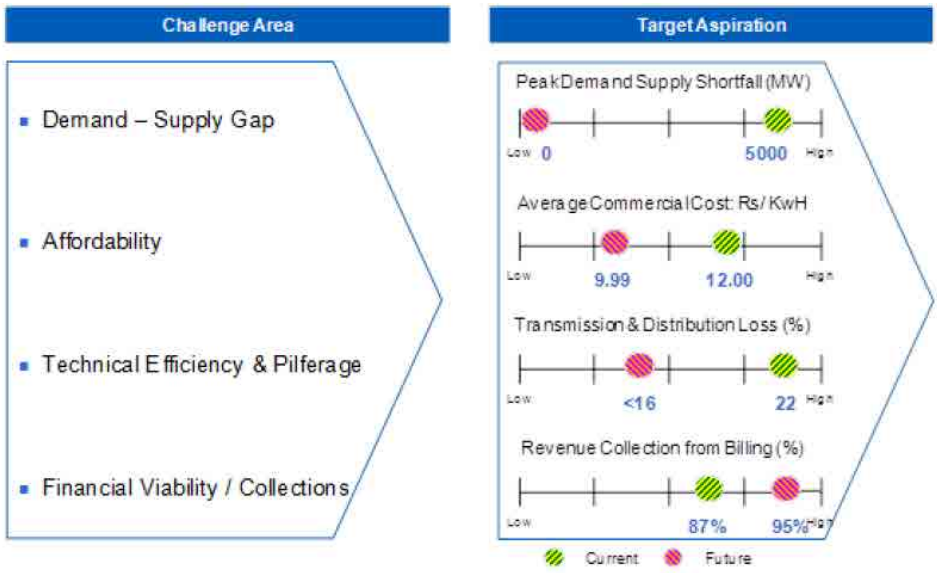
The Energy Policy 1994 (Policy Framework and Package of Incentives for Private Sector Power Generation Projects in Pakistan) provided lucrative incentives to investors, attracting much foreign investment in the energy Sector of Pakistan. This Policy is

[1] The Electricity Act 1994 is based on the authority of the English Law, while the Electricity Act 2002 is based on the authority of the Sale and Purchase Act .
Electricity Act, 1910 :http://www.kpkep.com/documents/Electricity%20Act%201910.pdf(Referred in September 13th,2013)

characterized by using a "Cost-Plus Method[2]" in determining energy tariff and showing investors the lucrative energy tariff of 6.5 cents/kWh[3]. Moreover, the policy in 2002 further increased the Government-determined purchase price for energy, and guaranteed 17% IRR.

The situation of the energy sector in Pakistan as of 2013 shows that each distribution company is in the red due to the below-cost tariff determined politically and low collection ratio. Although the Government subsidy had previously compensated for losses of the DISCOs, not only reduction of the subsidy after the economic crisis in 2008, but steep rise of the oil price in the international market have resulted in arrears of payment to the transmission companies (NTDC/CPPA), getting into a trouble that they have had debts to the transmission companies. In turn, the transmission companies have debts to generation companies, followed by the generation companies having debts to fuel supply companies in a chain reaction manner, and what is called "Circular Debt" has occurred and become a serious problem. Faced with these situations, the Ministry of Water and Power (MOWP) in Pakistan announced the National Power Policy 2013 in July, 2013. This Policy sets forth the following vision:

"Pakistan will develop the most efficient and consumer-centric power generation, transmission and distribution systems that meet the needs of its population and boost its economy in a sustainable and affordable manner."



Source：National Power Policy 2013

Summary Table 1 Major Target in National Power Policy 2013

[2] A method of determining price where a fixed rate of profit is added to the cost of production.

[3] It may be safe to say that this tariff level was equal to the international PPA price based on the fuel available at the time, because PPA price ofGT/Diesel in Indonesia as of 1996 was set at 6.44～6.55Cents/kWh.

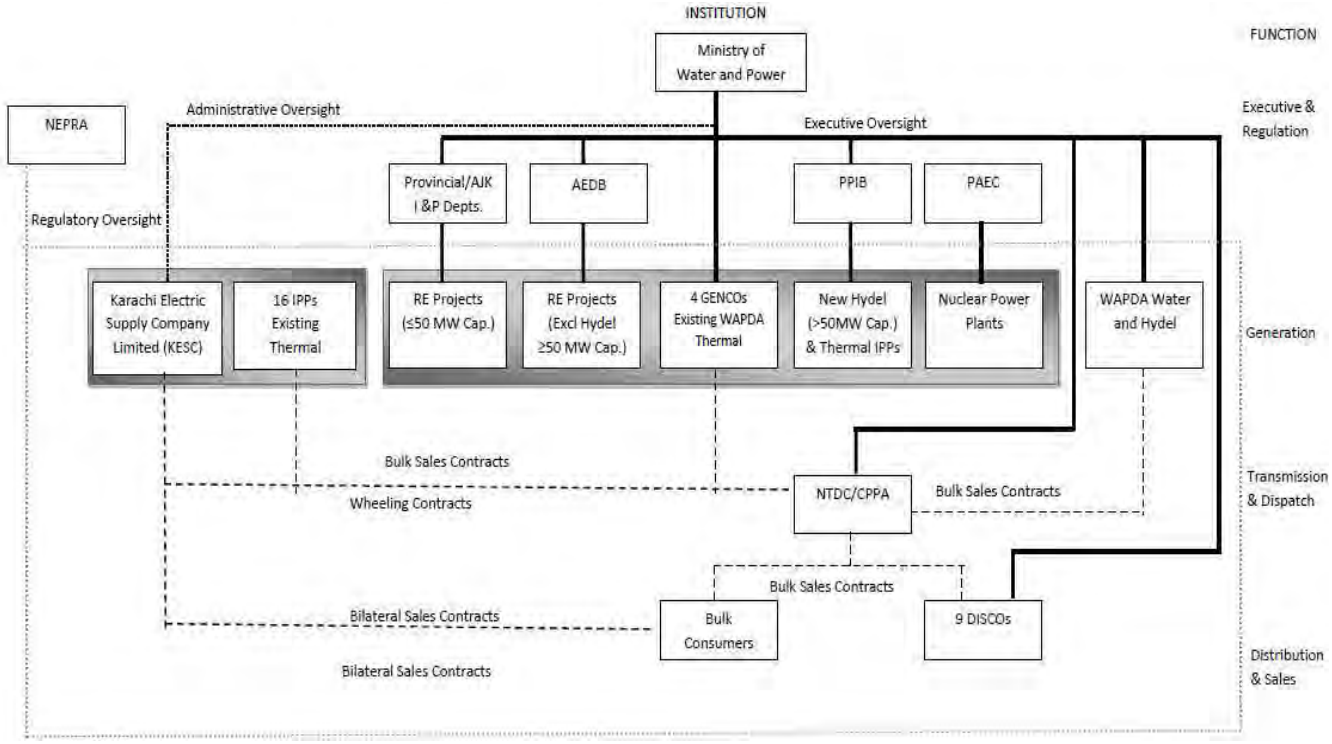
This Policy sets forth the following five targets:

1) Supply-Demand Gap
   Reduce the current supply-demand gap of 4,500MW to 5,000MW to null by 2017.
2) Affordability (reduce the cost to a price level affordable for consumers)
   Reduce the current 12 cents/kWh to 10 cents/kWh or lower by 2017.
3) Efficiency (improved efficiency)
   Reduce the current transmission and distribution loss of 23 to 25% to 16% or lower by 2017.
4) Financial Viability and Collection (improved collection ratio)
   Increase the current collection ratio of not higher than 85% to 95% by 2017.
5) Governance
   Improve speed and shorten a period for a decision-making process in the ministries, relevant institutions and regulatory agencies.

Furthermore, IMF set up a benchmark, including a 3-year reform plan to abolish TDS (Tariff Differential Subsidy), audit for transparent reduction process of the Circular Debt and disintegration of CPPA from NTDC as part of 27 economic and financial reforms of the energy sector announced in September, 2013 (Reference 10).

2.1.2 Institutional Organization of Pakistan's Power Sector

As of 2013, as shown in Summary Table 2, the generation sector includes four GENCOs responsible for thermal power, WAPDA for water power, PAEC for nuclear power and other IPPs, operating under the supervision of the MOWP in the energy business in Pakistan. In addition, there are nine distribution companies and KESC, a vertically integrated power company with its service territory in Karachi.



Note: Provincial/AJK I&P Depts. also responsible for non-RE projects of ≤50MW capacity. KESC is a vertically-integrated utility engaged in power generation and distribution.

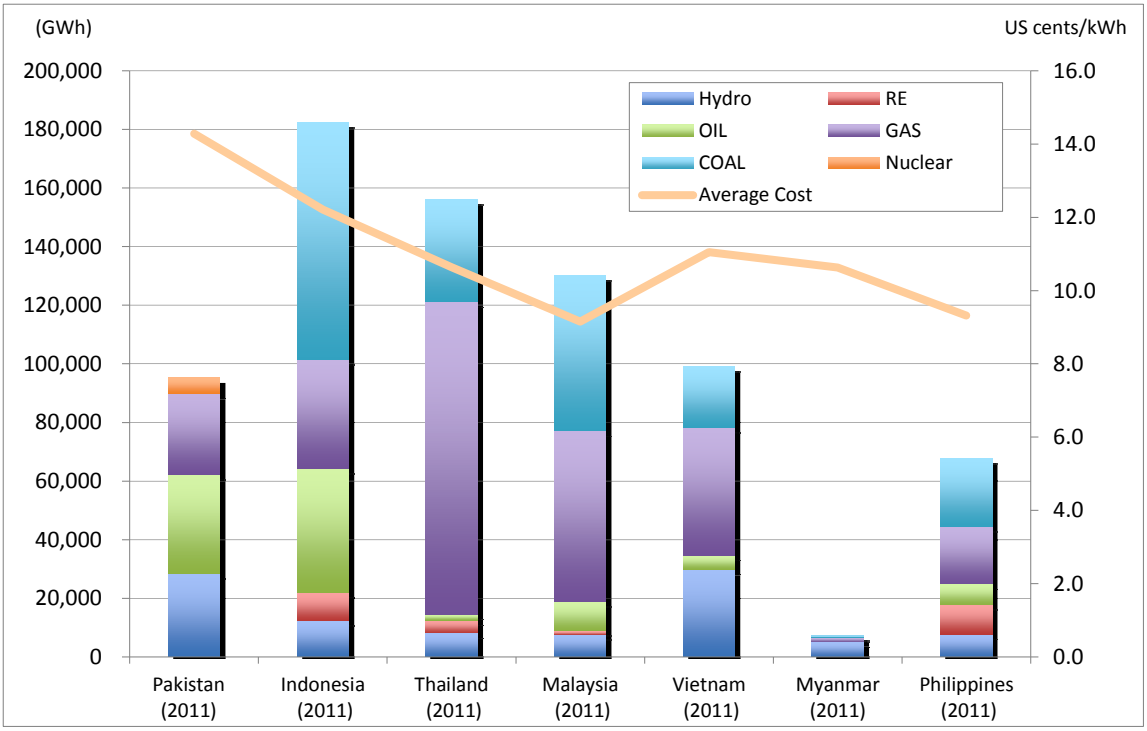
Source：Developed by JICA Survey Team referring to Policy for Development of Renewable Energy for Power Generation, 2006 Government of Pakistan

Summary Table 2　Institutional Organization of Pakistan's Power Sector

2.2 Present Situation and Development of Energy Sources

The primary energy in Pakistan has a higher dependence rate on gas and oil. Furthermore, the power mix is shifting from hydropower to thermal power mainly generated by IPPs, of which national development, however, is growing stagnant.

As Summary Table 3 shows, absence of coal-fired thermal power contributes to the higher cost structure of the energy sector in Pakistan, different from other Asian countries. It is possible to lower the unit price of power generation in future through increasing thermal power using domestic coal and further developing hydropower using abundant water in the northern area.



Note 1: Referring to the Cost Verification Committee's Report (December, 2011), it was assumed that for nuclear power, the tariff was set at 5.4 yen/kWh using energy availability factor of 10%, for oil-fired thermal power, at 21.6 yen/kWh using energy availability factor of 80%, for coal-fired thermal power, at 9.6 yen/kWh using energy availability factor of 80%, for RE, at 9.2 yen/kWh using geothermal power in Indonesia and the Philippines, for general hydropower, at 10.6 yen/kWh using energy availability factor of 45%, and for gas, at 10.9 yen/kWh using energy availability factor of 80%,

Note 2 : The exchange rate between US dollars and Japanese yen is assumed to be 100 yen to the dollar.

Source : For cost, refer to data obtained from "Cost Verification Committee", for energy source mix, refer to WDI.

Summary Table 3 Generation Capacity by Energy Sources and Average Unit Price

An enhancement plan for generation power in the Plan 2010 includes the following projects.

- Develop large-capacity hydropower plants (Tarbela, Dasu, Bhasha and Ghazi Barotha)
- Develop Thar coal-fired power plant
- Expand Chasma nuclear power plant

- Import a total of 2,000MW from Iran and other countries

However, the following issues are recognized in constructing coal-fired thermal power plants:

- It is necessary to establish technology for operation and maintenance, because of almost no track record on coal-fired thermal power.
- It is necessary to put infrastructure in place, ranging from coal mining to power generation

Generation Plan 2 (for 2021 – 2030) of the Generation Plan including up to 2030 developed by NTDC plans to enhance coal-fired thermal power plants to be constructed in accordance with the Generation Plan 1 (for 2011 – 2020). As a result, Thar coal-fired thermal power plant will account for approx. 40 % of power to be generated until 2030.

2.3 Present Situation of and Development Plans for Transmission Lines

Transmission and distribution grid in Pakistan are operated at 500kV, 220kV, 132kV and 66kV, of which 500kV and 220kV transmission and distribution are under the control of NTDC, and the rest under the control of DISCOs.

Geographically, Pakistan is a long country from north to south, resulting in 500kV transmission grid or the base trunk lines in an oblong form from north to south in a similar manner. The 500kV transmission lines are laid from Peshawar in the north via the Punjab and Sindh Provinces in the middle to HUBO (in the vicinity of Karachi) in the south, of which total transmission length is extremely long, or as long as 5,077km.

In addition, large energy consumption areas in the north (including Islamabad and Lahore) and in the south (Karachi) are interconnected by transmission lines of two routes.

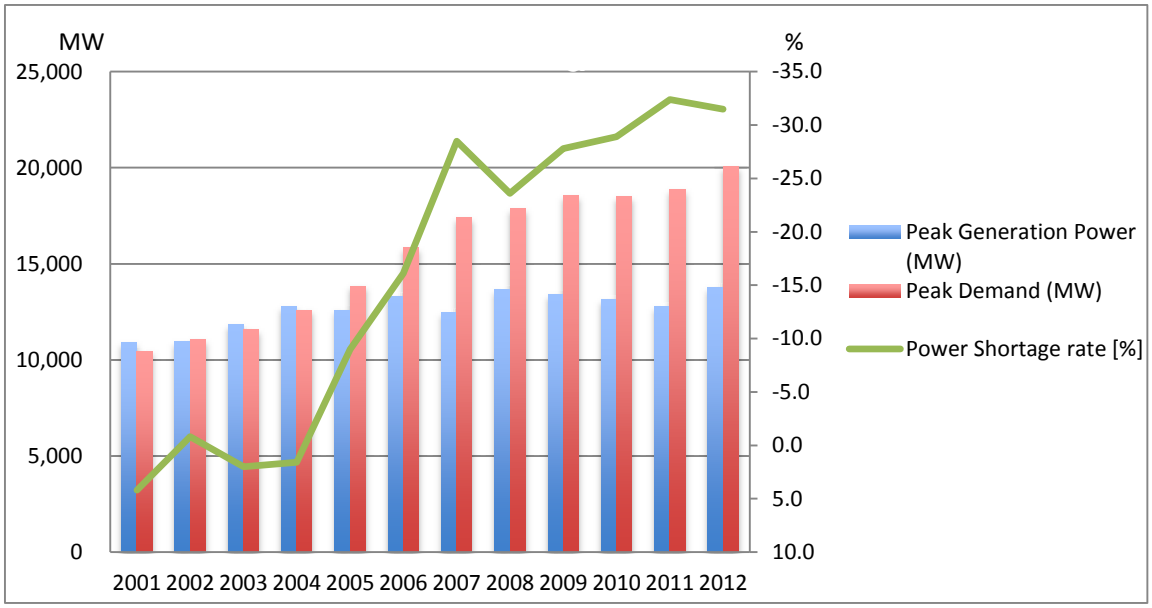
As technical issues in transmission and transformation grid to deal with the current energy demand growing at the rate of 7 to 8% per annum, and to reduce power outage rate, what follows are listed:

- A sign of fragility of base transmission lines linking the south and north
- A risk of major power outage at the time of facility trouble, due to many single line territories
- Insufficient maintenance and progressing aging of facilities

2.4 Energy Supply-and-Demand Situation

From a viewpoint of the current demand and supply of energy, growth in demand is 7% per annum for the last 10 years as shown in Summary 4. Regardless of the fact that the installed facility capacities are showing higher growth than an expansion plan, available power

supplies remain mostly unchanged for the last several years, with its growth below demand. For this reason, shortage of supply is estimated as 4,000-4,500MW, providing one of the causes of frequent power outages.



Source: Presentation Documents for Participants of 10th SMC of National Institute of Management, Karachi
For data in 2012 only, picked up from NEPRA State of Industry Report 2012

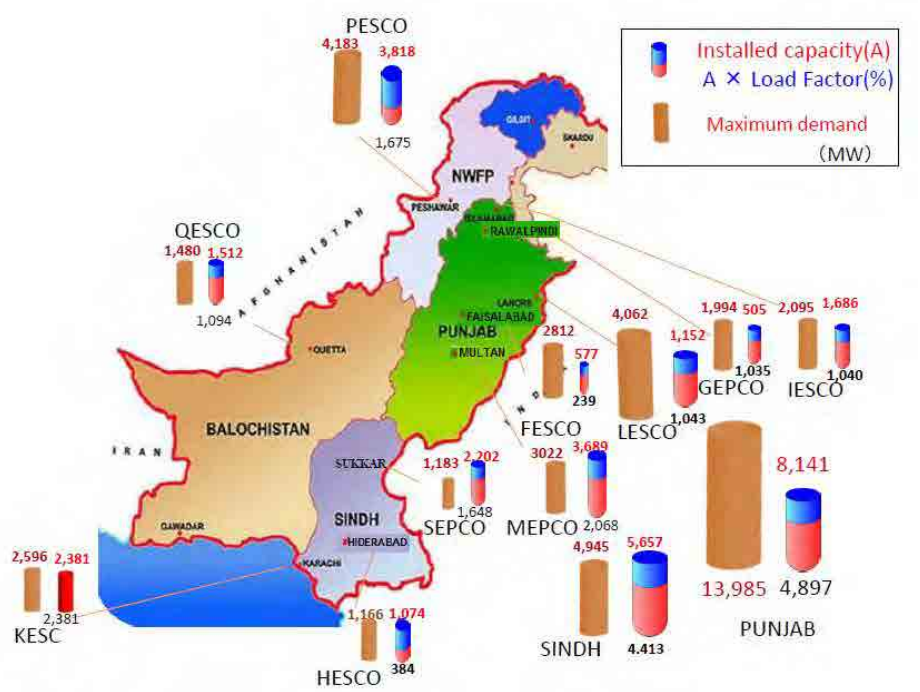
Summary Table 4 Transition of Energy Demand and Installed Facility

2.4.1 Supply-and-Demand by Region

In respect of power sources, hydropower plants are concentrated on the northern part, where much rain is precipitated in the mountain area, while many thermal power plants are located in the southern part, where fuel transportation is easier. Therefore, in rainy season, energy flow goes from the northern part to southern part, while in drought season, it goes from the southern part to the northern part replenished by the maximum power operation.

Summary Table 5 shows that the maximal power demand exceeds available supplies in general.

Particularly in the Punjab Province (service territory of LESCO), on which textile industries concentrate, power energy shortage is serious.



Note 1: Actual generation capacity is derived from Installed Generation Capacity (MW) shown in Pakistan Energy Year Book 2012, p87 and p88, multiplied by Load Factor (%), then followed by allocation to each DISCO in its service area according to the location of the generation plants.
Note 2: Load Factor does not contain a number about KESC.
Maximum demand is collected from NEPRA State of Industry Report 2012, p112, using all data in 2011-2012.
Note 3: DISCOs operated in each Province is as follows: HESCO, SEPCO and KESC in Sindh Province; IESCO, LESCO, FESCO, MEPCO and GEPCO in Punjab Province; QESCO in Balochistan Province; PESCO in KP (NWFP) Province.
Source: Pakistan Energy Yearbook 2012
NEPRA State of Industry Report 2012

Summary Table 5 Supply-Demand Gap in DISCOs

Pakistan has ten distribution companies, of which scope of business ranges from receiving energy at 132kV to distributing power to consumers. Losses in the transmission and distribution grid are generated in each of the distriburtion network operating at 132kV and 11kV.

The distribution loss (sum of nontechnical loss and technical loss) ranges from the lowest 7.8% at IESCO to the highest 32.6% at PESCO.

An average loss of eight distribution companies including HESCO, QUESCO, PESCO, LESCO, MEPCO, GEPCO, IESCO and FESCO is calculated as 16.5%.

While most of the loss is presumed to be due to, what is called, non-technical loss such as power theft and short circuit, the present situation is, however, that no drastic measures have been taken.

Out of these companies, IESCO alone, which still keeps the transmission and distribution losses at a 9% level for the last three years, has been actively making efforts to solve a measuring problem (prevention of illegally modified meters) and take countermeasures against power theft (severe crackdown, including revelation).

For this reason, non-technical loss is particularly low at IESCO.

IESCO and LESCO located in the Punjab Province have lower transmission and distribution loss of 9.8% and 13.8%, respectively, while HESCO in the Sindh Province and PESCO in the KPK (Khyber-Pakhtunkhwa) Province have the transmission and distribution loss of 34.8% and 37.1%, respectively. Long length of feeder line leads to higher transmission and distribution loss.

The operation rate of Thermal GENCOs is lower, compared with GENCO, KESC and IPPs, which also becomes a major obstacle in providing energy in Pakistan.

All GENCOs were founded in 1990s or before. For this reason, it is considered that the low operation rate of GENCOs is caused by the fact that they cannot purchase fuel due to lack of finance and renew their power facilities.

The electrification rate in Pakistan is higher than in Afghanistan and Bangladesh, but lower than in Sri Lanka, Nepal and India, compared with the neighboring South Asian countries.

2.5 Present Situation of Energy Tariff System

The energy tariff in Pakistan is set at 9 cents/kWh, both for residence and industry, which is at a higher level in Asian countries excluding the Philippines. The Government policy aims to further raise the energy tariff in future and gradually reduce the subsidy.

The distribution companies file tariff application, which is reviewed by NEPRA, followed by tariff determination through public hearing (NEPRA Determined Tariff).

The Government determines GoP Notified Tariff based on the tariff by the most efficiently operated company of all the 10 distribution companies. The difference between NEPRA Determined Tariff and GoP Notified Tariff is treated as TDS (Tariff Differential Subsidy).

As a result of having revised the energy tariff on October 1st, 2013, the energy tariff after the revision became as shown in Summary Table 6 and 7 below. This revision of the energy tariff reduced the subsidy to a large extent for more than 200kWh～300kWh, and abolished the subsidy for more than 700kWh. This revision was made by the Government as part of the structural reform, to which Finance Minister Ishaq Dar agreed with IMF as the conditionality of providing 6.67 Billion USD loan associated with the Extended Fund Facility (EEF). It is expected that the reform will be performed in four phases, which will reduce the energy subsidy from approx. 1.8% to 0.3 or 0.4% of the GDP in three years.

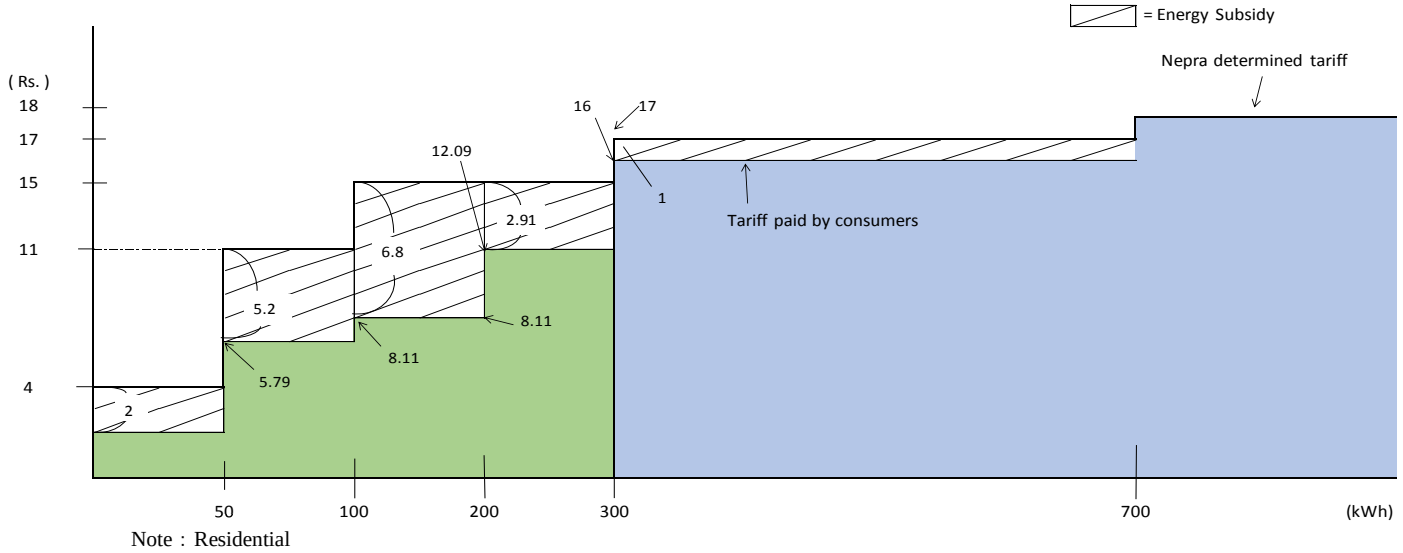
Source: Memorandum on Economic and Financial Policies for2013/14–2015/16, Ministry of Finance, September4, 2013

In addition to the above, a full scale implementation of Multi-Year Tariff and shortening of the examination period under the Fuel Adjustment System are under consideration.

Summary Table 6 Revised Energy Tariff as from October 1st, 2013

Rs/kWh

		Before October 1st , 2013	After October 1st ,2013
Domestic consumer	0-50	2	2
	1-100	5.79	5.79
	101-200	8.11	8.11
	201-300	8.11	14
	301-700	12.33	16
	700-	15.01	18
Agricultural consumer		6.77	10.35



Note : Residential

Source : Developed by the JICA Survey Team based on No. NEPRA/TRF-100/11280-11282 October 11, 2013 Subject: Decision of the Authority regarding Request for Reconsideration of Tariff Determinations Pertaining to the Ex-WAPDA Distribution Companies for the Financial Year 2012-13 under Section 31(4) of NEPRA Act 1997

Summary Table 7 Energy Tariff Determined for IESCO (October 11th, 2013)

2.6 Present Situation and Challenges of Energy Distribution Business

It is considered that the following five factors are the causes of the Circular Debt incurred in the distribution companies.

① Notification by NEPRA

② Determination by GoP

③ Loss (transmission loss in 132kv and distribution loss in 11kv)

④ Collection ratio (commercial loss)

⑤ Interest cost due to delay in payment from CPPA to IPPs is not allowed to pass through to end consumers.

It is assumed that the Circular Debt due to the factors ① and ② above accounts for more than 60% of the total Circular Debt.

The difference between billing and collected amount is extremely large, because the collection ratio is low at HESCO in Hyderabad, PESCO in Peshawar and QESCO in Quetta in the borderland.

IMF Country Report (2013) includes the following in the program as loss reduction measures:

1) Execution of Performance Contract[4]
2) Reinforcement of penalty for power theft
3) Installation of smart meters

2.7 Energy Conservation

Energy conservation in Pakistan is assumed by ENERCON under MOWP and other institutions or agencies under the Ministry of Science and Technology (MOST) including PSQCA and PCSIR.

ENERCON and other several institutions or agencies get involved in energy conservation in Pakistan. For example, Pakistan Standard Quality Control Agency (PSQCA) is responsible for introduction and adoption of the International Energy Performance Standard, while Pakistan Council of Science and Industrial Research (PCSIR) has a function of inspection and certification on equipment used in Pakistan.

What follows are issues in promoting Energy Conservation Policy:

1) Issues in designating energy business operators: While the obligation of declaring energy usage is imposed on factories and offices using more energy than a pre-defined level in some foreign countries, energy usage may not always be declared honestly in the event that production volume is cheated to reduce tax payment.
2) Issues in financing energy conservation: It is not possible to seize leasee's property in Pakistan, even in the case where arrears is incurred after leasing out energy saving machinery.

Even today, a draft Energy Conservation Bill is established, which, however, remains on mainly having stipulated foundation of ENERCON.

[4] Performance Contract in Pakistan is called Signalling System, consisting of (i) Performance Information Sytem to measure practical measures taken, (ii) Performance Evaluation System to evaluate socially desirable measures taken and (iii) Incentives giving a reward or imposing penalties based on the performance of the distribution companies at the end of the term.

Building Code

Building Energy Code (S.R.O.249 (I) 2013) is a Seismic Provision submitted in the same manner in September, 2008 as a Provision of Building Code, which had become effective in 1986, after a big earthquake attacked Kashmir in the northern part of Pakistan in 2005. The Building Energy Code was developed by Pakistan Engineering Council (PEC) and S.R.O. (Statutory Notifications) was submitted by the Ministry of Science and Technology in March, 2013. Thereafter, implementation of the Code has been relegated to provinces and cities. It is pointed out that lack of finance and technological competence are seen in implementing the Building Energy Code in each provincial government.

This Building Energy Code (S.R.O.249 (I) 2013) stipulates that buildings consuming energy more than 100kW for facilities or with contract energy of more than 125kVA are targeted for regulation.

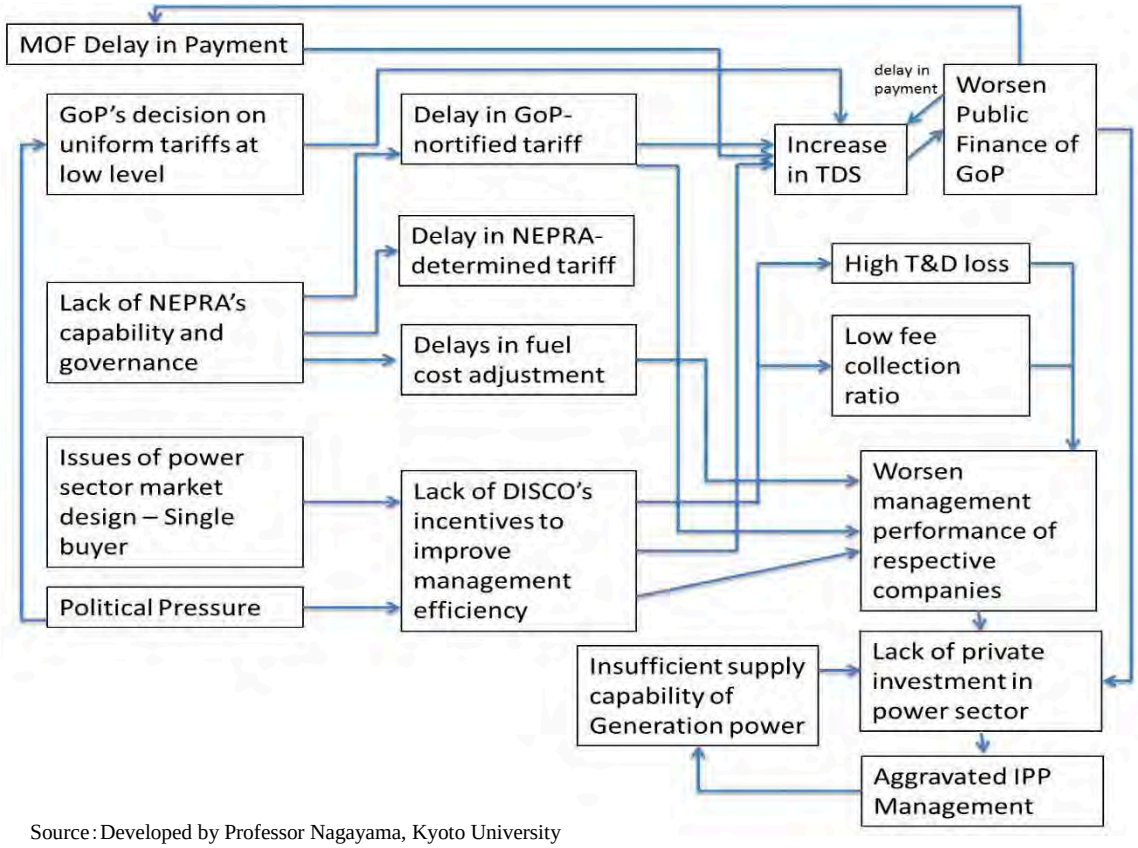
Source: http://www.pec.org.pk/sro/28march.pdf (Referred in February 9th, 2014)

Note, however, that PEC serves as a Statutory Regulatory Body (meaning statutory legal), and takes responsibility for all the technical matters.

Any codes drafted by any other ministries or authorities would never become legal without PEC authorization.

3.1 Circular Debt Situation in Energy Sector

What is called, “Circular Debt” is incurred at each energy entity that the distribution companies cannot pay the billed amount to the generation companies, which cannot pay in turn to the fuel supply companies due to the tariff set at a level by which the cost cannot be recovered, high transmission and distribution loss and low tariff collection ratio. Furthermore, under the framework of a single buyer, incentives for the distribution companies to procure less inexpensive power will be lost, because they may just purchase it from the single buyer.



Source：Developed by Professor Nagayama, Kyoto University

Summary Table 8　Major Cause of Circular Debt

One of the causes that the Circular Debt has been accumulated is that deficiency is inherent in the retail tariff setting method. Since 2007, the differential tariff has been applied to the distribution companies, while actual tariff had continuously been collected from end consumers, to which not the differential tariff but the nationwide Uniform Tariff is applied. The subsidy grant based on this difference is called Tariff Differential Subsidy (TDS). Each distribution company has a big difference in its business scale, geographical conditions, socio-political background, consumer density and composition, technical and administrative loss and management ability. For these reasons, Differential Tariff is applied to each company.

As Summary Table 9 shows, TDS is transitional with some tariff gap.

Source: ENERGY SECTOR CRISIS ISSUES & REFORMS WAY FORWARD by SHAHID SATTAR Member (Energy) PLANNING COMISSION May 23rd, 2013

Summary Table 9 Increased Gap between NEPRA Determined and GOP Tariff

The Circular Debt exceeding 35 Billion Rs. has been accumulated every month, due to increase of this TDS and other factors including non-technical loss in transmission and distribution (T&D), low collection ratio, payment arrears[5] from CPPA to IPPs and overdue interest associated with it and loss due to Fuel Adjustment Surcharge (FAS). T&D loss exceeding NEPRA-indicated target value[6] and/or collection below the cost leads to expense incurred in the distribution companies, pressing the management thereof.

The Government of Pakistan paid off 342 billion Rs. at the end of June, 2013 out of the payment arrears amounting to Rs. 503 billion identified at the end of May, 2013, and resolved the residual amount by the end of July, 2013.

3.2 Energy Subsidy

The Pakistani Authorities have launched a program to gradually eliminate most of the energy subsidy[7].

The four-phased plan is expected to reduce the subsidy from about 1.8% to 0.3–0.4% of GDP in three years.

5 National Policy 2013 stipulates that the delay limit from due date is 45-60 days for RFO, and 30-45 days for Gas.

6 For example, the target value is set at 12% (substantially 13.2%) for LESCO (source from interview with LESCO on September 25, 2013).

7 Fuel price changes are passed through to electricity prices on a monthly basis.

3.3 Financial Condition of Generation, Transmission and Distribution Companies and CPPA

While the distribution companies including IESCO and LESCO have negative profit, the generation companies excluding Japan Power have positive profit. Although the profit of IPPs are protected by the PPA, the distribution companies including IESCO and LESCO are suffering loss, due to influence of the energy policy in Pakistan.

Chapter 4 Outline of Institutions Related to Energy Sector

4.1 For the present status of each company, refer to respective Chapter

4.2 Governance Issues

Governance issues in Pakistan are shown as below:

- Institutional issues causing the Circular Debt（Institutional Issue）
  Regulation requires ensecuring transparency.
- Setup of Performance Indicator
- In addition, the Project Management Office (PMO) to be established for conducting evaluation according to the above Performance Indicator

Chapter 5 See text.

Chapter 6 See text.

Summary Table 10　Performance Evaluation of the Energy Sector in Pakistan

	Entry	Ideal form in the situation of Pakistan in 2013	Present evaluation		Way Forward
Power generation	Efficient energy generation	Not only IPPs but GENCOs will generate power efficiently at low cost.	×	− Large-capacity hydropower has not been developed. − Even though Pakistan is a coal-producing country, almost no coal-energy generation hasn't been in place. − GENCOs' efficiency is extremely poor[8]. − Restrictions are imposed on fuel purchase because of the Circular Debt and the adjustment for the WADPA payment.	GENCO or part of GENCO plants will be privatized or leased out.
	Smooth start-up of IPPs	Transparent and clear-cut IPP procedures are put in place for investors and revision of the tax system after investment is not made. Transparent selection of power generation operators are put in place.	○	PPIB accepts loaned staff from MOWP, having experience of almost 20-year history and evaluation capability.	Solicited bid will be taking place under an energy supply project at minimal cost.

[8] The operation method of the plants with poor combustion efficiency and/or operation rate should be reviewed.

Power generation	Development of renewable energy	Smooth development of solar light energy, wind power and small hydropower will be made.	×	FIT (Upfront tariff)[9] is provided for wind power. 17% IRR is undertaken. Even though there is a possibility of small and medium hydropower using irrigation plant and canal, no information is available for investors. The capacity building of AEDB/provincial government is at issue.	Small and medium hydropower plan will be eveloped.
	Energy source at optimum and minimum cost, considering operation of water.	It is necessary to consider an optimal water operation (between dams, or using irrigation).	△	Part of cascade hydropower has to be fixed without conflict between upper stream and lower stream.	
	CPPA (single buyer)	Under the framework of a single buyer, distribution companies do not have incentive to procure less inexpensive power.			CPPA should further reinforce the governance in future and improve transparency of transaction between IPPs and distribution companies.
	Neutralization of transmission network (clarifying the wheeling charge).	N/A	×		

[9] Upfront tariff means that electric power generated as renewable energy will be purchased at more favorable price or fixed price (same as FIT scheme). Note, however, that it will be provided not from the Government subsidy, but from power tariff.
(Reference: Working Paper for Solar PV Upfront Tariff Development (http://www.nepra.org.pk/Tariff/Upfront/UPFRONT SOLAR INFORMATION.PDF))(Referred in October 31st, 2013)

Transmission	Designing for clear-cut transmission tariff used for system reinforcement and planning method for transmission system.	Finalized through NEPRA determination and public hearing.	×	(Further study is required.) There is a room for further study whether or not the wheeling charge is appropriate.	A centralized and efficient planning unit should be founded to improve planning for an integrated generation sector, regarding investment, generation and supply.
	Institutionalization of smooth energy interchange.		×	A single buyer of NTDC/CPPA/WPPO is being replaced with a whole sale competition.	
	Healthy financial condition of a single buyer (due to promotion of energy generation).		△	A different the payment method is used for payment from a single buyer (CPPA/ WPPO) of NTDC to IPPs, considering the power relationship between the parties concerned.	CPPA should be disintegrated from NTDC (with regard to license as well as budget).
	Effort to reduce transmission loss.	No problem of restriction on transmission has been revealed due to less load flow.	△	Transmission loss (500kv, 220kv) is as low as approx. 2.8%, probably because load flow is lower.	

Distribution /retail service	Options of consumers for energy source.	N/A	×	There is no room for options because the distribution companies are responsible for their segmented service territory.	Bulk consumers will make a direct contract with the generation companies.
Energy Conservation	An energy conservation plan is developed and implemented.	Building and update of energy database, labeling, DSM, enlightenment of consumers, ESCO and diffusion of LED lamps will be performed.	×	Private business operators for energy conservation such as IESCO are not fostered. While many institutions responsible for energy conservation have been put in place, no cross-ministerial platform is established.	A comprehensive energy conservation policy for the country will be required. Passage of the Energy Conservation Bill will be required. Capacity building between energy-related institutions including ENERCON will be required.

Source：Developed by Professor Nagayama, Kyoto University

Comment of the Survey Team Head

This survey report puts together the data collected for the purpose of developing a draft matrix on the energy sector reform and its preparation during our visits to a wide range of institutions in Pakistan from September to October in 2013, when a joint mission of the World Bank, ADB and JICA was conducted to provide a program loan for the energy sector reform in Pakistan.

The draft matrix and its annexed technical documents for the energy sector reform were developed to describe in detail and clarify a scope of our business activities to provide aid again to the electricity business that Pakistan should do in future.

The overall objective of this survey program is to meet needs of Pakistani population for electric power, thereby boosting Pakistani economy in a sustainable and affordable manner, developing an efficient and consumer-centric electricity system and aiming to achieve the financial health of the energy sector and alleviate the public financial burden for this sector. This draft matrix prioritizes establishment of transparency, predictable policies and regulatory frameworks to ensure a sustainable and an environmentally conscious generation mix at the minimal cost and attract foreign investment.

Technical support projects to which Japan can contribute will include aid to comprehensive support comprising development of a master plan for energy conservation that provides much room for effective energy conservation, and to establishing a training center for coal technology that bears in mid implementation of coal-fired power generation.

And what I expect the most is that Pakistan will make efforts for the energy sector reform of its own motive, with this program loan provided by the World Bank, ADB and JICA as a turning point.

February 17th, 2014
Hiroaki Nagayama
Head of the Survey Team
Professor at Kyoto University

Chapter 1
Background and Circumstances of the Survey

Chapter 1 Background and Circumstances of the Survey

1.1 Outline of the Survey

This final report was completed for the purpose of conducting collection of data, survey and identification (hereinafter referred to as "this survey") regarding the energy sector reform in Pakistan. This survey commenced at the beginning of September, 2013 and terminated in March 2014. During the period of this survey, the survey team members conferred and conducted interviews with institutions related to the energy sector in Pakistan, international donor organizations and donor organizations from other countries regarding the issues and the current situation of the energy sector and the attitudes of these organizations toward the energy sector reform, collecting and making analysis of data, including relevant reports.

Item	Details	Special notes/Considerations
Objective	1) Conduct survey on issues and the current situation in the energy sector 2) Conduct trend survey on each institution toward the energy sector reform 3) Collect and make analysis of data, including relevant reports	1) Conduct hearing survey on relevant institutions in Pakistan 2) Hold conferences with international donor organizations 3) Understand needs
Target Cities	Islamabad, Lahore and Karachi	Relevant institutions
Scope of Work	1) Development of a draft matrix on the energy sector reform 2) Collect and make analysis of structure, institution and regulatory framework and basic data regarding the circular debt in the power sector.	1) Confirm consistency with aid provided by and share information with other donor organizations

1.2 Background of the Survey

The energy sector in the Islamic Republic of Pakistan (hereinafter referred to as "Pakistan") has a supply-demand gap reaching a maximum of 6,000MW, and the reason for which rests not only on lack of capacity alone, but on electricity tariff being set at a level below the cost, low collection ratio and reliance on imported oil. These factors have caused, "Circular Debt" issue, which has resulted in a shortage of fuel supply and obstructions to renewal of the infrastructure, leading in turn to low expansion of power generation facilities and operation availability.

Especially since a new administration was established in June, 2013, the Government has been struggling with the power shortage as an urgent issue. A basic agreement was made

on an IMF program in early July, which has become an official agreement in September 2013. The implementation of the energy sector reform is assumed to be conditionality for introducing the IMF program, and program loans from the World Bank and ADB to assist the energy sector reform are also scheduled to be provided.

JICA also aims to assist such energy sector reform, cooperating with the World Bank and ADB.

The energy sector of Pakistan is experiencing one of the worst crises at present. Power outrages and the Circular Debt issue hamper economic growth. The overall reform and restructuring process in the energy sector initiated in 1990's has not made a steady progress and still remains in a quagmire.

Rural areas in Pakistan are facing an acute electricity shortage for 16 to 18 hours, while in urban areas 9 to10 hours. It is estimated that the country is losing 2 to 3 % of its GDP due to such power shortage.

The key issues facing the energy sector is the Circular Debt. As it is impossible to pass through the full cost of generation as it is to the consumers, and payment of the difference between the applied tariff and the Determined Tariff in the form of subsidy is made to the power distribution and generation companies.; if the payment were delayed due to financial difficulties in the government, the distribution companies could not pay to the generation companies which in turn could not make payments to the fuel suppliers. Also at serious issues are huge transmission and distribution loss due to the adverse changes in the generation mix that a proportionate share of hydel power declines, shortage of gas occurs, and reliance on expensive furnace oil increases, the poorest efficiency of GENCOs, the inefficiencies and governance issues in the distribution companies in the public sector[10].

1.3 Objective of the Survey

The objective of this survey is to review various reports regarding issues including the Circular Debt retained in the energy sector and the current situation in Pakistan, make analysis of collected data and make feasibility study of Japan's aid to the energy sector reform. The result of this survey is also used for studying Japan's stance on assistance to the energy sector reform envisaged to be implemented in Pakistan in future as conditionality of the IMF Program.

1.4 Survey Regions

This survey targets Islamabad, the Punjab Province and the Sindh Province.

[10] For this description, refer to NEPRA Annual Report 2011-2012 P.1 CHAIRMAN'S MESSAGE

1.5 Survey Period

The Survey Team visited various institutions, and made an interview survey in each timeframe between September 7 and October 1, 2013, October 18 and November 1, 2013 and February 7 and February 15, 2014.

Chapter 2
Energy Condition in Pakistan

Chapter 2 Energy Condition in Pakistan

2.1 History, Structure and Organization of the Energy Sector

2.1.1 Political Climate in Pakistan

What follows is a political climate in Pakistan after 1988.

Bhutto was the youngest woman ever to be elected as the Head of Government and the first woman to be elected as the Head of Government of Muslim country in 1988.

Her government was followed by Nawaz Shariff, and the two leaders alternated until the military coup staged by Geberal Pervez Musharraf in 1999.

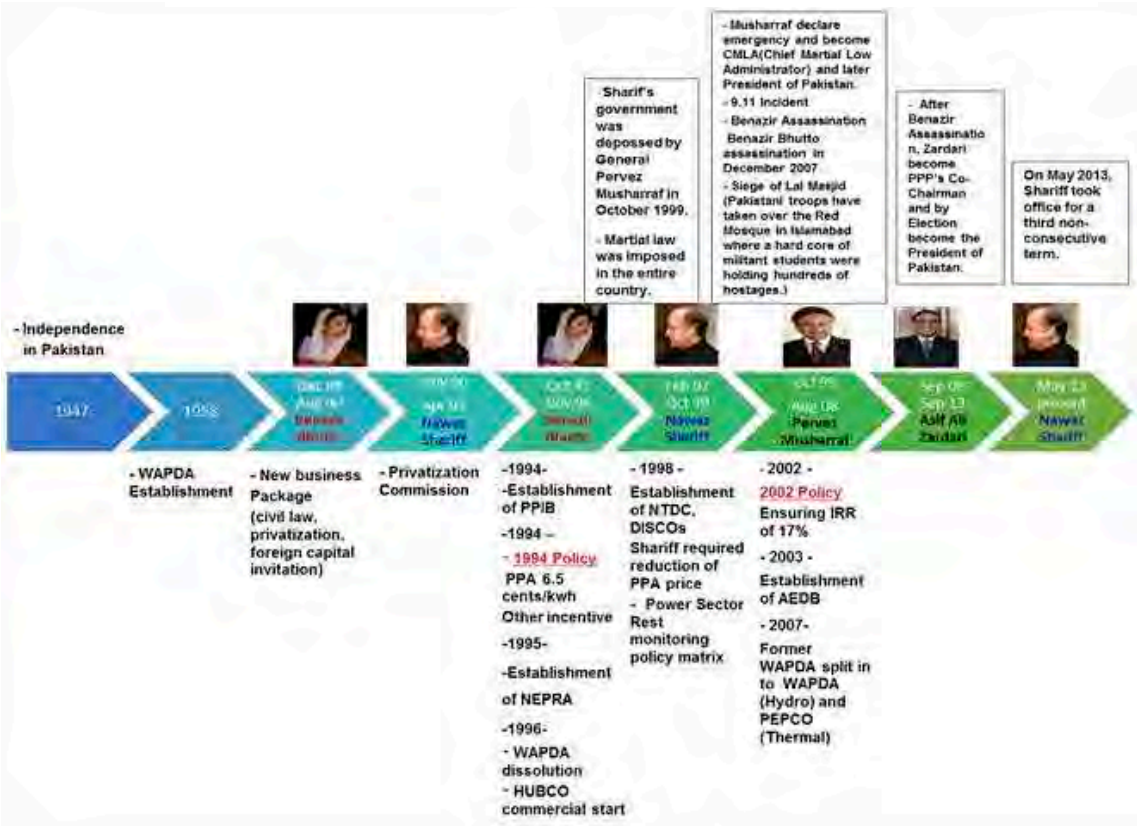
He served as the chief executive until 2002 and resigned the presidency in 2008 to avoid impeachment.

Bhutto's husband, Asif Ali Zardari, subsequently went into self-exile in Dubai, but returned to his home country in December, 2007 after Bhutto's assassination.

As the Co-Chairman of the PPP, he led his party to victory in the 2008 general election. He spearheaded a coalition that forced Musharraf to resign and was elected as President.

Shariff took office the third time in May, 2013.

Table 2.1-1 Politics and History of Energy Sector in Pakistan



Source: http://www.pmo.gov.pk/former_pms.php
http://www.presidentofpakistan.gov.pk/index.php?lang=en&opc=2&sel=4
(Developed by JICA Survey team referring to the URLs)

2.1.2 History of the Energy Sector in Pakistan

The Electricity Act 1910[11] was enacted in 1910 under the British Rule in Pakistan. KESC was founded in 1913. The Electricity Rules (administrative instruction of the Electricity Act 1910) was established in 1922 and in 1937, respectively.

Thereafter, Pakistan attained independence in 1947, and power companies, each responsible for generation, transmission and/or distribution, existed in each region in the timeframe between 1947 and 1958.

The WAPDA Bill in 1958 enabled to establish WAPDA consisting of three wings: hydropower (development of water resources), electric power and service administration.

In respect of structural reform, decentralization and a disintegration/privatization program for WAPDA have commenced since 1990, aiming at making energy supply more competitive market-oriented and pursuing efficient management.

At the same time, the Energy Policy 1994 (Policy Framework and Package of Incentives for Private Sector Power Generation Projects in Pakistan) was announced to deal with shortage of energy supply.

The revision of the WAPDA Bill in 1998, aiming at atracting private capital through disintegration of generation, transmission and distribution, enabled to disintegrate WAPDA at the same time as founding PEPCO (Pakistan Electric Power Company), resulting in, from the Power Wing of WAPDA, three GENCOs responsible for thermal power (including eleven generation plants of WAPDA, eventually leading to four GENCOs due to foundation of one more GENCO as it stands), WAPDA for hydropower and management of water resources, NTDC for transmission and eight DISCOs for distribution.

The Energy Policy 1994 (Policy Framework and Package of Incentives for Private Sector Power Generation Projects in Pakistan) provided lucrative incentives to investors, attracting much foreign investment in the energy sector of Pakistan. This Policy is characterized by using a "Cost-Plus Method[12]" in determining energy tariff and showing investors the lucrative energy tariff of 6.5 cents/kWh[13]. Moreover, the policy

[11] The Electricity Act 1994 is based on the authority of the English Law, while the Electricity Act 2002 is based on the authority of the Sale of Purchase Act.
Electricity Act, 1910: http://www.kpkep.com/documents/Electricity%20Act%201910.pdf

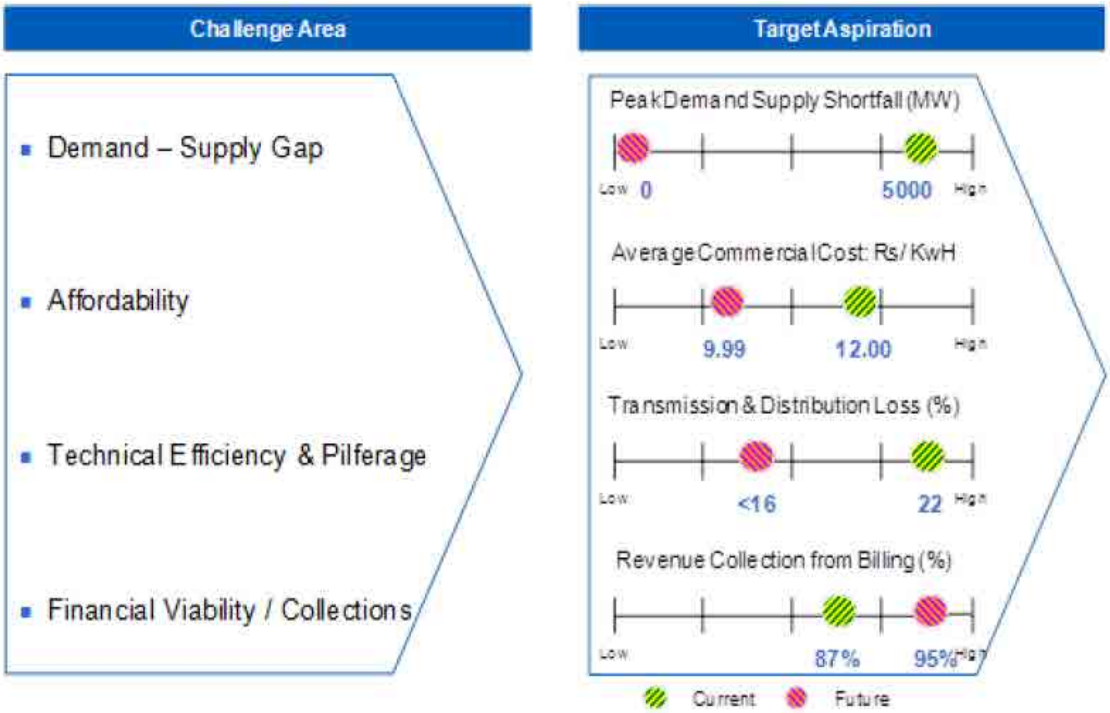
[12] A method of determining price where a fixed rate of profit is added to the cost of production

[13] It may be safe to say that this tariff level was equal to the international PPA price based on the fuel available at the time, because PPA price of GT/Diesel in Indonesia as of 1996 was set at 6.44～6.55Cents/kWh.

in 2002 further increased the Government-determined purchase price for energy, and guaranteed 17% IRR.

The situation of the energy sector in Pakistan as of 2013 shows that each distribution company is in the red due to the below-cost tariff determined politically and low collection ratio. Although the Government subsidy had previously compensated for losses of the DISCOs, not only reduction of the subsidy after the economic crisis in 2008, but steep rise of the oil price in the international market have resulted in arrears of payment to the transmission companies (NTDC/CPPA), getting into a trouble that they have had debts to the transmission companies. In turn, the transmission companies have debts to generation companies, followed by the generation companies having debts to fuel supply companies in a chain reaction manner, and what is called "Circular Debt" has occurred and become a serious problem. Faced with these situations, the Ministry of Water and Power (MOWP) in Pakistan announced the National Power Policy 2013 in July, 2013. This Policy sets forth the following vision:

"Pakistan will develop the most efficient and consumer-centric power generation, transmission and distribution systems that meet the needs of its population and boost its economy in a sustainable and affordable manner."



Source：National Power Policy 2013

Table 2.1-2 Major Target in National Power Policy 2013

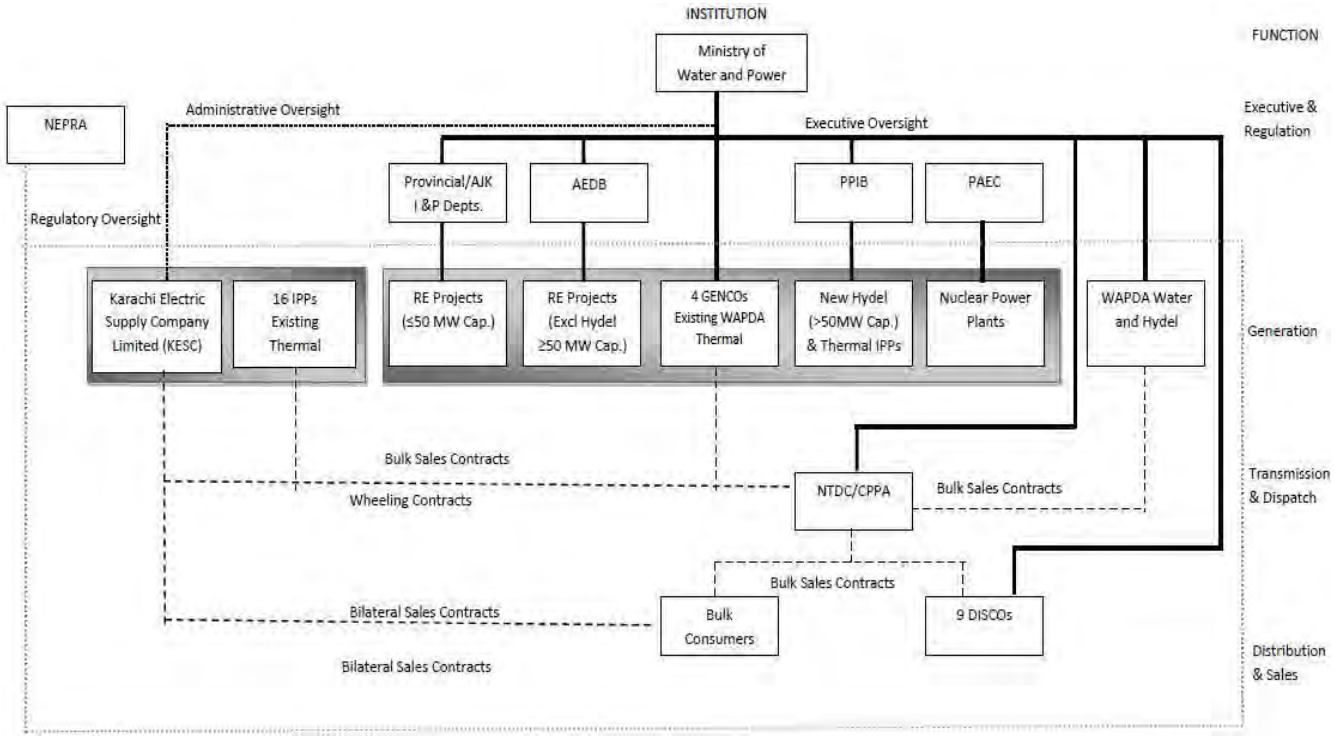
This Policy sets forth the following five targets:

1) Supply-Demand Gap
   Reduce the current supply-demand gap of 4,500MW to 5,000MW to null by 2017.
2) Affordability (reduce the cost to a price level affordable for consumers)
   Reduce the current 12 cents/kWh to 10 cents/kWh or lower by 2017.
3) Efficiency (improved efficiency)
   Reduce the current transmission and distribution loss, ranging from 23% to 25% , to 16% or lower by 2017.
4) Financial Viability and Collection (improved collection ratio)
   Increase the current collection ratio of not higher than 85% to 95% by 2017.
5) Governance
   Improve speed and shorten a period for a decision-making process in the ministries, relevant institutions and regulatory agencies.

Furthermore, IMF set up a benchmark, including a 3-year reform plan to abolish TDS (Tariff Differential Subsidy), audit for transparent reduction process of the Circular Debt and disintegration of CPPA from NTDC as part of 27 economic and financial reforms of the energy sector announced in September, 2013 (Reference 10).

2.1.3 Institutional Organization of Pakistan's Power Sector

As of 2013, as shown in Table 2.1-3, the generation sector includes four GECOs responsible for thermal power, WAPDA for water power, PAEC for nuclear power and other IPPs, operating under the supervision of the MOWP in the energy business in Pakistan. In addition, there are nine distribution companies and KESC, a vertically integrated energy company with its service territory in Karachi.



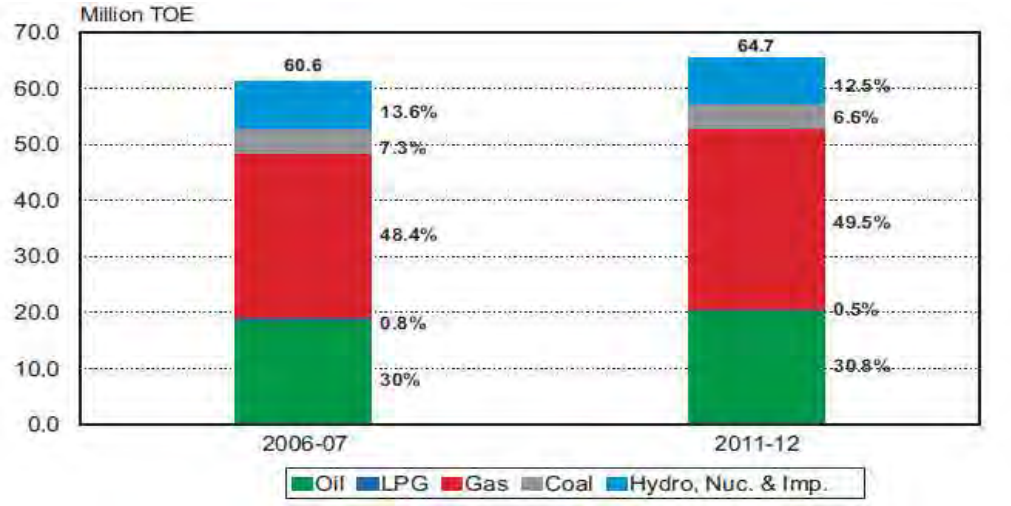
Note: Provincial/AJK I&P Depts. also responsible for non-RE projects of ≤50MW capacity. KESC is a vertically-integrated utility engaged in power generation and distribution.
Source：Developed by JICA Survey Team referring to Policy for Development of Renewable Energy for Power Generation, 2006 Government of Pakistan

Table 2.1-3 Institutional Organization of Pakistan's Power Sector

2.2 Present Situation of and Development of Energy Sources

2.2.1 Primary Energy

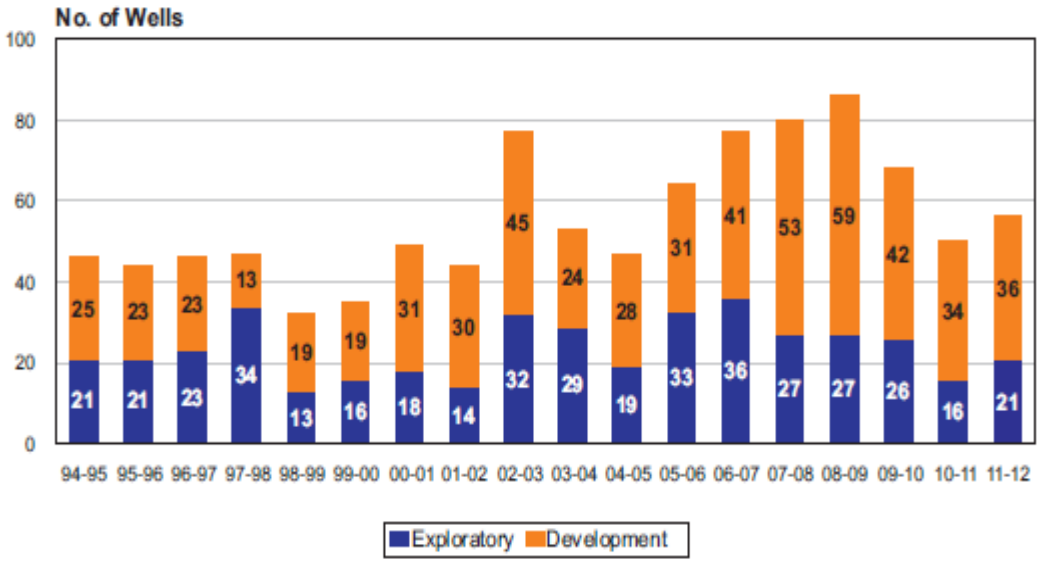
As Table 2.2-1 shows, the primary energy in Pakistan has a higher dependence rate on gas and oil.



Source: Pakistan Energy Yearbook 2012

Table 2.2-1 Primary Energy Supplies by Source

As Table 2.2-2 shows, however, as exploration and development of oil well have been retarded, more active development is expected.



Source: Pakistan Energy Yearbook 2012

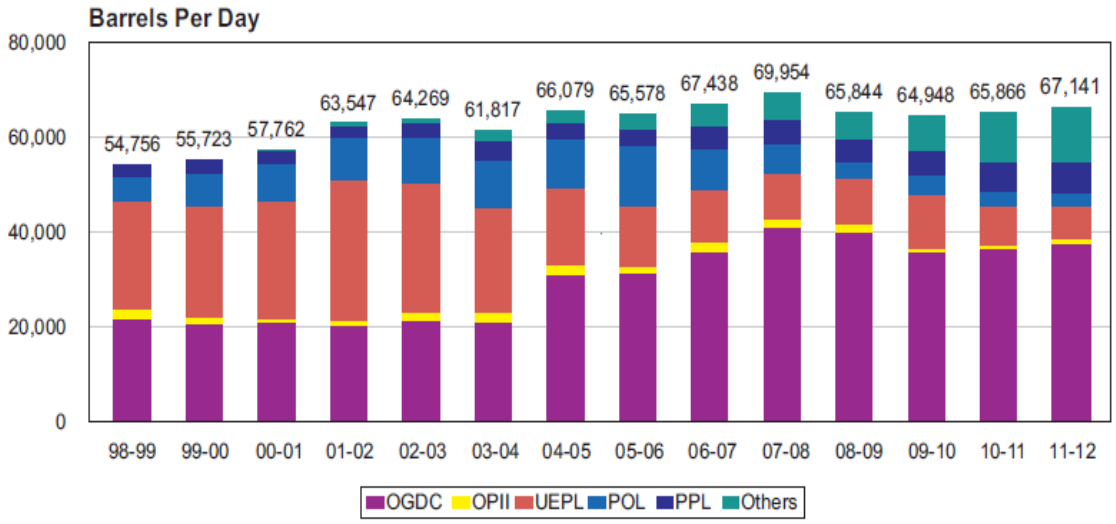
Table 2.2-2 Exploratory and Development Wells Drilled

- Exploratory Wells 806
- Development Wells 1102
- Sedimentary Area: 827,268 sq km
- Expl. Drilling Density One well per 1376 sq km
- Discoveries: 247
  - Oil 72
  - Gas/condensate 175
- Overall Success Rate: 1 : 3.3

Source: Pakistan Energy Yearbook 2012

Table 2.2-3 Oil and Gas Exploration (As on July 1st, 2012)

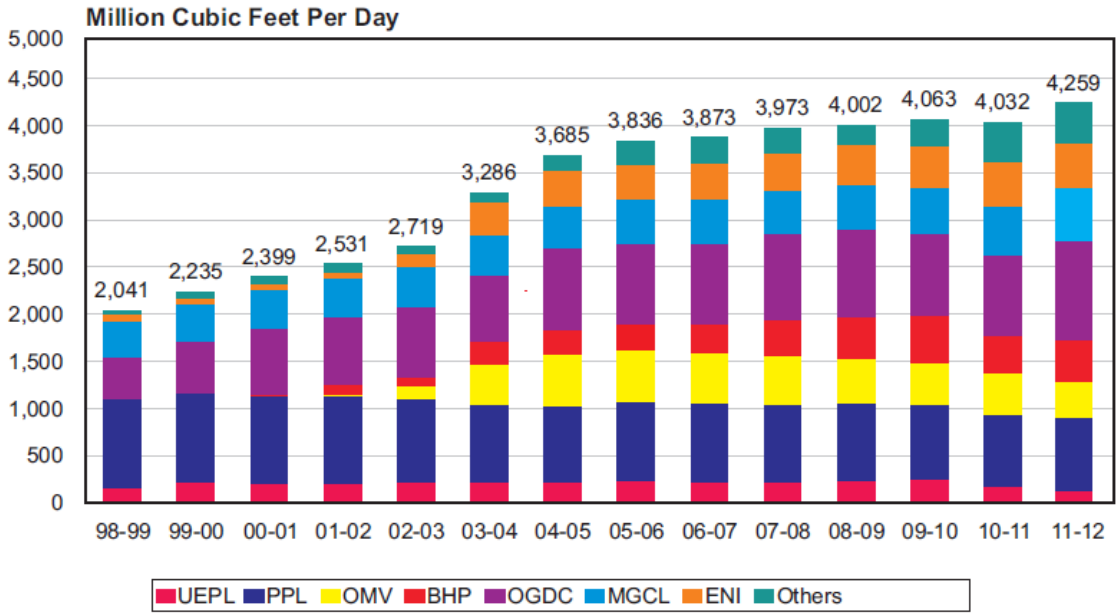
Production of oil has been retarded since 1998 (Table 2.2-4).



Note: OGDC: Oil and Gas Development Company Limited, OPII: Ocean Pakistan Limited, UEPL: United Energy Pakistan Limited, POL: Pakistan Oilfields Limited, PPL: Pakistan Petroleum Limited
Source: Pakistan Energy Yearbook 2012

Table 2.2-4 Crude Oil Production

Production of natural gas also has been retarded since 1998 (Table 2.2-5).

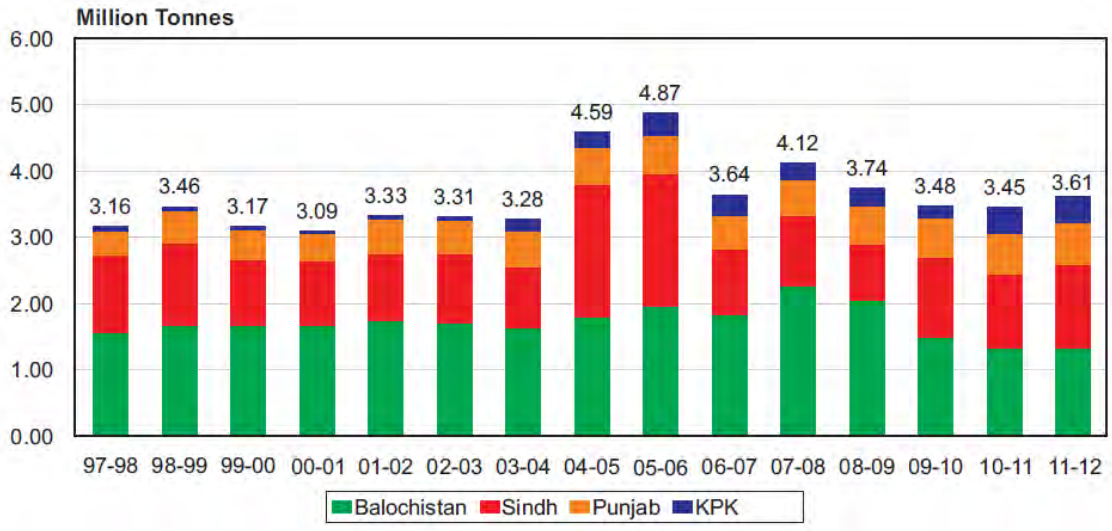


Note: UEPL: United Energy Pakistan Limited, PPL: Pakistan Petroleum Limited OMV: OMV (Pakistan) Exploration GmbH, BHP: Bhp Billiton Petroleum (Pakistan) Pty Ltd, OGDC: Oil and Gas Development Company Limited, MGCL: Mari Gas Company Limited, ENI: Eni Pakistan Ltd
Source: Pakistan Energy Yearbook 2012

Table 2.2-5 Natural Gas Production

Coal resources of the country are estimated at 185 billion tons, of which 184 billion tons are located in the Sindh province, with the major concentration on Thar (175 billion tons).

Source：Energy Pakistan Challenges and Opportunities P.21

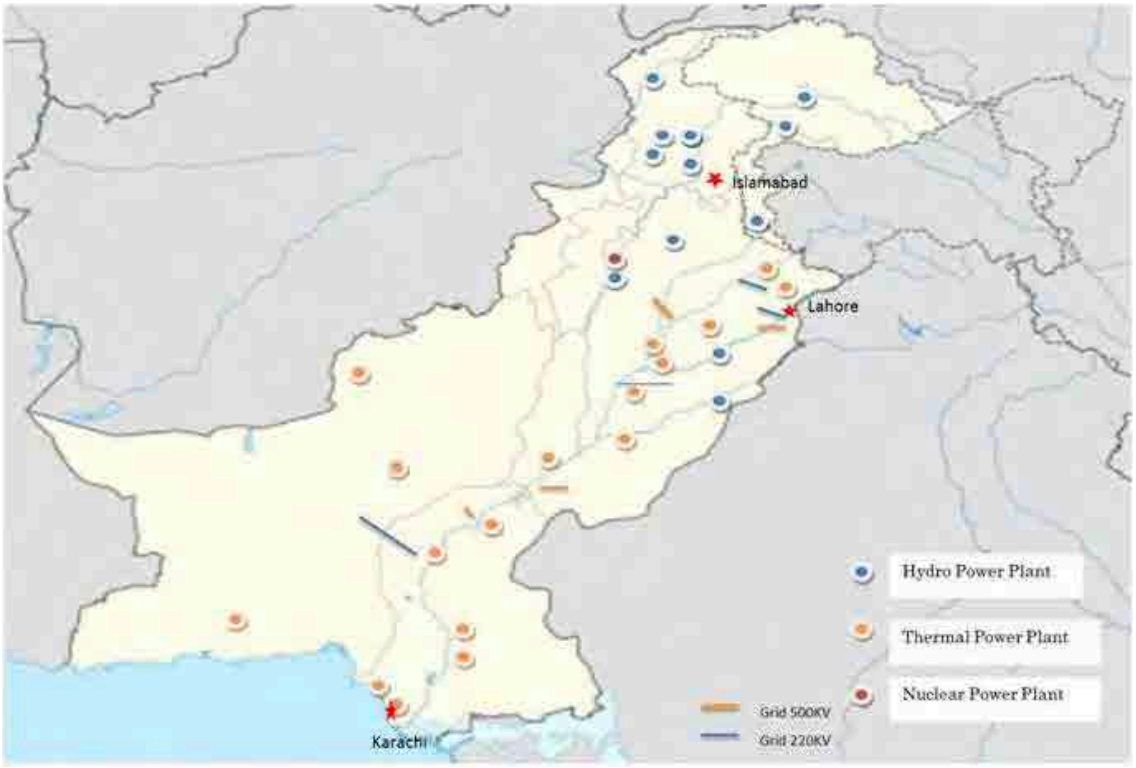


Source: Pakistan Energy Yearbook 2012

Table 2.2-6 Coal Production

2.2.2 Present Situation of Energy Sources in Pakistan

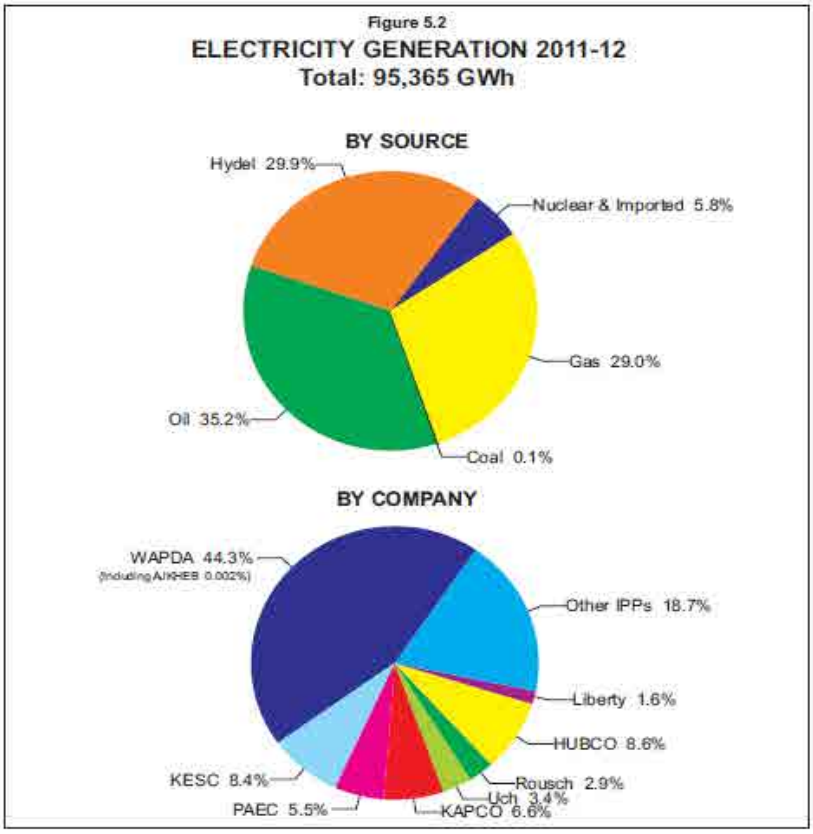
As Table 2.2-7 shows, hydropower plants are concentrated on the northern part, where much rain is precipitated in the mountain area and many thermal power plants are located in the southern part, where fuel transportation is easier. Therefore, in rainy season energy flow goes from the northern part to southern part, while in drought season, it goes from the southern part to the northern part replenished by the maximum power operation.



Source: JICA Survey Team using material from Created from NTDC, National Power System Expansion Plan Main Report 2011-2030

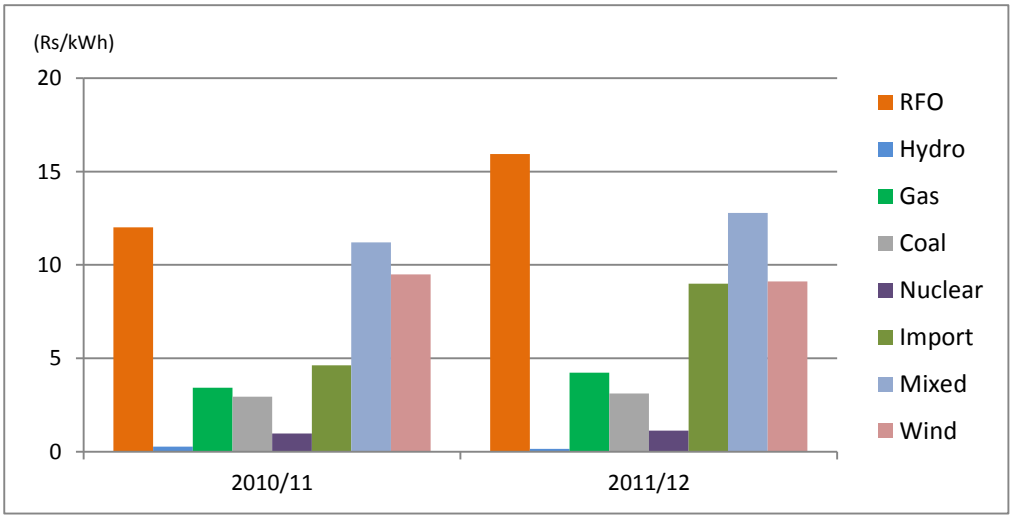
Table 2.2-7 Location of Major Generation Plant

As Table 2.2-8 Generation Capacity by Energy Sources shows, the energy source in Pakistan comprises fossil fuel, which accounts for a large percentage of 35.2% for high cost thermal power and 29% for gas turbine, hydraulic resources, which are abundant, but account for nothing but 29.9%, and others, which account for 2% for nuclear power and 0.1% for coal power, respectively.



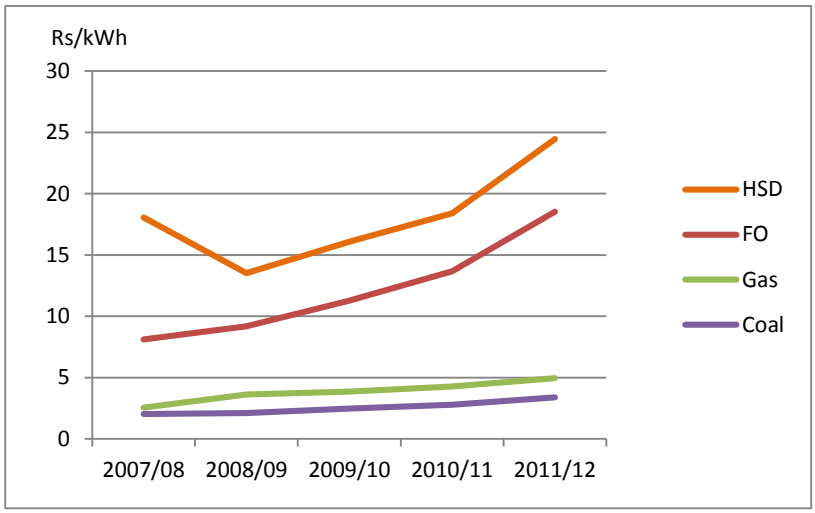
Source: Pakistan Energy Yearbook 2012 P.82

Table 2.2-8 Electricity Generation (2011-12)



Note: Mixed is composed of Gas, Furnace oil and Hydro
Source：NEPRA State of Industry Report 2012

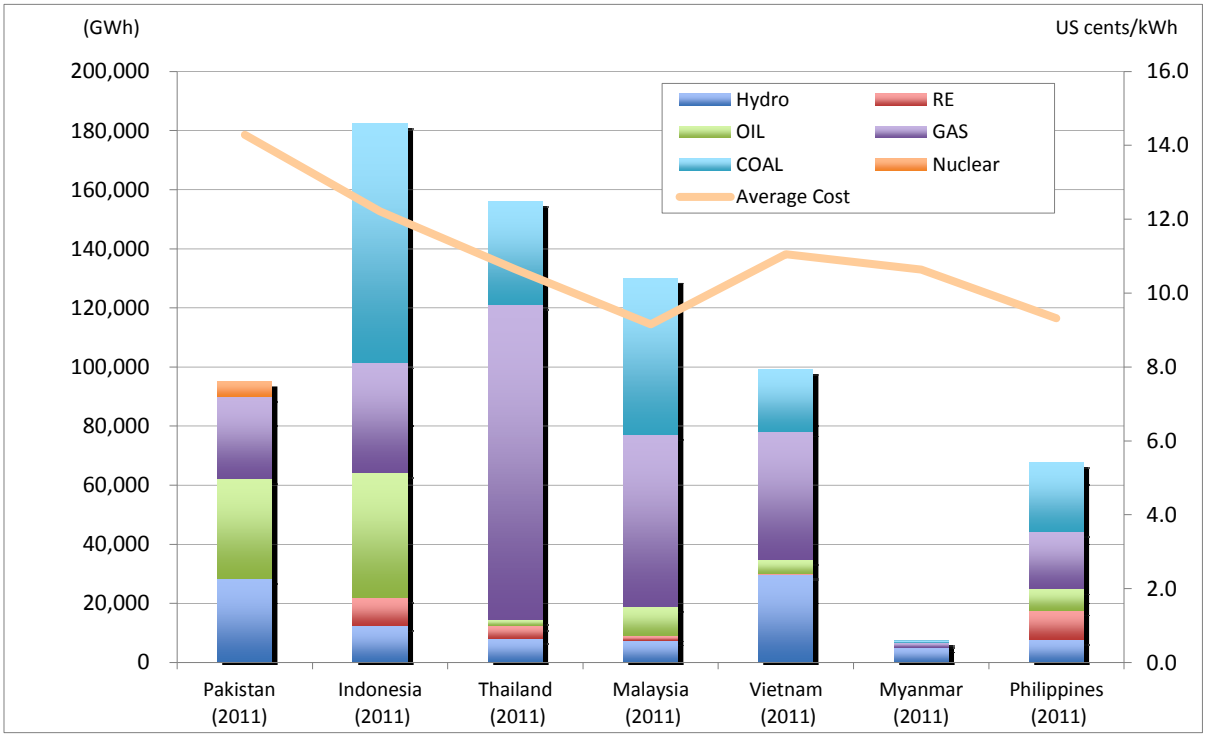
Table 2.2-9 Generation Cost by Generation Source



Note: HSD:High Speed Diesel, FO:Furnace Oil
Source：NEPRA State of Industry Report 2012

Table 2.2-10 Change in Thermal Generation Cost

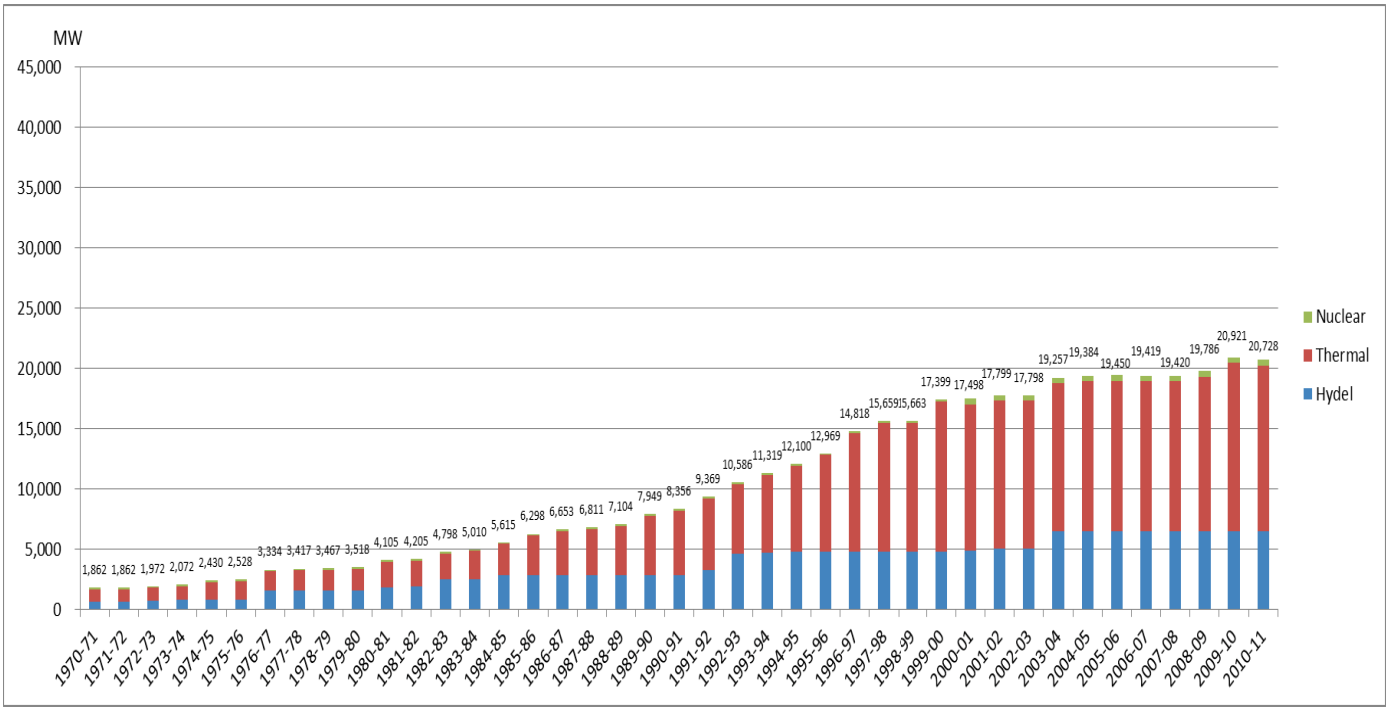
As shown in Table 2.2-11, absence of coal-fired thermal power contributes to the higher cost structure of the energy sector in Pakistan, different from other Asian countries. It is possible to lower the unit price of power generation in future, by increasing thermal power using domestic coal and further developing hydraulic power using abundant water in the northern area.



Note 1: Referring to the Cost Verification Committee's Report (December, 2011), it was assumed that for nuclear power, the tariff was set at 5.4 yen/kWh using energy availability factor of 10%, for oil-fired thermal power, at 21.6 yen/kWh using energy availability factor of 80%, for coal-fired thermal power, at 9.6 yen/kWh using energy availability factor of 80%, for RE, at 9.2 yen/kWh using geothermal power in Indonesia and the Philippines, For general hydropower, at 10.6 yen/kWh using energy availability factor of 45%, and for gas, at 10.9 yen/kWh using energy availability factor of 80%,
Note 2：The exchange rate between US dollars and Japanese yen is assumed to be 100 yen to the dollar.
Source：For cost, refer to data obtained from "Cost Verification Committee", for energy source mix, refer to WDI.

Table 2.2-11 Generation Capacity by Energy Sources and Average Unit Price

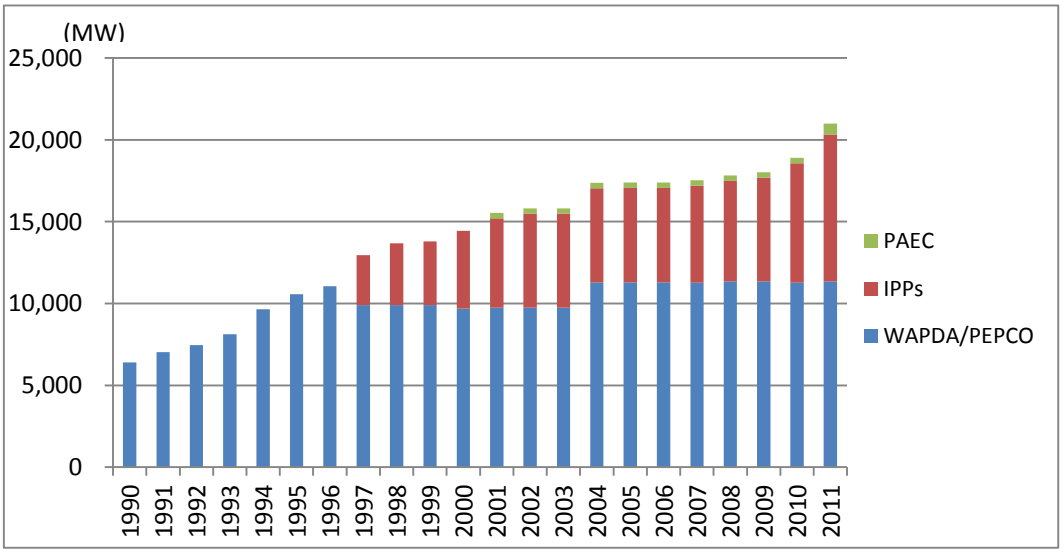
As Table 2.2-12 shows, gradual transition from hydropower to thermal power (the rate of hydropower decreases from 70% in the 1980's to 30%.) is taking place, and the generation cost increases in recent years due to transition to FO (Fuel Oil) caused by lack of natural gas.



Source: Handbook of Statistics on Pakistan Economy published by State Bank of Pakistan

Table 2.2-12 Installed Capacity and Generation of Electricity by Source

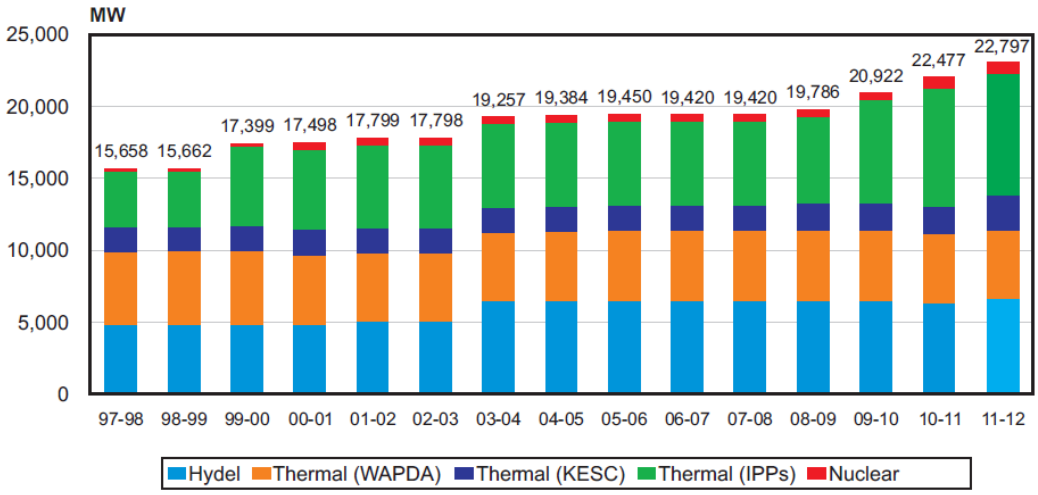
The generation facilities owned by IPPs have been reinforced since 1997 (Table 2.2-13).



Source：PEPCO Electricity Marketing Data

Table 2.2-13 Progress of Installed Generating Capacity

While installed thermal power capacity remains slightly reinforced as shown in Table 2.2-14, most of which is contributed by IPPs.



Source: Pakistan Energy Yearbook 2012

Table 2.2-14 Electricity Installed by Type（Thermal）

The existing total hydro power generation capacity in Pakistan amounts to 6,555MW (2010). However, inflowing water volume undergoes a lot of changes seasonally, which gives impact on the hydropower generation capacity. The generation capacity reduces to as low as 2,414MW, when the inflowing water volume decreases in winter (Table 2.2-15).

Source: National Power System Expansion Plan Main Report 2011-2030 P.6-8

Table 2.2-15 Summary of Existing Hydro Plants

Type	Nominal Capacity (MW)	Capacity in Winter (MW)
WAPDA Hydro Plants	6,444	2,303
IPPs	111	111
Total Hydro Capacity	**6,555**	**2,414**

Source: NTDC, National Power System Expansion Plan Main Report 2011-2030

Table 2.2-16 Energy Data of Hydel Power Stations (2011-12)

ENERGY DATA OF HYDEL POWER STATIONS (2011-12)

Power Station	Installed Generation Capacity (MW)	Units Generated (GWh)	Overall Cost of Generation (Ps/KWh)	Auxiliary Consum. (GWh)	Maximum Load (MW)	Minimum Load (MW)	Load Factor (%)	Capacity Factor (%)	Utilization Factor (%)
A. WAPDA									
Tarbela	3,478.0	14,105.33		48.30	3,702.0		43.38	106.44	46.17
Ghazi Brotha	1,450.0	7,059.69		80.56	1,450.0		55.43	100.00	55.43
Mangla	1,000.0	4,799.25		133.40	1,120.0		48.78	112.00	54.64
Warsak	243.0	991.09		0.32	204.0		55.31	83.96	46.44
Chashma	184.0	1,074.79		7.95	184.0		66.50	100.00	66.50
Dargai	20.0	84.65		0.37	17.0		56.69	85.00	48.18
Rasul	22.0	68.05		2.93	16.0		48.42	72.73	35.22
Shadiwal	13.5	32.68		2.25	7.1		52.40	52.59	27.56
Chichoki Malian	13.2	34.48		0.90	8.0		49.06	60.61	29.74
Nandipur	13.8	42.03		0.91	9.2		52.00	66.67	34.67
Kurram Garhi	4.0	10.91		0.48	4.0		31.05	100.00	31.05
Renala	1.1	2.88		0.06	0.8		40.93	72.73	29.77
Chitral	1.0	3.50		0.02	1.0		39.79	100.00	39.79
KKHP	72.0	156.89		2.98	70.0		25.52	97.22	24.81
WAPDA Sub-total:	6,515.6	28,466.2		281.4	*				
B. AJKHEB*									
Kathai	3.2	7.03		n.a	n.a	n.a	n.a	n.a	25.01
Kundal Shahi	2.0	2.47		n.a	n.a	n.a	n.a	n.a	14.08
Jagran	30.4	32.01		n.a	n.a	n.a	n.a	n.a	11.99
Leepa	1.6	4.84		n.a	n.a	n.a	n.a	n.a	34.45
Kel	0.4	0.46		n.a	n.a	n.a	n.a	n.a	13.15
Sharian	3.2	3.90		n.a	n.a	n.a	n.a	n.a	13.86
AJKHEB Sub-total:	40.8	50.7							
Total:	**6,556.4**	**28,516.9**		**281.4**					

* AJKHEB Generation data is for 9 months (Jul-2011 to Feb-2012)
Original Source: WAPDA, AJKHEB: Azad Jammu & Kashmir Hydro Electric Board.
Source: Pakistan Energy Year Book 2012

Table 2.2-17 Summary of Existing Thermal Capacity

Type	Nominal Capacity (MW)	De-rated Capacity* (MW)
PEPCO total (excluding nuclear)	4,829	3,580
IPPs serving PEPCO	7,475	6,909
Rental units	113	113
Nuclear - PEPCO system	325	300
Total Thermal – PEPCO system	**12,742**	**10,902**
KESC Thermal	1,655	1,463
Nuclear – KESC System	136	122
IPP serving KESC	367	353
Total Thermal – KESC system	**2,158**	**1,938**
Total Thermal Capacity	**14,900**	**12,840**

**De-rated capacity = Gross dependable capacity*

Source: NTDC, National Power System Expansion Plan Main Report 2011-2030

New candidate hydropower plants are shown in the list of future generation projects of PEPCO published in 2011 (Table 2.2-18), in which hydropower generation plants to be installed by WAPDA and IPPs are included.

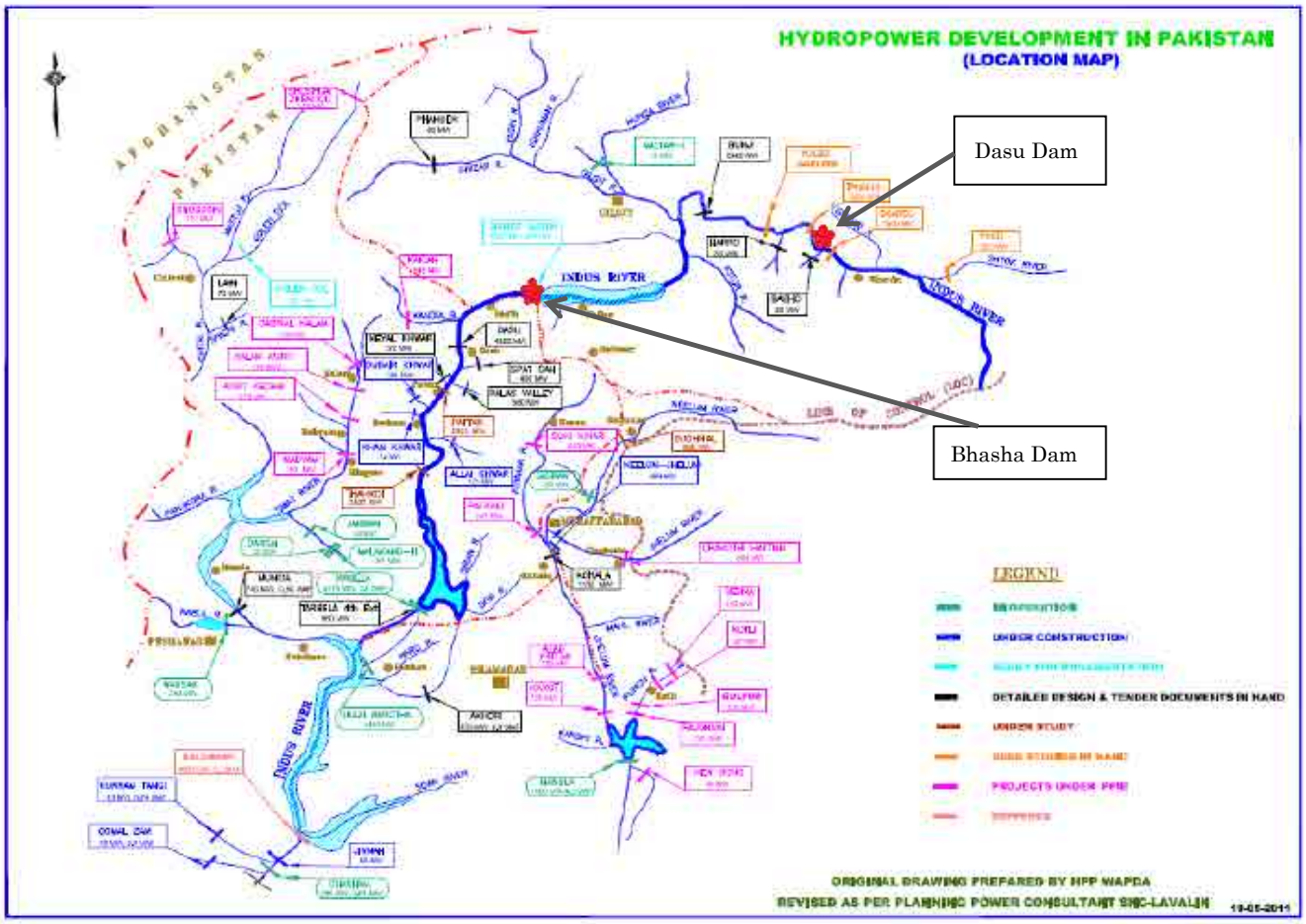
Table 2.2-18 Hydraulic Energy Plants Under Construction and with Finance Committed (IPP/Ministry of Power and Water alone)

Hydro - Public Sector	Installed Capacity	Commissioning Year
Mangla Dam Raising	644 GWh*	2010-11
Khan Khwar	72 MW	2010-11
Allai Khwar	121 MW	2010-11
Duber Khwar	130 MW	2010-11
Jinnah Barrage	96 MW	2010-11
Satpara Dam	15.8 MW	2010-11
Gomal Zam	17.4 MW	2011-12
Neelum Jhelum	969 MW	2015-16
Kurram Tangi	83 MW	2013-14
Total	**1,504 MW**	
Hydro - Private Sector	**Installed Capacity**	**Commissioning Year**
New Bong Escape	84 MW	2013-14

Note: * →The project only provides additional energy.
Original Source 1: Hydro Potential in Pakistan, WAPDA, November 2010
Original Source 2: Letter from General Manager (WPPO) dated February 23, 2011
Source: NTDC, National Power System Expansion Plan Main Report 2011-2030

There are 23 WAPDA hydro projects, totalling 37,057 MW, and 18 IPP hydro projects, totalling 5,519 MW(that have been identified and proposed on the future projects list provided by NTDC). There are additional two hydro projects, Kalabagh 2,776MW and Doyian 490 MW, that are not in the WAPDA list but the feasibility studies on the both projects have been completed in 1987 and 2004, respectively. The total capacity of the future hydro potential is 43,676 MW.

Source: National Power System Expansion Plan Main Report 2011-2030 P.6-11



Source: NTDC, National Power System Expansion Plan Main Report 2011-2030

Table 2.2-19 Location of Hydro Projects

Bhasha Dam can impound water up to 8.1 Million Cubic Meter. It is expected that this dam not only ensures supply of dietary, but provides inexpensive energy of 4,500MW, because it is used for agriculture, resulting in increasing agricultural crops. The Government and CCI already approved this project.

Table 2.2-20 Identified Future Hydro Projects

No.	Project Name	Status Category	Installed Capacity (MW)	Average Annual Energy (GWh)	Earliest Commissioning Date
WAPDA					
1	Diamer Basha	B	4,500	18,072	2022-23
2	Golen Gol	B	106	437	2017-18
3	Kurram Tangi	A	83	350	2013-14
4	Tarbela 4th Ext.	B	960	2,000	2017-18
5	Munda	C	740	2,272	2022-23
6	Keyal Khwar	C	122	426	2021-22
7	Phander	C	80	350	2020-21
8	Basho	C	26	131	2019-20
9	Harpo	C	33	187	2019-20
10	Lawi	C	70	303	2021-22
11	Dasu	B	4,320	23,189	2023-24
12	Bunji	B	7,100	24,129	2022-23
13	Akhori	C	600	2,156	2022-23
14	Lower Spat Gah	C	496	2,106	2023-24
15	Palas Valley	C	665	2,635	2022-23
16	Pattan	C	2,800	15,230	2024-25

Note1: Lead Time of Future Hydro Projects by Category

Status Category	Current Status	Lead Time
A	Under Construction	as per the schedule given
B	Ready for implementation	Construction period + 1~2 years
C	Detailed design & tender documents	Construction period + 4 years
D	Under study	Construction period + 6 years
E	Desk study	Construction period + 8 years

Note2: Although Diamer Basha is categorized in Status Category "B", F/S is now being conducted by USAID.
Note3: Bunji, categorized as Status Category "B", is under preparation for submission, as a result of extension of the consultant contract executed on March 31, 2013.
Source: NTDC, National Power System Expansion Plan Main Report 2011-2030

Table 2.2-21 Identified Future Hydro Projects (Cont'd)

No.	Project Name	Status Category	Installed Capacity (MW)	Average Annual Energy (GWh)	Earliest Commissioning Date
IPPs					
17	Thakot	D	2,800	14,095	2024-25
18	Dudhnial	D	800	5,425	2025-26
19	Yulbo	E	3,000	12,058	2026-27
20	Tungas	E	2,200	9,583	2026-27
21	Skardu	E	1,650	7,130	2026-27
22	Yugo	E	520	2,012	2026-27
23	Kalabagh	D	2,776	11,749	2023-24
24	Taunsa	C	120	665	2020-21
25	Doyian	D	490	2,419	2021-22
26	New Bong Escape	A	84	470	2013-14
27	Gul Pur	B	100	466	2015-16
28	Rajdhani	B*	132	664	2015-16
29	Kotli HPP	B*	97	479	2016-17
30	Patrind HPP	B*	147	675	2016-17
31	Sehra HPP	B*	130	513	2016-17
32	Karot HPP	B*	720	2,575	2017-18
33	Asrit-Kedam HPP	B*	215	911	2017-18
34	Madian HPP	B*	157	784	2017-18
35	Azad Pattan	B*	222	781	2018-19
36	Chakothi HPP	B*	500	2,459	2018-19
37	Kalam - Asrit HPP	B*	197	881	2018-19
38	Gabral Kalam HPP	B*	101	445	2018-19
39	Shogosin HPP	B*	127	583	2018-19
40	Shushgai Zhendoli HPP	B*	102	368	2018-19
41	Suki Kinari HPP	B*	840	2,958	2019-20
42	Kaigah HPP	B*	548	1,975	2019-20
43	Kohala HPP	C	1100	3,964	2021-22

Note 1: Lead Time of Future Hydro Projects by Category

Status Category	Current Status	Lead Time
A	Under Construction	as per the schedule given
B	Ready for implementation	Construction period + 1~2 years
C	Detailed design & tender documents	Construction period + 4 years
D	Under study	Construction period + 6 years
E	Desk study	Construction period + 8 years

Note 2: B*: Detailed information of the project status is not available. However, since the construction of the project has not started and the earliest commissioning date of the projects was postponed by 2 year based on the commissioning date on the PEPCO future project list considering the lead time for project preparation and construction.

Source: NTDC, National Power System Expansion Plan Main Report 2011-2030

Table 2.2-22 Thermal Energy Plants Under Construction and in Future (IPP/Ministry of Power and Water alone)

Thermal - Public Sector	Installed Capacity	Commissioning Year	Fuel Type
Nandipur Power Project	425 MW	2011-12	RFO
Chashma Nuclear	340 MW	2011-12	Nuclear
UAE GT, F/Abad	320 MW	2012-13	Gas
Guddu CC Sind	750 MW	2013-14	Gas
Total	**1,835 MW**		
Thermal - IPP/Rental	**Installed Capacity**	**Commissioning Year**	**Fuel Type**
Karkey Project Karachi (Rental)	232 MW	2010-11	RFO
Fauji Foundation	202 MW	2010-11	Gas
Hub Power Narowal	225 MW	2010-11	RFO
Halmore Power Bhikki	225 MW	2010-11	RFO
Reshma (Rental)	200 MW	2010-11	RFO
Santiana F/Abad (Rental)	201 MW	2010-11	RFO
Zorlu	50 MW	2011-12	Wind
Fauji Fertilizer	50 MW	2011-12	Wind
Total	**1,385 MW**		
KESC	**Installed Capacity**	**Commissioning Year**	**Fuel Type**
Bin Qasim CC	560 MW	2012-13	Gas
Retrofit Bin Qasim	420 MW*	2012-13	Coal
KESC Bio Waste to Energy	25 MW	2012-13	Bio Waste
Total Committed Additional Capacity	**585**		

Note: ＊→Two oil-fired existing steam turbine units are planned to be converted into coal-fired units. Therefore the net capacity addition is zero
Original Source 1: NTDC List of Future Generation Projects, GENCO (projects up to serial no. 30 are considered committed).
Original Source 2: NTDC List of Future Generation Projects for Rental projects
Letter from General Manager (WPPO) dated February 23, 2011 for IPPs
Status as of Feb 2011 of Projects being processed by PPIB, PPIB website
Original Source 3: Data provided by KESC.
Source: NTDC, National Power System Expansion Plan Main Report 2011-2030

New thermal generation includes Gas Turbines (GTs), Combined Cycle Gas Turbines (CCGTs) and steam turbines using FO (Fuel Oil) and coal.

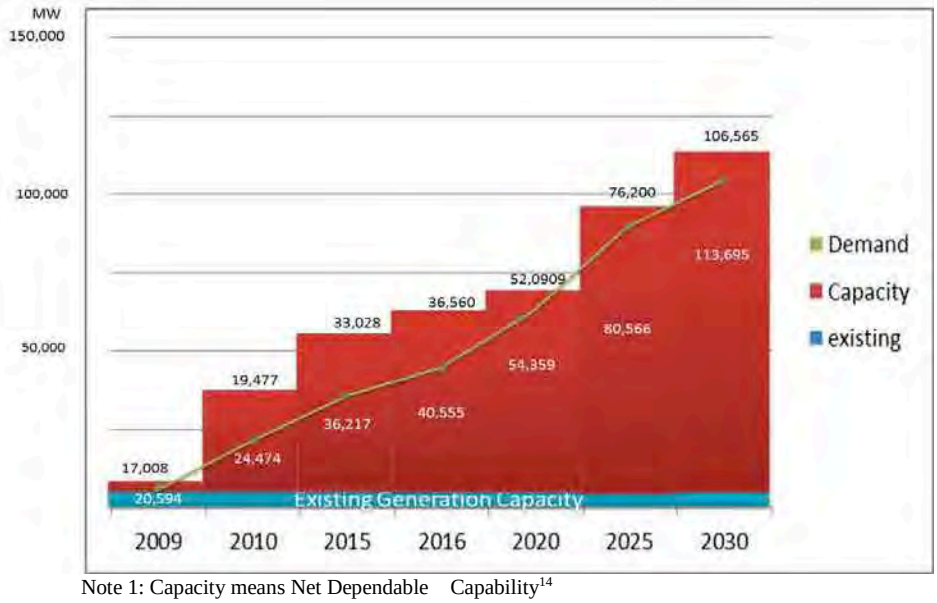
2.2.2.1 Generation Plan Developed in 2008

In 2007, NTDC performed demand forecasting up to 2030, in which Low Scenario (Peak Demand: average growth rate of 7.4%), Normal Scenario (Peak Demand: average growth rate of 8.1%), High Scenario (Peak Demand: average growth rate of 9.3%) were developed, considering consumption, economic growth rate and the number of customers in the past.

Table 2.2-23 Future Demand Forecast Made by NTDC

Description	2007	2010	2015	2020	2025	2030	G.R. (2007-30)
Sale (GWh)							
Low Scenario	83,463	112,311	176,178	261,042	370,882	500,117	8.1%
Normal Scenario	83,463	112,955	181,018	276,937	409,874	578,560	8.8%
High Scenario	92,647	113,355	185,239	295,706	470,527	735,592	9.9%
Generation (GWh)							
Low Scenario	111,078	143,910	212,724	307,328	436,911	589,460	7.5%
Normal Scenario	111,078	144,711	218,448	325,740	482,080	680,330	8.2%
High Scenario	111,078	145,233	223,618	348,182	554,680	868,434	9.4%
Peak Demand (MW)							
Low Scenario	18,883	24,339	35,271	51,296	73,041	98,557	7.4%
Normal Scenario	18,883	24,474	36,217	54,359	80,566	113,695	8.1%
High Scenario	18,883	24,562	37,075	58,120	92,762	145,304	9.3%

Source: JICA Survey Team using material from Electricity Demand Forecast Based On Regression Analysis (Period 2008 to 2030), February 2008 NTDC. OFFICE OF G.M. PLANNING POWERNTDC / PEPCO WAPDA HOUSE LAHORE



Note 1: Capacity means Net Dependable Capability[14]
Note 2: This table shows normal Scenario case

Source: JICA Survey Team using material from WAPDA Hydro Potential in Pakistan

Table 2.2-24 Long Term Demand Forecast and Required Generating Capacity

[14] It is most common to define Firm Capacity as available generation power output in a state, where it is assumed the largest unit in the grid is under suspension due to maintenance and repair (this state is called "Dependable Capacity"), followed by occurrence of suspension due to a failure of the second largest unit. If the peak demand is lower than the Firm Capacity, stable power can be supplied, and difference of which will provide reserved capacity. Net Dependable Capacity in Table 2.2-24 means transmittable Dependable Capacity ater subtracting power consumed in the generation plant.

2.2.2.2 Generation Plan Developed in 2010

Table 2.2-25, developed as the future energy demand forecast in Pakistan revised in 2010, shows that forecasting data for Sales (GWh), Generation (GWh), Peak Demand (MW) in 2010, 2020 and 2035 respectively provides Base Case, Base Case with DSM, Low Case and High Case. What is evident from Peak Demand (Base Case) in Table 2.2-25 is that generation power in 2020 and 2030 requires more than 2 times and six times of the generation power in 2010, respectively.

Table 2.2-25 Summary of Forecasts for Selected Years for Country (developed in 2010)

	2010	2020	2035	Growth Rate (2010 – 2035)
Sales (GWh)				
Base Case	106,569	254,105	737,860	8.1 %
Base Case with DSM	106,569	254,105	737,860	8.1 %
Low Case	106,569	217,348	551,314	6.8 %
High Case	106,569	280,299	916,155	9.0 %
Generation (GWh)				
Base Case	139,954	306,797	889,583	7.7%
Base Case with DSM	139,954	306,797	889,583	77%
Low Case	139,954	262,518	665,210	6.4 %
High Case	139,954	338,663	1,106,567	8.6 %
Peak Demand MW				
Base Case	22,251	49,824	149,665	7.9%
Base Case with DSM	22,251	49,146	144,779	7.8%
Low Case	22,251	42,612	111,906	6.7%
High Case	22,251	54,998	186,228	8.9%

Source：NTDC, National Power System Expansion Plan Main Report 2011-2030

A list of Generation Projects is developed as Table 2.2-26 in tandem with Supply Plan in Table 2.2-23 and Table 2.2-25. This table lists generation plants developed on the basis of Base Case.

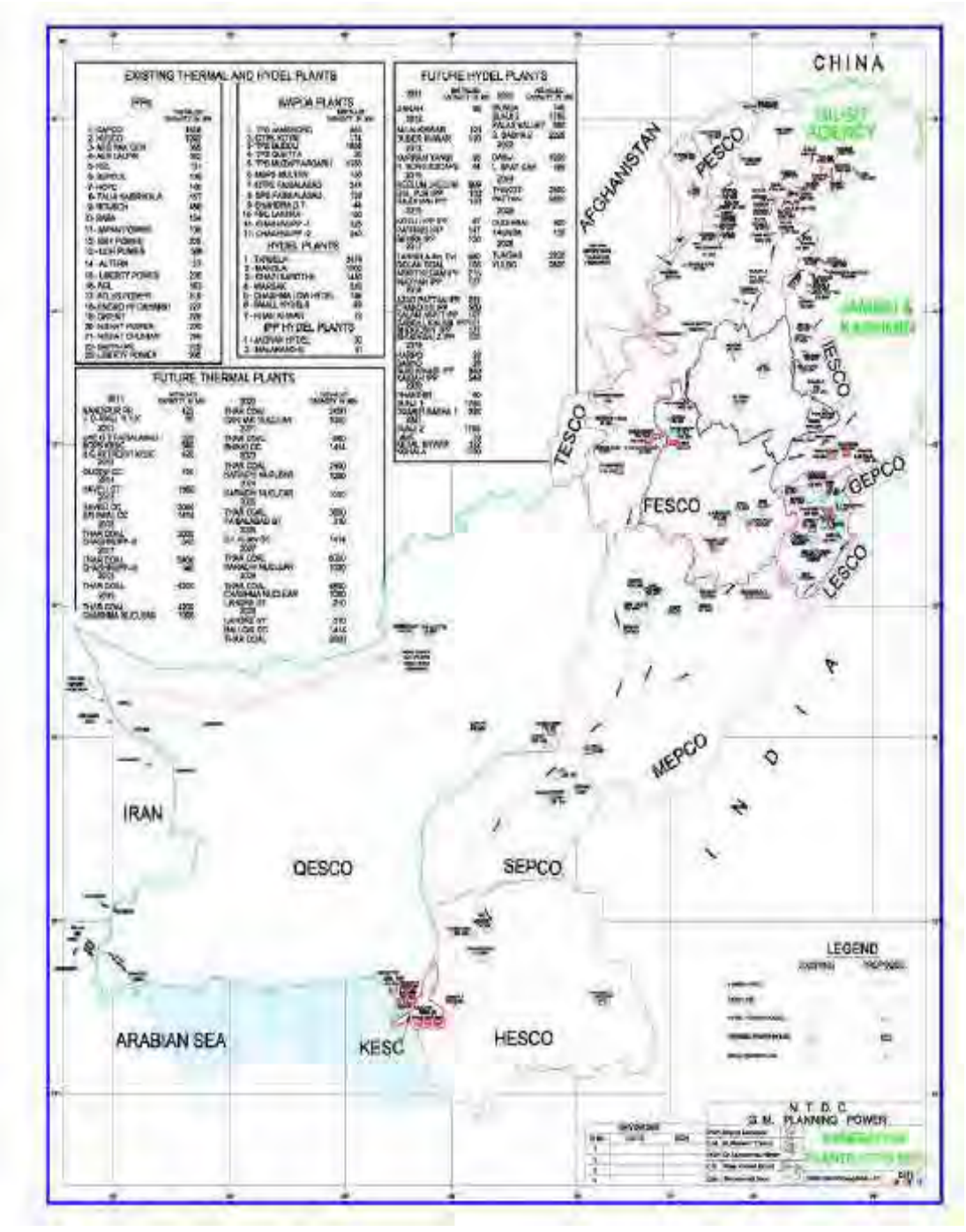
Table 2.2-26 List of Generation Project

Plan		Generation Plan 1		Generation Plan 2	
Organization to formulate plans		NTDC,National Power System、Expansion Plan Main Report 2011-2030, Table 6-19		NTDC,National Power System、Expansion Plan Main Report 2011-2030, Table 6-19	
Installed Capacity		**48, 000MW**		**97,000 MW**	
Commission Year		**(forecast by 2020)**		**(forecast by 2030)**	
Plants Included	CHASHNUPP-III. (Nuclear)	1 x 320 MW	～2017		
	Kotli HPP,IPP	1x96 MW	～2017		
	Patrind HPP,IPP	1x146MW	～2017		
	Sehra HPP,IPP	1x129MW	～2017		
	Iran-Pakistan and CASA	2x1000 MW	～2017		
	CHASHNUPP-IV（Nuclear）	1 x 320 MW	～2018		
	Tarbela 4th Hydro	2 x 475 MW	～2018		
	Golen Gol Hydro	3x35MW	～2018		
	Karot Hydro,IPP	1x 713 MW	～2018		
	Asrit-Kedam Hydro, IPP	1x 213 MW	～2018		
	Madian Hydro, IPP	1x 155 MW	～2018		
	Azad Pattan Hydro,IPP	1 × 220 MW	～2019		
	Chakothi Hydro, IPP	1 × 495 MW	～2019		
	Kalam-Asrit Hydro, IPP	1 × 195 MW	～2019		
	Gabral Kalam HPP,IPP	1 × 100 MW	～2019		
	Shogosin HPP,IPP	1 × 126 MW	～2019		
	Shushgai Zhendoli HPP,IPP	1 × 101 MW	～2019		
	Chashma (Nuclear)	1 × 940 MW	～2020	1 × 940 MW	～2029
	Harpo Hydro	1x33 MW	～2020		
	Basho Hydro	1x28 MW	～2020		
	Suki Kinari Hydro, IPP	4 × 208 MW	～2020		
	Kaigan Hydro, IPP	1 × 543 MW	～2020		
	Qadiradad (Nuclear)			1 × 940 MW	～2021
	Phander Hydro			4x20 MW	～2021
	Bhikki Thermal(CC)			2×689 MW	～2022
	Thar Thermal(Coal)	23×567 MW	～2016-2020	50×567 MW	～2021-2030
	Lawi Hydro			3 x 23 MW	～2022
	Keyal Khwar Hydro			2x61MW	～2022
	Kohala Hydro			4 x 272 MW	～2022
	Munda Hydro			1 × 733 MW	～2023
	Bunji Hydro(1～3)			21 x 355 MW	～2021-2023
	Palas Valley Hydro			3 × 191 MW	～2023
	Daimer Bhasha, Hydro (1,2)			12 × 371 MW	～2021-2023
	Candidate wind	8 x 50 MW	～2017-2020	64 x 50 MW	～2021-2030
	Dasu Hydro			8 × 535 MW	～2024
	Karachi (Nuclear)(1,2,3)			3 × 940 MW	～2024-2028
	Lower Spot Gah Hydro			3 × 164 MW	～2024
	Thakot Hydro			8 × 347 MW	～2025
	Pattan Hydro			8 × 347 MW	～2025
	Faisalabad Thermal(GT)			2 × 153 MW	～2026
	Dubhnial Hydro			1 x 792 MW	～2026
	Taunsa Hydro			1 x 119 MW	～2026
	D.I. Khan Thermal(CC)			2 × 689 MW	～2027
	Tungas Hydro			10 × 198 MW	～2027
	Yulbo Hydro			10 × 238 MW	～2027
	Lahore Thermal(GT)			4 × 153 MW	～2029-2030
	Balloki Thermal(CC)			2 × 689 MW	～2030

Note：Installed Capacity is derived from 26,083MW as of 2011 as a base data included in NTDC, Electrical Marketing Data (30-6-2011)
Source：JICA Survey Team using material from NTDC, National Power System Expansion Plan Main Report 2011-2030 P.6-50

In the generation plan up to 2030 developed by NTDC, Generation Plan 1 put together generation plan for 10 years from 2010 to 2020, and Generation Plan 2 for 10 years from 2020 to 2030.

Table 2.2-27 shows locations of generation plants that NTDC plans to construct by 2030, based on Base Case (Refer to Reference 12 for the list and details of Map).



Source: NTDC, National Power System Expansion Plan Main Report 2011-2030

Table 2.2-27 Base Case Generation Additions

Considering the current situation, increase of generation capacity is an urgent issue, because frequent power outages occur due to lack of energy sources. For this purpose, it is an important challenge to ensure energy sources by means of new thermal power plants, by which increased generation capacity can be expected by 2030, while promoting to develop large-capacity hydropower.

2.2.2.3 Issues in Energy Development Plans

An enhancement plan for generation power in the Plan 2010 includes the following projects.

- Develop large-capacity hydropower plants (Tarbela, Dasu, Bhasha, Ghazi Barotha)
- Develop Thar coal-fired power plant
- Expand Chasma nuclear power plant
- Import a total of 2,000MW from Iran and other countries

However, there are following issues for construction of coal-based thermal power plants:

- It is necessary to establish technology for operation and maintenance, because of almost no track record on coal-fired thermal power
- It is necessary to put infrastructure in place, ranging from coal mining to power generation

Generation Plan 2 (for 2021 – 2030) of the Generation Plan up to 2030 developed by NTDC plans to enhance coal-fired thermal power plants to be constructed in accordance with the Generation Plan 1 (for 2011 – 2020). As a result, Thar coal-fired thermal power plant will account for approx. 40 % of power to be generated by 2030.

Although thermal power relies on imported fuel at present, it is important to develop domestic resources.

"ENERGY SECTOR CRISIS" ISSUES & REFORMS WAY FORWARD SHAHID SATTAR Member (Energy) PLANNING COMMISSION May 23rd, (2013) issued by Planning Comission of the Ministry of Planning and Reform reveals that the supply plan by nuclear power, hydropower and coal-fired thermal power is developed, and a total energy by means of this three energy sources will be increased from the current 33.7% to 81.2% in 2030 (Refer to Table 2.2-28).

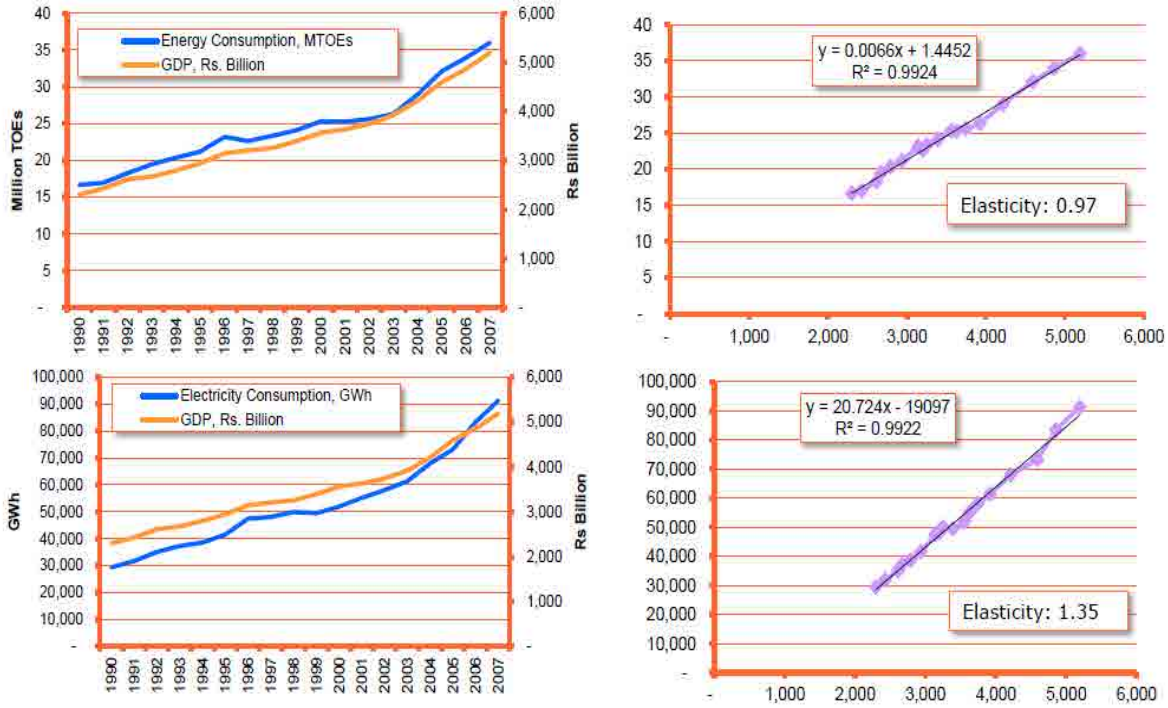
In addition, domestic gas production and usage will be increased to not lower than 10,000 MMCFD (Millions of Cubic Feet per day) within five years. For this reason, multi-national enterprises will be attracted to exploit Shale gas and Tight gas.

Table 2.2-28 Supply Plan by Energy Source

	(MW)		
	Nuclear	Hydel	Coal
Existing	462 (2.2%)	6,481 (31.3%)	35 (0.2%)
Planned addition (by 2016)	340	1,979	3,605
Cumulative capacity	802 (2.5%)	8,460 (26.6%)	3,640 (11.5%)
Envisaged additions (by 2030)	7,680	41,036	19,400
Cumulative capacity	8,482 (8.5%)	49,496 (49.6%)	23,040 (23.1%)

Source：ENERGY SECTOR CRISIS ISSUES & REFORMS WAY FORWARD SHAHID SATTAR Member(Energy) PLANNING COMMISSION May 23rd, 2013

Table 2.29 shows that the value of elasticity of 0.97 against GDP and the correlation factor of 1.35 with energy consumption are assumed for final energy consumption.



Original Source: Pakistan Energy Yearbook and Pakistan Economic Survey
Source: ENERGY SECTOR CRISIS ISSUES & REFORMS WAY FORWARD SHAHID SATTAR Member(Energy) PLANNING COMMISSION May 23rd, 2013

Table 2.2-29 Final Energy Consumption: Forecast using Electricity Consumption and GDP

2.2.3 Gadani Project

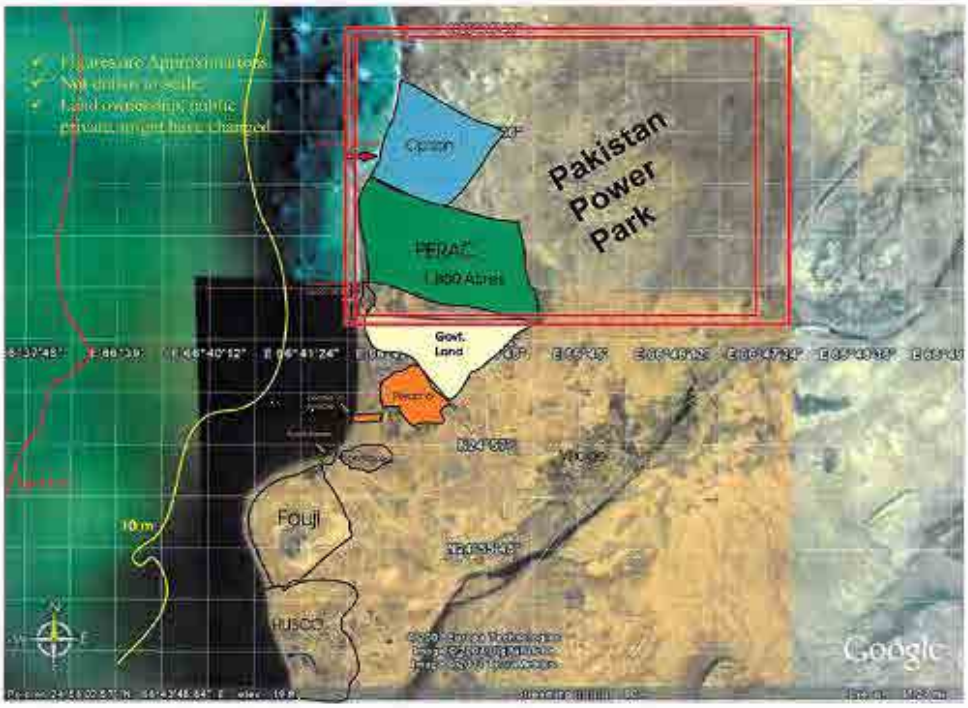
2.2.3.1 Outline of Gadani Project

The Gadani Project will construct jetty of 7km long in a land of 5,000 acres provided by the Bolochistan Government (the construction cost is equivalent to 800 Million USD). It is planned to carry in imported coal of 20 million tons at the jetty, and generate 6,600MW energy.

The reason for not using coal produced in Pakistan is that it was considered that construction of jetty near the port would reduce transportation cost.

The development cost of the project will amount to 14Billion USD, with the project commencement day in March, 2014, COD (Commercial Operation Day) in 2017 using the BOOT（Build-Operate-Own-Transfer）method and a contract period of 25 to 30 years. Pakistan Power Park Management Company, a SPV, will be founded with contribution of 1 Billion Rs. by the SPV, another 1 Billion Rs. by the GoP.

The equity part will consist of a land of 3,000 acres invested in kind by the Bolochistan Government and a land of 2,000 acres invested in a similar manner by the private sector. The shortfall is provided by finance loan.



Source: Private Power Infrastructure Board (PPIB)

Table 2.2-30 Overview of Gadani Project

Source: Private Power Infrastructure Board(PPIB)

Table 2.2-31 Gadani Project Site

Source: Private Power Infrastructure Board (PPIB)

Table 2.2-32 Plan for Gadani Coal Project

The Punjab Government will directly get involved in the project, and transmit generated power to the Punjab Province. Three parties, KESC, the Punjab Government and the Federal Government (PPIB) are discussing the project. Secretary of MOWP and the Project Company signed the MOU. China (China Power Investment Company) singed the MOU for the 1st and 2nd 660MW units.

Source：http://tribune.com.pk/story/597257/mous-signed-qatar-to-invest-in-pakistan-power-sector/(Referred in September 18th, 2013)

Source: Private Power Infrastructure Board (PPIB)

Table 2.2-33 Evacuation Plan from Gadani

2.2.3.2 Issues of Gadani Project

The coal-fired thermal generation plant that uses 100% imported coal and approved by the President has the following three issues:

1) Investigation on the Ocean Graphic has not been conducted.

It is nowhere in sight how much impact of monsoon for four months and sandstorm are given, because the jetty is 7km long. The jetty cannot be used, because monsoon causes heavy waves for 8 to 12 weeks a year.

2) Regulation imposed by the World Bank and ADB cannot be cleared due to environmental regulation.

At issue are NO_X, SO_X and CO_2. Site setting at a proposed location will cause further environmental issues, because HUBCO and chemical fertilizer refinery plants are located in the neighborhood of the site. Furthermore, for handling cold ashes produced at coal-fired generation plants, it would be necessary to consider their utilization at cement plants as one of the comprehensive processing modes of them.

3) Availability of coal

Gadani (6600MW) alone requires coal of 30 million tons per year.

2.2.4 Thar Coalfield Project

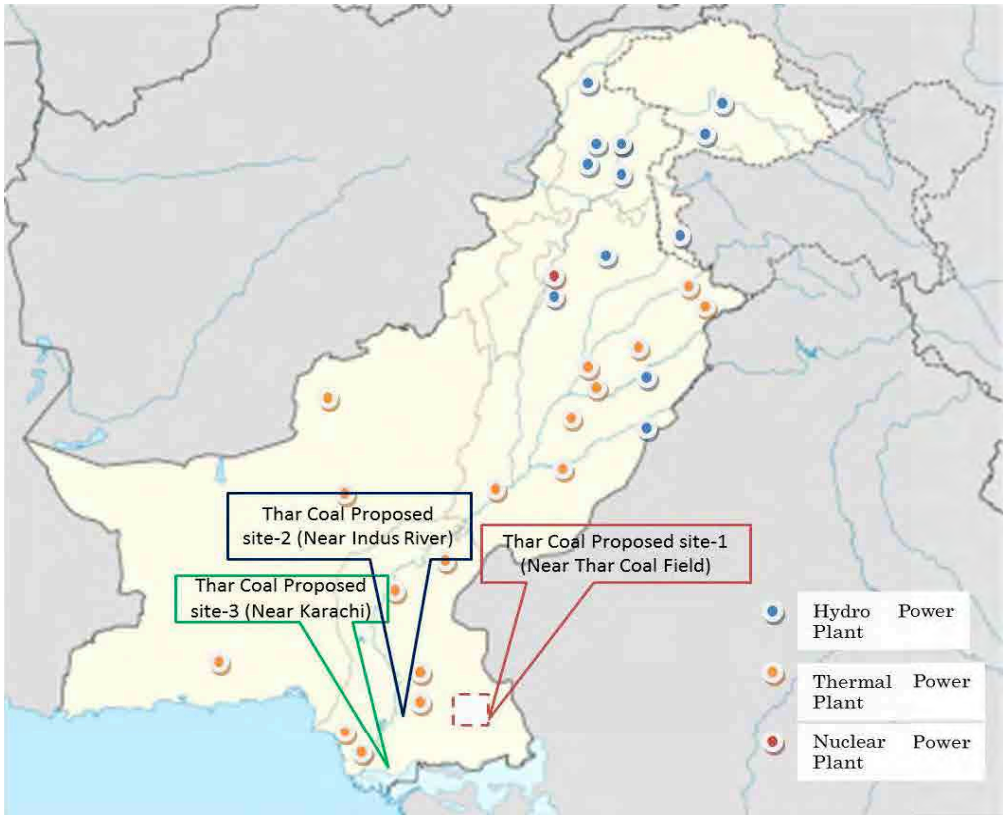
In the wake of the current energy shortage and steep rise of fuel price, the GoP has been studying construction of a generation plant with 1200MW capacity.

JICA is conducting a survey in preparation for Thar Coal-fired Generation Plant Project.

As a planned construction site for the Generation Plant, the following three candidate sites are under consideration.

- In the vicinity of Thar Reservoir for mine-mouth generation
- Along the Indus River
- In the vicinity of seashore

If a project site is located along the coastal area, it is possible to perform mixed combustion with imported coal, because it is easy to get water and imported coal required for power generation.



Source: Map from NTDC Electricity Marketing Data 2011

Table 2.2-34 Thar Coalfield Project

The Thar Coal field, located about 380km East of Karachi is spead over 9,100 sq. km with dimensions of 140km (North-South) and 65km (East-West). The explored area has been divided into six blocs. However, what has investigated to date is limited to 488

sq.km, where a grid distance between the boreholes is 1.8km. Two more blocks, i.e. Ⅶ and Ⅷ, are under exploration. Thar Coal & Energy Board (TCEB), with the Chief Minister of the Sindh Province as its Chairman and Federal Minister for Warter & Power as Vice Chairman, was established in July, 2008 as a "one-window"organization to expedite the development of coal for power generation.

Source：Energy Pakistan Challenges and Opportunities P.21

2.2.5 Import of Power

As of 2013, NTDC imports only a modest amount of power from Iran.

Furthermore, power interchange between NTDC and KESC is also classified as export/import.

Table 2.2-35 Electricity Import and Export by NTDC(GWh)

Country/Agency	2007-08	2008-09	2009-10	2010-11	2011-12
Electricity Import					
Iran	199	227	249	269	296
KESC	65	33	20	26	32
Total Electricity Imported	264	260	269	295	328
Electricity Export					
KESC	4,072	4,982	5,187	5,449	5,684
Any other Country/Region	0	0	0	10	43
Total Electricity Exported	4,072	4,982	5,187	5,459	5,727

Source1: NTDC
Source2: NEPRA "State of Industry Report 2012"

CASA (Central Asia South Asia)-1,000 is designed to transmit 1,300MW of surplus electricity from Tajikistan and Kyrgyz Republic through Afghanistan, which is going to consume 300MW, to Pakistan. The memorandum of understanding among the four governments was signed on November 16, 2007 in Kabul.

Source:http://tribune.com.pk/story/559377/project-financing-adb-to-pull-out-of-casa-1000mw-import-project/
(Referred in September 17th, 2013)

The total investment amount is estimated 1.0 Billion USD.

The following two means are considered as import of power to Pakistan from neighbouring countries:

- The import of 1,000 MW from Zahedan, Iran to Quetta, Pakistan via a ± 500 kV HVDC bipole (Draft feasibility study report was issued in August, 2010); and
- The import of 1,000 MW from Sangtuda, Tajikistan via Kabul, Afghanistan to Pechawar by means of ±500kV HVDC 3-terminal bipole.

Source: NTDC, National Power System Expansion Plan Main Report 2011-2030 P.6-40

2.2.6 Renewable Energy

Pakistan has a large potential for renewable energy. According to the USAID finaced NREL maps of Pakistan on Solar and Wind Energy, Pakistan's wind potential is approximately 340,000MW, and the solar potential is 1.2 Million MW. Similary, a large potential exists in the areas of geothermal, waste-to-energy (WTE) and wave energy. Pakistan started late but is making a rapid progress as the present Government attaches the highest priority to this sector.

Source：Energy Pakistan Challenges and Opportunities P.21

2.2.6.1 Small Hydropower

Small hydropower in Azad Kashmir (AJK), the Khyber-Pakhtunkhwa (KPK) Province and Gilgit has a potential to be successful. High potential is expected in the north including the Punjab Province and KPK due to an abundant source of water. It may be difficult, however, to tap resources in mountainous terrain of these Provinces, because it is necessary to build a long transmission line to be connected to the grid for small hydropower with a capacity of 10-20 MW. It is necessary to reduce a 7-10 year period from LOI to COD to 5 years.

Small hydropower plants with a capacity of 5 to 35MW are provided by in Malakand, Jabban and Chichoki Mallian and with a capacity of 1.5MW in Nalla.

Small hydropower plants with a capacity of 100 to 185MW are found in Chashma, Jinnah, Allai Khwa, Duber Khwar, Khan Khwar and Golen Gol. Lots of sites for small hydropower are found in Gilgit-Baltistan. Four to five small hydropower plants and training facilities are found in Malakand in KPK. Development of a small hydropower plant with a capacity of 5MW or above will require authorization of each administrative district (Province). While each administrative district (Province) has individual projects, no consolidated project has been developed to date.

Development procedures of small hydropower

1) A developer files application to the Provincial government for approval, showing capability of the applicant developer, including Technical Specifications, Source equipment, Firm record, Economic analysis.
2) A developer exchanges Letter of Intent and LoS (Letter of Support) with the provincial government.
3) A developer executes PPA with DISCOs (excluding Tariff only)
4) NEPRA evaluates Tariff (holding public hearing)
   NEPRA will evaluate whether an applicant developer has a firm capital formation,

ensures collection of billed amount and sets Tariff affordable for resident beneficiary in terms of payment.

While training for small hydropower is conducted using the facilities for training installed in Hydro Training Institute at WAPDA in Mangla, capacity building will be required because such facilities were introduced in 1960's.

2.2.6.2 Hydropower

Pakistan has a large hydro potential (50,000 MW), of which only 15% has been tapped so far. The Government's plan is to increase the share of hydropower in the power generation mix from the currenct 35% to 70% by 2030.

Source：Energy Pakistan Challenges and Opportunities P.21

Finance Minister Ishaq Dar announced the government would start work on the pending Dasu and Diamer Bhasha Dams simultaneously at the end of August, 2013. Summary of Dasu Dam and Bhasha Dam are described in Section 2.2.6.2.1 and 2.2.6.2.2.

Source: http://tribune.com.pk/story/595525/public-sector-development-programme-work-on-bhasha-dasu-dams -to-start simultaneously/(Referred in December 25th, 2013)

2.2.6.2.1 Dasu Dam

Dasu hydropower project is located at 7 km upstream of Dasu village on the Indus River, Kohistan of Khyber Pakhtunkhwa, approximately 350km north of Islamabad.

The summary of this project is shown in the table below.

Table 2.2-36 Overview of Dasu Hydraulic Generation Project

Salient Features		Explanation
Installed Capacity MW		4,320
Average Annual Energy (GWh)		21,484
Dam	Type	RCC (Roller Compacted Concrete)
	Height (m)	242
Construction Period (Years)		18 (in four phases)
No. & Type of Turbine		12 Units (Vertical Francis)
Project Base Cost		US$ 4906.5 Million
Background		The Feasibility study of the Project was completed on 28th February, 2009 by a Joint Venture of M/s NESPAK (Lead Firm), ACE and COLENCO in association with Binnie & Partners.

Source: http://wapda.gov.pk/vision2025/htmls_vision2025/dhp.html(Referred in December 16th, 2013)
http://www.brecorder.com/top-stories/0:/1180426:world-bank-agrees-to-provide-financing-for-dasu-dam-hafeez/?date=2012-04-21 (Referred in December 16th, 2013)

2.2.6.2.2 Bhasha Dam

Diamer-Bhasha Hydropower Project is located on the Indus River, about 315 km upstream of Tarbela Dam, Bhasha Diamer District of the Gilgit-Baltistan (GB).

The Government of Pakistan announced in August, 2013 that the World Bank and USAID decided to provide loans for the Bhasha Dam Project.

There is a possibility that a new compensation issue may arise, because the location of the dam lake has not been fixed yet whether at GB (Gilgit–Baltistan) or KPK due to the fact that the dame site is situated on the border between GB and KPK. Although the Government of Pakistan (GoP) has already paid part of the cost of the land to GB, GB requires that GoP should make the remaining payment at the current land price.

Source : http://tribune.com.pk/story/668194/diamer-bhasha-construction-giving-a-dam-comes-at-a-price-for-g-b-locals/(Referred in December 25th, 2013)

The summary of this project is shown in table 2.2-37 below.

Table 2.2-37 Overview of Bhasha Hydraulic Generation Project

Salient Features		Explanation
Installed Capacity MW		4,500
Mean Annual Energy (GWh)		19,208
Dam	Type	RCC (Roller Compacted Concrete)
	Height (m)	272
Construction Period (Years)	Open ceremony	October 18, 2013
	Operation start	2020(Plan)
No. of Turbines		12 Units (375MW/Unit)
Project Base Cost		US$ 14 Billion(2013)
Background		WAPDA make feasibility study (FS) in 2002-04 and carried out an in detail technical design in 2005-08. In addition, WAPDA carried out a field work in the same period, and 25 million US dollars was paid to GB as part of the cost of land in 2010-11.

Source: http://www.thenews.com.pk/Todays-News-3-96493-US-ADB-agree-to-finance-Diamer-Bhasha-Dam (Referred in December 16th, 2013)
http://www.dawn.com/news/1037281/wb-has-agreed-to-finance-diamer-bhasha-dam-dar(Referred in December 16th, 2013)

2.2.6.3 Geothermal Energy

Twenty potential sites identified by the geological investigation in the area of Tarbela Project showed that the Project has possibilities of geothermal generation. Preliminary investigation on geothermal power was performed at the site, focusing on 2 to 3 locations.

2.2.6.4 Biogas

AEDB approved in 2013 that Pakistan Sugar Mills Association (PSMA) builds biogas generation power plants with a total capacity of 3,000MW, using biogas ejected from sugar mills.

2.2.6.5 Biomass

As biomass is usually generated as by-product of industrial activities, its cost is subject to influence of the overall economic activity condition. Generally, a total cost of biomass generation plant amounts to 10 to 15 cents/kWh, which is higher than the cost of other energy supply in Pakistan.

2.2.6.6 Wind Energy

It is said that Pakistan has a potentiality of wind-power generation amounting to 300,000MW throughout the country.

In the Punjab Province, the cost of sales for wind power with a capacity of 500MW is estimated 7 cents/kWh, whereas the upfront tariff is set at 13-14 cents/kWh as of 2013. Subsidy, a total of 145.0 Billion Rs. in five years, will be granted to the wind-power generation.

2.2.6.7 Solar Light Energy

There is a possibility of small-capacity off-grid power, using solar light energy.

"The Project for Introduction of Clean Energy by Solar Electricity Generation System" (2009) was conducted by means of a grant aid scheme.

2.2.7 Nuclear Energy

Pakistan's first nuclear plant, based on Canadian technology, started operation in 1966. The second nuclear plant, Chashma-1, which has been in operation since 2000, and the third nuclear plant, Chasnupp-2, which has been in operation since 2010, were construced in cooperation with China. Another ucler plant is under construction. Pakistan has a strong and effective nuclear regulator, or Pakistan Nuclear Regulatory Authority (PNRA) .

Source：Energy Pakistan Challenges and Opportunities P.21

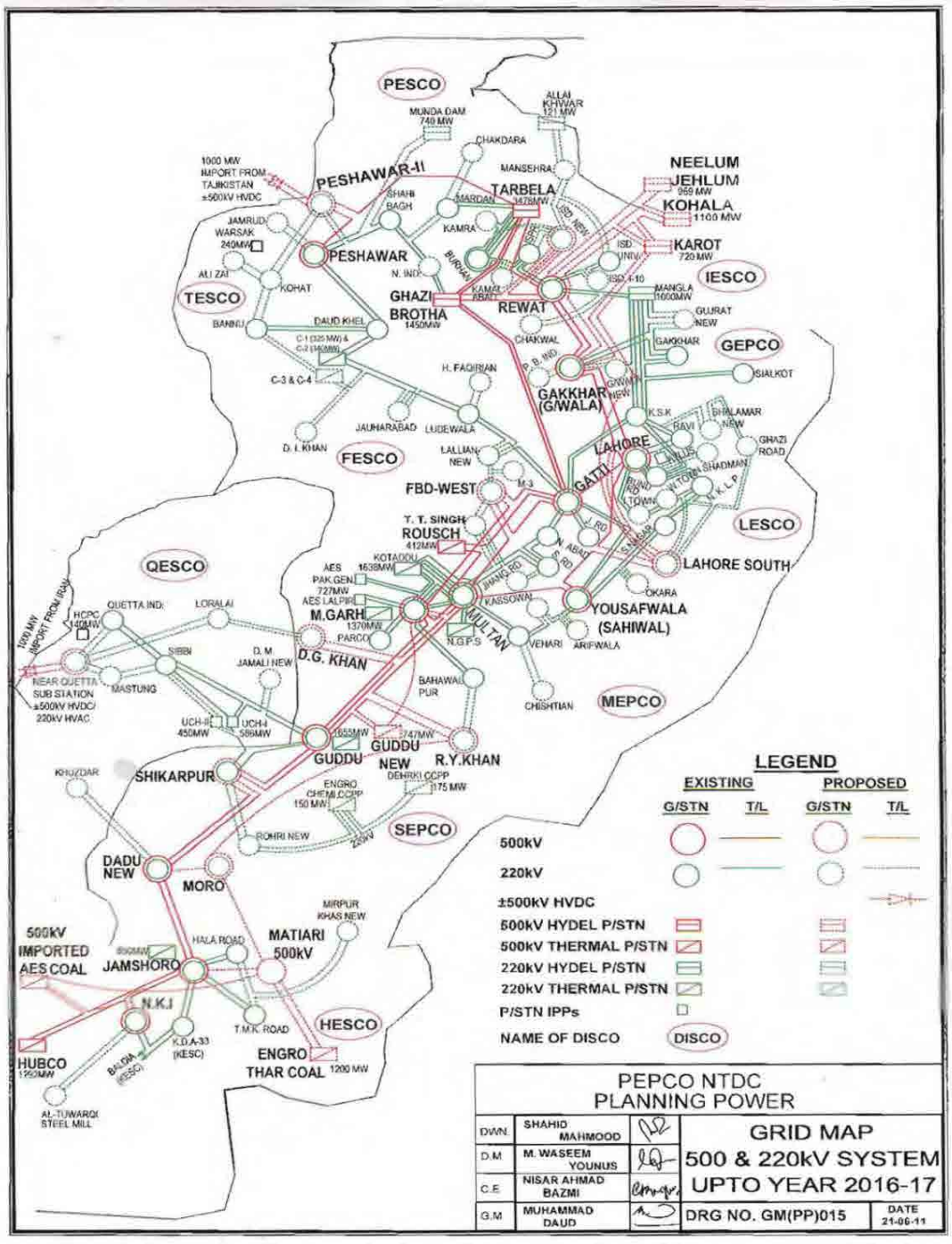
2.3 Present Situation of and Development Plans for Transmission Lines

2.3.1 Outline of Transmission and Transformation Grid

Transmission and distribution grid in Pakistan are operated at 500kV, 220kV, 132kV and 66kV, of which 500kV and 220kV transmission and distribution are under the control of NTDC, and the rest under the control of DISCOs.

Geographically, Pakistan is a long country from north to south, resulting in 500kV transmission grid or the base trunk lines in an oblong form from north to south in a similar manner. The 500kV transmission lines are laid from Peshawar in the north via the Punjab and Sindh Provinces in the middle to HUBO (in the vicinity of Karachi) in the south, of which a total transmission length is extremely long, or as long as 5,077km.

In addition, large energy consumption areas in the north (including Islamabad and Lahore) and in the south (Karachi) are interconnected by transmission lines of two routes.



Source: National Transmission & Dispatch Company (NTDC) Limited

Table 2.3-1 Existing/Committed/Planned 500/220kV System

2.3.2 Outline of Five-Year Expansion Plan for Transmission and Transformation Facilities

The investment plans as shown in Table 2.3-2 is now on going in Pakistan as a five-year plan to resolve energy shortage.

Table 2.3-2 Investment Plan for Generation Until 2016-17

Power Plants	Type	Installed Capacity, MW	Commissioning Year
Guddu New	CC	747	2013-14
Haveli Bahadur Shah	CC	3000	2015-16
Sahiwal	CC	1450	2015-16
Neelum-Jehlum	Hydro	969	2015-16
Thar/Imported Coal	Coal	3000	2016-17
CHASHNUPP-III & IV	Nuclear	680	2016-18
Import from Iran and CASA	Import	2000	2016-17
Wind Power (Gharo/Jhimpir)	Wind	1400	2012-17

Source: NTDC, National Power System Expansion Plan Main Report 2011-2030

Table 2.3-3 shows 500kV and 220kV transmission facilities, quantity of transmission facilities and expanded quantity of these facilities under the medium and longer term expansion plan as of 2011.

200kV transmission lines are concentrated on the middle of the Punjab Province where energy demand is higher, and partly extended to thermal generation areas in the south and border areas in the west.

Table 2.3-3 Status of Transmission and Transformation Plants Existing and Under Planning

I Existing Transmission Data

Sr.No.	Province	Lenght of T/L (Circuits km)			Capacity of Sub station(kVA)			
		500kV	220kV	Total	No.	500kV	No.	230kV
1	Punjab	3,660	5,054	8,714	7	10,050	18	12,014
2	Sind	1,216	855	2,071	4	3,900	4	1,920
3	K.P.K	175	750	925	1	900	3	1,760
4	Baluchistan	27	768	795	0	0	2	800
	Total①	5,078	7,427	12,505	12	14,850	27	16,494
II Existing & Future Transmission Data		Lenght of T/L (Circuits km)			Capacity of Sub station(kVA)			
		500kV	220kV	Total	No.	500kV	No.	230kV
Ongoing Projects (Total)②		1,150	1,258	2,408	14	6,900	40	8,870
Project Ready for Implementation(Total)③		1,090	246	1,336	0	0	8	2,500
All Total (①+②+③)		7,318	8,931	16,249	26	21,750	75	27,864

Note 1：Total①→PEPCO NTDC Electricity Marketing Data (Updated UP to 30th June 2011)
Note 2：Total②→NTDC Monthly Progress Report on NTDC Development Projects for March
Source：JICA Survey Team using material from PEPCO NTDC Electricity Marketing Data (Updated UP to 30th June 2011)
Source：JICA Survey Team using material from NTDC Monthly Progress Report on NTDC Development Projects for March 2013

In line with the expansion plan of generation capacity, expansion of transmission and transformation facilities are planned as a 10-year plan as from 2011. Considering energy demand forecast of DISCOs controlling distribution grid at below 132kV, the plan is also made in terms of longer forecast up to 2030.

The plan developed by NTDC in 2011 includes the first phase (2012-2014), the second phase-I (2014-2016) and the second phase-II (2014-2016).

(1) First phase

The current on-going projects (Table 2.3-4) includes, as of August, 2013, three competed projects, sixteen projects to be completed within 2013 and nine projects to be completed within 2014, out of twenty-eight projects.

(2) Second phase-I

The projects under preparation for implementation (Table 2.3-5) will be completed in 2015-16.

(3) Second phase-II

Cross Border Interconnection Projects (Table 2.3-6) shows that transmission lines from Iran and transformer station will be completed in 2014. DC converters will be completed in 2015-16.

Table 2.3-4 Current On-Going Projects of NTDC

Sr.No.	Name of the Project	T/L length (km)		Sub station		Expected Commissoning
		500 kV	220 kV	500 kV	220 kV	
1	Extension at 500kV Seikh Muhammadi			1x450MVA T/F	1x160MVA T/F	Commissioned in June 2012
2	Extension at 500kV Dadu			1x450MVA T/F	1x160MVA T/F	Commissioned in June/December 2012
3	In/out of 220kV Ghazi Barotha-Shahi Bagh at Mardan		30			Commissioned in Dec. 2012
4	220kV GIS Bandala		10		2x160 MVA T/F	June,2013
5	220kV Rohri		175		2x250 MVA T/Fs	June,2013
6	220 kV Khuzdar & 220kv Dadu-khuzgar D/C T/L		274		2x160 MVA T/Fs	Sept..2013
7	220kV Kassowal		90		2x160 MVA T/Fs	Dec.2013
8	220kV GIS Shalamar		15		2x160 MVA T/Fs	Sept..2013
9	220 kV Okara		10		3x250 MVA T/Fs	June,2013
10	220kV T. T Singh		2		3x250 MVA T/Fs	June,2013
11	220kV Loralai		200		2x250 MVA T/Fs	June,2013
12	500kV Rahim Yar Khan		60	2x,600MVA T/Fs	2x250MVA T/Fs	Dec.2013
13	Ext. at 500kV Ghazi Barotha			1x600MVA T/F		Dec.2013
14	220 kV Gujrat		4		3x250 MVA T/Fs	2013-14
15	220 kV Ghazi Road, Lahore		85		3x160 MVA T/Fs	2013-14
16	220kV Chishtian		65		2x250MVA T/Fs	Dec.2013
17	500kV D.G Khan	40		2x600MVA T/Fs	2x250MVA T/Fs	Dec.2013
18	Augmentation of existinig Grid Stations			1x750MVA T/Fs	18x250MVA T/Fs	Dec.2013
19	SVC at NKLP			1x450MVA SVC		Dec.2013
20	200kV Dera Murad Jamail		5		1x160MVA T/F 1x100MVA T/F	June,2014
21	500kV Lahore (South)	130	95	2x750MVA T/Fs		June,2014
22	SVC at Quetta			1x450MVA SVC		Dec.2014
23	500kV Shikarpur	84	50	2x600MVA T/Fs		June,2014
24	Power Dispersal from 747MW CCPP Guddu	576				Dec.2014
25	Power Dispersal from Uch-II		126.5			Dec.2014
26	Power Dispersal from Neelum Jhelum HPP	280				2015-16
27	Power Dispersal from Duber Khwar House		33			June,2013
28	Dispersal of power from 2x50MW Wind Power Plant at Mirpur Sakro		Only 132kV T/L(77km)			Dec.2013

Note 1: D. G. Khan: Dera Ghazi Khan, NKLP: New Kot Lakhpat
Note 2: T/Fs: Transmission Feeder, SVC: Static Var Compensator
Source：Monthly Progress Report on NTDC Development Projects for March,2013

The projects under preparation for implementation (Table 2.3-5) show that transmission lines and transformer stations mainly operated at 500kV, including other relevant ones at 220kV, are scheduled to expand.

Table 2.3-5 Projects Under Preparation for Implementation in September,2013

Sr.No.	Name of the Project	Transmission Line in (km)		Sub station		Expected Commissoning
		500kV	220kV	500kV	220kV	
1	3rd Circuit from Jamshoro to Rahim Yahim Yar Khan	590		SW Station at Moro Extension at Jamshoro, Dadu & RYK Grid Stations		2015-16
2	Power Dispersal from Chashma Nuclear (C3&C4)		127			2015-16
3	Power Dispersal from 1200MW Thar Coal Based Power Plant	250		SW Station at Matiari		2015-16
4	220kV Nowshera		10		3 x 250MVA T/Fs	2015-16
5	220 kV Lalian New		8		3 x 250MVA T/Fs	2015-16
6	220kV Mansehra		1		2 x 250MVA T/Fs	2015-16
7	220/132 kV D.I Khan		100		2 x 250MVA T/Fs	2015-16

Note：SW: Switching Station
Source：Monthly Progress Report on NTDC Development Projects for March,2013

Furthermore, Table 2.3-6 shows that "Cross Border Interconnection Projects" is planned, where procurement of energy by means of DC transmission from Iran, Tajikistan and India is considered.

Table 2.3-6 International Cooperation Projects

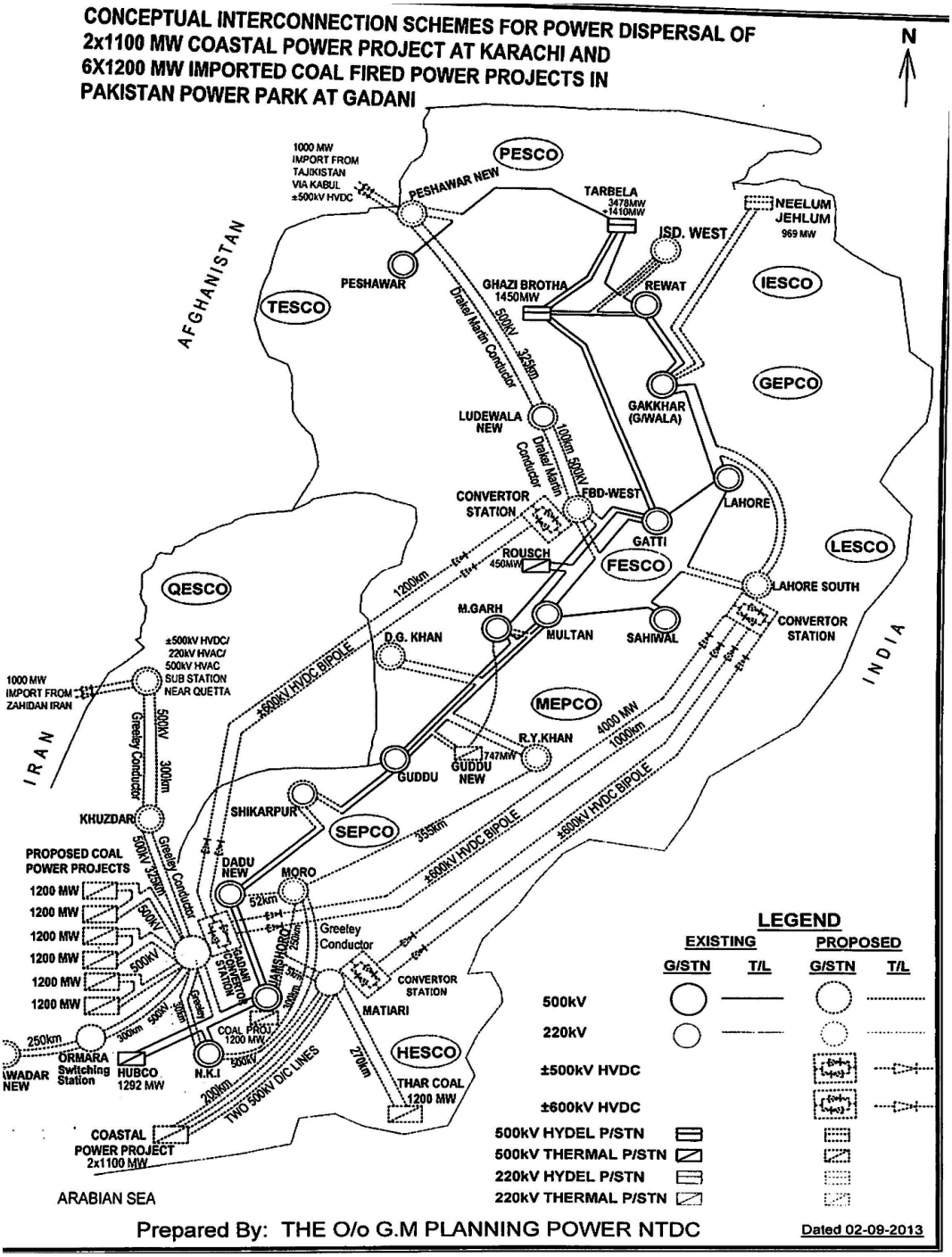
Sr.No.	Name of the Project	Transmission Line in (km)		Sub station		Expected Commissoning
		500 kV	220 kV	500 kV	220 kV	
1	Import of 100MW Power from Iran		Pak Iran Boader-Gwadar D/C(100km)		GIS at Gwadar with 2x160MVA T/Fs	Aug. 2014
2	Import of 1000 MW according to CASA Program	HVDC Bipolar Transmission Line from Pak-Iran Border to Quetta(585km)		Convertor Station at Quetta		2015-16
3	Import of 1000MW Power Tajikistan	HVDC Bipolar Transmission Line from Pak-Afghan Border to Peshawar(71km)		Convertor Station at Peshawar		2015-16
4	Impor of 200-500 MW Power from India	Different options for innterconnection are under study				

Note: HVDC: high-voltage, direct current, DC: Direct Current, GIS: Gas-insulated switchgear, MVA: Million Volt-Amperes
Source : Monthly Progress Report on NTDC Development Projects for March,2013

One of these Projects plans that AC-DC-AC converter stations will be installed on the border of Iran and Tajikistan, from where 1,000WM energy by means of DC transmission will be imported.

Cross border interconnection has advantages that an unstable transmission grid in a home country does not give its influence on other countries, because such interconnection is performed through DC and capable of transmitting lots of energy without causing increased short-circuit current.

In addition to the above Projects, it is planned that new coal thermal energy plants with 2,200MW capacity will be installed in Karachi and with 7,200MW at Gadani. Although capacity of such two plants amounting to a total of 9,400MW will resolve energy shortage in the north, high-voltage transmission at ±600kV (HVDC) is considered, because the existing transmission at AC500kV will cause capacity shortage.



Source: National Transmission & Dispatch Company (NTDC) Limited

Table 2.3-7 Transmission Planning including Gadani Project

While one of the methods to cover vulnerability of transmission lines at AC500kV is to install quadruple lines, adding two more transmission lines at AC500kV, installation of such quadruple lines is not planned as of 2013.

2.3.3 Technical Problems of Transmission and Transformation Grid

As technical issues of transmission and transformation grid to deal with the current energy demand growing at the rate of 7 to 8% per annum, and reduce power outage rate, what follows are listed:

- A sign of fragility of base transmission lines linking the south and north
- A risk of major power outage at facility trouble, due to many single line territory
- Insufficient maintenance and progressing aging of facilities

(1) Vulnerable bulk power system

Many countries install bulk power systems, each with multiple lines of more than two lines to enable planned outage at the time of maintenance in preparation for failures and/or natural disasters, while Pakistan installs 500kV and 200kV bulk power systems, both with one or two lines. Although no installation of quadruple lines is planned, reinforcement of the bulk power systems through HVDC at ±600kV is planned.

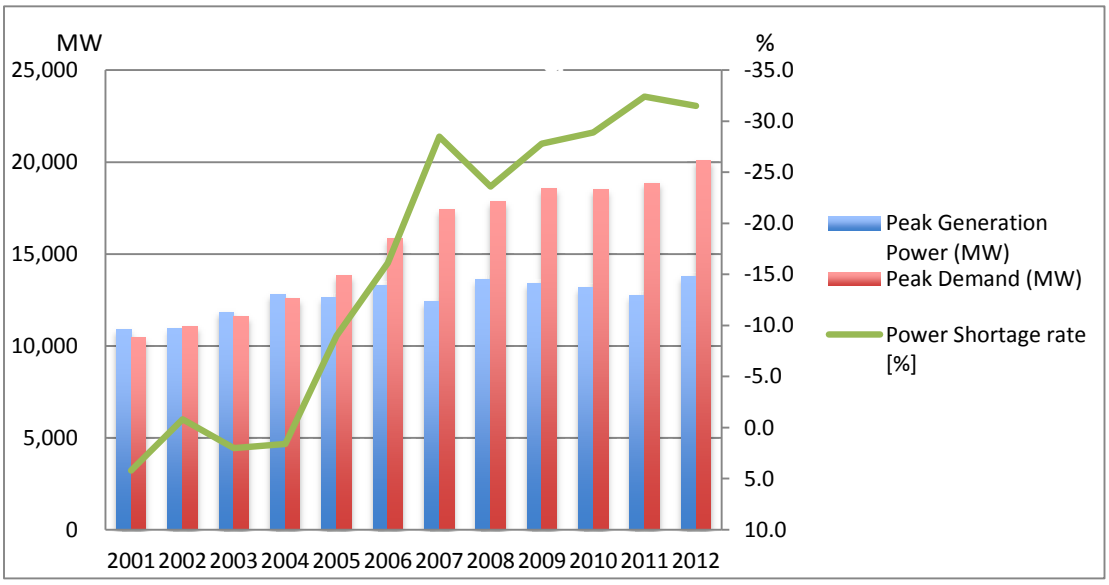
(2) Improvement of system stabilization technology

Introduction of a power simulator for analyzing power systems is considered to study reproducibility of repeated power failures and countermeasures against them. It is expected that analysis of power systems will make it possible to analyze transient and voltage stability at the time of power failures, determine the cause of such failures and take countermeasures against them, leading to decreased system failures through horizontally developing such countermeasures to other companies in the energy sector (horizontal development). In addition, the power simulator will work for prior examination on stability associated with future expansion, enabling optimal design of power systems.

2.4 Energy Supply-and-Demand Situation

2.4.1 Energy Supply-and-Demand Situation

From a viewpoint of the current demand and supply of energy, growth in demand is 7% per annum for the last 10 years as shown in Table 2.4-1. Regardless of the fact that the facility capacities are showing higher growth than an expansion plan, available energy supplies remain mostly unchanged for the last several years, with its growth below demand. For this reason, shortage of supply is estimated as 4,000-4,500MW, providing one of the causes of frequent power outages.

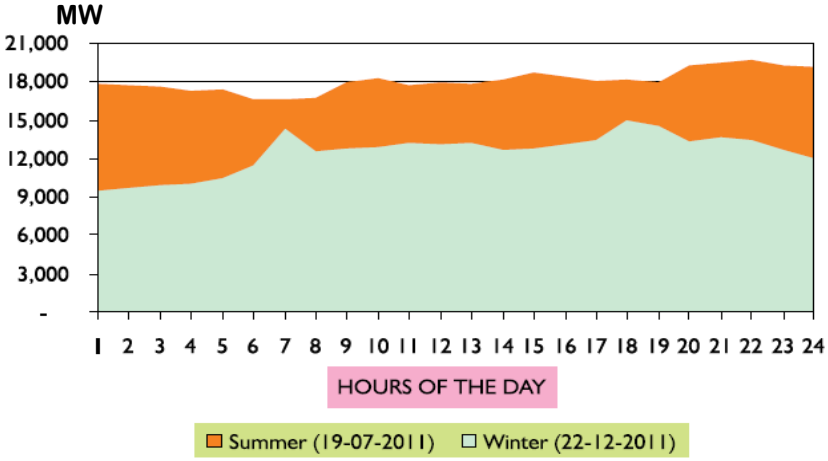


Source: Presentation Documents for Participants of 10th SMC of National Institute of Management, Karachi
JICA Survey Team using data of 2012 picked up from NEPRA State of Industry Report 2012

Table 2.4-1 Transition of Energy Demand and Installed Facility Capacity

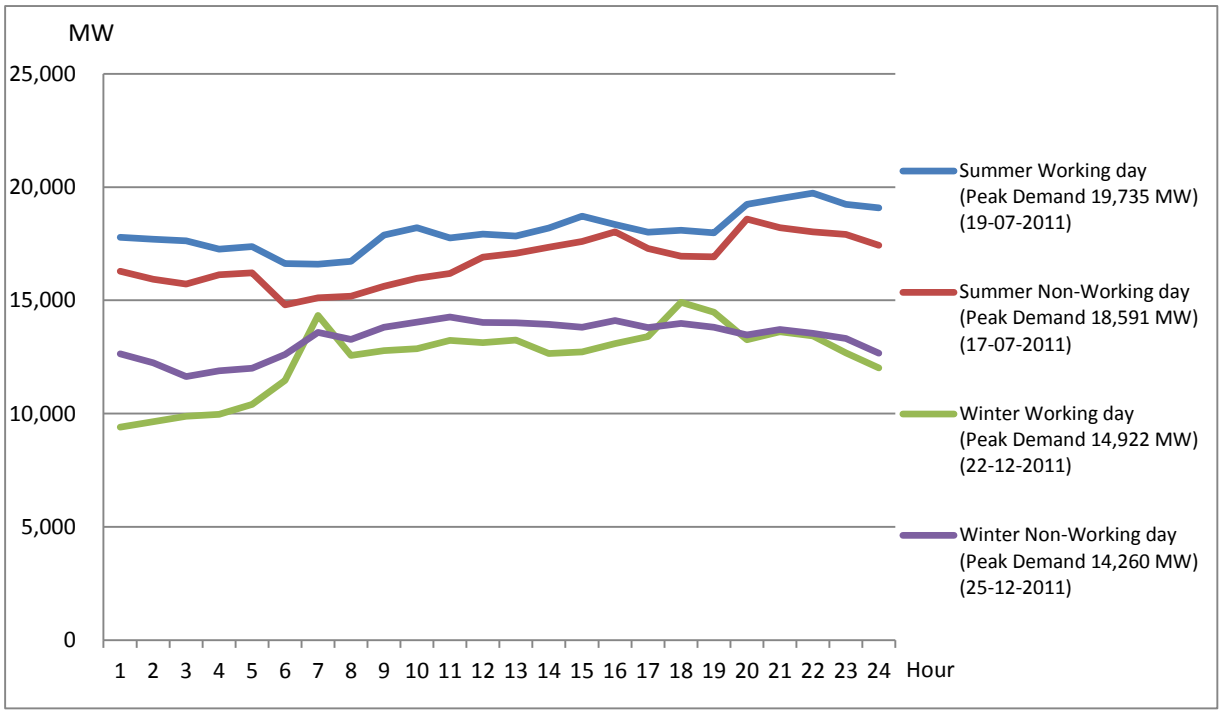
2.4.2 Load curve

Table 2.4-2 shows a graph of daily load curve. The peak load comes between 21 and 23 hour in summer evening, with a slight difference varying from season to season.



Original Source：National Power Control Center NTDC
Source：NEPRA State of Industry Report 2012

Table 2.4-2 Maximum Demand (MW)



Source：: NEPRA State of Industry Report 2012

Table 2.4-3 System Demand for a Typical Day in Summer and Winter (MW)

In Pakistan, however, the peak hour tariff is set up for the hour between 17:00 and 23:00.

Table 2.4-4 Peak Hour Tariff Setup of LESCO

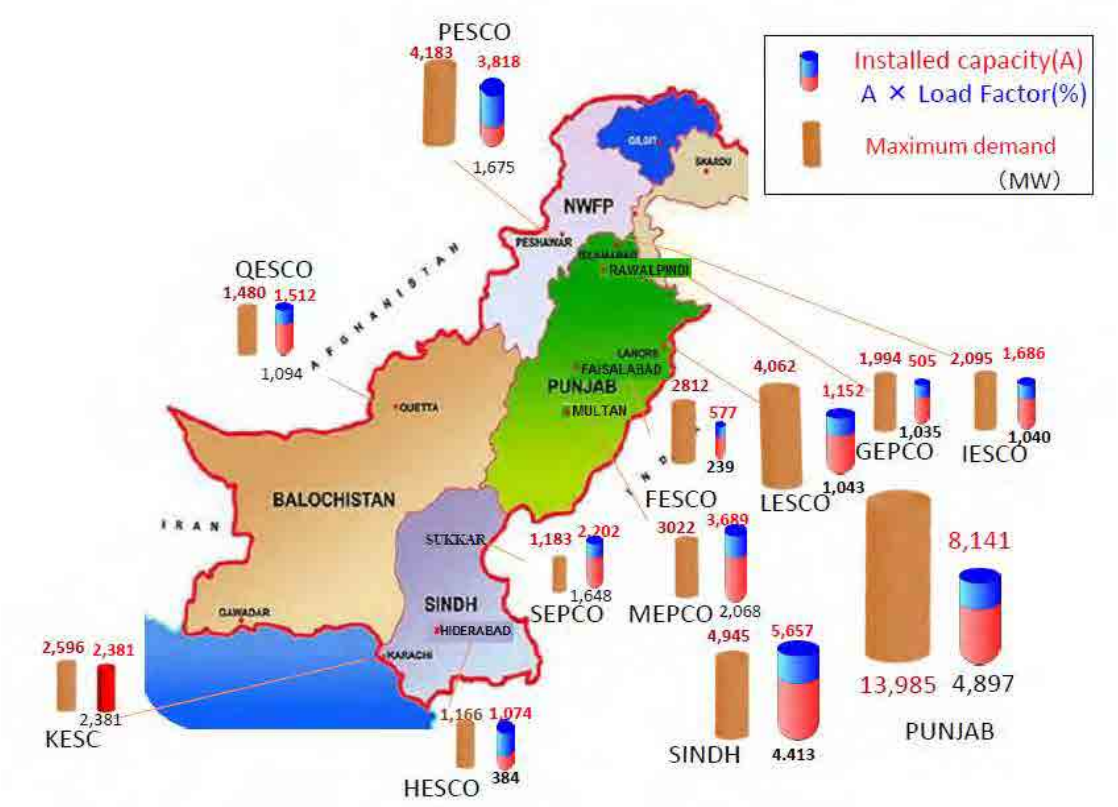
LESCO PEAK / OFF PEAK TIMINGS		
Season	**Peak Timing**	**Off-Peak Timing**
Dec to Feb	5 PM to 9 PM	Remaining 20 hours
Mar to May	6 PM to 10 PM	-do-
Jun to Aug	7 PM to 11 PM	-do-
Sep to Nov	6 PM to 10 PM	-do-

Source：http://www.lesco.gov.pk/CustomerServices/3000063.asp

2.4.3 Supply-and-Demand by Region

Generally, the maximal energy demand exceeds available supplies.

Particularly in the Punjab Province (service territory of LESCO), on which textile industries concentrate, energy shortage is serious.

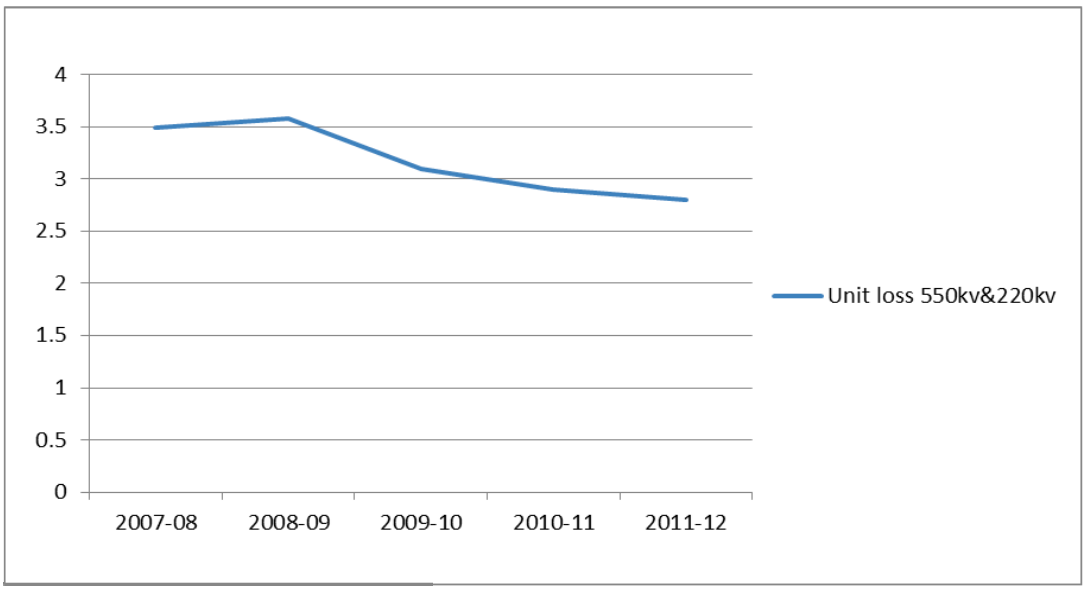


Note 1: Actual generation capacity is derived from Installed Generation Capacity (MW) as shown in Pakistan Energy Year Book 2012, p87 and p88, multiplied by Load Factor (%), then followed by allocation to each DISCO in its service area according to the location of the generation plants.
Note 2: Load Factor does not contain a number about KESC.
Maximum demand is collected from NEPRA State of Industry Report 2012, p112, using all data in 2011-2012.
Note 3: DISCOs operated in each Province is as follows: HESCO, SEPCO and KESC in Sindh Province; IESCO, LESCO, FESCO, MEPCO and GEPCO in Punjab Province; QESCO in Balochistan Province; PESCO in KP (NWFP) Province.
Source: Pakistan Energy Yearbook 2012
NEPRA State of Industry Report 2012

Table 2.4-5 Supply-Demand Gap in DISCOs

2.4.4 Transmission and Distribution Loss/Power Outage

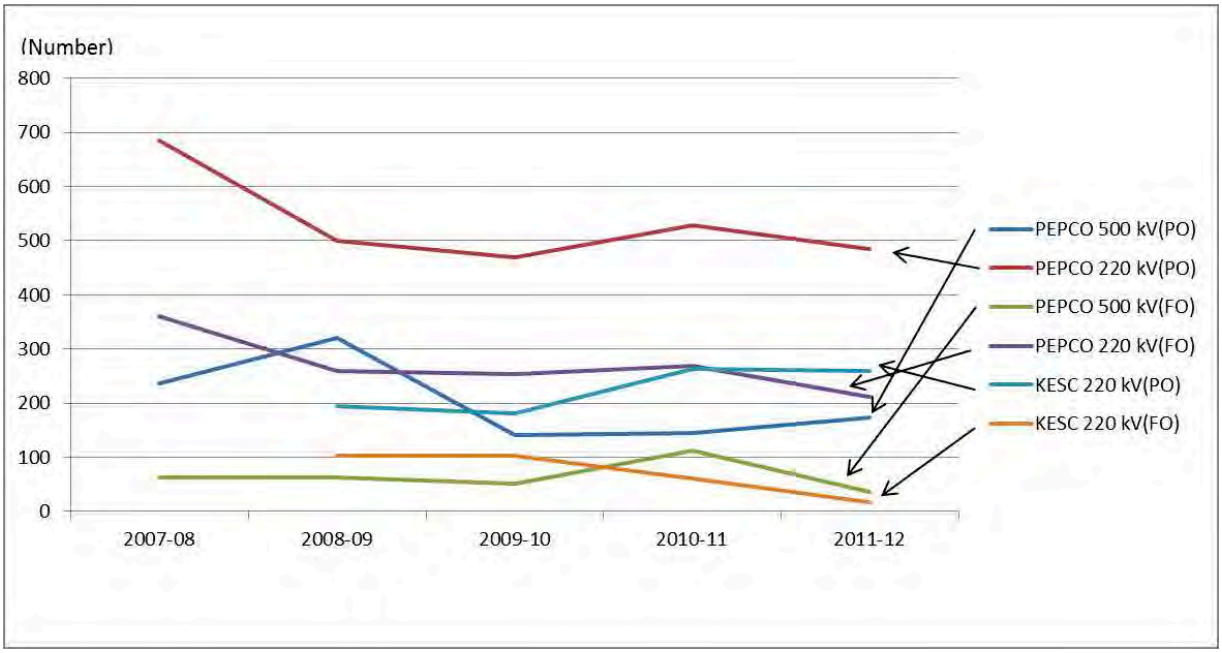
Transmission loss of NTDC is below 3% (2011-2012), decreasing year by year. It is considered that the low loss is caused by less transmission energy as compared to the transmission capacity.



Note：500kV and 220kV
Source：NEPRA State of Industry Report 2012

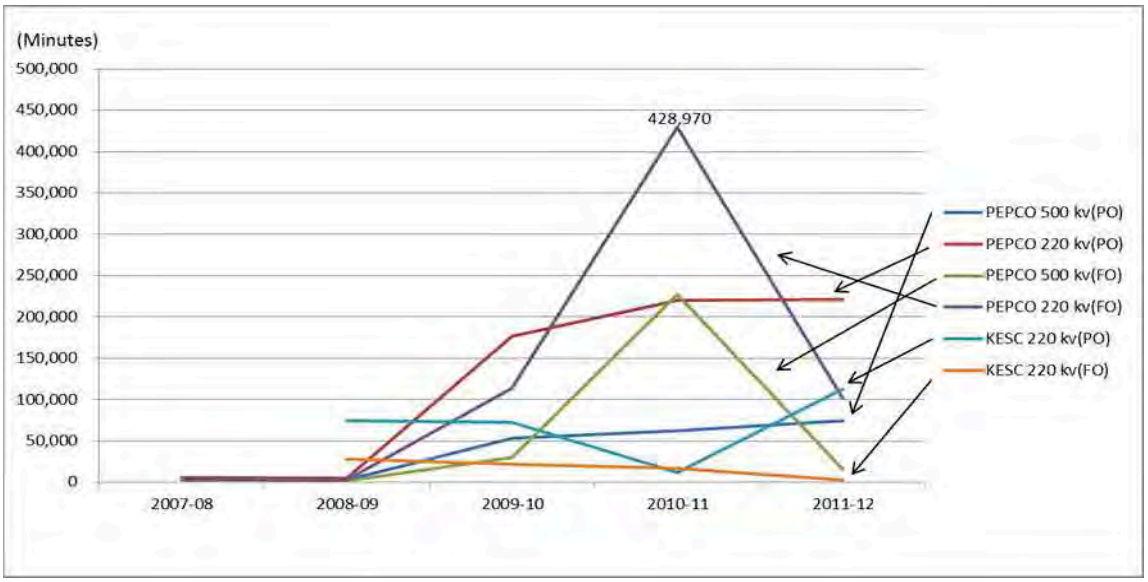
Table 2.4-6 Transmission Loss in NTDC System

Particularly, planned outages are conducted mainly on 220kV transmission grid operated by PEPCO.



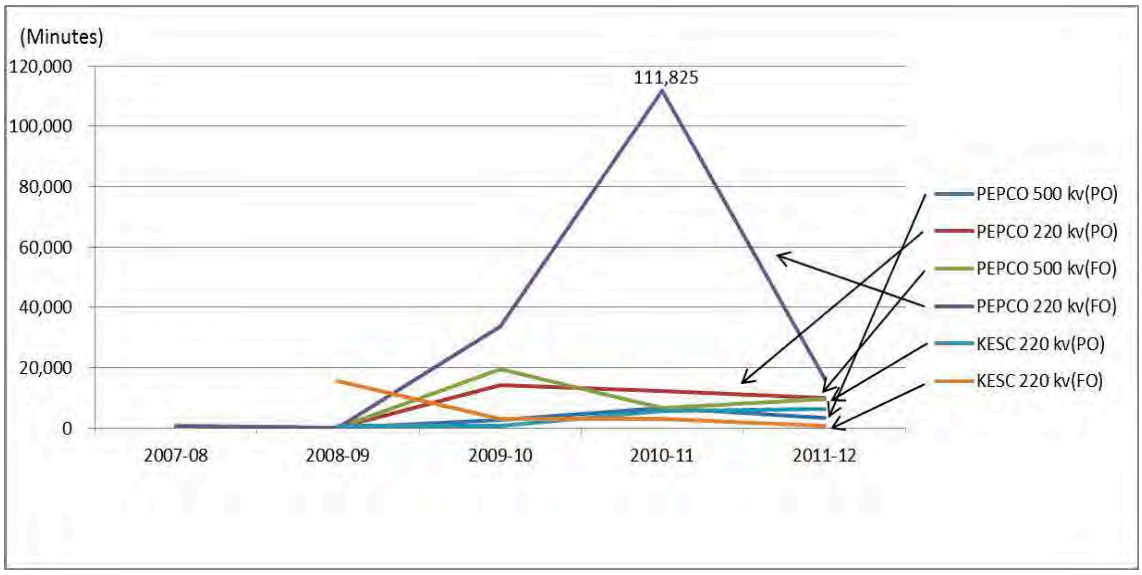
Note：PO :Planned Outages
FO: Forced Outages
Source：Nepra State of Industry Report 2012

Table 2.4-7 Frequency of Outages in PEPCO Systems and KESC Systems



Note：PO :Planned Outages
FO: Forced Outages
Source：NEPRA State of Industry Report 2012

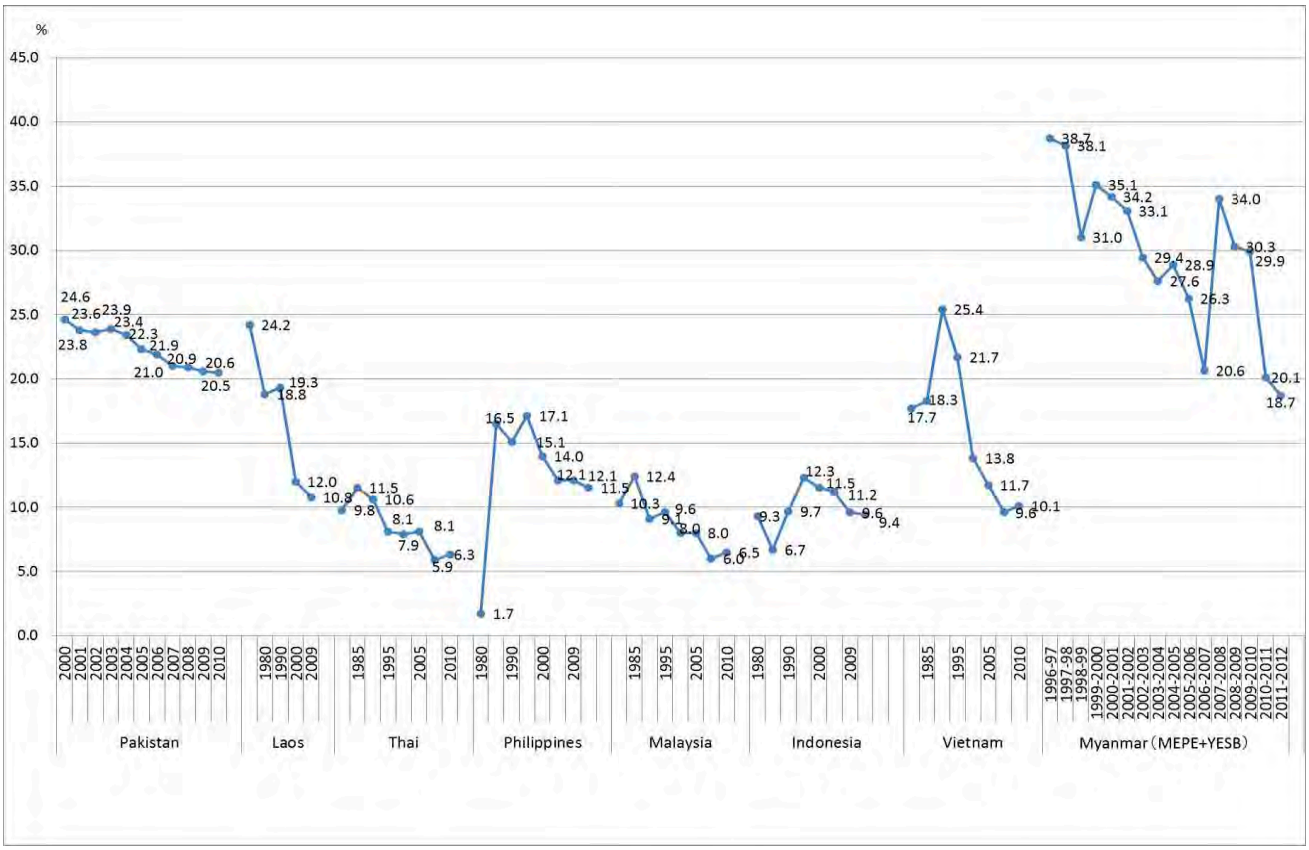
Table 2.4-8　Outage Time in PEPCO Systems and KESC Systems



Note：PO :Planned Outages
FO: Forced Outages
Source：Nepra State of Industry Report 2012

Table 2.4-9　Maximal Duration Time of per Outage in PEPCO Systems and KESC Systems

Transmission and distribution losses are decreasing year by year. They still remain at a higher level as compared to other Asian countries (excluding Myanmar).

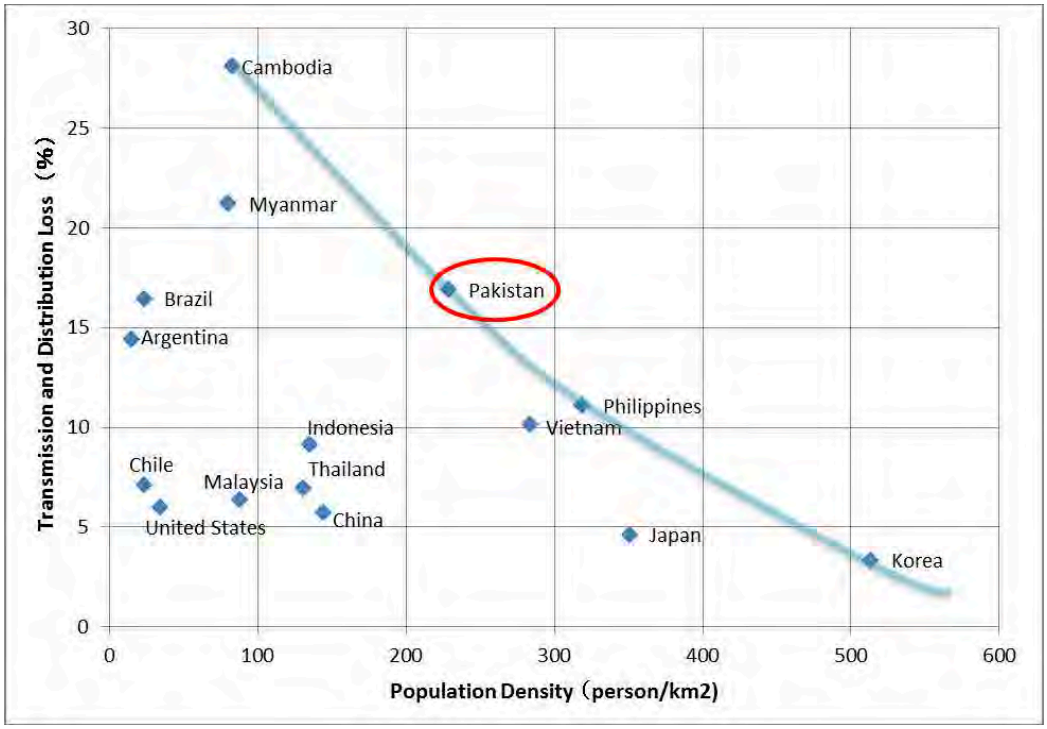


Note 1：Thai (EGAT, Philippines (Meralco), Malaysia (TNB), Indonesia (PLN), and Vietnam (EVN)
Note 2: For Laos: Distribution loss only
Source: WDI (Thai, Philippines, Malaysia, Indonesia, Vietnam), EDL (EDL), MEPE, ESE, YESB statistics (Myanmar)

Table 2.4-10 Transmission and Distribution Loss (%)

As Table2.4-11 shows, transmission and distribution losses have a tendency to become higher, as the population density is getting smaller.

Generally, in countries with a small national territory, where a point of consumption and supply is geographically adjoining, transmission and distribution losses are small. On the other hand, in countries with a large national territory, where a point of consumption and supply is separately-placed, economic growth will increase transmission and distribution losses. Nearly all developing countries in Asia and Pacific Rim with a larger population density ratio are at a higher rate of distribution loss.



Source: 'World Development Indicators' -World Databank, http://databank.worldbank.org/

Table 2.4-11 Population Density versus Transmission and Distribution Loss (2011)

Pakistan has ten distribution companies, of which scope of business ranges from receiving energy at 132kV to providing energy to consumers. Transmission and distribution losses are generated in 132kV and 11kV lines, respectively.

The distribution loss (sum of nontechnical loss and technical loss) ranges from the lowest 7.8% at IESCO to the highest 32.6% at PESCO.

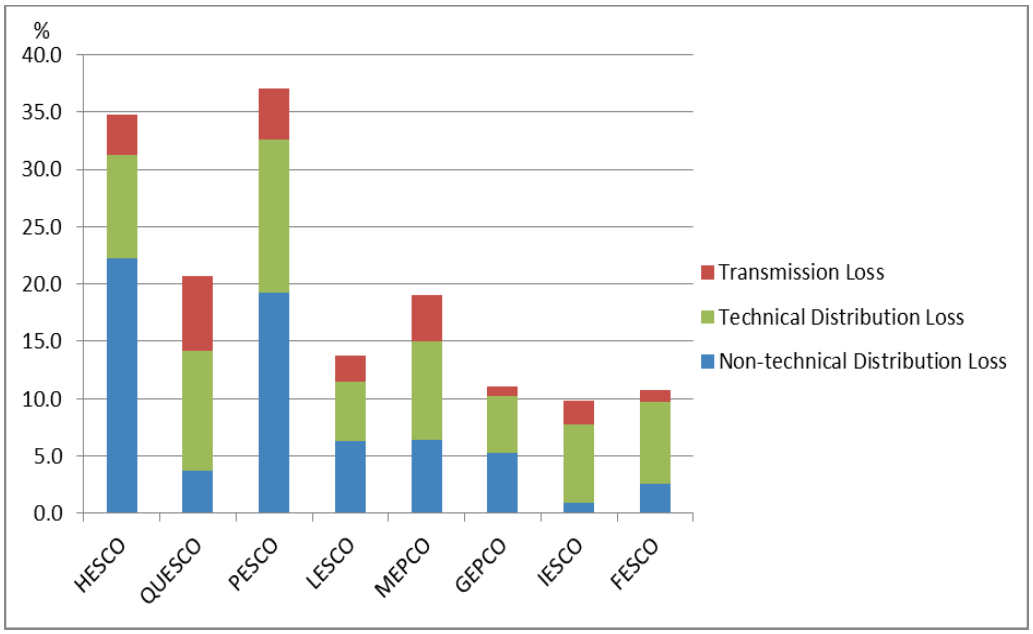
An average loss of eight distribution companies including HESCO, QUESCO, PESCO, LESCO, MEPCO, GEPCO, IESCO and FESCO is calculated as 16.5%.

While most of the loss is presumed to be due to, what is called, non-technical loss such as power theft and short circuit, the present situation is, however, that no drastic measures have been taken.

Out of these companies, IESCO alone, which still keeps the transmission and distribution losses at a 9% level for the last three years, has been actively making efforts to solve a measuring problem (prevention of illegally modified meters) and take countermeasures (severe crackdown, including revelation) against power theft.

For this reason, non-technical loss is particularly low at IESCO.

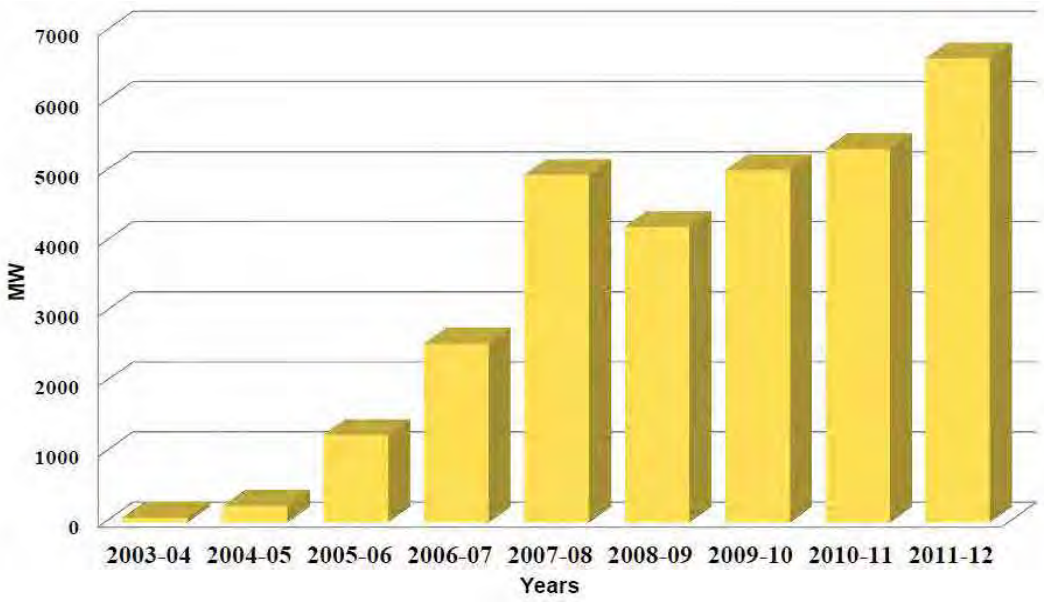
Table 2.4-12 shows that IESCO and LESCO located in the Punjab Province have lower transmission and distribution loss of 9.8% and 13.8%, respectively, while HESCO in the Sindh Province and PESCO in the KPK (Khyber-Pakhtunkhwa) Province have the transmission and distribution loss of 34.8% and 37.1%, respectively. Long length of feeder line leads to higher transmission and distribution loss. (Refer to Table 2.4-12).



Original Source: Ministry of Water and Power, USAID
Source: State Bank of Pakistan Annual Report 2010-2011

Table 2.4-12 Composition of T&D Losses for the Public Sector in Pakistan

After 2007-2008, Load Shedding (MW) is rapidly increasing (Table 2.4-13).



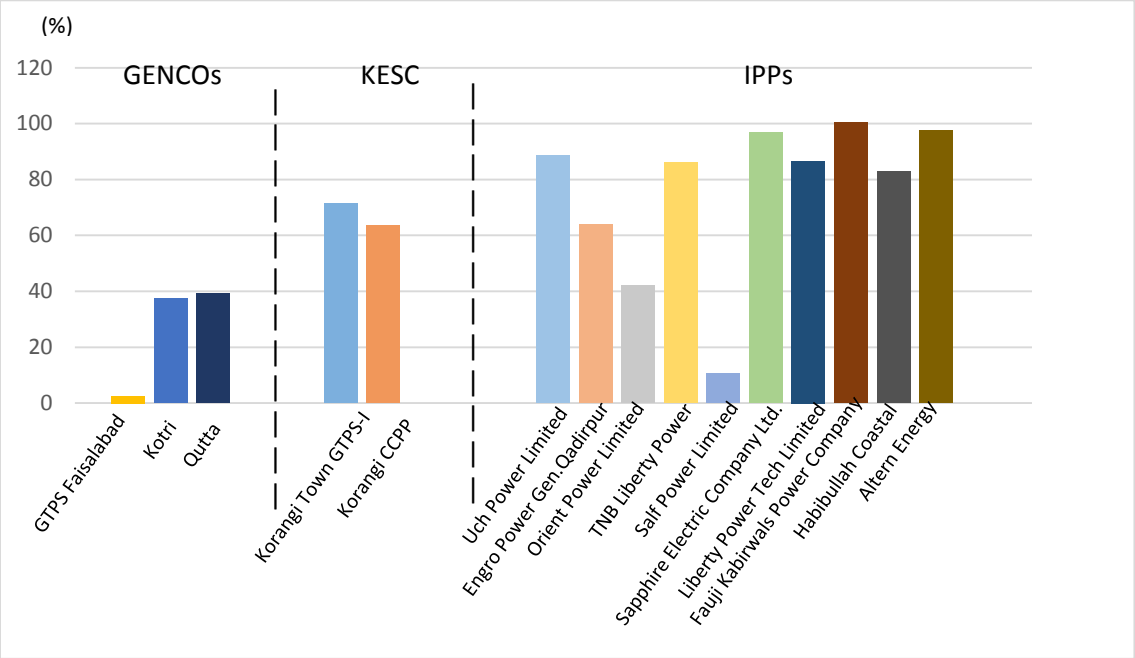
Source：ENERGY SECTOR CRISIS ISSUES & REFORMS WAY FORWARD SHAHID SATTAR Member(Energy) PLANNING COMMISSION May 23rd, 2013

Table 2.4-13 Transition of Load Shedding(MW)

2.4.5 Operating Rate of Major Generation Plants

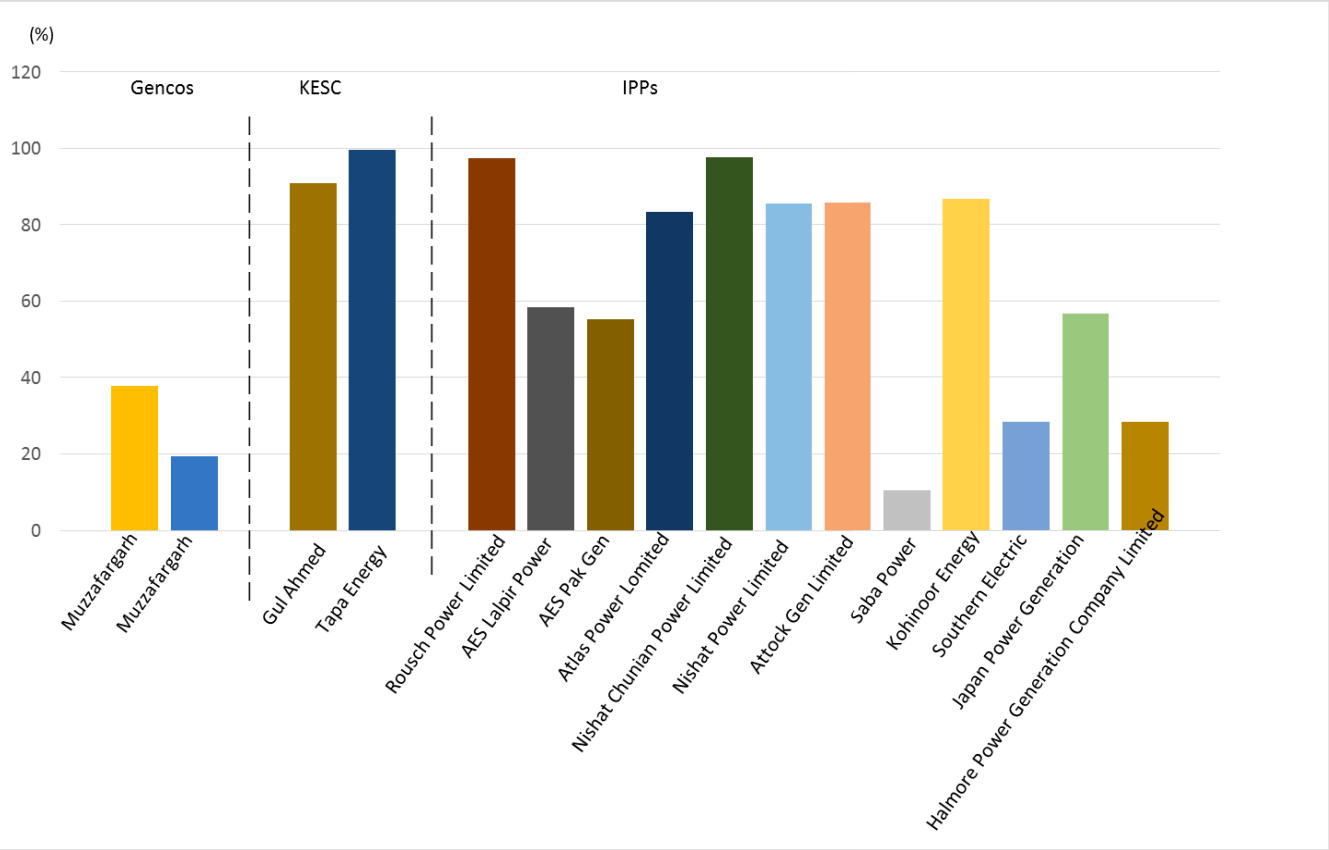
The operating rate of Thermal Genocs is lower compared with GENCO, KESC and IPP, which also becomes a major obstacle in supplying energy in Pakistan (Table 2.4-14～16) .

All GENCOs were founded in 1990s or before. For this reason, it is considered that the low operation rate of GENCOs is caused by the fact that they cannot purchase fuel due to lack of finance and renew their energy facilities.



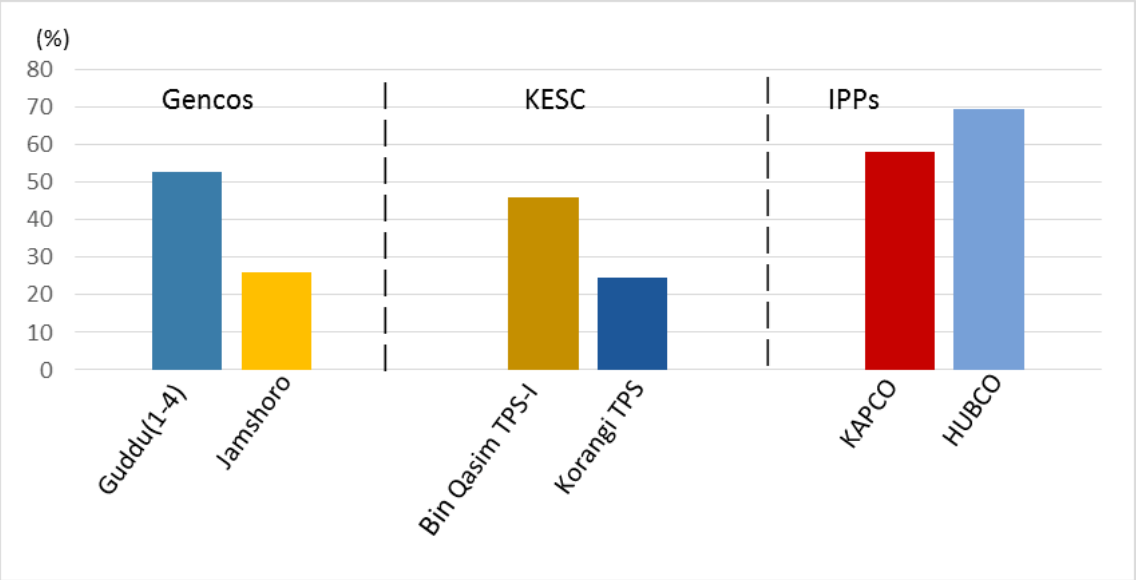
Note 1: Data in 2011-2012: GTPS Faisalabad, Uch Power Limited, Engro Power Gen., Qadirpur, Orient Power Limited, TNB Liberty Power, Saif Power Limited, Sapphire Electric Company Ltd., Liberty Power Tech Limited, Fauji Kabirwala Power Company, Habibullah Coastal, Altern Energy
Data in 2010-2011 : Kotri,Quetta,Korangi Town GTPS-I, Korangi CCCP
Note 2: Utilization Factor (Annual) (%) = (Annual operation hour/8760 hour) x100
Source: Revised from Ministry of Water and Power, State Bank of Pakistan Annual Report 2010-2011
PPIB Success Story State of Industry report 2012
Fuel type in plants of KESC→Pakistan power sector outlook:Appraisal of KESC in post privatization period Policy dialogue series SDPI

Table 2.4-14 Operating Rate by Energy Source and Owner〈Gas〉



Note 1: Data in 2011-2012: Muzaffargar, Rousch Power Limited, AES Lalpir Power, AES Pak Gen, Atlas Power Limited, Nishat Chunian Power Limited,
Nishat Power Limited, Attock Gen Limited, Saba Power, Kohinoor Energy, Southern Electric, Japan Power Generation, Halmore Power Generation Company Limited
Data in 2010-2011: Gul Ahmed, Tapa Energy
Note 2: Utilization Factor (Annual) (%)=(Annual operation hour/8760 hour)x100
Source：Revised from Ministry of Water and Power, State Bank of Pakistan Annual Report 2010-2011.
PPIB Success Story State of Industry report 2012
Nishat Power Limited→http://www.hubpower.com/about-hubco/
Fuel type in plants of KESC→Pakistan power sector outlook: Appraisal of KESC in post privatization period Policy dialogue series SDPI

Table 2.4-15　Operating Rate by Energy Source and Owner〈RFO〉



Note 1：Data in 2011-2012: Guddu(1-4),Jamshoro, KAPCO,HUBCO
Data in 2010-2011: Bin Qasim TPS-I, Korangi TPS
Note 2：Utilization Factor(Annual)(%)=(Annual operation hour/8760 hour)x100
Source：Revised from Ministry of Water and Power,
State Bank of Pakistan Annual Report 2010-2011
PPIB Success Story State of Industry report 2012
Fuel type in plants of KESC→Pakistan power sector outlook: Appraisal of KESC in post privatization period Policy dialogue series SDPI

Table 2.4-16　Operating Rate by Energy Source and Owner〈RFO/Gas〉

2.4.6 Energy Supply Cost

It is said that GENCOs have higher operation cost (29-30Rs/kWh) and perform inefficient operation (whereas operation cost of IPPs is below 15-16Rs/kWh).

Table 2.4-17 shows that of all GENCOs, Guddu has lower supply cost. This is because the operation cost[15] of IPPs includes capacity cost.

Table 2.4-17 Average Electricity Generating Costs in United States Cents per Kilowatt hour in Pakistan (2001 to 2009)

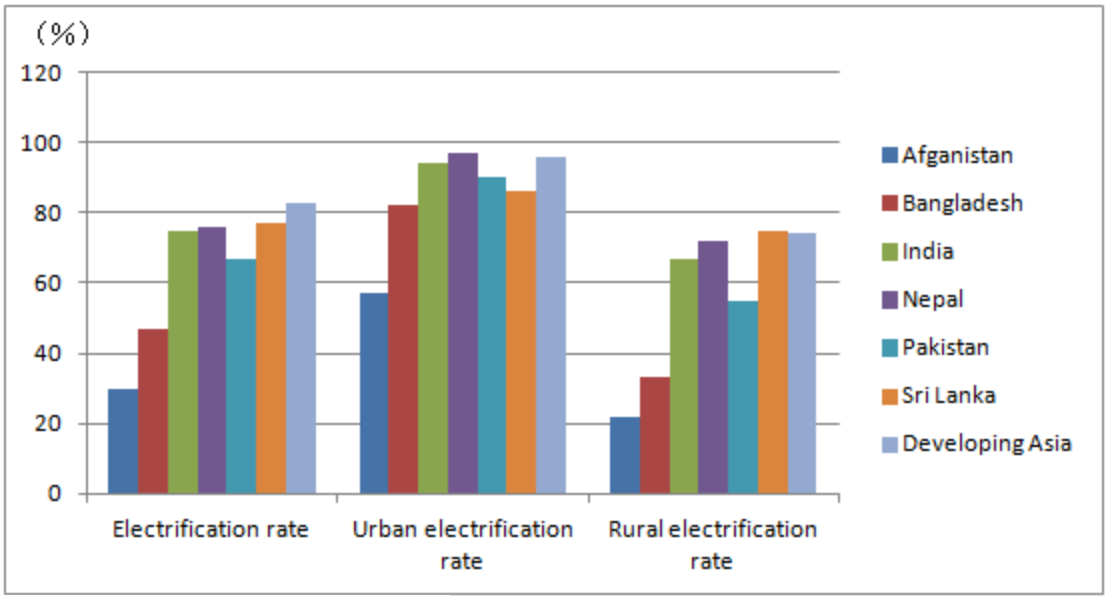
Year	Nuclear	GENCOs		IPPs				Hydroelectric	
	Chasnupp (C-1) 325(MW)	Guddu (5-13) 1015 (MW)(gas)	Muzaffar Garh 1350 (MW)(oil+gas)	HUBCO 1200 (MW)(Oil)	Kapco 1342 (oil+gas)	Habibullah Coastal 126 (MW)(gas)	Fauji kablrwala 150 (MW)(gas)	Tarbel 3478 (MW)	Ghazi Brotha 1450 (MW)
2001	-	1.78	2.70	-	-	-	-	0.22	-
2002	1.75	1.90	2.72	6.12	4.17	3.34	3.76	0.25	-
2003	1.99	2.02	2.97	7.34	4.21	3.35	3.35	0.54	-
2004	2.25	1.78	2.35	9.79	3.93	3.38	3.90	0.52	1.57
2005	2.84	1.87	2.66	8.85	3.46	3.52	4.10	0.63	1.31
2006	3.00	2.20	3.91	7.13	4.27	3.93	4.40	0.50	1.31
2007	3.08	2.47	5.11	6.12	4.54	4.17	4.17	0.49	1.36
2008	2.99	2.46	8.00	8.65	6.73	3.88	4.24	0.48	1.44
2009	4.57	-	-	9.88	10.52	4.51	4.70	-	-
Welghted Average Generation Cost	2.78	2.08	3.78	7.98*	5.34*	3.76*	4.04*	0.46	1.39

Note 1: Chasnupp=Chashma Nuclear Power Plant, GENCO=generating company, HUBCO=Hub Power Company, IPP=independent power producer
Note 2:* This includes capacity, energy and other supplemental charges. Does not include GST
Original Source: PEPCO Electricity Marketing Data-33rd Issue; PEPCO Letter
Source: Integrated Energy Sector Recovery Report & Plan October 2010

[15] Capacity cost is classified as fixed cost amd maily used for investment-related cost.

2.4.7 Local Electrification

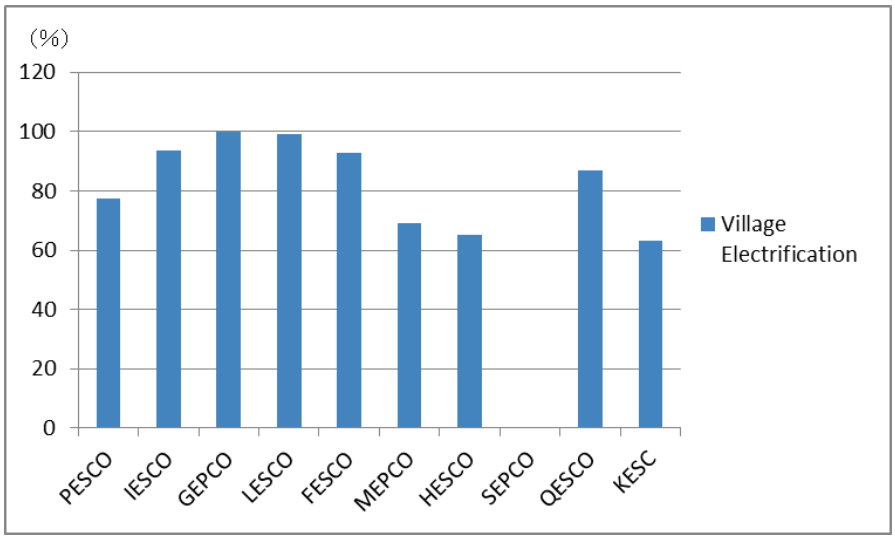
The electrification rate in Pakistan is higher than in Afghanistan and Bangladesh, but lower than in Sri Lanka, Nepal and India, compared with the neighboring South Asian countries (Table 2.4-18).



Source: IEA, World Energy Outlook 2012

Table 2.4-18 Electrification Rate in South Asian Countries

As compared to the electrification rate in villages, IESCO, GEPCO and LESCO have a higher electrification rate, while HESCO, MEPCO and KESC have an extremely low electrification rate. (Table 2.4-19).



Note：SEPCO has no data
Source：NEPRA State of Industry Report 2012,

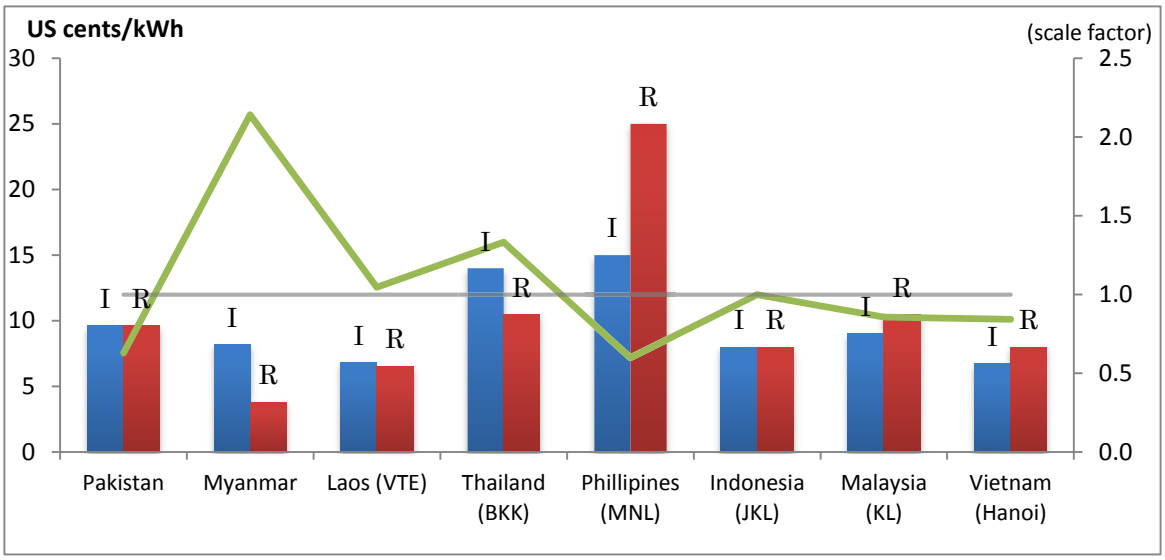
Table 2.4-19 Village Electrification in all Distribution Companies (2011-2012)

2.5 Present Situation of Energy Tariff System (Including IPP-related System)

2.5.1 International Comparison of Energy Tariff Level

It is important to properly determine energy tariff. It is also important to determine cost-reflective tariff under a fair and reasonable energy tariff system to secure a stable source of revenues and reinforce the financial base of the energy sector (including off-takers).

The energy tariff in Pakistan is set at 9 cents/kWh, both for residence and industry, which is at a higher level in Asian countries excluding the Philippines (Table 2.5-1). The Government policy aims to further raise the energy tariff in future and gradually reduce the subsidy.



Note 1: I : Industry
R : Resident
Note 2: The on-site interview points out that re-categorization of consumers are required.
For example, commercial consumers are included in the category of residential consumers or roadside consumers in the category of agriculture consumers.
Note 3: 1USD=100PKR

Source : For Indonesia, Laos, Malaysia, Philippines, Cambodia, Vietnam: JETRO 2013
(Indonesia: Jakarta, Laos: Vientiane, Malaysia: Kuala Lumpur, Philippines: Manila, Cambodia: Phnom Penh, Vietnam: Hanoi)
Myanmar: MEPE
Pakistan: Computed from LESCO customer service (Reference on Sep.19, 2013

For: Resident	For: Industry Supply
General supply for sanctioned load exceeding 5kw	25-500kw(at 400volts)
peak 13.99 Rs/kwh(4hours)	Fixed charge 400Rs/kw/month
Off-peak 8.22Rs/kwh(20hours)	Variable charge Peak 12.77Rs/kWh(4hours)
Off-peak use 2kwh	Off-peak 8.01Rs/kwh
	Off-peak use 200kw

Thailand: MEA (2009), DEDE "Electric Power in Thailand)

Table 2.5-1 Comparison of Energy Tariff by Country

2.5.2 Tariff Table

As is shown in Table 2.5-2, the tariff is basically composed of variable cost only for residential consumers[16], while it consists of fixed cost and variable cost for commercial and industry consumers. Regardless of usage, the minimal tariff will be collected every month by household. TOU is introduced to all the tariff categories.

Table 2.5-2 A-1 General Supply Tariff - Residential

A-1 GENERAL SUPPLY TARIFF - RESIDENTIAL								
Sr. No.	TARIFF CATEGORY/ PARTICULARS	FIXED CHARGES Rs/kW/M	VARIABLE CHARGES Rs/kWh		GOVERNMENT SUBSIDY	FIXED CHARGES Rs/kW/M	VARIABLE CHARGES Rs/kWh	
a)	For Sanctioned load less than 5 kW							
i	Up to 50 Units For Consumption exceeding 50 Units	-	4.00			-	-	2.00
ii	001—100 Units	-	11.00			-	-	-
					101- 200 Units	-	-	5.21
iii	101-300 Units	-	15.00		201- 300 Units	-	-	6.89
						-	-	2.91
iv	301-700 Units	-	17.00			-	-	1.00
v	Above 700 Units	-	18.00			-	-	-
b)	For Sanctioned load 5kW & above	-						
			Peak	Off-Peak		-	Peak	Off-Peak
	Time Of Use		18.00	12.50				

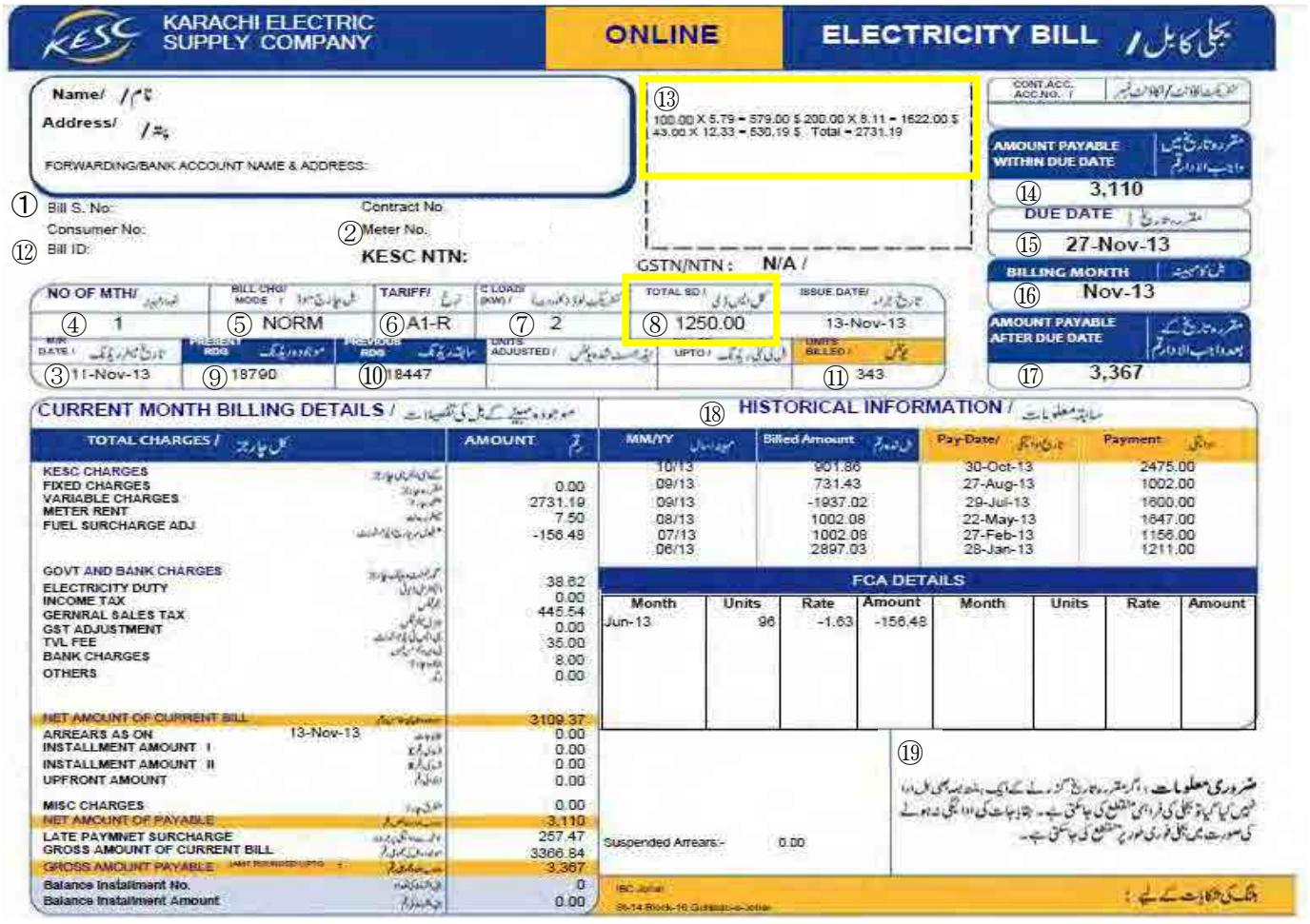
Note 1: As per the Authority's decision residential consumers will be given the benefits of only previous SLAB.
Note 2: "Sanctioned load demand" means the load in kW/HP (kilo Watt/Horse Power) which the Licensee has agreed to supply from time to time subject to the governing terms and conditions.
Under tariff A-1, there shall be minimum monthly customer charge at the following rates even if no energy is consumed.
a) Single Phase Connections: Rs. 75/ - per consumer per month
b) Three Phase Connections: Rs. 150/ - per consumer per month

Source : No.NEPRA/TRF-100/11280-11282 October 11,2013
Subject: Decision of the Authority regarding Request for Reconsideration of Tariff Determinations Pertaining to the EX-WAPDA Distribution Companies for the Financial Year 2012-13 under Section 31(4) of NEPRA Act 1997

The following Table 2.5-3 shows an example of the tariff for a general household, indicating 343kWh is used from October 1st to 31st, and the electricity tariff to be collected is 2,731.19Rs.

[16] It appears to reduce the buren for residencial consumers.

No.	Description	No.	Description
①	Bill S. No	②	Meter No.
③	Metering Date	④	No of Month
⑤	BILL Charge/MODE	⑥	Tariff
⑦	Contract Load(W)	⑧	Total Subsidy
⑨	Present Reading	⑩	Previous Reading
⑪	Load Billed	⑫	Bill ID
⑬	Calculation of amount payable based on SLAB	⑭	Amount Payable
⑮	Due Date	⑯	Billing Month
⑰	Amount Payable After Due Date	⑱	Historical Information of Payment



Note 1: (This Table shows) Tariff Bill applied to consumers in the service area of KESC.
Note 2: Tariff Bill for five members in a family living in an apartment with 5 rooms and 3 beds.
Electrical appliance used includes a refrigerator, a television, 5 fans and 5 lights of 40W.
Note 3: ⑲is written in Urdu, of which meaning is described below.
<Important> In case that no payment is made within 1 week after the due date, electricity supply may be suspended.
Source: Survey Team (This Table was developed, using a Tariff Bill obtained from an average family.)

Table 2.5-3 Example of Energy Tariff: Normal Household Consumers

Table 2.5-4 A-2 General Supply Tariff - Commercial

A-2 GENERAL SUPPLY TARIFF - COMMERCIAL								
Sr. No.	TARIFF CATEGORY/ PARTICULARS	FIXED CHARGES Rs/kW/M	VARIABLE CHARGES Rs/kWh		GOVERNMENT SUBSIDY			
						FIXED CHARGES Rs/kW/M	VARIABLE CHARGES Rs/kWh	
a)	For Sanctioned load less than 5 kW		18.00					
b)	For Sanctioned load 5kW & above	400.00	16.00					
			Peak	Off-Peak		-	Peak	Off-Peak
	Time Of Use	400.00	18.00	12.50				

Note : Under tariff A-2, there shall be minimum monthly customer charge at the following rates even if no energy is consumed.
a) Single Phase Connections: Rs. 175/ - per consumer per month
b) Three Phase Connections: Rs. 350/ - per consumer per month

Source : No.NEPRA/TRF-100/11280-11282 October 11,2013
Subject: Decision of the Authority regarding Request for Reconsideration of Tariff Determinations Pertaining to the EX-WAPDA Distribution Companies for the Financial Year 2012-13 under Section 31(4) of NEPRA Act 1997

Table 2.5-5 B Industrial Supply Tariff - Commercial

B INDUSTRIAL SUPPLY TARIFF - COMMERCIAL								
Sr. No.	TARIFF CATEGORY/ PARTICULARS	FIXED CHARGES Rs/kW/M	VARIABLE CHARGES Rs/kWh		GOVERNMENT SUBSIDY			
						FIXED CHARGES Rs/kW/M	VARIABLE CHARGES Rs/kWh	
B1	Up to 25kW (at 400/230 Volts)		14.50					
B2	exceeding 25-500kW (at 400 Volts)	400.00	14.50					
	Time Of Use		Peak	Off-Peak			Peak	Off-Peak
B1 (b)	Up to 25kW		18.00	12.50				
B2 (b)	exceeding 25-500kW (at 400 Volts)	400.00	18.00	12.30				
B3	For all Loads up to 5000kW (at 11, 33kV)	380.00	18.00	12.20				
B4	For All Loads (at 66, 132kV & above)	360.00	18.00	12.10				

Note : For B1 consumers there shall be a fixed minimum charge of Rs. 350 per month
For B2 consumers there shall be a fixed minimum charge of Rs. 200 per month
For B3 consumers there shall be a fixed minimum charge of Rs. 50,000 per month
For B4 consumers there shall be a fixed minimum charge of Rs. 500,000 per month

Source : No.NEPRA/TRF-100/11280-11282 October 11,2013
Subject: Decision of the Authority regarding Request for Reconsideration of Tariff Determinations Pertaining to the EX-WAPDA Distribution Companies for the Financial Year 2012-13 under Section 31(4) of NEPRA Act 1997

2.5.3 NEPRA Determined Tariff and GoP Notified Tariff

NEPRA determines the tariff in accordance with the tariff standard and procedure rule set in 1998, considering the principle on economic efficiency and service quality. NEPRA Determined Tariff is set by NEPRA for each DISCO, apart from which, however, GoP Notified Tariff is set by the Government of Pakistan for applying to the

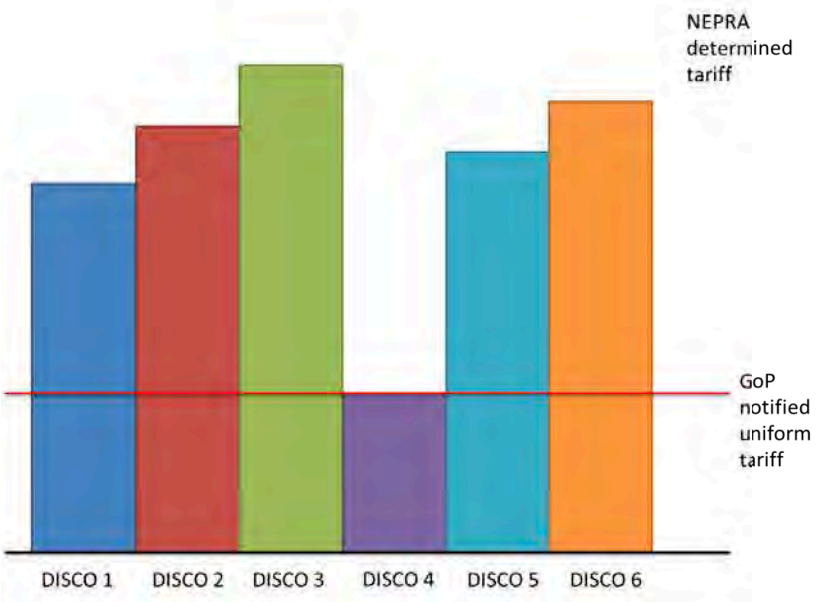
actual tariff to be collected. The distribution companies file tariff application, which is reviewed by NEPRA and followed by tariff determination through public hearing (NEPRA Determined Tariff).

The Government determines GoP Notified Tariff based on the tariff set by the most efficiently operated company of all the 10 distribution companies. The subsidy to the difference between NEPRA Determined Tariff and GoP Notified Tariff is called TDS (Tariff Differential Subsidy).

Reasonable Economic Consumer Tariff is determined based on before-tax return, using Return on Asset (ROA) of each distribution company as a standard. A tax payment made by a distribution company will require tariff adjustment later.

No subsidy has not been granted to the industry tariff. It is argued, as a rule, that lack of efficient government brings huge amount of loss reaching as much as 35-40 Billion Rs. every year to the Water and Power Development Authority (WAPDA). Most of transmission and distribution losses is due to a broad range of power theft using unregistered meters and stealing from transmission and distribution trunks.

MOWP formulates a new energy policy to take measures for abolishing Load Shedding, thereby aims to lower generation cost and make necessary investment in base facilities to attract investment in the energy sector. According to the National Energy Policy developed by Council of Common Interests (CCI), the subsidy granted to the energy sector will be reduced by 2014 through tariff rationalization. While new tariff is notified, the new tariff will be applied to commercial and industry consumers on August 1st, and the revision of the tariff for residential users will be made on October 1st. The new tariff will not be applied to consumers using below 200kWh per month. Efforts to make solvent consumers bear the tariff are under way through tariff rationalization.

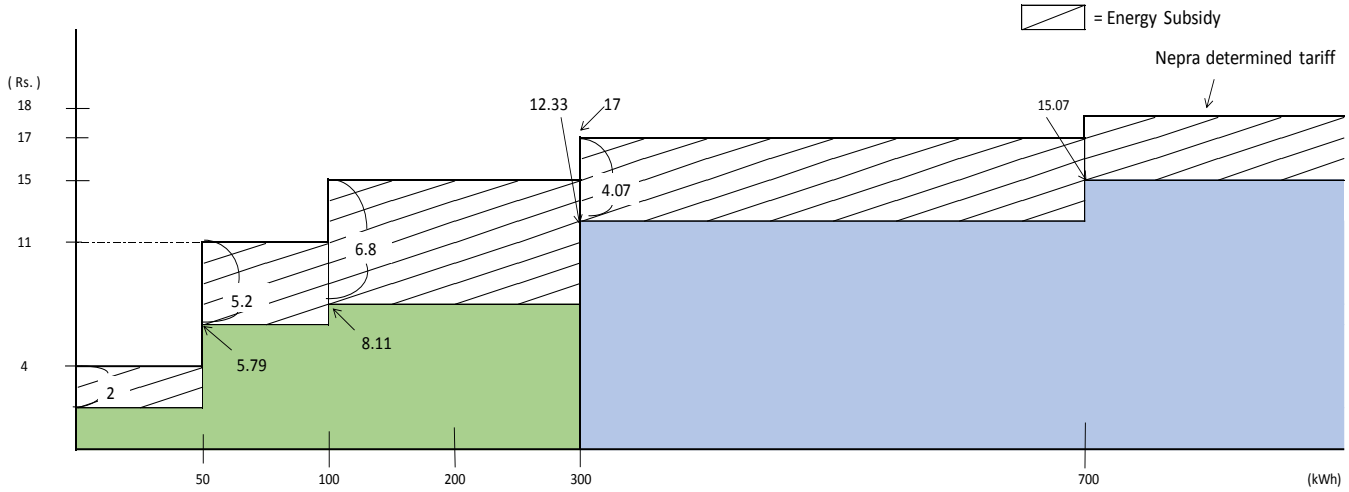


Source: JICA Survey Team

Table 2.5-6 Conceptual Mechanism of TDS

2.5.4 Subsidy to Energy Tariff

All the users in each tariff category had received the subsidy regardless of their usage until September 30th, 2013 (Table 2.5-7). The users paid 2.0Rs. for the first 50 units (kWh), 5.79Rs. for 100 units (kWh), 8.11Rs. for 300 units (kWh), 12.33RS. for 301～700kWh and 15.07Rs. for 70kWh or above.



Source：Developed by the JICA Survey Team based on MOWP notification (August 5th, 2013)

Table 2.5-7 Energy Tariff determined for IESCO (August 5th, 2013)

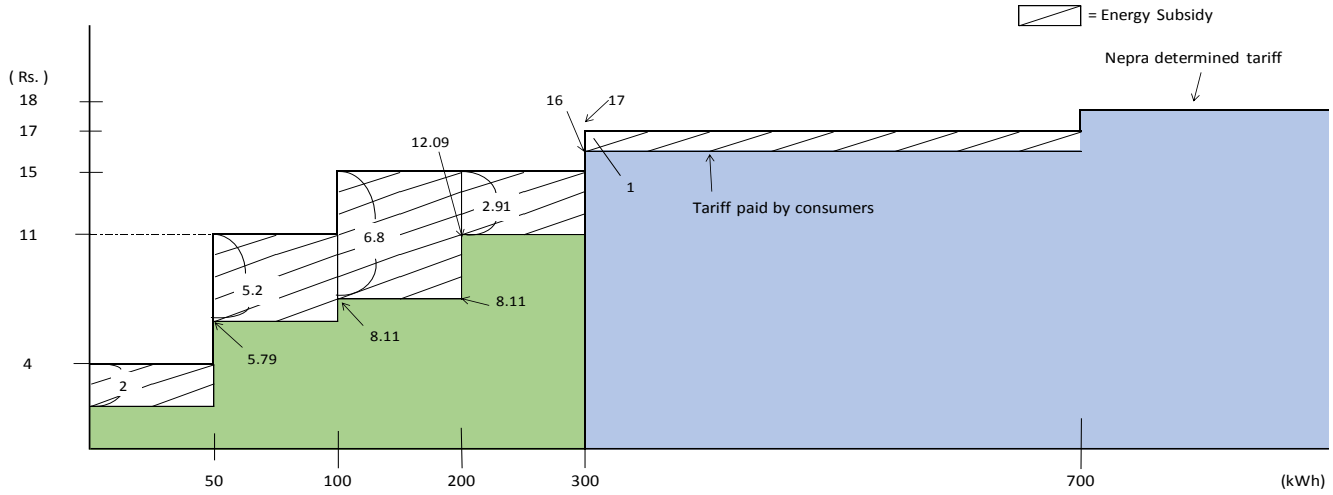
As a result of having revised the energy tariff on October 1st, 2013, the energy tariff after the revision became as shown in Table 2.5-8 below. This revision of the energy tariff reduced the subsidy to a large extent for 200kWh～300kWh or above, and abolished the subsidy for 700kWh or above. This revision was made by the Government as part of a structural reform, to which Finance Minister Ishaq Dar agreed with IMF as conditionality on 6.67 Billion USD loan associared with the Extended Fund Facility (EEF). It is expected that the reform will be performed in four phases, which will reduce the energy subsidy from approx. 1.8% to 0.3 or 0.4% of the GDP in three years.

Source: Memorandum on Economic and Financial Policies for2013/14–2015/16, Ministry of Finance, September4 2013

Table 2.5-8 Revised Energy Tariff as from October 1st, 2013

Rs/kWh

		Before October 1st , 2013	After October 1st ,2013
Domestic consumer	0-50	2	2
	1-100	5.79	5.79
	101-200	8.11	8.11
	201-300	8.11	14
	301-700	12.33	16
	700-	15.01	18
Agricultural consumer		6.77	10.35



Note：Residential

Source：Developed by the JICA Survey Team based on No. NEPRA/TRF-100/11280-11282 October 11, 2013 Subject: Decision of the Authority regarding Request for Reconsideration of Tariff Determinations Pertaining to the Ex-WAPDA Distribution Companies for the Financial Year 2012-13 under Section 31(4) of NEPRA Act 1997

Table 2.5-9 Energy Tariff determined for IESCO (October 11th, 2013)

2.5.5 IMF Recommendation on Revision of Energy Tariff

According to IMF Country Report No.13/287 (Pakistan 2013 article IV consultation and request for an extended arrangement under the extended fund facility September 2013), IMF developed a three-year plan aiming at gradually reducing Tariff Differential Subsidy (TDS) and altering the tariff to a cost recoverable level.

What follows are excerpts from IMF Country Report No.13/287 (Pakistan 2013 article IV consultation and request for an extended arrangement under the extended fund facility September 2013)

The plan will be approved by the Government of Pakistan and will begin with:

(i) Notification of NEPRA Determined Tariff for FY2012/13

(ii) Immediately phasing-out the subsidy on industrial consumers and moving on to the

Minimum Determined Tariff for commercial, bulk and AJ&K consumers' electricity consumption through increasing the weighted average Notified Tariff by 50 percent
(iii) Announce the elimination and reduction of the subsidy on second group of consumers (as defined in the TMU) through increasing the weighted average Notified Tariff by 30 percent that will be effective from October 1st, 2013

The plan, together with implementation of the first step, should be undertaken by August 1, 2013 to kick start the reform (prior action). In addition, the costs of servicing the syndicated term credit finance facility which was issued to cover some past losses will be incorporated into the notified base tariff by the end ofDecember 2013. In the second and third year of the program, around 0.4 percent of GDP of savings per year through reduction in subsidy to 0.3-0.4 percent of GDP will be generated at the end of the program. Tariff for consumption between 0-200 kWh will be retained for the time being, and income support programs will cushion the impact of future tariff increases on the most vulnerable segments of the population. In the second and third year of the program, subsidy will be phased out for users above 200 kWh and reduced for all but the lowest consumers in the 0–200 kWh range.

Source : IMF Country Report No.13/287 Pakistan 2013 article consultation and request for an extended arrangement under the extended fund facility September 2013

2.5.6 NEPRA Suggestion on December 2012

The following relates to the tariff revision determined by NEPRA in February, 2010, according to Rethinking Electricity Tariff and Subsidy in Pakistan (Policy Note, July 2011) The Work Bank Report Number: 62971-PK, Authors: Chris Trimble (PRMPR), Nobuo Yoshida (PRMPR) and Mohammad Saqib (SASDE).

(Excerpts)

In December 2010, NEPRA completed the determination process for FY11 (period covering July 2010 to June 2011). One of the important proposals in these determinations was related to SLAB benefits: benefit of only one previous SLAB would be given to the customers, meaning consumption will be divided into a maximum of two SLABs and their corresponding rates will apply. On the March 2011 notifications, the GOP did not approve these proposals, but we explain in more detail here what they would have meant.

In 2008, all users, irrespective of their final amount, were charged Rs 3.08 for the first 100 kWh. For example, a user with the final consumption of 800 kWh per month was charged Rs 3.08 kWh for the first 100 kWh. However, had the proposed SLAB benefits been approved, for users of the second or above SLABs, only the rates of their SLAB

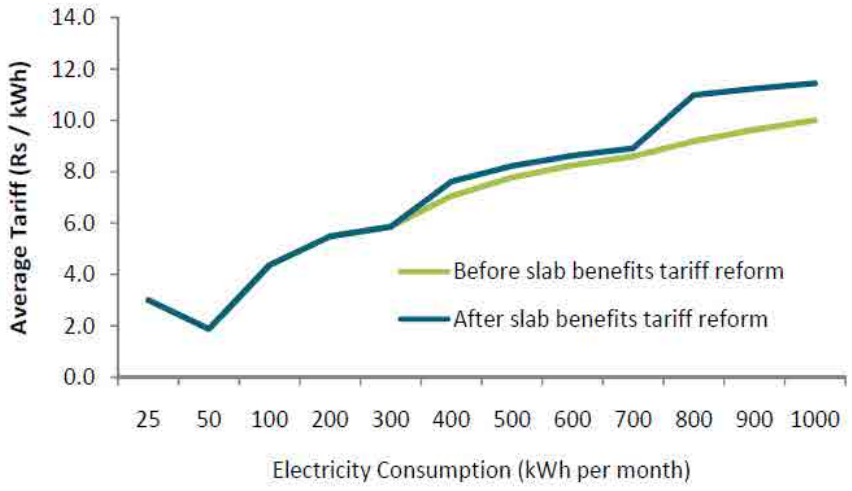
and one SLAB lower can be applied.

For instance, the users in the fifth SLAB are charged Rs 10.86 for the first 700 kWh and Rs 13.56 for the rest, while the users in the fourth SLAB are charged Rs 6.73 for the first 300 kWh and Rs 10.86 for the rest. Such a change increases the average tariff rate further (as Table 2.5-10 illustrates).

The effect of this change on the average tariff is illustrated in Table 2.5-10. The impact is most significant at the 300 and 700 kWh intervals. As Table 2.5-10 illustrates, this can be considered a progressive reform, because the most significant increase occurred at the higher levels of consumption (see Table 2.5-11, which illustrates how few poor households consume at these high levels).

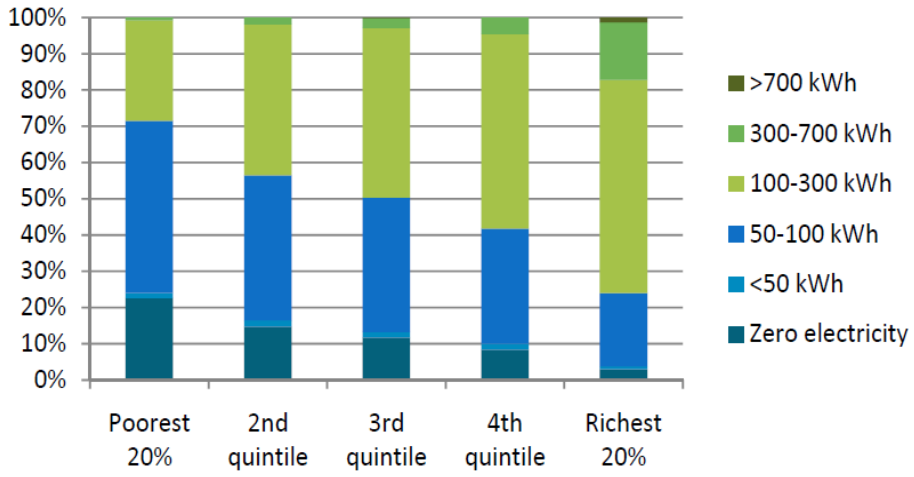
(End of excerps)

Source: Rethinking Electricity Tariff and Subsidy in Pakistan (Policy Note, July 2011) The Work Bank Report Number: 62971-PK



Original Source：World Bank analysis
Source: Rethinking Electricity Tariff and Subsidies in Pakistan (Policy Note, July 2011) The Work Bank Report Number: 62971-PK

Table 2.5-10 Average Tariff for Varying Levels of Electricity Consumption, Before and After Slab Benefits Tariff Reform



Original Source：World Bank staff estimations us z z ing PSLM 2007/08 data.
Source: Rethinking Electricity Tariff and Subsidies in Pakistan (Policy Note, July 2011)
The Work Bank Report Number: 62971-PK

Table 2.5-11 Pakistan HH Electricity Consumption, by Quintile (2008)

2.5.7 Multi-Year Tariff[17]

By Multi-Year Tariff, it means that DISCOs will file application for Tariff to NEPRA not on a single year but multi-year basis.

First of all, for advantages of DISCOs, forecast of cash flow will easily be made, thereby assurance may be given to investors.

Secondly, workload of DISCOs will be mitigated, because no review is required by NEPRA.

After the restructuring of the Water and Power Development Authority (WAPDA) and foundation of independent DISCOs, all the DISCOs filed petitions for the determination of their tariff. Accordingly, NEPRA approved the tariff to be valid for a period of one year excluding FESCO getting a multi-year (five-year) tariff. This was because it was slated for privatization at the time and a multi-year tariff was considered to increase the chances for successful privatization. (Since then, all the DISCOs excludinkg FESCO have been filing annual tariff petitions. NEPRA adopted quarterly tariff adjustments, but thereafter they have been scrapped without implementation.)

In 2008, the NEPRA Act was amended through the Finance Bill approved by the Parliament, directing NEPRA to determine and notify monthly adjustments in consumer tariff due to variations in fuel costs, i.e. energy portion of the power purchase price.

Source: USAID The Causes and Impacts of Power Sector Circular Debt in Pakistan March 2013 P37

Although Faisalabad Energy Supply Company (FESCO) is listed as one of the candidate companies for privatization, FESCO requested NEPRA to determine tariff every year to achieve the target set by the company, because it was not able to achieve privatization. Determination of Multi-Year tariff will also require tariff adjustment every quarter, although NEPRA work load is reduced.

2.5.8 Fuel Adjustment System

Necessity to revise the Tariff Rules is not accepted, because NEPRA Act has already stipulated a similar provision as Article 34. NEPRA has already shortened such an adjustment period to four months based on the information obtained. As shortening of the period depends on the number of petitions, however, it may be impossible to settle all the cases. If a liquidate damage (LD) issue arises, it may be possible to shorten the adjustment period.

Although the distribution companies have sent a bill, passing through the incremental fuel cost to consumers, it is not allowed. In response to the appeal filed by the

[17] Indexation will be increased in line with multi-year (30 years) tariff applied to IPP right of its start.

distribution companies against the previous court order that has tentatively sustained to reimburse the amount of the incremental fuel cost that they have collected to date, NEPRA Determined the tariff reflecting such incremental fuel cost, through the examination and judgment at the tribunal of Islamabad High Court opened in March 21st.

In addition, several appeals have been pending at the Supreme Court, and not only the Government of Pakistan (GoP) but consumers are paying attention to the progression of the examination.

2.5.9 Bulk Utilization

Any companies may go into direct energy sales to Bulk Purchase Consumer (BPC) exceeding 1MW energy usage. It is possible for any companies planning to go into such market to purchase energy directly from distribution or generation companies.

In response to Load Shedding, different tariffs are applied to various consumers. Although Multan Electric Power Company (MEPCO) has a problem of adjusting a balance with the national high voltage transmission grid, it may be solved. While NEPRA necessitates Mix Feeder[18], this system requires investment.

2.5.10 TOU

NEPRA has been working on the contract of Time of Use (TOU), and part of the distribution companies has already installed TOU meters at the rate of 85 to 100%. Consumers using 5kW or more are required to install TOU meters.

2.5.11 Distribution Code

The Distribution Code is a framework for regulating distribution and energy supply systems. In accordance with NEPRA-Determined "Regulation Act on Generation, Transmission and Distribution", all the distribution companies have to obtain license from NEPRA, and all the licensed distribution companies always have to abide by the authorized Distribution Code.

The license obtained by any distribution companies will be suspended for an undisclosed period or repealed, if they violate the said Act.

The Distribution Code authorized by NEPRA defines technical and operational aspects of the relationship among all the operators connecting to the distribution companies and the distribution systems thereof.

Any licensed generation and distribution companies and special purpose companies

[18] Mix feeder will cover both provincial regions and cities with different load.

responsible for generation shall arbitrarily comply with the relevant clauses provided in the Distribution Code.

2.5.12 Issues in Energy Tariff System

2.5.12.1 Analysis of Issues in Energy Tariff System

The following recommendation is made in ENERGY SECTOR CRISIS ISSUES & REFORMS WAY FORWARD by SHAHID SATTAR Member (Energy) PLANNING COMISSION May 23rd, 2013).

- Around 50% subsidy is due to the domestic sector tariff structure:
- Cost of supply is higher than tariff for even the two highest SLABs.
- Full SLAB benefit is given to all consumers:
  - ・Poor households (HH) receive only 10% of the subsidy while majority goes to the richest 40% HHs.
- Tariff structure does not match the consumption pattern of poor HHs:
  - ・Low cut-off point for lifeline consumers (<50 Kwh per month) with min. charge of Rs.75 results in high average tariff.
  - ・Over 50% of the poorest HHs consume 50-100 kWh per month.
- Significant subsidy exist for the first 300 kWh per month:
  - · All HHs (not only poor HHs) benefit from such subsidy.
  - · Subsidizing 300 kWh consumers is contrary to promoting conservation and efficiency.

Source : ENERGY SECTOR CRISIS ISSUES & REFORMS WAY FORWARD by SHAHID SATTAR Member (Energy) PLANNING COMISSION May 23rd, 2013

- For the overall power sector, the average base applicable tariff is Rs.9.00/kWh which is 66% below cost recovery as determined by NEPRA. An additional amount of over Rs.2.00 per kWh is being charged as Fuel Adjustment Surcharge (FAS) which is actually not being recovered.
- If increased fuel costs are merged into the base tariff, the estimated average NEPRA Determined Tariff increases to RS.16.00/kWh. Without a matching increase in Notified tariff, the difference between the applicable and cost recovery tariff increases to over 75%.
- The current tariff mechanism has also failed to arrest the huge non-technical Transmission and Distribution (T&D) losses which are estimated to be around 10-12% of the power generated and include theft, defective meters and unmetered supply.

Source : ENERGY SECTOR CRISIS ISSUES & REFORMS WAY FORWARD by SHAHID SATTAR Member (Energy) PLANNING COMISSION May 23rd, 2013

- Any losses, in addition to NEPRA determined technical T&D losses, would not be allowed as a pass through in the tariff and will be reflected in their respective profit and loss (P&L) accounts (estimated as RS.700 Billion for FY2011-12).
- The above losses may be covered by GoP on a reducing quantum basis (based on an agreed loss reduction program).
- Difference in controllable revenue requirements amongst the DISCOs may be reduced by fixing the targets of improvements, providing incentive to achieve the same and enforcing penalties on failure to achieve the targets during the control period of 5 years.

Source：ENERGY SECTOR CRISIS ISSUES & REFORMS WAY FORWARD by SHAHID SATTAR Member (Energy) PLANNING COMISSION May 23rd, 2013

2.5.12.2 Suggestion for Improved Energy Tariff System

1）Determination of appropriate tariff

The following improvement plan is recommended in ENERGY SECTOR CRISIS ISSUES & REFORMS WAY FORWARD by SHAHID SATTAR Member (Energy) PLANNING COMISSION May 23rd, 2013).

- Rationalize domestic sector tariff as it forms the bulk of the subsidy:
- Increase life-line SLAB to 100 Kwh/month/consumer and remove min. charge of Rs. 75/month with a direct subsidy mechanism.
- Increase tariff beyond 100 Kwh/month to NEPRA Determined tariff.
- Restrict the SLAB benefit to one previous SLAB only.
- Introduce an industrial tariff category (with 50% premium) for guaranteed uninterrupted supply.
- Devise a mechanism to deal with costs incurred outside NEPRA (fuel adjustment not collected, interest for late payments, GST not collected).

Source：ENERGY SECTOR CRISIS ISSUES & REFORMS WAY FORWARD by SHAHID SATTAR Member (Energy) PLANNING COMISSION May 23rd, 2013

2）Reduction of technical-loss and non-technical loss

According to ENERGY SECTOR CRISIS ISSUES & REFORMS WAY FORWARD by SHAHID SATTAR Member (Energy) PLANNING COMISSION May 23rd, 2013), the following improvement of tariff collection plan including necessary legislation of penalties will be conducted throughout the country.

- Implement a national plan to improve tariff collections (with necessary legislation for penalties).
- Outsource high loss feeders for tariff collection.
- Introduce pre-paid smart metering.

- Promulgate anti-theft law.
- Launch Public awareness campaign – if bills are paid and smart meters are installed, Load Shedding will be reduced.
- Adjust electricity bills of provinces/defense installations at source with federal govt.
- Assign priority of supplies to DISCOs (with lower Load Shedding) in areas with improved collection and lower losses.

Source : ENERGY SECTOR CRISIS ISSUES & REFORMS WAY FORWARD by SHAHID SATTAR Member (Energy) PLANNING COMISSION May 23rd, 2013

3) Development of a comprehensive plan

According to ENERGY SECTOR CRISIS ISSUES & REFORMS WAY FORWARD by SHAHID SATTAR Member (Energy) PLANNING COMISSION May 23rd , 2013), the Government should put together a summarized comprehensive plan that defines financial resources, schedule and implementation strategies, showing realistic targets as shown below:

- Prioritize investments required for generation and distribution infrastructure – owing to shortage of base load capacity, give priority to large sized multi-unit projects with low per unit cost and high capacity factor (Hydel, coal).
- Promote public-private partnerships (PPP) in a transparent manner.
- Introduce special purpose vehicles to meet the financing needs of large hydropower and coal projects.
- Revitalize the privatization program and ensure timely commissioning of 7,600 MW in process IPPs by 2017.
- Fast track the rehabilitation of de-rated capacities.
- Allow Feed in Tariff (say at 5% discount over average generation costs) with standard contracts to encourage distributed power supply to the grid at remote locations.

Source : ENERGY SECTOR CRISIS ISSUES & REFORMS WAY FORWARD by SHAHID SATTAR Member (Energy) PLANNING COMISSION May 23rd, 2013

2.6 Present Situation and Challenges of Energy Distribution Business

2.6.1 Outline of Energy Distribution Companies

Eleven distribution companies are operating in Pakistan. The Planning Commission considers that the demand of FESCO will grow the fastest. The Government of Pakistan has a plan to privatize the distribution companies in future, while at present having discussions to transfer the control over them to each Provincial Government concerned. The government of the KPK (Khyber Pakhtunkhwa) Province, where PESCO

(Peshawar Electric Power Company) is located, requires that the control over not only the distribution companies but the generation plants in the KPK Province should be transferred to the Provincial Government.

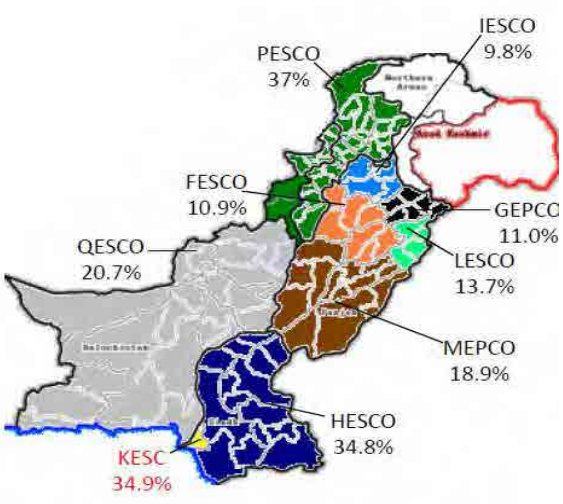
Souce : http://www.pakistantoday.com.pk/2013/12/30/national/nawaz-gives-nod-to-hand-pesco-over-to-kp-govt/
The News 11 Feb,2013(Referred in February 10th, 2014)

Table 2.6-1 DISCO-Wise Computed Peak Demand (MW) Forecast Summary

(MW)

Name	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2012-22	Increasing rate
LESCO	4062	4326	4478	4649	4855	5063	5271	5495	5736	5976	6210	4.3%
GEPCO	1994	2093	2198	2324	2439	2560	2686	2818	2957	3102	3254	5.0%
FESCO	2812	3013	3216	3427	3651	3886	4167	4480	4807	5127	5450	6.8%
IESCO	2285	2389	2481	2621	2754	2894	3047	3201	3354	3509	3669	4.8%
MEPCO	3106	3299	3499	3734	3949	4170	4399	4636	4894	5161	5438	5.8%
PESCO	2606	2645	2754	2865	2976	3089	3202	3316	3431	3547	3663	3.5%
HESCO	1350	1421	1496	1574	1656	1742	1831	1926	2024	2128	2236	5.2%
QESCO	1245	1288	1332	1377	1425	1474	1525	1579	1635	1693	1753	3.5%
TESCO	622	641	662	682	704	726	750	774	799	825	852	3.2%
SEPCO	1019	1070	1122	1176	1232	1290	1350	1412	1476	1542	1611	4.7%
DISCOs Demand (Diversified)	18592	19545	20473	21523	22590	23695	24871	2612	27412	28730	30075	4.9%
T & T Losses (500 & 220kV)	593	626	655	689	723	759	796	836	878	920	963	5.0%
% T & T Losses (500 & 220kV)	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	
NTDC Demand	19121	20171	21129	22212	23313	24453	25667	26948	28290	29649	31038	5.0%
Auxiliary Consumption	327	345	361	380	398	418	439	460	483	507	530	4.9%
% Auxiliary Consumption	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	
X- WDISCOs Demand w/o Export to KESC	19448	20516	21490	22592	23711	24871	26105	27408	28773	30156	31568	5.0%

Source : ENERGY SECTOR CRISIS ISSUES & REFORMS WAY FORWARD by SHAHID SATTAR Member (Energy) PLANNING COMISSION May 23rd , 2013



Distribution losses in 2009-10
Energy Sold as % of Energy Purchased (PEPCO)

Source: Financing Pakistan's Power Sector after the Global Financial Crisis, KazimSaeed World Bank Pakistan Energy Team Dhaka February 9, 2011

Table 2.6-2 Distribution Companies in Pakistan

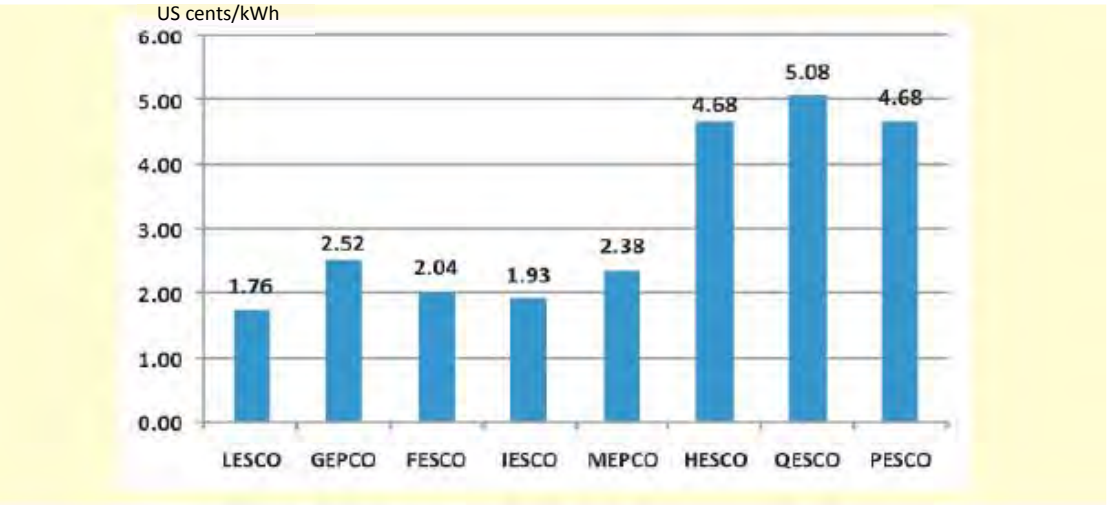
2.6.2 Issues in Managing Energy Distribution Companies

It is considered that the following five factors are the causes of the Circular Debt incurred in the distribution companies.

① Notification by NEPRA
② Determination by GoP
③ Loss (Transmission loss in 132kv lines and Distribution loss in 11kv lines)
④ Collection ratio(Commercial loss)
⑤ Interest cost due to payment arrears from CPPA to IPP is not allowed to pass through to end consumers.

It is assumed that the Circular Debt due to the factors ① and ② above accounts for more than 60% of the total Circular Debt

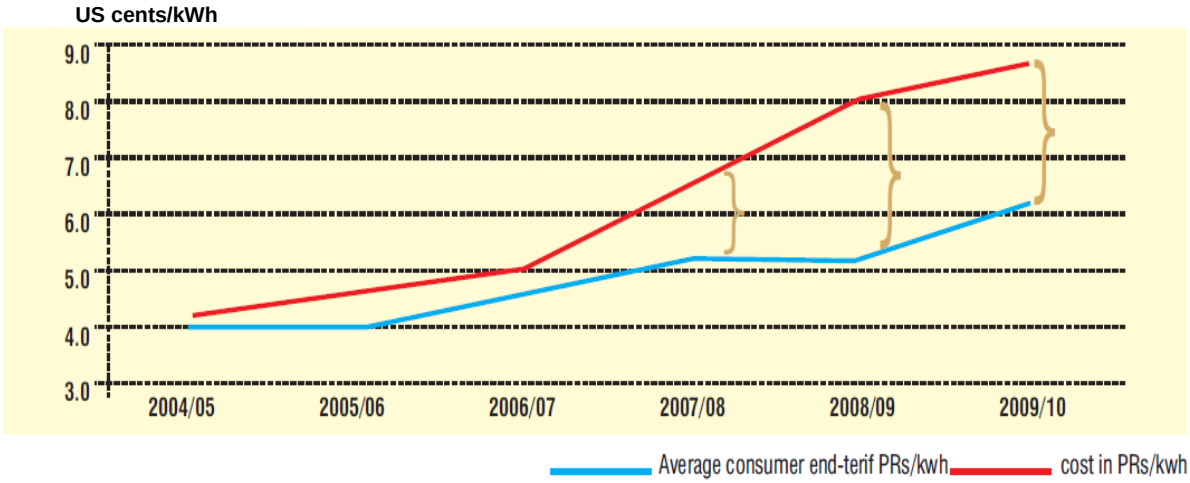
Looking at the subsidy (US cents/kWh) granted to each distribution company, it is especially high in QESCO, PESCO and HESCO in the borderland. (Table 2.6-3)



Note: FESCO=Faisalabad Electric Supply Company, GESCO=Gujranwala Electric Supply Company, HESCO=Hyderabad Electric Supply Company, IESCO=Islamabad Electric Supply Company, LESCO=Lahore Electric Supply Company, MEPCO=Multan Electric Power Company, PESCO=Peshawar Electric Supply Company, QESCO=Quetta Electric Supply Company
Original source: Based of PEPCO data
Source: Integrated Energy Sector Recovery Report & Plan October 2010

Table 2.6-3 Subsidies per Kilowatt Hour Sold per Distribution Company in Fiscal Year 2009/10

Cost loss margin or the gap between the retail price and Cost of Service is expanding year by year (Table 2.6-4).



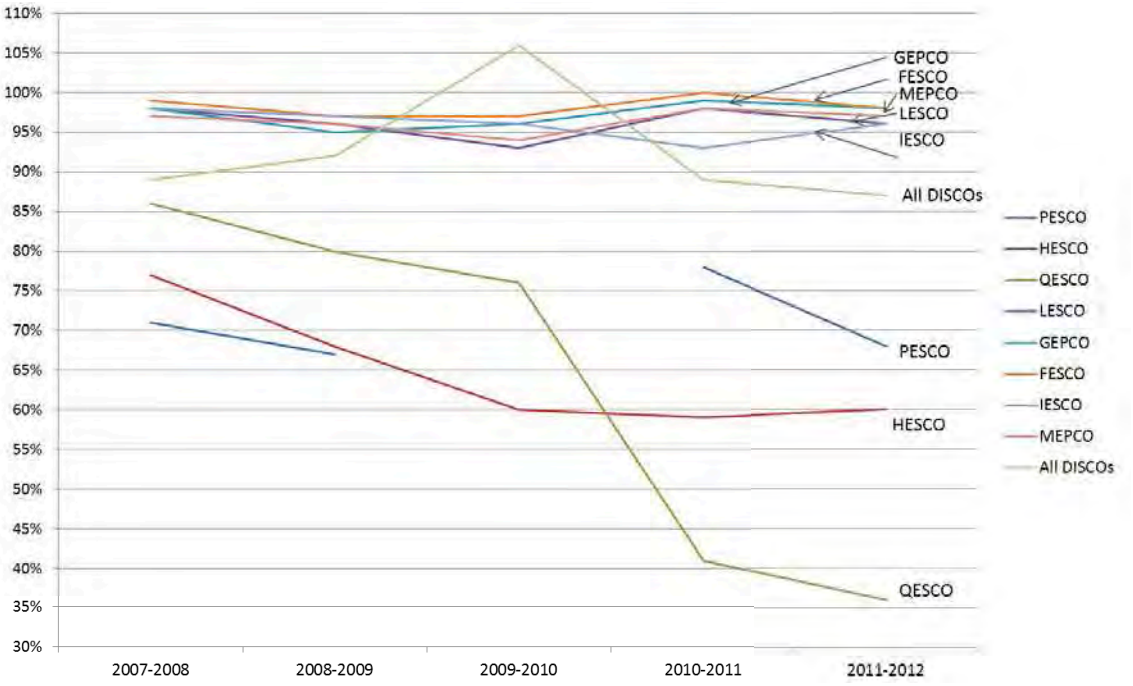
Original Source: .PEPCO data.
Source: Integrated Energy Sector Recovery Report & Plan October 2010

Table 2.6-4 Gap between Cost of Service and Retail Price

2.6.3 Tariff Collection Rate

Tariff collection ratio is lower, and the difference between billed and collected amount is extremely large at HESCO in Hyderabad, PESCO in Peshawar and QESCO in Quetta.

Looking at the ratio by Province, it is especialy low in the Balochistan Province and the Sindh Province, as compared to the national average of 86%.



Note 1: PESCO Includes TESCO. HESCO Includes SEPCO
Note 2: PESCO 2009-2010 figure is 227%
Source: PEPCO DISCOs Performance Reports FY 2008-2012

Table 2.6-5 Transition of Energy Collection Ratio by DISCO

2.6.4 Return on Business

A different System of Return on Business is applied to NTDC, a transmission company, and to generation companies (GENCOs) and distribution companies (DISCOs). Return on Business is defined as expense required for raising capital (equity and borrowed capital) to do and maintain business. As Table 2.6-6 shows, NTDC's required Return on Business is determined as a value in between required revenue (Maximum) submitted to NEPRA and NEPRA-calculated value (Minimum), which will be notified (Notification: S.R.O.886) as the Wheeling Charge (Fixed charge, Variable). The revenue requirement of NTDC includes transmission loss exceeding 2.5% and income tax, which are not approved by NEPRA. Whereas a fair rate of Return on Business as energy business is applied to GENCOs and DISCOs by the formula:

Return on Business = Rate Base x Rate of Return on Business

By this formula, the revenue requirement will be calculated and energy tariff will be determined.Note that Rate Base means the value of business asset (including fixed assets, long-term investment, cash and deposits for the electric power business), which is considered as necessary and effective for efficient management and Rate of Return on Business is calculated as WACC (Weighted Average Cost of Capital). Generally the following formula is used for WACC:

WACC = (Debt Radio × Cost of Debt) + (Equity Radio × Cost of Equity)

Table 2.6-6 Return on Business for NTDC and GENCOs/DISCOs

	NTDC Net Revenue Required :	GENCO/DISCOs Net Revenue Required :
Revenue Requirement	＜NTDC's Net Revenue Required submitted to NEPRA:Max＞ Estimation is made for the peak demand inccluding KESC. **Net Revenue Requirement** =General Establishment + Repair&Maintenance + Insurance + Depreciation + Transmission losses beyond 2.5% + Provision for bad debts + Financial Charges + Income Tax @ 35% + Return on Equity (=14.66 % Note1) (－) Other income NTDC (－)CPPA	Revenue Requirement of GENCO, DISCOs = Rate Base × WACC (=Return on Rate Base) WACC = (Debt ratio(注 2) × Cost of Debt) + (Equity ratio × Cost of Equity (=14.66 %) , where Cost of Equity = Rate of Return on Equity = Risk free rate + Equity β (Beta) × Market Premium (= Rm - Rp) = 11.4 + 1.33 × 8.39 = 14.66 %
	＜NEPRA's Calculation:Minimum＞ Capital Base = Fixed Assets + Current Assets – Debts (Loan + Borrowing) Capital Base × Reasonable return on Capital (Base (%)) (=12.75 %) =Reasonable return on Capital Base	

Note1 : While NTDC required 14.66% ROE, NEPRA finally approved 13.11%. In a previous case, NEPRA finally approved 13.11% ROE, when JPL required 15% in 2006.

Note2 : Debt Radio = Total Debt / Total Capital, Equity Radio = Total Equity / Total Capital

Source: Developed by Prof. Nagayama at Kyoto University, using Determination of the Authority in the matter of NTDC No. NEPRA/TRF-226/NTDC-2013 and S.R.O.886

Generally CAPM (Capital Asset Pricing Model) is used for Cost of Equity.
Where, Cost of Debt is Rate of Return on Borrowed Capital, whereas Cost of Equity is Rate of Return on Equity Capital.
Cost of Equity = Risk-free Rate + (Equity Beta x market Risk Premium)
Equity Beta = Measure of the risk of the business in relation to the risk of the equity market as a whole.
Market Risk Premium = Difference between the expected return and the risk-free rate

What follows is a description related to the calculation process of Return on Business for GENCOs and DISCOs excerpted from Determination of the Authority in the matter of NTDC No. NEPRA/TRF-226/NTDC-2013.

(Excerps)
The Petitioner requested the Authority to allow 14.66% return on equity as against the Authority's allowed ROE of 12.75% in the last determination for the FY 2010-11.

The Petitioner while justifying the ROE referred the CAPM model used by the Authority for DISCOs and GENCOs.

The Petitioner stated that DISCOs and GENCOs had worked out values of Beta, return on equity and weighted average cost of capital (WACC), however NEPRA did not agree with the companies and determined its own figures.

NTDC stated that NEPRA allowed in 2008 constant rate of return on equity of 19.86% to LESCO, GEPCO, MEPCO, IESCO, PESCO and QESCO whereas while approving the tariff for the year 2003 NEPRA allowed the Petitioner ROE of 12.75% as was done for JPCL. The ROE was maintained in 2006 and 2011 although NEPRA in 2006 allowed 13.11% ROE in case of JPCL.

While justifying the ROE, the Petitioner stated that NEPRA allowed DISCOs ROE based on the following:
Equity Beta 1.33
Tax Rate 35%
Risk Free Rate 11.40%
Market Premium 8.39%
ROE: Rate of Return on Equity: Risk Free Rate + Equity Beta x Market Premium

The Petitioner stated that substituting the above values in CAPM formula, the ROE is worked out as under:

11.40 + 1.33 x 8.39 = 22.6%

Return on Equity (after tax of 35%) = 14.66%

(End of excerpts)

Source：Determination of the Authority in the matter of NTDC No. NEPRA/TRF-226/NTDC-2013

2.6.5 Loss Reduction Program for DISCOs (IMF Report)

IMF Country Report (2013) includes the following in the program;

1) Execution of Performance Contract[19]

2) Reinforcement of penalty for power theft

3) Installation of smart meters

What follows are excerpts from IMF Country Report (2013)

A key shortcoming of the current electricity sector has been the limited ability to collect for energy supplied, due in part to a lack of specific real-time data on energy flows, and which also results in inadequate compliance with usage restrictions. To address this, we are going to sign strengthened performance contracts with all power sector companies to tackle losses, raise payment compliance, and improve energy efficiency and service delivery. In cases of failure to comply with the performance contracts, we will invoke remedial measures for management and the Boards as specified in the Companies' Ordinance. The government will enact the pending amendments to the Penal Code 1860 and the Code of Criminal Procedures 1898 to strengthen the legal framework in cases of electricity theft by enhancing investigation, prosecution, and penalties by end-December 2013 (structural benchmark). In parallel, we are drafting a new Electricity Act to modernize governance of the sector. The act will establish investigation systems and a fast track judicial mechanism to improve enforcement. We are also empowering the distribution companies (DISCOs) to take commercial decisions on power allocations and allowing them to impose differentiated outages on neighborhoods with low payment rates (as is already done in Karachi). This new legislation, along with the installation of smart or pre-paid metering trees, will allow better load management in the national grid and will reduce losses. Such legislation will also decrease the unscheduled load-shedding, which is particularly damaging to economic productivity. In the short-run, we will move

[19] Performance Contract in Pakistan is called Signalling System, consisting of (i) Performance Information Sytem to measure practical measures taken, (ii) Performance Evaluation System to evaluate socially desirable measures taken and (iii) Incentives giving a reward or imposing penalties based on the performance of the distribution companies at the end of the term.
Source: Performance Contracts: A Handbook for Managers

to a web-based reporting portal to monitor electricity draws to reduce overdraws and improve information flows. The metering at the incoming and outgoing 11kv feeders will be completed by end-August 2013. To minimize losses in fuel delivery to generation companies (GENCOs), we will lease the fuel storage and delivery facilities to Pakistan State Oil (PSO) by end-December 2013.

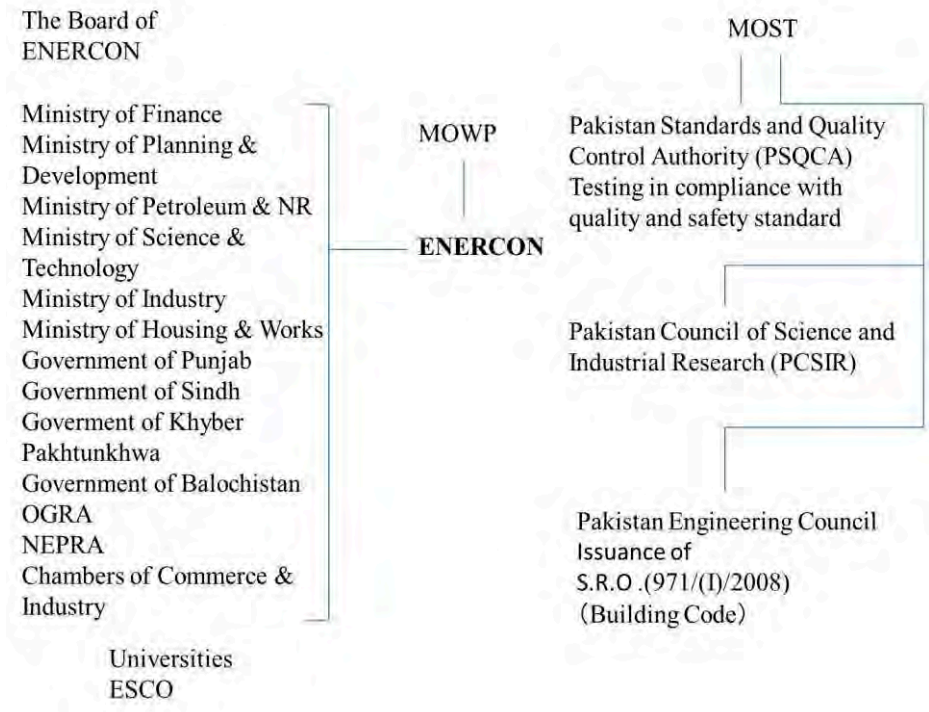
Source : IMF Country Report No.13/287 Pakistan 2013 article consultation and request for an extended arrangement under the extended fund facility September 2013

2.7 Energy Conservation

2.7.1 Organization of Energy Conservation

Energy conservation in Pakistan is assumed by ENERCON under MOWP and other institutions or agencies under the Ministry of Science and Technology (MOST) including PSQCA and PCSIR.

ENERCON and other several institutions or agencies get involved in energy conservation in Pakistan. For example, Pakistan Standard Quality Control Agency (PSQCA) is in charge of introduction and adoption of the International Energy Performance Standard, while Pakistan Council of Science and Industrial Research (PCSIR) has a function of inspection and certification on equipment used in Pakistan.



Source : JICA Survey Team

Table 2.7-1 Relationship Diagram of Institutions Related to Energy Conservation

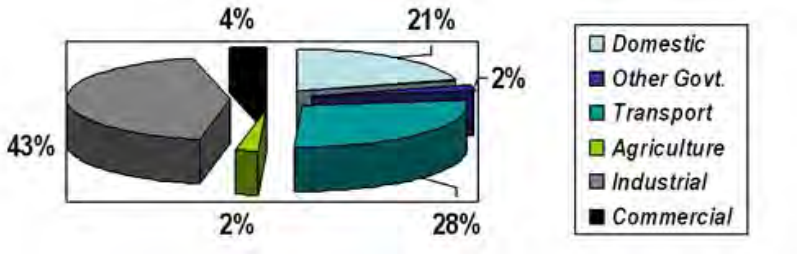
2.7.2 Present Situation and Potentiality of Energy Conservation

Energy conservation activities in Pakistan are required to rouse cost-consciousness. According to proforma calculation by ADB, potentiality of energy conservation in 2008 reached 15.4% of the total energy consumption. The National Energy Conservation Policy established by the Ministry of Environment in November, 2006 provides:

(a) Promote energy conservation and control across all the sectors
(b) Develop an energy conservation market and commercialize the relevant products and services
(c) Promote utilization of domestic energy source and reduce reliance on imported fuel
(d) Promote rationalization, innovation in technology and reduction of energy consumption through waste reduction

However, the Policy may not be workable, because no provision for responsible institution or method of achievement is defined.

The highest energy conservation level is achieved by the industry sector (43%), followed by the transportation sector (28%) and the construction sector (23%).



Note：Total: 39.4 Million TOE-excluding informal sector
Source: http://www.enercon.gov.pk/index.php?option=com_content&view=article&id=28&Itemid=27

Table 2.7-2 Energy Consumption by Sector

Assuming the entire potentiality to be 100%, potentiality of energy conservation in each sector is shown below:

Potentiality of energy conservation in Pakistan

Industry	25%
Transportation	20%
Agriculture	20%
Construction	30%
Average	25%

Potentiality of energy conservation in Pakistan will reach 5Billion USD a year.

Source:http://www.enercon.gov.pk/index.php?option=com_content&view=article&id=28&Itemid=27
(Referred in Ocotober28th,2013)

It may be possible to introduce boilers purchased in the competitive market as energy saving facilities, because competition is very keen with each other in the field of shoes, leather, textile and iron/steel.

In addition, reduction of technical loss through additional investment in transmission and distribution grid may lead to a great deal of energy conservation.

2.7.3 Issues in promoting Energy Conservation Policy

For promoting energy efficiency and conservation policy in Pakistan, the following two issues are envisaged as a peculiarly Pakistani aspect.

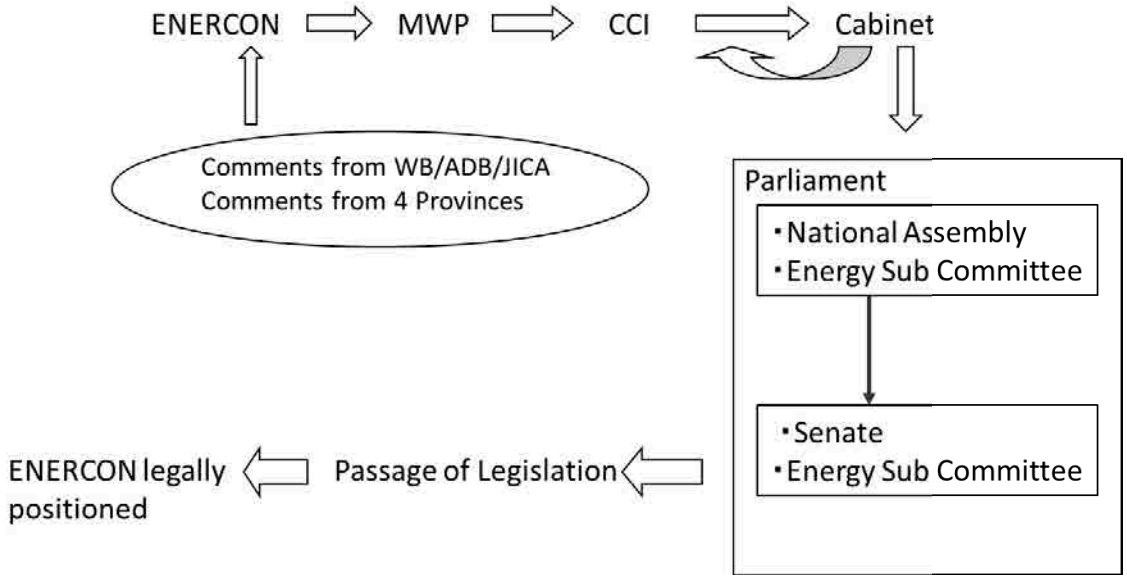
1) Issues in designating energy business operators: While the obligation of declaring energy usage is imposed on factories and offices using more energy than a pre-defined level in some foreign countries, energy usage may not always be declared honestly in the event that production volume is cheated to reduce tax payment.
2) Issues in financing: It is not possible to seize leasee's property in Pakistan, even in the case where arrears is incurred after leasing out energy saving machinery.

2.7.4 Energy Conservation Bill

2.7.4.1 Previous Circumstances of Draft Energy Conservation Bill

Even today, the draft Energy Conservation Bill is established, which, however, remains on mainly having stipulated foundation of ENERCON.

Table 2.7-3 shows a process where the Energy Conservation Bill will be examined in the Government of Pakistan and legally positioned thereafter.



Source: JICA Survey Team

Table 2.7-3 Deliberation Steps for Energy Conservation Bill

The "Pakistan Energy Efficiency & Conservation Bill, 2011", was approved in principle by the Cabinet in its meeting held on 28 September 2009, and vetted by Law & Justice Division on November 2010. It was introduced in the National Assembly on 26 January 2011.

Source : http://www.enercon.gov.pk/index.php?option=com_content&view=article&id=17&Itemid=18(Referred in Ocotober 28th,2013)

2.7.4.2 Characteristics of Energy Conservation Bill in Pakistan

As Pakistan introduces a federal system like India, Characteristics of Energy Conservation Bill in Pakistan follows a process flow where the Bill defines legal authority of an implementing agency of the Bill, thereafter the detailed rules determines major implementing items. For this reason, no numerical rule is provided in the draft Energy Conservation Bill.

Table 2.7-4 Comparison between Energy Conservation Bill of Pakistan and Other Countries

Thailand			Japan	Vietnam	Philippines	India	Pakistan
Energy Conservation Promotion Act (1992) B.E. 2535 Latest revision B.E.2552 (2009)			Law Concerning the rational use of Energy 1979 Latest version May 2013	Law on Energy Efficiency and Conservation(2010) Decree (March 2011) On detailed regulations and implementation measures of the Law on Energy Efficiency and Conservation	House Bill 3018	India	Energy Efficiency and Conservation Bill, 2013
	Main Items	Contents					
1	Target energy source	Renewable energy and Non-renewable energy	Fossil fuels (Including heat and/or electrical energy to be converted)			All kind of energy including "fossil fuels, nuclear power, hydroelectricity and Renewable energy" (Ch I 2. (h))	
2	Energy Conservation in factories and buildings	install one or many transformers with a total installed capacity of 1,000kWh(1,175kVA) Annual energy consumption of not less than 200 millions mega Jules.	Annual energy consumption of 1,500 kL-TOE and over	Production facilities in industry, agriculture, transportation that have total annual energy consumption of one thousand tons of oil equivalent (1,000 TOE) or higher Construction works which annually consume energy of five hundred tons of oil equivalent (500TOE) or higher.	The industrial, commercial and transport establishments consuming more than two million (2,000,000) fuel oil equivalent liters of energy annually among the establishments consuming more than five hundred thousand (500,000) fuel oil equivalent liters of energy are required to submit energy conservation programs through qualified engineers to act as energy managers.	"Access to a Continuous load of 500kW,or Contract over 600kVA Full commercial facility" (Ch I 2. ©)	No numerical provisions
	2-1 Designated Standards (Decree)						
	2-2 Energy Manager	PRE(Person Responsible for Energy) and Senior PRE(S-PRE) (buildings and factories with 60 million MJ/ year or Trans capacity of 3000kW or over)	Energy management control officer, Energy management planning officer, Energy manager (3000kL/year and over), Energy management officer	Specified	N/A	Individuals that meet pre-denined criteria “energy manager” means any individual possessing the qualifications prescribed under clause (m) of section 14 (Ch I 2. (m))	No numerical provisions
	2-3 Fundamental Policies	Fundamental policies of 7 measures for factories and buildings	Energy management standard setting duties Evaluation standard		N/A	“energy consumption standards” means the norms for process and energy consumption standards specified under clause (a) of section 14 Ch I 2. (k)	N/A
	2-4 Periodical Reports	Report using designated forms for buildings and factories Report on Energy management(cf.2-5)	Periodical report, medium-to-long term plans		N/A	Periodic reports (Ch.V 14. (l))	Not specified

Thailand			Japan	Vietnam	Philippines	India	Pakistan
Energy Conservation Promotion Act (1992) B.E. 2535 Latest revision B.E.2552 (2009)			Law Concerning the rational use of Energy 1979 Latest version May 2013	Law on Energy Efficiency and Conservation(2010) Decree (March 2011) On detailed regulations and implementation measures of the Law on Energy Efficiency and Conservation	House Bill 3018	India	Energy Efficiency and Conservation Bill, 2013
Main Items		Contents					
	2-5 Standards of energy management	Contents and fundamental items to be executed (9 items) Energy management investigations and investigators (including qualitification requirements)	N/A		N/A		Not specified
3	Standards for energy conservation in building design	Plans on applied standards and subjected equipment, equipment standards and calculation method on energy conservation and usage of renewable energy	Specified as in Thailand; provided, however, renewable energy including solar power generation is not included.		N/A		Building code
4	Energy conservation in Machinery, Equipment and promotion of energy-efficient materials	Energy efficiency standards and labeling system (MEPS: Minimum Energy Performance Standard HEPS: High Energy Performance Standard)	Top-runner standards and labeling system	Specified	As the Energy Conservation Law is not established, DTI-BPS (Department of Trade and Industry-Bureaw of Product Standard) defines in the EES & L (Energy Efficiency Standards & Labeling), regulates by law in the PNS (Philippines National Standards), including MEPS as well.	Specified (Ch. V 14. (a), (b))	necessary Adjustment with ✓Pakistan Standards and Quality Control Authority(PSQCA), ✓Pakistan Council of Seience and Industrial Research(PCSIR) required
5	Fund for promotion energy conservation	Establishment of Fund Committee to carry out financial support, regulations on systems and standards of fund raising and investment	N/A	Specified	Specified	energy conservation Funds available Ch VII 20. (1)	Energy conservation Funds available
6	Others	Measures for promotion and assistance, including penal provisions	Policies on transportation, Duties on raising public awareness by the energy suppliers and penal regulations.	Energy Conservation Master Plan(2008-2009)	NEECP	"Penalties Rules" (Ch VIII 26. (1))	There are provisions of the "energy audit (Article 11) Penalties+A14:H1 6 rules

Note：Penalties in Thailand are stricter than in Japan. (the severest punishment is by 2-year imprisonment or a fine of 1000THB.)

Source: For the format of the whole table, Thailand and Japan (note 1), referred to “Trend of Energy Conservation in the South Asian countries” (2013), Kazuhiko Yoshida, The Energy Conservation Center, Japan, in the second Business Seminar of the Business Promotion Conference including Global Energy Conservation, for the Philippines, developed, referring to “Survey on Energy Conservation Plan”, JICA (2012), for Vietnam, developed, referring to the materials obtained from respective government, and for Pakistan, developed, referring to http://www.enercon.gov.pk/index.php?option=com_content&view=article&id=59&Itemid=59 in December 23,2013

The following items are listed as what should be incorporated in the Bill in future.

- ✓ Legislate designation of factories as "designated factories" by type, energy usage and energy usage method
- ✓ Minimum Energy Performance Standard (MEPS)
- ✓ National qualification system for Energy Manager and Auditor (Certified Energy)
- ✓ Detailed examination through regulation.

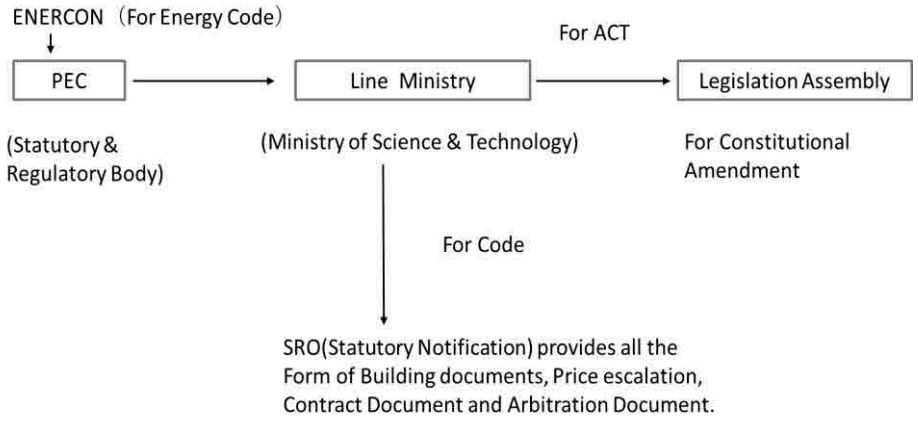
2.7.5 **Building Code** (refer to Reference 5 for the Building Code)

As a lot of energy is consumed in buildings in most countries, even Pakistan has a tremendous amount of potential in energy conservation. Building Energy Code (S.R.O.249 (I) 2013) is a Seismic Provision submitted in September, 2008 as a provision of Building Code, which had become effective in 1986, after a big earthquake attacked Kashmir in the northern part of Pakistan in 2005. The Building Energy Code was developed by Pakistan Engineering Council (PEC) and S.R.O.249 (I) 2013 (Statutory Notifications) was submitted by the Ministry of Science and Technology (MOST) in March, 2013.

This Building Energy Code (S.R.O.249 ( ) 2013) stipulates the buildings with facilities consuming more than 100kW or contract energy of more than 125kVA are targeted for regulation.

Note, however, that PEC serves as a Statutory Regulatory Body (meaning statutory legal), and takes responsibility for all the technical matters.

Source: http://www.pec.org.pk/sro/28march.pdf (Referred in February 9th, 2014)



Source: JICA Survey Team

Table 2.7-5 Process from PEC to Code/Act

2.7.6 Energy Conservation Project by International Institutions

Energy Efficiency Loan from the Asian Development Bank is provided for replacement of 3 million inefficient incandescent bulbs with energy efficient CFLs.

This will reduce peak load by about 1,000 MW and result in savings of about 2,100 GWh. The World Bank is also providing 3 million CFLs under a loan approved in June 2008.

Source：Energizing Pakistan Challenges and Opportunities in Energy Sector P.19

2.7.7 Future Energy Conservation

The following recommendation is made in ENERGY SECTOR CRISIS ISSUES & REFORMS WAY FORWARD by SHAHID SATTAR Member (Energy) PLANNING COMISSION May 23rd, 2013).

The Apex institution should give momentum to some critical EEC (Energy Efficiency Conservation) measures, such as:

- Mandatory convert to solid state lighting.
- Replace conventional gas geysers with solar and hybrid heaters (solar/power and solar/gas) and instant gas heaters saving of around 300 MMCFD of gas.
- Retrofit gas geysers with cone baffles (estimated saving of 77 MMCFD gas if implemented at national level).
- Mandatory solar lighting for telecom towers and billboards.
- Pursue proper implementation of the Tube-well Efficiency Program.
- Implement a mechanism for annual fitness testing and certification of motor vehicles to improve vehicle efficiencies.
- Continue implementation of effective load management strategies at national level (leveling peak demands).

Source: ENERGY SECTOR CRISIS ISSUES & REFORMS WAY FORWARD by SHAHID SATTAR Member (Energy) PLANNING COMISSION May 23rd, 2013

2.8 Performance Evaluation of the Energy Sector in Pakistan

Performance evaluation of the energy sector in Pakistan is summarized as Table 2.8-1.

Table 2.8-1 Performance Evaluation of the Energy Sector in Pakistan

	Entry	Ideal form in the situation of Pakistan in 2013	Present evaluation		Way Forward
Power generation	Efficient energy generation	Not only IPPs but GENCOs will generate power efficiently at low cost.	×	− Large-capacity hydropower has not been developed. − Even though Pakistan is a coal-producing country, almost no coal –energy generation hasn't been in place. − GENCOs' efficiency is extremely poor[20]. − Restrictions are imposed on fuel purchase because of the Circular Debt and the adjustment for the WADPA payment.	GENCO or part of GENCO plants will be privatized or leased out.
	Smooth start-up of IPPs	Transparent and clear-cut IPP procedures are put in place for investors and revision of the tax system after investment is not made. Transparent selection of power generation operators are put in place.	○	PPIB accepts loaned staff from MOWP, having experience of almost 20- year history and evaluation capability.	Solicited bid will be taking place under an energy supply project at minimal cost.

[20] The operation method of the plants with poor combustion efficiency and/or operation rate should be reviewed.

Power generation	Development of renewable energy	Smooth development of solar light energy, wind power and small hydropower will be made.	×	FIT (Upfront tariff)[21] is provided for wind power. 17% IRR is undertaken. Even though there is a possibility of small and medium hydropower using irrigation plant and canal, no information is available for investors. The capacity building of AEDB/provincial government is at issue.	Small and medium hydropower plan will be developed.
	Energy source at optimum and minimum cost, considering operation of water.	It is necessary to consider an optimal water operation (between dams, or using irrigation).	△	Part of cascade hydropower has to be fixed without conflict between upper stream and lower stream.	
Transmission	CPPA (single buyer)	Under the framework of a single buyer, distribution companies do not have incentive to procure less inexpensive power.	×	N/A	CPPA should further reinforce the governance in future and improve transparency of transaction between IPPs and distribution companies.
	Neutralization of transmission network (clarifying the wheeling charge).	N/A	×		

[21] Upfront tariff means that electric power generated as renewable energy will be purchased at more favorable price or fixed price (same as FIT scheme). Note, however, that it will be provided not from the Government subsidy, but from power tariff.
(Reference: Working Paper for Solar PV Upfront Tariff Development
(http://www.nepra.org.pk/Tariff/Upfront/UPFRONT SOLAR INFORMATION.PDF)) (Referred in October 31st, 2013)

Transmission	Designing for clear-cut transmission tariff used for system reinforcement and planning method for transmission system.	Finalized through NEPRA determination and public hearing.	×	(Further study is required.) There is a room for further study whether or not the wheeling charge is appropriate.	A centralized and efficient planning unit should be founded to improve planning for an integrated generation sector, regarding investment, generation and supply.
	Institutionalization of smooth energy interchange.		×	A single buyer of NTDC/CPPA/WPPO is being replaced with a whole sale competition.	
	Healthy financial condition of a single buyer (due to promotion of energy generation).		△	A different payment method is used for payment from a single buyer (CPPA/ WPPO) of NTDC to IPPs, considering the power relationship between the parties concerned.	CPPA should be disintegrated from NTDC (with regard to license as well as budget).
	Effort to reduce transmission loss.	No problem of restriction on transmission has been revealed due to less load flow.	△	Transmission loss (500kv, 220kv) is as low as approx. 2.8%, probably because load flow is lower.	

Distribution /retail service	Options of consumers for energy source.	N/A	×	There is no room for options because the distribution companies are responsible for their segmented service territory.	Bulk consumers will make a direct contract with the generation companies.
Energy Conservation	An energy conservation plan is developed and implemented.	Building and update of energy database, labeling, DSM, enlightenment of consumers, ESCO and diffusion of LED lamps will be performed.	×	Private business operators for energy conservation such as IESCO are not fostered. While many institutions responsible for energy conservation have been put in place, no cross-ministerial platform is established.	A comprehensive energy conservation policy for the country will be required. Passage of the Energy Conservation Bill will be required. Capacity building between energy-related institutions including ENERCON will be required.

Source：Developed by Professor Nagayama, Kyoto University

Chapter 3
Present Situation of Institutions related to Energy Sector in Pakistan

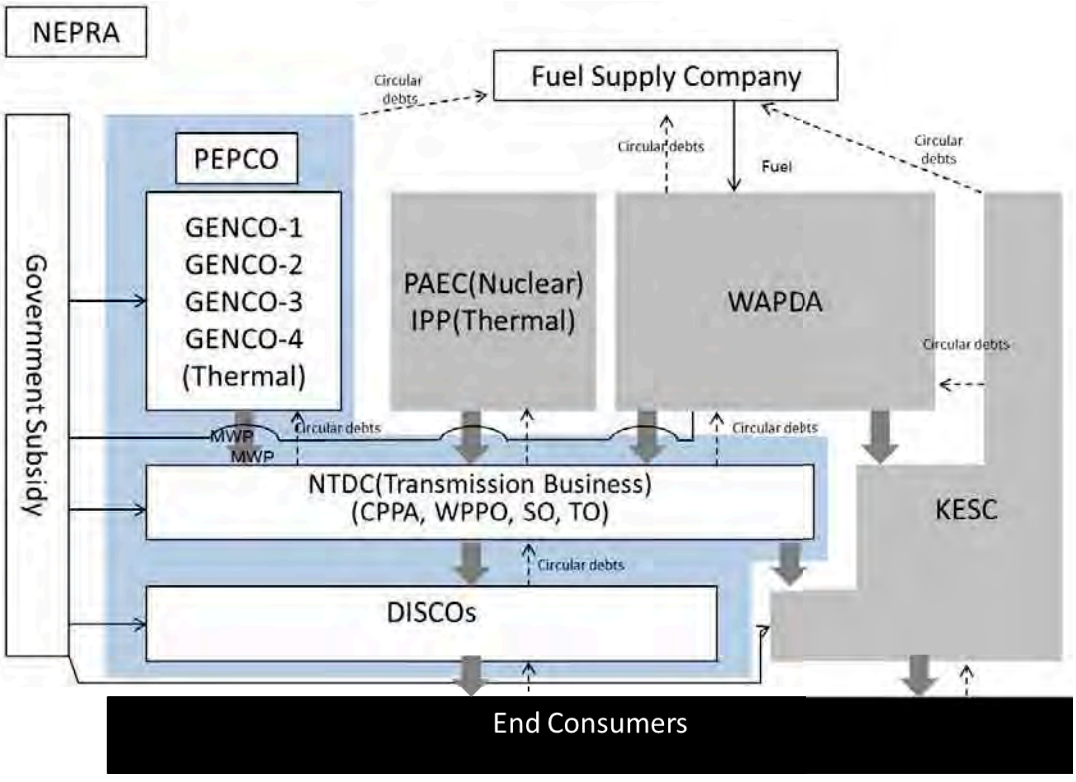
Chapter 3 Present Situation of Institutions related to Energy Sector in Pakistan

3.1 Circular Debt Situation in Energy Sector

3.1.1 Present Situation and Issues of Circular Debt

3.1.1.1 Present situation of Circular Debt

Due to the tariff set at a level by which the cost cannot be recovered, higher transmission and distribution loss and lower tariff collection ratio, the distribution companies cannot pay the billed amount to the generation companies, which cannot pay in turn to the fuel supply companies. For this reason, what is called a "Circular Debt" is incurred at each energy entity.

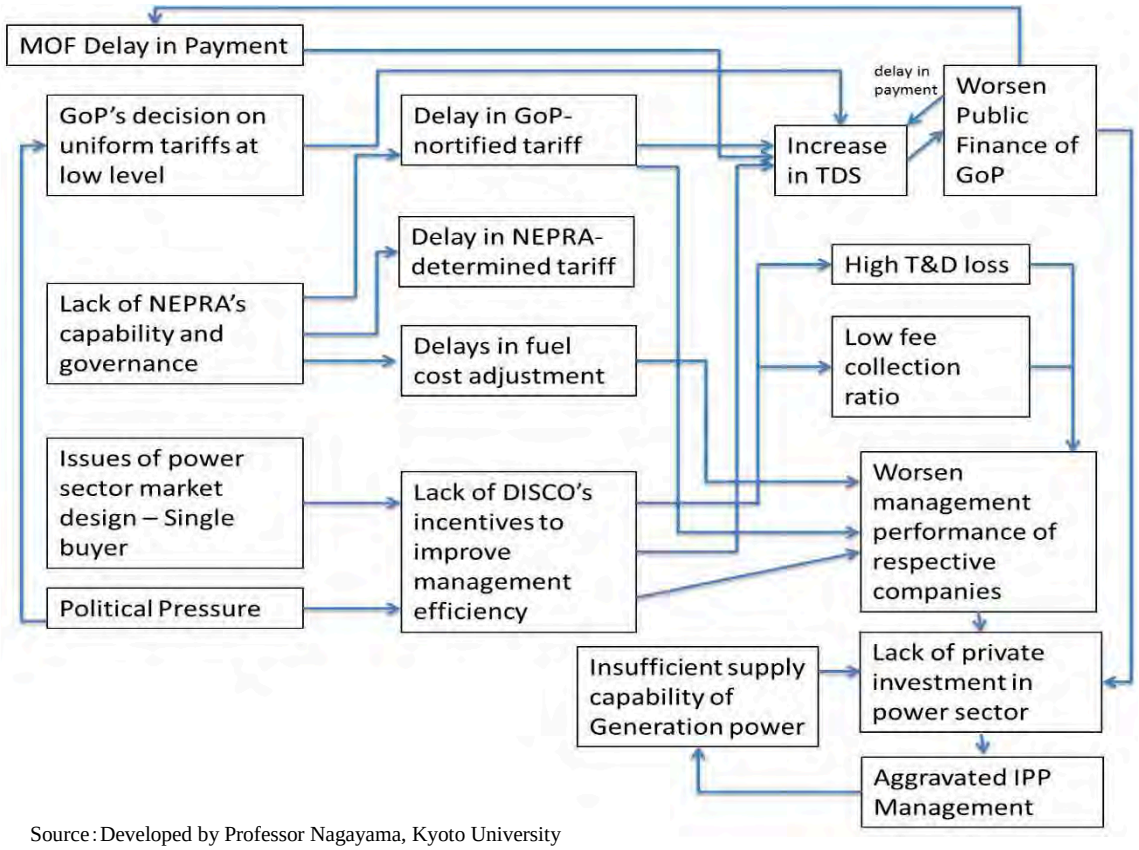


Note 1: Figures (red) are circular debt in 2012
Note 2: Billion Rs
Note 3: AR: Accounts Receivable, TDS: Tariff Differential Subsidy
Note 4: Figures (black) are cash subsidy
Source1: Revised from JEPIC
Source2：JICA Survey Team referring to various kinds of Materials

Table 3.1-1 Framework Diagram of the Energy Sector and Circular Debt in Pakistan

3.1.1.2 Structure of Circular Debt

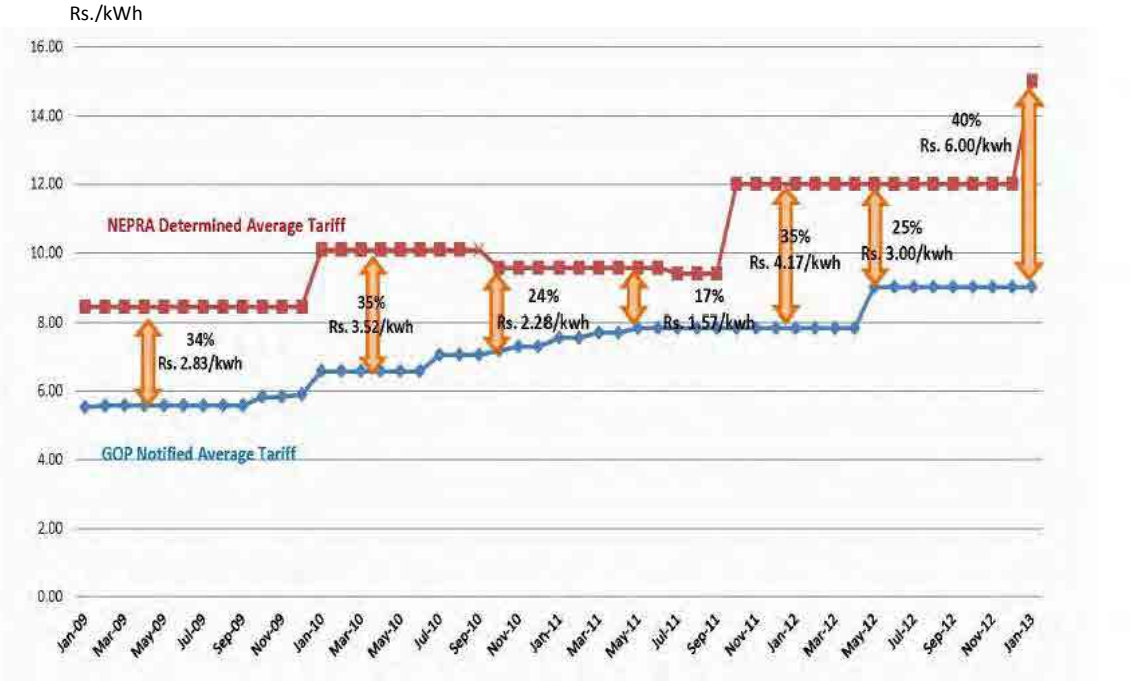
One of the causes that the Circular Debt has been accumulated is that deficiency is inherent in the retail tariff setting method. Since 2007, the differencial tariff have been applied to the distribution companies, while actual tariff had continuously been collected from end consumers, in which not the Differencial Tariff but the nationwide Uniform Tariff has been applied. The subsidy grant based on this difference is called Tariff Differential Subsidy (TDS). Each distribution company has a big difference in its business scale, geographical conditions, socio-political background, consumer density and composition, technical and administrative loss and management ability. For these reasons, the Differencial Tariff is applied to each company.



Source: Developed by Professor Nagayama, Kyoto University

Table 3.1-2 Major Cause of Circular Debt

Table 3.1-3 shows that TDS transitions at a regular interval.



Source: ENERGY SECTOR CRISIS ISSUES & REFORMS WAY FORWARD by SHAHID SATTAR Member (Energy) PLANNING COMISSION May 23rd, 2013

Table 3.1-3 Increased Gap between NEPRA Determined and GOP Tariff

The Circular Debt exceeding 35 Billion Rs. has been accumulated every month, due to increase of this TDS and other factors including non-technical loss in transmission and distribution (T&D), lower collection ratio, payment arrears[22] from CPPA to IPP and overdue interest associated with it and loss due to Fuel Adjustment Surcharge (FAS). T&D loss exceeding NEPRA-indicated target value[23] and/or collection below cost lead to expense incurred to the distribution companies, pressing the management thereof.

In the case where no payment is made from NTDC/CPPA, the Government of Pakistan guarantees to make payment to IPPs on behalf of NTDC/CPPA (Sovereign Guarantee).

22 National Policy 2013 stipulates that the delay limit from due date is 45-60 days for RFO, and 30-45 days for Gas.

23 For example, the target value is set at 12% (substantially 13.2%) for LESCO (source from interview with LESCO on Spetemer 25, 2013).

3.1.1.3 Breakdown of Circular Debt

Table 3.1-4 shows the Circular Debt from 2006 to 2012. The Circular Debt accumulated to 111.26 Billion Rs. swelled up to 872.42 Billion Rs. in 2012.

Table 3.1-4 Growth in Circular Debt (Impact of Primary Causes)

(Billion Rs.)

Growth in Circular Debt (Impact of Primary Causes)								
Primary Causes	2006	2007	2008	2009	2010	2011	2012	2006-2012 (cumulative)
Stock of Debt - Beginning of the Year	84.07	111.26	144.99	161.21	235.65	365.66	537.53	1640.37
Non-Collection								
DISCOs Receivables From:								
Federal Government	0.22	0.35	0.08	0.15	1.79	1.57	0.19	4.35
FATA	10.87	6.36	9.43	10.24	-78.34	4.3	13.42	-23.72
Provincial Governments	2.25	0.75	5.09	7.17	16.72	36.07	15.84	83.89
AJK Government	0.54	0.27	0.46	1.18	2.00	5.50	6.05	16.00
Agri-Tubewells	0.42	1.28	1.07	3.01	3.46	-3.68	-3.12	2.44
Private Consumers	9.08	7.96	9.64	19.88	25.59	39.29	54.55	165.99
Sub-Total	23.38	16.97	25.77	41.63	-28.78	83.05	86.92	248.94
CPPA Receivables from KESC	3.81	16.76	26.74	-11.87	4.04	-1.79	13.78	51.47
Total Non-Collection	27.19	33.73	52.51	29.76	-24.74	81.26	100.69	300.40
Tariff & Subsidy issues								
Tariff Determination & Notification Delay	n/a	n/a	n/a	n/a	n/a	n/a	72.19	72.19
Fuel Price Adjustments	n/a	n/a	n/a	n/a	n/a	20.1	33.19	53.29
Difference Between DISCOs TDS claims Vs. Actual Disbursed	n/a	n/a	-36.29	39.66	134.84	48.68	106.02	292.91
Difference between DISCOs NEPRA Allowed Vs. Actual T&D Losses	n/a	n/a	n/a	5.02	19.91	21.84	22.78	69.55
Sub-Total Tariff & Subsidy Issues	n/a	n/a	-36.29	44.68	154.75	90.62	234.18	487.94
Total Circular Debt (As of Year End)	111.26	144.99	161.21	235.65	365.66	537.53	872.41	

Original Source1: PEPCO DISCOs Performance Statistics Reports FY 2005-2012
Original Source2: USAID PDP Analysis based on data from NEPRA's DISCO tariff determination 2012 (Data only available for the year shown)
Original Source3: Data from MOWP - Tariff Cell (Data only available for the 2 years shown)
Original Source4: Chief Engineer's Office - MWP
Original Source5: USAID PDP Analysis
Source : USAID The Causes and Impacts of Power Sector Circular Debt in Pakistan March 2013

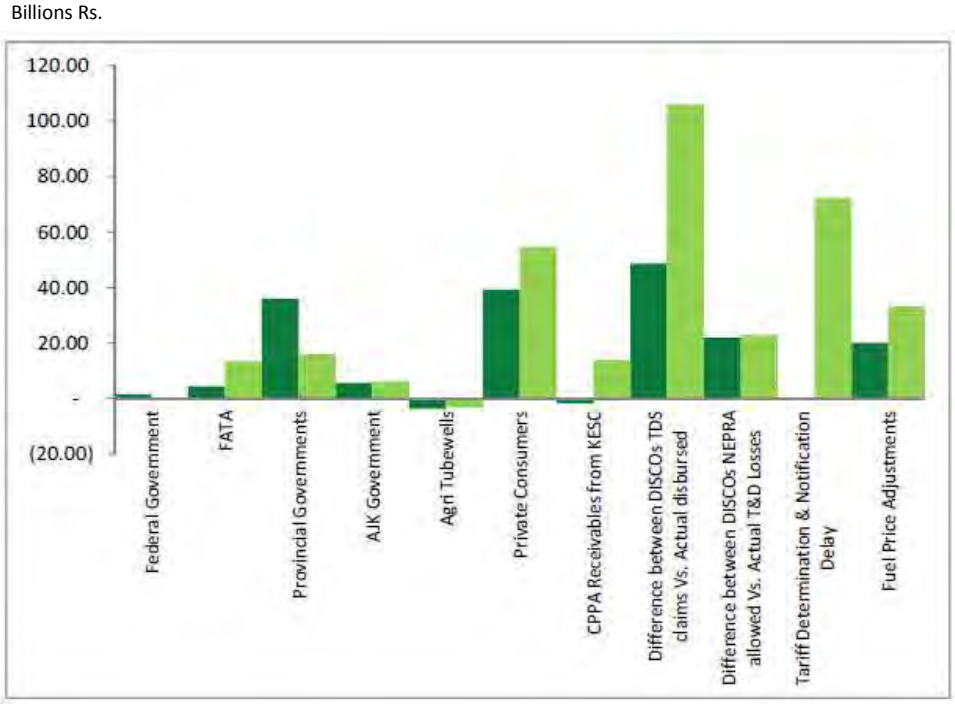
Table 3.1-5 Major Causes of Circular Debt (2012)

		Ammounts in 2012(Billion Rs.)	Major Causes(To be checked)
Non-Collection		100.69	
	DISCO's receivables	86.92	Collection capability of DISCOs is low. Lack of incentives to improve collection. Issues of single buyer
	CPPA Receivables from KESC	13.78	Payment governance of KESC CPPA collection capability
Tariff & Subsidy		234.18	
	Tariff determination & Notification delay	72.19	NEPRA and GoP delay in tariff notification process
	Fuel Price Adjustments	33.19	NEPRA's capability to implement -executing Fuel price adjustment
	Difference between DISCOs T&D claims vs Actual disbursed	106.02	MOF delay in payment
	Difference between DISCOs NEPRA Allowed vs Actual T&D Losses	22.78	Legal constraints NEPRA's tariff setting issue GoP's uniform price is too low
	Total	334.87	
	Cumulative as of 2012	872.41	

Source: Revised from USAID (2013) "The Causes and Impacts of Power Sector Circular Debt in Pakistan March 2013(The United States Agency For International Development (USAID))

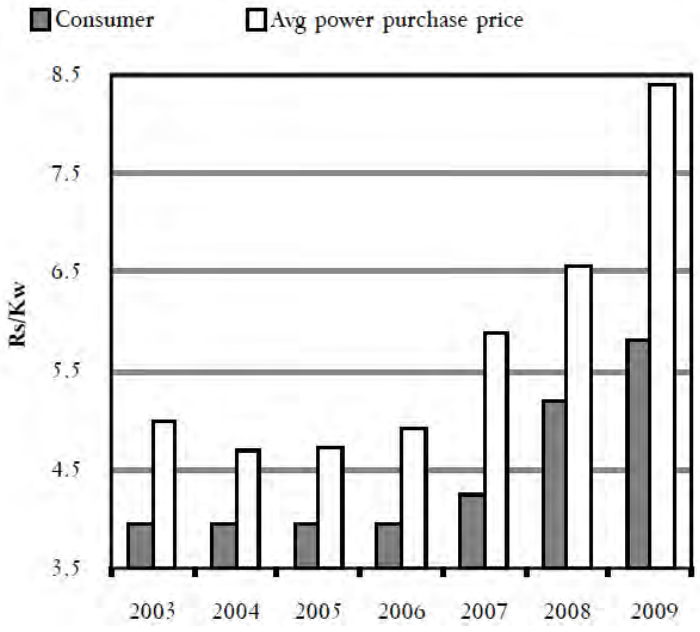
The lowest determined tariff from amongst all the DISCOs continues to be notified. Over time, GoP has fallen behind notification of even the lowest notified tariff particularly in the case of the first three household SLABs. For this reason, the subsidy has accumulated to huge amount.

Source : ENERGY SECTOR CRISIS ISSUES & REFORMS WAY FORWARD by SHAHID SATTAR Member (Energy) PLANNING COMISSION May 23rd , 2013



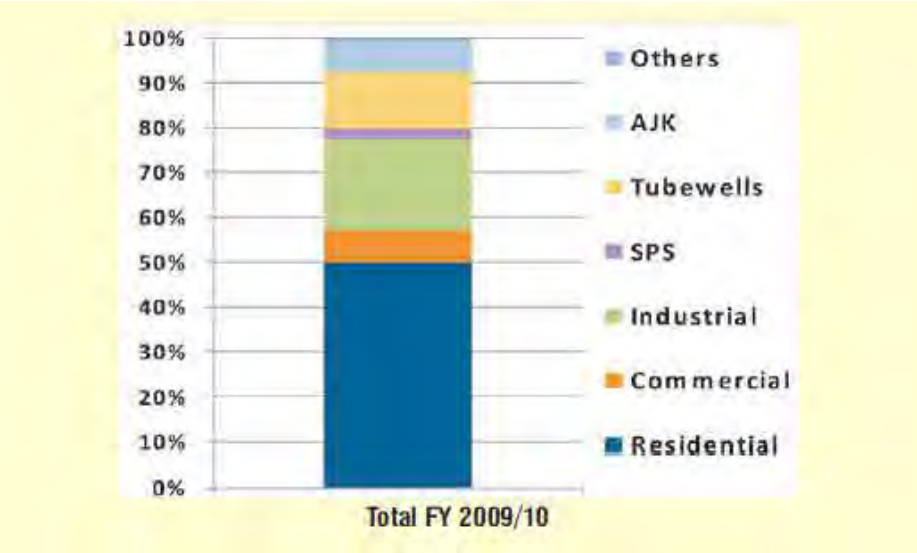
Note: Dark green shows FY2010-11, while light green shows FY2011-12.
Original Source1: PEPCO DISCOs Performance Statistics Reports FY 2005-2012
Original Source2: USAID PDP Analysis based on data from NEPRA's DISCO tariff determination 2012 (Data only available for the year shown)
Original Source3: Data from MOWP - Tariff Cell (Data only available for the 2 years shown)
Original Source4: Chief Engineer's Office - MWP
Original Source5: USAID PDP Analysis
Source: The Causes and Impacts of Power Sector Circular Debt in Pakistan March 2013(The United States Agency For International Development (USAID)

Table 3.1-6 Circular Debt Components Comparison FY 2010-11 & FY 2011-12



Source: Syed Sajid Ali and Sadia Badar (2010) "Dynamics of Circular Debt in Pakistan and Its Resolution"

Table 3.1-7 Consumer Tariff vis-à-vis Cost of Power Generation



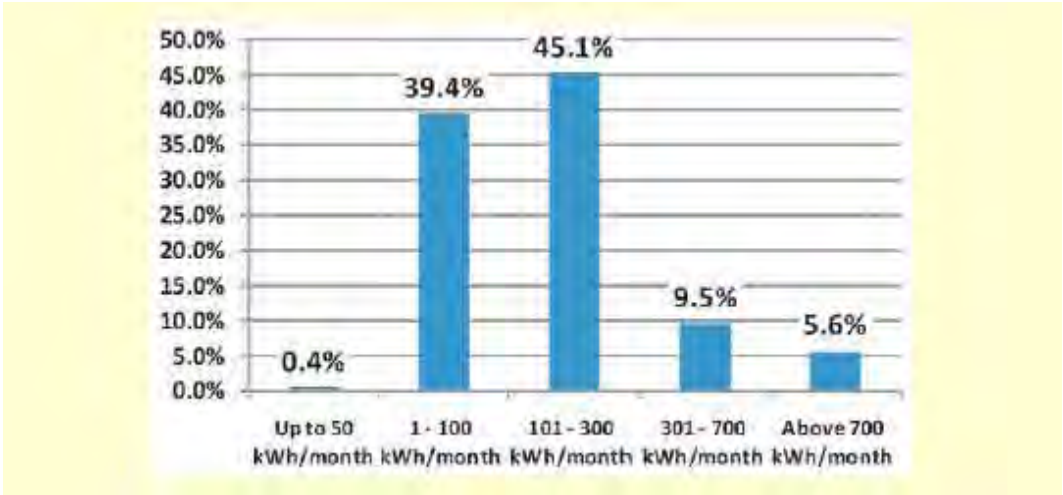
Note: SPS= Single Point Supply
SINGLE-POINT SUPPLY FOR; (A) PURCHASE IN BULK BY A DISTRIBUTION LICENSEE, (B) FOR SUPPLY TO MIX LOAD CONSUMERS NOT FALLING IN ANY OTHER CONSUMER CLASS
"Single-Point Supply" for the purpose of this Tariff means a supply given at one point to a licensee for the purpose of further distribution within its respective exclusive territory and jurisdiction or to a mix load consumer such as embassies which do not fall under the definition of any other consumer categories A, B, C, D, E, F, G and H, and are not reselling to any other consumer.

General Conditions
1. Average Power Factor of the consumer governed by this tariff, at the point of supply shall not be less than 90 percent. In the event of the said power factor falling below 90 percent, the consumer shall pay a penalty of two percent increase in the fixed charges corresponding to one percent decrease in the power factor below 90 percent.
2. If for any reason, the meter reading date of a consumer is altered and the acceleration/ retardation in the date is up to 4 days, no notice will be taken of this acceleration or retardation. But if the date is accelerated or retarded by more than 4 days the fixed charges shall be assessed on proportionate basis for actual number of days between the date of old reading and the new reading.

Single-Point Supply consumers governed by tariff C having peak load requirement exceeding 20 kW shall have the opinion to convert to Time-of Day (TOD) Tariff under the respective category.

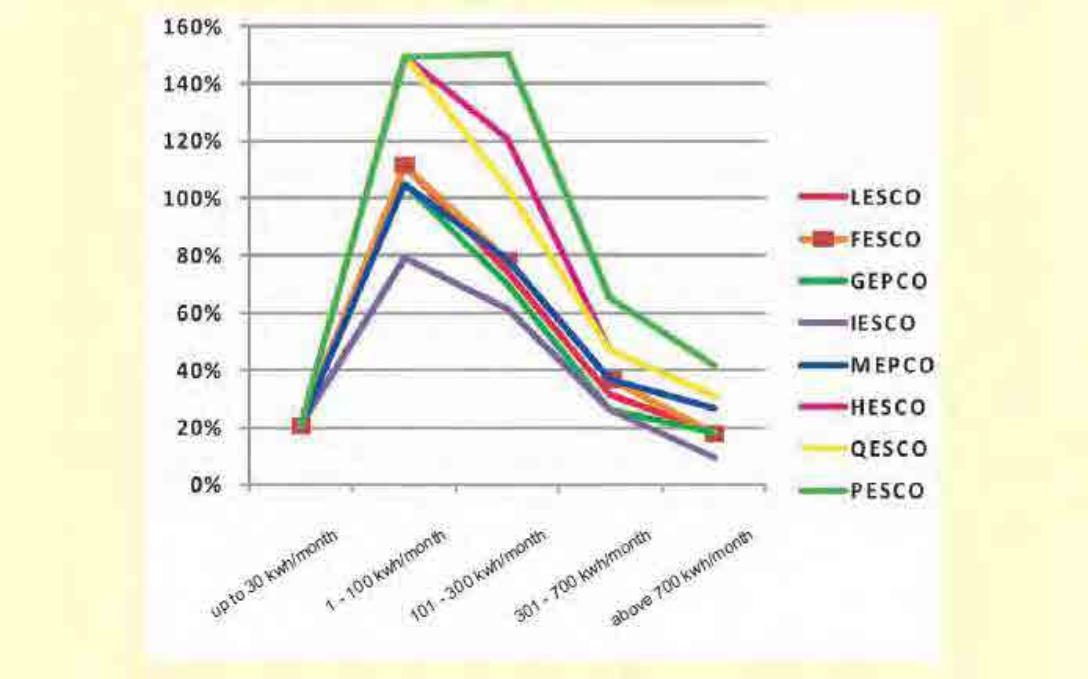
Original Source: NEPRA first quarter FY2009 tariff determination and PEPCO
Source: Integrated Energy Sector Recovery Report & Plan October 2010

Table 3.1-8 Allocation of the Tariff Differential Subsidies to Customer Classes



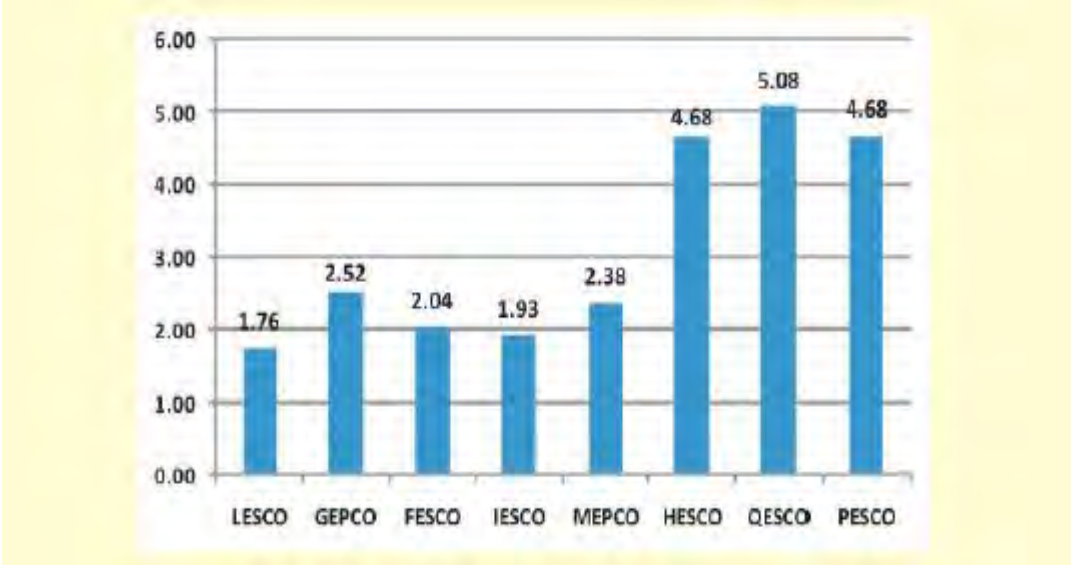
Original Source: Based on Annex 2 of NEPRA decision of DISCOs' tariff petitions for the first quarter of FY2009/10 and PEPCO data.
Source: Integrated Energy Sector Recovery Report & Plan October 2010

Table 3.1-9 Allocation of Tariff Differential Subsidies in the Power Subsector



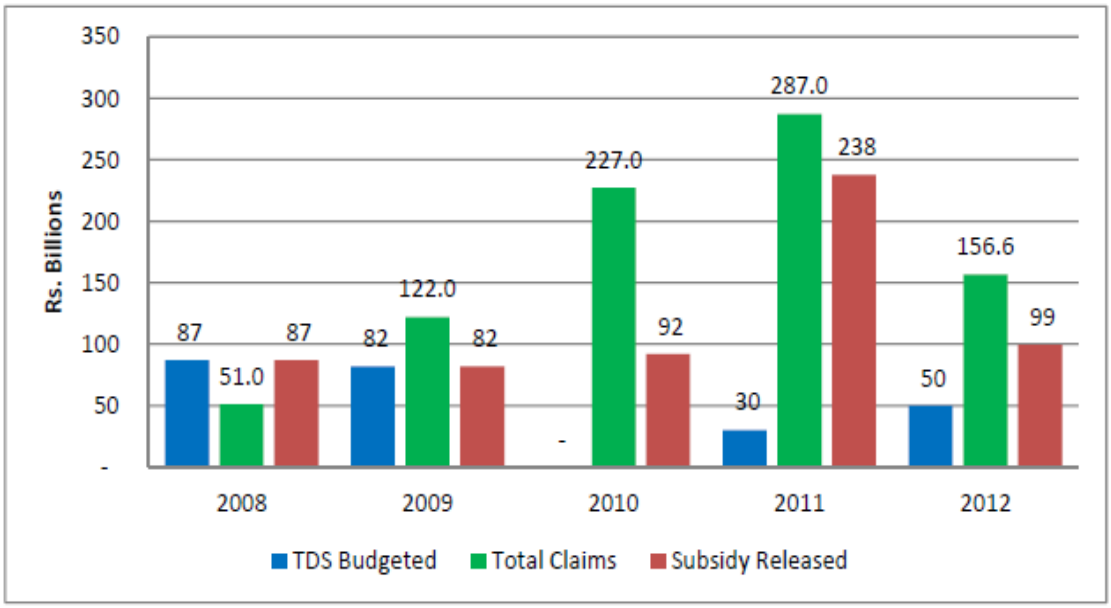
Note: FESCO=Faisalabad Electric Supply Company, GESCO=Gujranwala Electric Supply Company, HESCO=Hyderabad Electric Supply Company, IESCO=Islamabad Electric Supply Company, LESCO=Lahore Electric Supply Company, MEPCO=Multan Electric Power Company, PESCO=Peshawar, Electric Supply Company, QESCO=Quetta Electric Supply Company
Original Source: ESTF Secretariat assessment
Source: Integrated Energy Sector Recovery Report & Plan, ADB October 2010

Table 3.1-10 Residential Customer Tariff Increases if Tariff Differential Subsidies are eliminated by July 2010



Note: FESCO=Faisalabad Electric Supply Company, GESCO=Gujranwala Electric Supply Company, HESCO=Hyderabad Electric Supply Company, IESCO=Islamabad Electric Supply Company, LESCO=Lahore Electric Supply Company, MEPCO=Multan Electric Power Company, PESCO=Peshawar Electric Supply Company, QESCO=Quetta Electric Supply Company
Original Source: Based of PEPCO data
Source: Integrated Energy Sector Recovery Report & Plan October 2010

Table 3.1-11 Subsidies per Kilowatt Hour Sold per Distribution Company in Fiscal Year 2009/10



Original Source: Ministry of Water & Power, Chief Engineer's Office,
Source: The Causes and Impacts of Power Sector Circular Debt in Pakistan March 2013(The United States Agency For International Development (USAID)

Table 3.1-12 Tariff Differential Subsidy Budgeted, Claimed & Disbursed

3.1.2 Occurrence of arrears

The Government of Pakistan paid off 342 billion Rs. at the end of June, 2013 out of the payment arrears amounting to Rs. 503 billion identified at the end of May, 2013, and resolved the residual amount by the end of July, 2013.

Such arrears reduction will alleviate cash constrained power producers and allow them to bring additional electricity supply to the system and reduce load shedding by around three hours. A professional audit firm will also be hired to conduct a technical and financial audit of the system to identify the stock and flow of payables at all levels of the energy sector (including Power Sector Holding Company Limited) by the end of November 2013 (structural benchmark), and based on the findings of the report, a roadmap will be designed to prevent the accumulation and recurrence of payables arrears.

Source : IMF Country Report No.13/287 Pakistan 2013 article consultation and request for an extended arrangement under the extended fund facility September 2013

In addition to Kibor (Karachi Interbank Offered Rate), the Government agreed to pay payment arrears and its interest rate of 4.5% to IPPs, while IPPs will pay to the bank the amount of payment arrears, to which the interest rate of 2.5% is added.

Although IPPs (ex. Atalas) were operating the generation plant at 70-80% of total capacity before payment of the Circular Debt, they are now generating 1700-2000MW in full operation.

SETTLEMENT OF POWER SECTOR CIRCULAR DEBT

Settlement on 28 June 2013

		Rs. (Billion)	
Gross Transaction Amount		503.025	
Liquidated Damages		(22.916)	
	Total (Excluding LDs) (A)	480.109	
Gross Transaction (B)		341.958	
Dividend received		19.710	
	Total Net Transaction	**322.247**	
Payments Details			
Cash IPPs		161.229	
PIB OGDCL		56.322	
PIB PPL		23.363	
PSO Cash – PIB		81.333	(Cash 33.217 + PIB 48.116)

Settlement on 21 July 2013

WAPDA-Hydel		90.083
NTDC		10.216
Gencos		14.888
Nuclear Plants		22.964
	TOTAL (C)	**138.151**
GRAND TOTAL (A = B + C)		**480.109**

Note1: PIB OGDCL Pakistan Investment Bond (PIB) OGDCL (Oil and Gas Development Company Limited)
PIB PPL Pakistan Investment Bond (PIB) PPL (Pakistan Petroleum Limited)
PSO Cash + PIB Pakistan State Oil(PSO)
Source: Ministry of Finance Settlement of Power Sector Circular Debt (http://www.finance.gov.pk/press/circular_debt_1.pdf), reference day Nov 25 2013.

Table 3.1-13 Settlement of Power Sector Circular Debt

An interview survey reveals that the method of the Circular Debt payment used by the Government varies from operator to operator, and that the Government seems to control the payment, evaluating bargaining power of the operators.

Table 3.1-14 Payment to IPPs/Energy Sector Other Entities on 28-06-2013

PAYMENT TO IPPS/ENERGY SECTOR OTHER ENTITIES ON 28-06-2013

Sr. No	Entity Name	Total Amount Rs. Min
1	HUBCO (RFO)	75,000
2	KAPCO (GAS & RFO)	41,354
3	AES (Pakgen) (RFO)	6,982
4	AES (Lalpir) (RFo)	4,546
5	KEL (RFO)	3,504
6	SABA (RFO)	-
7	LIBERTY (GAS)	9,906
8	UCH (GAS)	19,261
9	ROUSCH (GAS)	8,687
10	FAUJI (GAS)	5,100
11	HABIBULLAH (GAS)	2,540
12	ALTERN (GAS)	270
13	AGL POWER (GAS)	19,336
14	THE HUBCO NAROWAL (RFO)	17,397
15	ATLAS POWER (RFO)	5,400
16	NISHAT POWER (RFO)	7,080
17	NISHATCHUNIAIN (RFO)	6,860
18	LIBE4RTY TECH (RFO)	6,817
19	ORIENT POWER (GAS/HSD)	1,307
20	SAIF POWER (GAS/HSD)	4,902
21	SAPPHIRE ELECTRIC (GAS/HSD)	4,208
22	HALMORE POWER (GAS/HSD)	2,522
23	ENGRO POWER (GAS)	8,974
24	FOUNDATION POWER (GAS)	7,074
25	SHYDO POWER (HYDEL)	1,159
26	LARAIB ENERGY (HYDEL)	105
Total:		**270,291**
27	SNGPL (Genco-II)	18,996
28	SSGC (Genco I&II)	2,901
		586
29	Mari Gas (Genco-II)	9,358
30	PPL (Genco-II)	13,843
31	PSO (Genco-I & III)	6,130
		19,853
Total:		**71,667**
G/Total:		**341,958**

Source：Ministry of Finance Settlement of Power Sector Circular debt (http://www.finance.gov.pk/press/circular_debt.pdf), reference day Sep 30 2013

The payment of 322 Billion Rs. by the Government in June, 2013 temporarily resolved most of the Circular Debt, while it is reported that the Circular Debt of 100 Billion Rs. newly accrued in several months.

Business Recorder Lahore

NA informed

Sep 26, 2013

Rs100bn circular debt has resurfaced in power sector

WAQAR LILLAH

ISLAMABAD: A circular debt of Rs 100 billion has resurfaced in the power sector despite clearance of the previous circular debt of Rs 503 billion by the newly formed government of Pakistan Muslim League-Nawaz, the National Assembly was informed on Wednesday.

Ministers of State for Education, Trainings and Standards in Higher Education, Muhammad Baligh-ur-Rehman, while responding to a question, said that circular debt resurfaced due to tariff differential subsidies, adding the Ministry of Finance had not provided any separate allocation for clearance of circular debt under normal budgetary process, and presently there was no such proposal under consideration.

However, the Ministry of Finance provided

> P 4 Col 1

Rs100bn circular debt

> from page 1

tariff differential subsidy to the Discos to bridge the gap between the tariff determined by Nepra and the tariff notified by Ministry of Water and Power for which Rs 220 billion had been allocated for the current financial year, he added.

Baligh-ur-Rehman said the government was expecting that combination of measures like tariff rationalisation, recovery maximisation, reduction in losses/theft, revenues of power sector companies would significantly increase and re-emergence of circular debt would be greatly contained.

To another question, the Minister told the House that the PML-N had borrowed US$544 million from IMF after coming into power, while it had paid off US$ 700 million to IMF. He added that the government had to pay off more than US$ 2.15 billion to IMF in the current financial year.

About depreciation of Pakistani rupees against international currencies, the Minister said the Pak rupee depreciated in the inter-bank market against Euro, Great Britain Pound (GBP), Japanese Yen (JPY) and US dollar by 6.9 percent, 4.7 percent and 5.5 percent respectively in FY14 (from July 1 to September 10) in FY14.

The House was also informed that there was no proposal under consideration of the government for any incentive to the small companies. However, as part of drive to encourage corporate business, the rates of income tax for all companies have been reduced from 35 percent to 34 percent in the Budget-2013.

Meanwhile, Interior Minister Chaudhry Nisar Ali Khan, while replying to a question, told the House that the government was going to utilise modern technology like CCTV cameras for the security of federal capital. He said that police check-post in the city would be removed, if government succeeded in establishing effective control and command system.

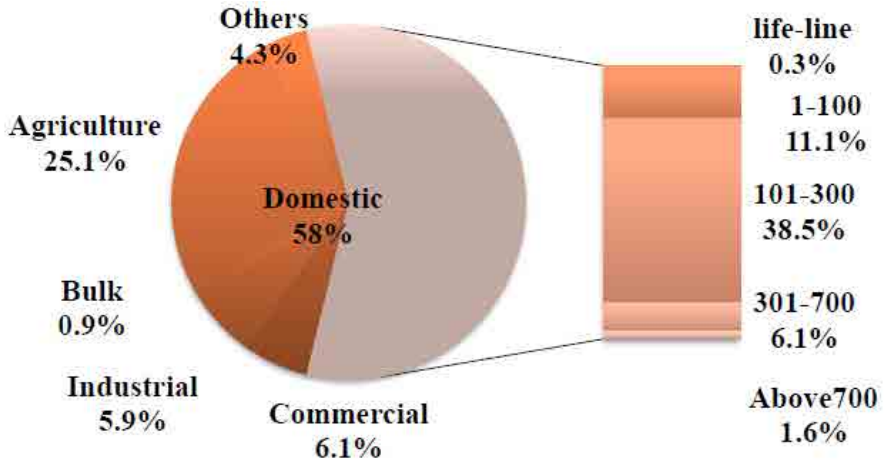
While providing details of drugs seized by the Anti Narcotics Force (ANF) during 2013, Chaudhry Nisar Ali Khan told the House that confiscated drugs were burnt by the ANF on Anti Narcotics Day, adding that a ban had been imposed on the foreign trips of ANF officials.

Source：Business Recorder Lahore, September 26, 2013

3.2 Energy Subsidy

According to ENERGY SECTOR CRISIS ISSUES & REFORMS WAY FORWARD SHAHID SATTAR Member (Energy) PLANNING COMMISSION (2013), allocation of the subsidy is as follows:

- Large subsidy going to medium and high income residential consumers and tube-wells
- Residential consumers receive ~58% of total subsidy
  - Only 0.3% of total subsidy goes to the poor (0-50kWh/m)
- Agriculture accounts for ~25% of total subsidy

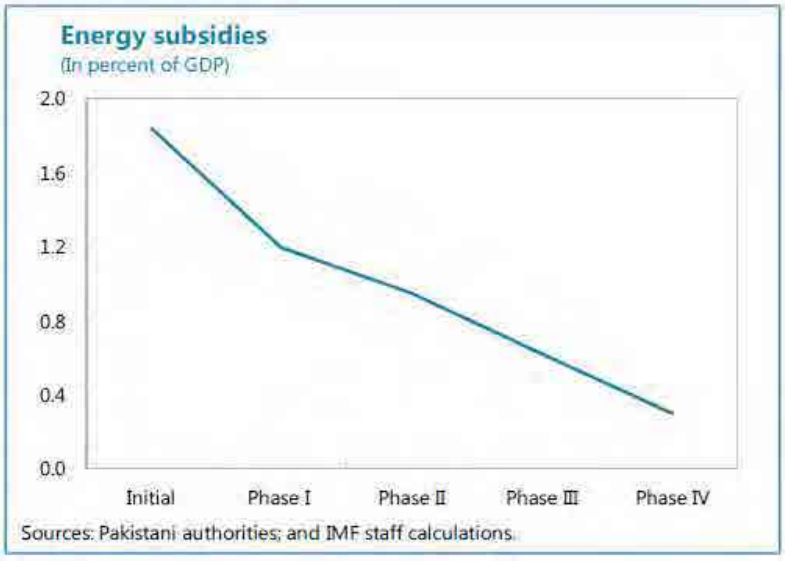


Source : ENERGY SECTOR CRISIS ISSUES & REFORMS WAY FORWARD SHAHID SATTAR Member(Energy) PLANNING COMMISSION May 23nd ,2013

Table 3.2-1 Subsidy Break-up

The report issued by International Monetary Fund (IMF) in September, 2013 describes reduction of the energy subsidy as shown below.

(What follows are Excerpts from IMF Report).



Source : IMF Country Report No.13/287 Pakistan 2013 article consultation and request for an extended arrangement under the extended fund facility September 2013

Table 3.2-2 IMF Schedule for Slash of Energy Subsidies

The authorities of Pakistan have launched their plan to gradually eliminate most of the energy subsidy.[24]

[24] Fuel price changes are passed through to electricity prices on a monthly basis.(IMF Country Report No.13/287 Pakistan 2013 article consultation and request for an extended arrangement under the extended fund facility September 2013)

The four-phase plan is expected to reduce the subsidy from about 1.8 percent of GDP to 0.3–0.4 percent of GDP in three years.

・Phase Ⅰ:

The first phase entailed the almost full elimination of the subsidy for industrial, commercial, bulk and AJ&K[25] users, accomplished through an increase in tariff of about 50 percent at end—July. The majority of domestic consumers are excluded from increases at this stage.

・Phase Ⅱ:

The second phase entails the elimination of the subsidy for consumption over 200 Kwh, SCARP[26] and others (public lightning, housing schemes, railways, HVTL[27]), and reducing the subsidy in agriculture by about 13 percent. The corresponding price increases have already been approved and notified – effective October 1st.

・Phase ⅢandⅣ:

In FY 2014/15 and FY 2015/16 the authorities will reduce the remaining subsidy (on agriculture and consumption below 200 Kwh) in order to reduce the fiscal burden to 0.3-0.4 percent of GDP. By the end of Phase Ⅳ the subsidy for consumption above 200 Kwh. While most households will see price increases, subsidy will remain for the lowest level consumers and increases in targeted transfer programs will also protect the poorest.

(End of excerpts)

Source : IMF Country Report No.13/287 Pakistan 2013 article consultation and request for an extended arrangement under the extended fund facility September 2013

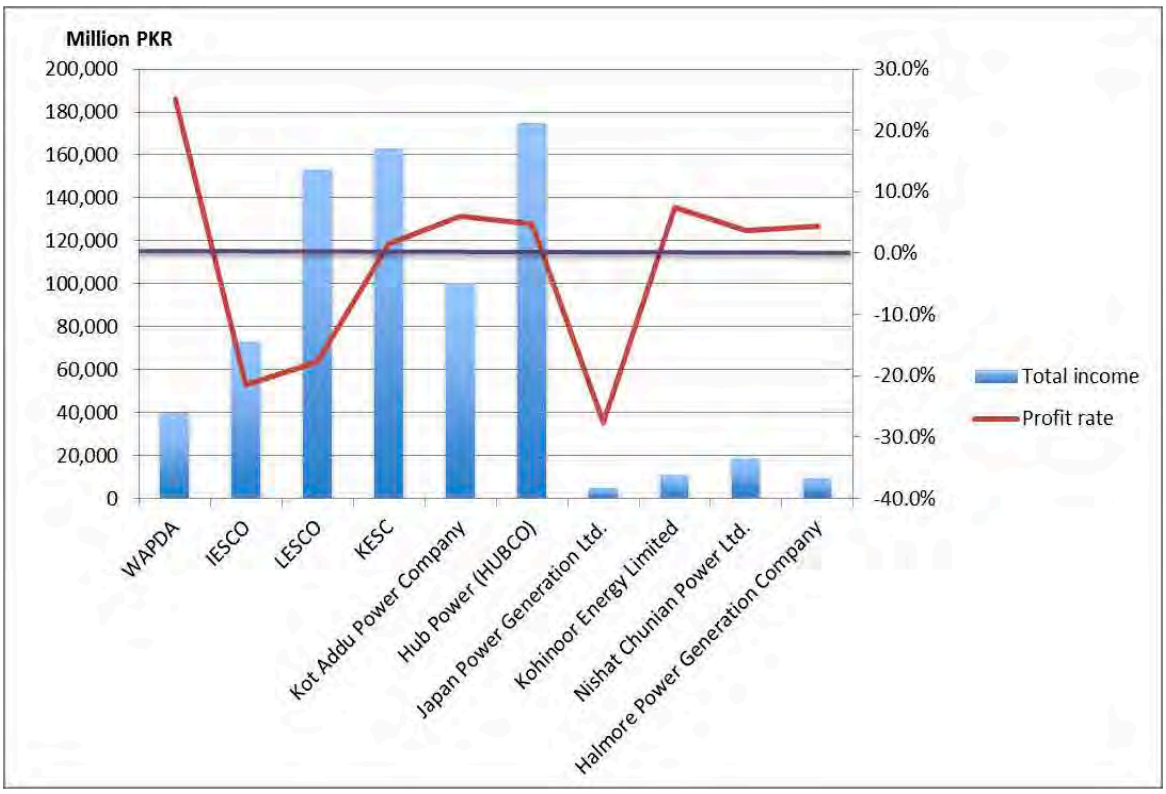
[25] AJ&K: Azad Jammu and Kashmir

[26] SCARP: Salinity Control and Reclamation Project

[27] HVTL: High Voltage Transmission Line

3.3 Financial Condition of Generation, Transmission and Distribution Companies and CPPA

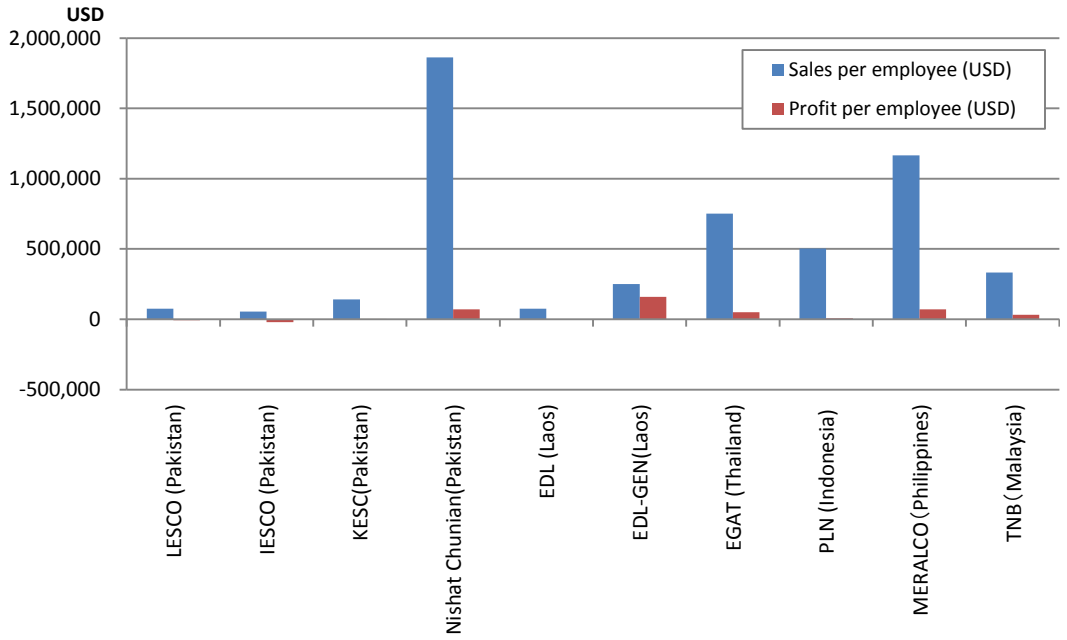
While the distribution companies including IESCO and LESCO have negative profit, the generation companies excluding Japan Power have positive profit. Although the profit of IPPs are protected by the PPA, the distribution companies including IESCO and LESCO are suffering loss, subject to influence of the energy policy in Pakistan.



Note1: Profit rate = profit after tax
Note2: WAPDA (2012), IESCO (2012), LESCO(2012), Kot Addu Power Company (2012), HUBCO (2012), Japan Power Generation Ltd. (2012),Kohinoor Energy Ltd. (2012), Nishat Chunian Power Ltd. (2012), Halmore Power Generation Company (2012)
Source: Annual report of respective companies

Table 3.3-1 Sales and Profit Ratio Power Companies in Pakistan

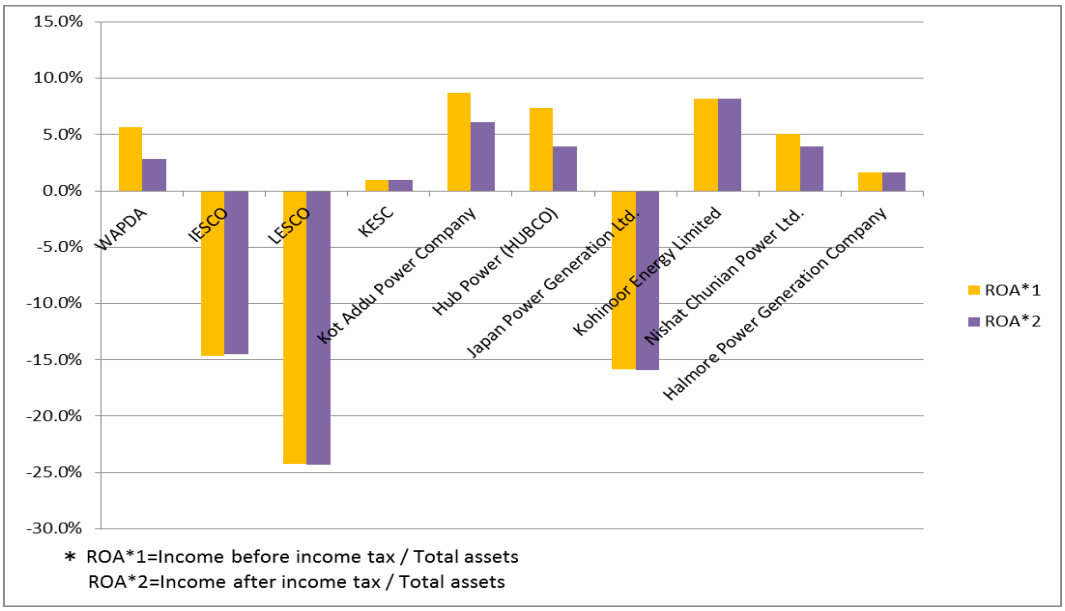
Nishat Chunian, one of the IPPs, has extraordinarily higher per capita sales, compared with energy companies in other Asian countries (Table 3.3-2).



Note1: for YESB: only regular employees
Note2: Income include subsidy from GOP
Note3: for HPGE, MEPE, YESB, ESE exchange rate 1USD=970kyats
Note4: Profit = Profit after payment income tax
Note5: For EDL (Laos), EDL-GEN (Laos), Data in 2011 The rest in 2012
Source：MEPE statistics 2011,2012, Financial statement of respective companies

Table 3.3-2 Sales and Profit per Employee

Table 3.3-3 shows that energy-related companies including Kohinor and Hubco have higher RoA.



Note: WAPDA (2012), IESCO (2012), LESCO(2012), Kot Addu Power Company (2012), HUBCO (2012), Japan Power Generation Ltd. (2012),Kohinoor Energy Ltd. (2012), Nishat Chunian Power Ltd. (2012), Halmore Power Generation Company (2012)
Source: Annual report of respective companies

Table 3.3-3 ROA of Respective Companies

Chapter 4
Outline of Institutions Related to Energy Sector

Chapter 4 Outline of Institutions Related to Energy Sector

4.1 Functions, Organization Control and Business Performance of NEPRA, NTDC/WPPO/CPPA, Generation, Transmission and Distribution Companies

4.1.1 NEPRA

4.1.1.1 Business Overview of NEPRA

NEPRA (National Electric Power Regulatory Authority) has been formed to introduce transparent and judicious economic regulation, based on a sound commercial principle to the electric energy sector of Pakistan.

The December 16, 1997 issue of the Gazette of the Government of Pakistan proclaimed the enactment of the Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997, which became effective on December 13th, 1997.

NEPRA's main responsibilities are to:

1. Issue Licenses for generation, transmission and distribution of electric power;
2. Establish and enforce Standards to ensure quality and safety of operation and supply of electric power to consumers;
3. Approve investment and power acquisition programs of the utility companies
4. Determine Tariff for generation, transmission and distribution of electric power.

The NEPRA statute reflects the desire of the Government to establish an autonomous regulatory body to improve the efficiency and availability of electric power services by protecting the interest of the investors, the operators and the consumers.

Source: http://www.nepra.org.pk/nepra.htm (Referred in Spetember 16th, 2013)

4.1.1.2 Primary Task of NEPRA

Primary task of NEPRA is to:

1） Issue Licenses for generation, transmission and distribution of electric power;

- Regulation on generation business (Annual Report 2011-2012 P.40)

  The law establishes that the power generation companies have an obligation to construct and operate power facilities under the authority of a license issued by NEPRA. In case of the power generation facilities directly or indirectly connected to the national power grid, they shall be made available for the national grid company for economic power dispatch and operation with safety and reliability. The government grant is targeted to the authorities for voltage support and uneconomic power dispatch by the national grid companies.

- Regulation on transmission and distribution business (Annual Report 2011-2012 P.47, P48, P50)

The law establishes that the power transmission companies and the power distribution companies have an obligation to perform power transmission and distribution business, respectively, under the authority of a license issued by NEPRA.

Base on Performance Standards Rules (PSTR) established for Transmission and Distribution, the power transmission and distribution companies have submitted annual performance reports. As it was difficult, however, to compare the submitted data due to a different fiscal year between the power transmission company (NTDC) and the power distribution company (DISCOs), the Rules were modified to match a period of submission for synchronizing both data.

2）Determination and change in electricity tariff and contract terms;

- Tariff setting (Annual Report 2011-2012 P.23,36,42,50)

NEPRA is entrusted with the responsibility for the determination, modification or revision of rates and determination of the cost and terms and conditions for power generation, transmission, interconnection and distribution services and power sales to consumers by the licensees.

For tariff setting for the entities in the power sector, NEPRA has developed a team of professionals well versed with tariff setting in a separate division. The team members determine and approve the rates after analyzing cost effectiveness of investment and the present cost.

Although they had the authorities for quarterly determining the rates, the code was established that obligates NEPRA to make adjustments on account of monthly variation in fuel price, and make notification accordingly.

- Composition of pass-through structure (Annual Report 2011-2012 P.1, 39)

Although it is recognized the importance of a pass-through structure, the status quo is that the government grants subsidy to gap the difference between the tariff determined by NEPRA and collected prices.

Variation in monthly fuel prices of the power distribution companies is adjusted according to a pre-determined system, determined by NEPRA and notified by the government. Other distribution companies than those setting multi-year tariff had made quarterly adjustment of the tariff, and had had the authorities to determine the comprehensive tariff. In addition, the bye-law was established to the effect that they were obliged to make adjustment of monthly variation in the fuel prices, and made notification to the government accordingly.

- Meter reading system (Annual Report 2011-2012 P.57)
  It is planned to introduce an Automatic Meter Reading System (ARMS) in future.

3) Enforcement of legal actions (including penal rules)

- Initiatives attracting investment in the power sector
  As energy crisis that the country is now faced with has roused necessity to encourage development of alternative form of energy, NEPRA approved not only development of wind generation but an advance payment rate system that may facilitate investment in hydropower, solar light power and biogas power.

4) Monitoring of status of compliance with regulations

5) Opening of a public hearing and disclosure of information/publicity

6) Handing claims for protection of consumers

- Protection of consumers (Annual Report 2011-2012 P.57)
  Consumer Affairs Division (CAD) has been established in NEPRA to perform consumer protection activities. One of the main responsibilities is to protect the benefit of consumers, and protect them from discriminative treatment and damage caused by part of the power sector companies. The consumers may file a claim to NEPRA without any problem of claim procedures, and CAD has a responsibility to handle the claim accordingly.

4.1.1.3 Problem of Financial Independence of NEPRA

1) The government subsidy has not been granted to NEPRA for its independence (Annual Report 2011 – 2012 P.155).

Main source of income of NEPRA comes from license fees including its renewal fees.

The license fees in 2010 amounted to 272,676,675 Rs., and 341,568,607 Rs. in 2011 (Annual Report 2011 – 2012 P. 156).

Not only application fees but annual fees were abated to reduce economic burden on license fees so that new power generation projects are attracted to Pakistan.

Investment amounted to 141,080,102 Rs. in 2010, and 103,059,282 Rs. in 2011 (Annual Report 2011 – 2012 P. 156).

NEPRA reserved surplus funds amounted to 4 million Rs. in the Federal

Consolidated Fund of the Pakistani government in the period from FY2001 and FY2012, abiding by requirements of NEPRA Financial Regulations 2010.

2) Work capacity problem

For work capacity, the following was pointed out in the survey conducted in September, 2013.

Thirty (30) professional staff members are available.

As NEPRA requires a preparatory period for dealing with increase of workload, it is not possible to further reduce a period for evaluating energy tariff. Furthermore, NEPRA is an agncy for determining the tariff, but not for dealing with general matters. In the case where the tariff increased beyond NEPRA's expectation, Tariff A (provisional) in the category of NEPRA-Determined Tariff will be issued (see Table 2.5-2~4).

3) Energy tariff

Five-Year Multi-Year Tariff was once implemented, thereafter, however, it was changed to the tariff to be revised every year. Procurement cost of fuel is forecasted three month before the revision and reflected to the energy tariff.

4) NEPRA regulation policy for distribution companies

NEPRA will take a step-by-step approach for alteration of the energy tariff applied to the distribution companies.

As the DISCOs varies from company to company in that some of them has a robust financial base but others not, or some of them has a greater loss but others not, technological capability of each DISCO will be adjusted to the same level. Therafter NEPRA will change a tariff level applied to each DISCO.

4.1.2 NTDC/WPPO/CPPA/GENCO

4.1.2.1 NTDC

4.1.2.1.1 Business Overview of NTDC

National Transmission & Dispatch Company (NTDC) Limited was incorporated on November 6th, 1998 and commenced commercial operation on December 24th, 1998. It was founded to take over all the properties, rights and assets obligations and liabilities of 220 KV and 500KV Grid Stations and Transmission Lines/Network owned by Pakistan Water and Power Development Authority (WAPDA). NTDC operates and maintains twelve 500kV and twenty nine 220kV Grid Stations, 5,077 km of 500kV transmission network and 7,359 km of 220 kV transmission network throughout Pakistan.

In addition, NTDC possesses 132kV lines for the distribution companies.

Major roles of NTDC are summarized as four functions as shown below:

1. Central Power Purchasing Agency (CPPA)

   As the Central Power Purchasing Agency (CPPA), it procures power from GENCOs responsible for thermal power, WAPDA Hydel & IPPs responsible for hydropower on behalf of Distribution Companies (DISCOs) for delivery of power through 500 kV, 220 kV and 132kV Network.

2. System Operator

   It conducts safe, secure and highly reliable operation, maintenance and control of the generation facilties, and peforms power distribution.

3. Transmission Network Operator

   It conducts operation & maintenance, planning, design and expansion of the 500 kV and 220kV transmission network.

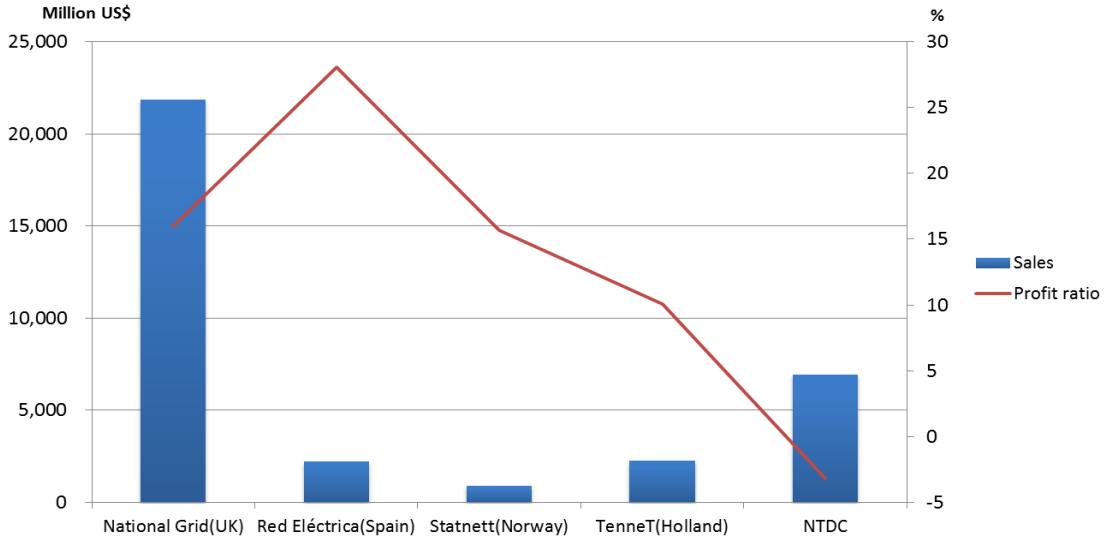
   As Contract Registrar and Power Exchange Administrator (CRPEA), it conducts recording and monitoring of contracts related to a sales transaction system.

Source: http://www.ntdc.com.pk/CompanyProfile.php(Referred in September 24th, 2013)

4.1.2.1.2 Financial Condition of NTDC

While the sales of NTDC are increasing year by year, it had been operated in deficit during a time frame between 2008 and 2011. The company, however, turned into the black in 2012.

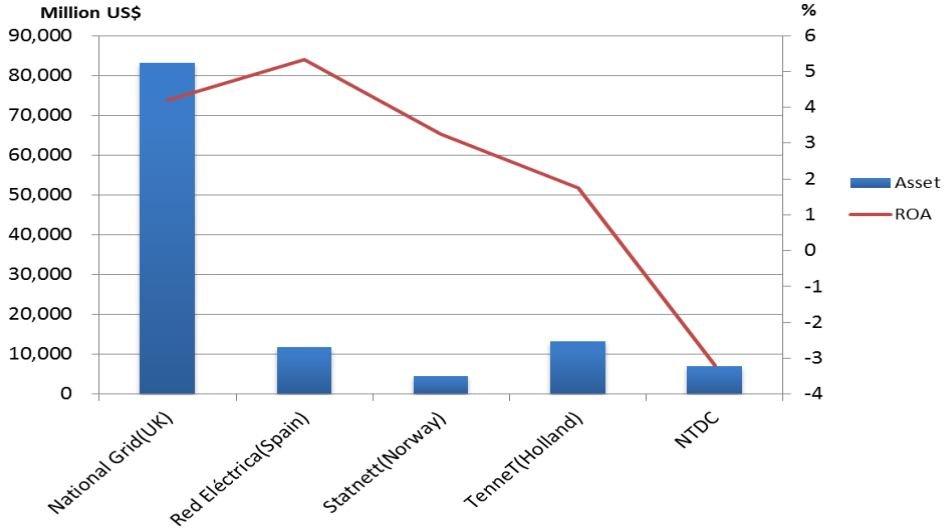
What compares the sales volume and profit ratio of NTDC with generation companies in other countries is Table 4.1-1, which is characterized by particularly low return on sales.



Note1: For National Grid (UK), Red Eléctrica (Spain), Statnett (Norway),TenneT(Holland), Data in 2012
For NTDC, Data in 2010
Note2: After tax profit is use
Source: Annual reports of respective companies

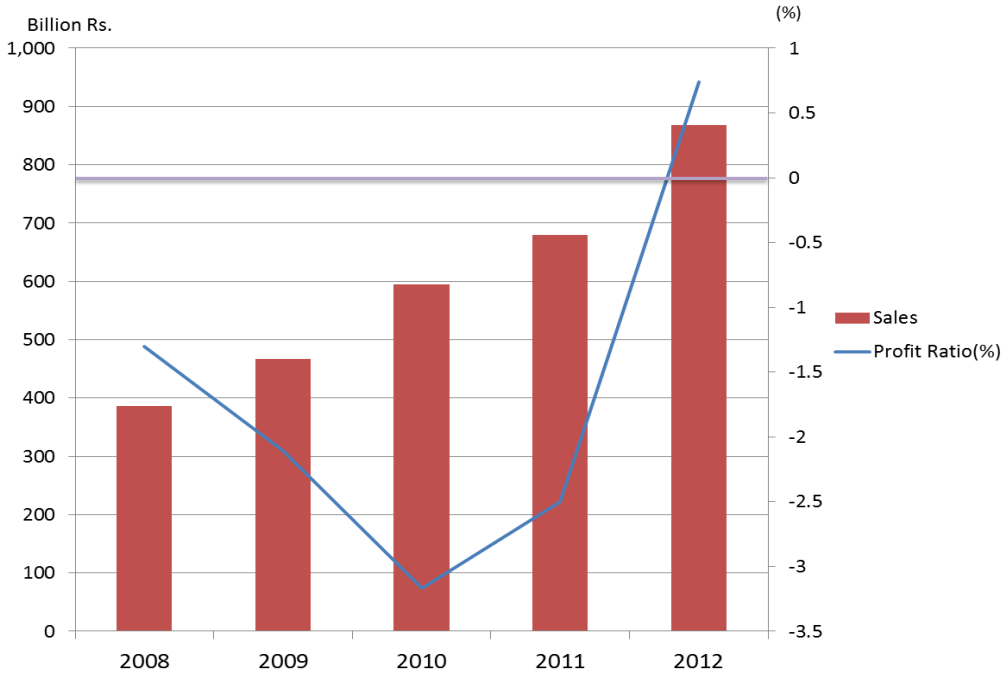
Table 4.1-1 Sales and Profit ratio

NTDC is given a low evaluation for energy generation assets and its return on asset (ROA) is also low.



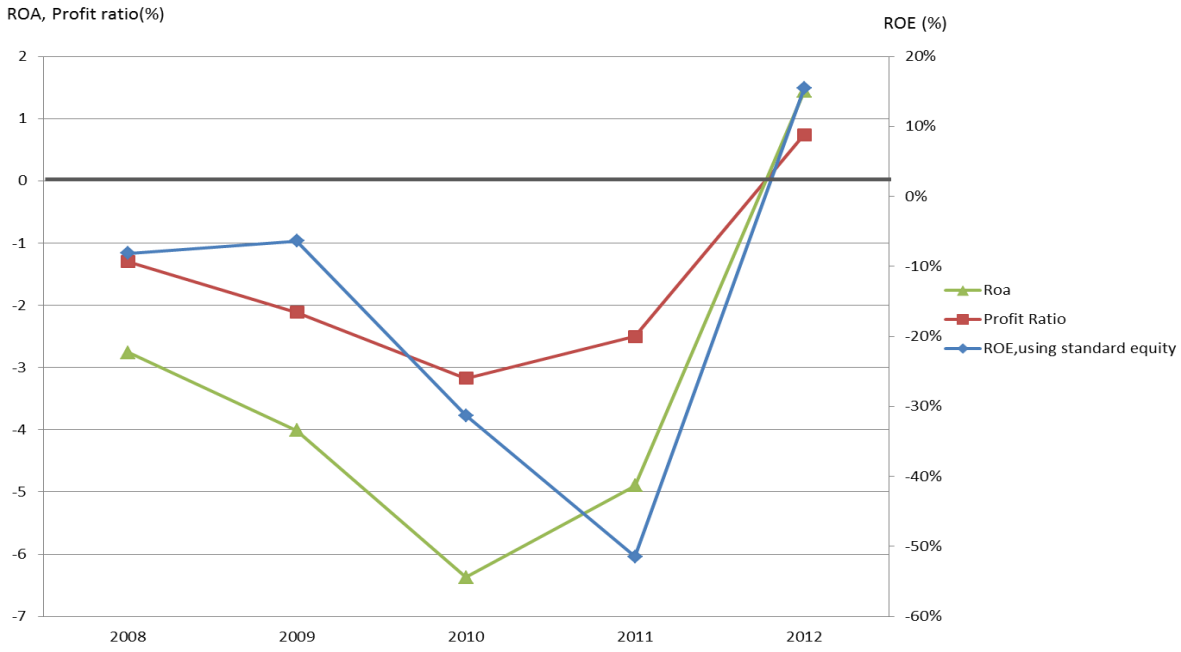
Note: For National Grid (UK), Red Eléctrica (Spain), Statnett(Norway),TenneT(Holland),Data in 2012
For NTDC, Data in 2010
Source : Annual reports of respective companies

Table 4.1-2 Total Asset and ROA



Note: Profit Ratio
Source：NTDC Financial Statement in each year

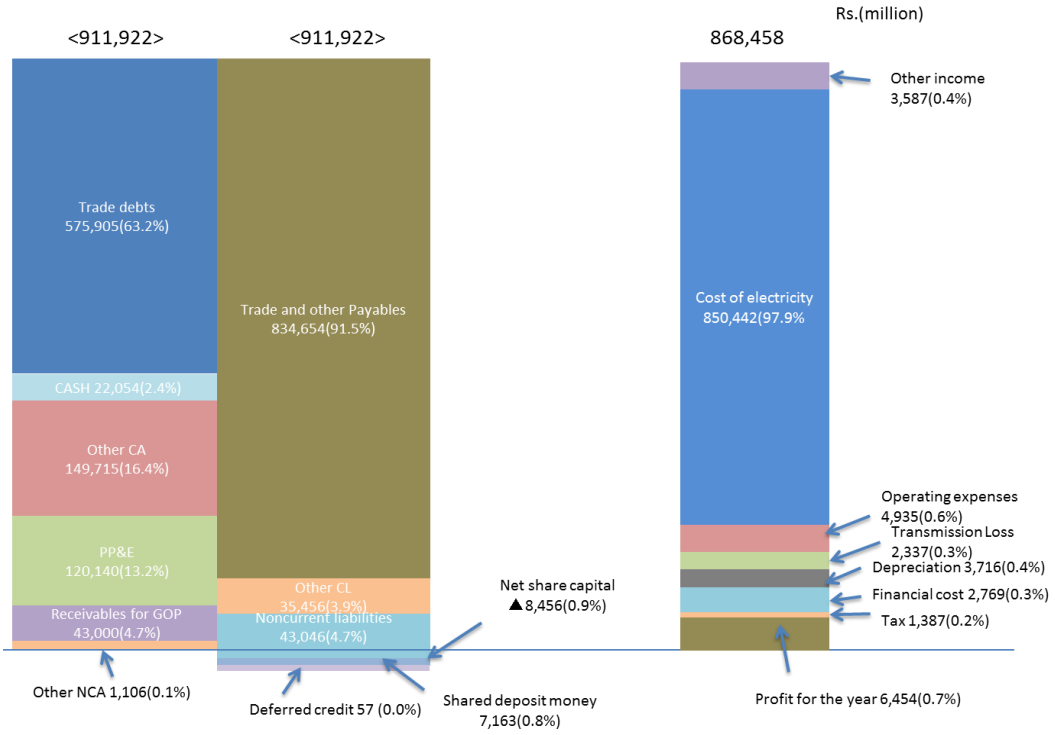
Table 4.1-3 Transition of Sales and Profit of NTDC



Note：ROA: Return on Assets(after tax profit rate)
Profit ratio: Profit after tax/sales
Source：NTDC Financial Statement in each year

Table 4.1-4 Transition of Profit Ratio and ROA of NTDC

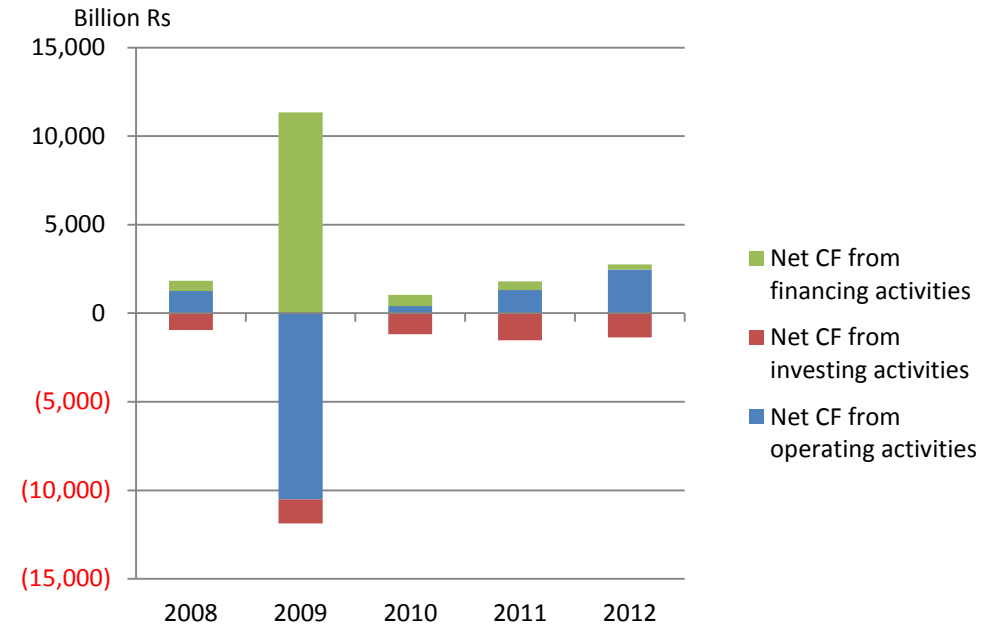
NTDC was in a state of capital deficit in 2012.



Source：JICA Survey Team using material from NTDC Financial Statement 2012

Table 4.1-5 BS and PL of NTDC (2012)

According to Determination of the Authority in the matter of NTDC (No NEPRA/TRF-226NTDC-2013) issued by NEPRA in 2013, it is recommended that transmission loss should be reduced to a level below 2.5%. In other words, modest 2.5% loss can be passed through, resulting in 3 Billion Rs. on annual average.



Source：NTDC financial statements

Table 4.1-6 Cash Flow of NTDC

4.1.2.1.3 Wheeling Charge

The Wheeling Charge in Pakistan consists of Fixed Charge per kW and Variable Charge per kWh. Fixed Charge is 85.91Rs./kW per month determined by NEPRA (this charge is revised every year, considering various factors.).

While Fixed Charge is 85.91kW/month derived from Prevalent Tariff (Tariff as of August, 2013), it is 102.43/kW/month derived from New Tariff after September, 2013.

This Fixed Charge is determined by NEPRA, thereafter submitted to the Government, and then notified to NTDC.

Fixed Charge (USCF: USCV: Use of System Charge Fixed) = Rs.102.43/kW/Month

Variable Charge (USCV: Use of System Charge Variable) = Rs. 0.2367 per kWh x LAL factor

(Source：S.R.O.886)

Where, LAL factor is the Adjustment Rate between Transmission Loss defined for each consumer and Load put on transmission grid, of which loss allocation is determined by NEPRA. Until NEPRA determines the standard for the allocation, LAL Factor of unity (“1”) is applied.

In addition to the Wheeling Charge, sales includes condideration of services booked as other sales for the service unit, providing DISCOs with transmission-related services based on knowledge and experience on transmission line and/or grid that they do not have.

For example, the Adhesive Terms and Conditions for Implementing Wheeling of Electric Power defined by Tokyo Electric Power Company specifies that the contract electricity tariff of transmission service for small user connected to high-tension transmission line (eg.50kW) is set at 577.50Yen/kW for the minimum power charge and at 2.47Yen/kWh for power charge as of September 1st, 2009.

Assuming that a monthly utilization rate is 50% (24 hours x 30 days x 50% = 360 hours), the calculation shows that the total charge amounts to 73,335 Yen, because the minimum power charge of 577.5Yen/50kW=28,875 Yen is added to the power charge of 44,460Yen (50kW x 360h = 18,000kWh, 18,000kWh x 2.47Yen = 44,460Yen) as a total charge, leading to the average power charge of 4.07Yen/kWh (73,335Yen/18,000kWh = 4.07Yen/kWh). The total power charge of low tension for household consumer will be higher, compared with small user charge shown by the above calculation.

Source: "Political Economics", Hiroaki Nagayama (2012)

What follows are an example of calculating Wheeling Charge. It is envisaged that the Wheeling Charge of NTDC is set at 0.51Yen/kWh, or at an extremely low level, compared with Japan.

Fixed charge	Variable charge
Assuming -104.23Rs/kW and 50kW	0.2367Rs./kWh
	50kW x (24 hour x 30 day x 50%)[28] = 18,000kWh
104.23x50kW = 5,211.5Rs	18,000kWh x 0.2367Rs. = 4,260.6Rs.
9,382.1Rs.	
9,382.1 Rs. / 18,000kWh = 0.5212Rs./kWh(0.51Yen/kWh)	

Source : Pro forma calculation made by Prof. Nagayama at Kyoto University, referring to S.R.O.886.

[28] Assuming monthly operational rate is 50%, a proforma calculation was made.

4.1.2.1.4 Investment Decision Mechanism at NTDC

For Rate of Return on NTDC, its cost is set at a higher level than DISCOs to ensure that NTDC supplies power to DISCOs with certainty, and that it can provide competitive service, which means that NTDC should be on a safe side financially with a balance sheet to be as healthy as possible.

The most fruitful outcome for Pakistan is that an agreement was made to hold a meeting to review this plan, because Geo-planning[29] will be submitted to NEPRA and the Government. When a scope of target investment is determined, it will be necessary to cleverly consider many factors including national geography of Pakistan, generation operators, service territory and transmission loss.

4.1.2.1.5 Issues at NTDC

The following measures are required to deal with poor performance of NTDC.

- Response to Real Time[30] market
- Economical load dispatch
- Tariff modulation (for the wheeling charge)
- Full automation of work
- Financial Analysis

4.1.2.1.6 Personnel Affairs at NTDC

Although the position of Chairman at NTDC is vacant as of August, 2013, he will be elected from the private business sectors, which has already been notified. A Court Order was issued to determine CEO of National Transmission and Dispatch Company (NTDC), Private Power Infrastructure Board (PPIB) and Alternative Energy Development Board (AEDB) through interview with candidates from these organizations.[31] The candidates listed above all come from the private sector.

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29 Geo-planning is a short, medium and long term investment plan announced by the Planning Commission.

30 Real Time Market means a procurement market for obtaining demand-supply capability (including generation capability and/or megawatt capacity) for a power grid operator to match demand capacity with supply capacity in an entire power supply area in a real time basis.
Source: http://techon.nikkeibp.co.jp/article/WORD/20130108/259192/?ST=print
1. Neutrality of an electricity grid operator to market participants (on a bid tendering or a negotiation basis) should be guaranteed.
2. A system to make real time adjustment (final adjustment of demand-supply) should be established.
3. Not only new generation (companies) but generation and retail units of power companies should provide same power capacity as a planned capacity or on real time basis simultaneously.

31 It means that a court order was issued not for the purpose that a committee should be formed, but for the purpose that CEO should necessarily be determined through interviews in the existing committee, although not functioning well for determining CEO, for stopping widespread personnel reshuffle conducted thus far in a self-centered manner, giving much thought on politicians' wishes and disregarding the determination of the committee.

4.1.2.2 WPPO

1) Role of organization

WPPO has two roles as shown below:

1) PPA

Control of PPA before 2002, based on the Policy 1994.

2) Corporatization of NTDC

This is almost completed.

2) Policy 1994 and Policy 2002

WAPDA and IPPs signed the PPA Contract based on the Policy 1994. All the matters on this PPA are controlled by WPPO. Later, the Policy 2002 was developed (actually, it became effective in 2004). Major matters on the IPPs thereafter were to be controlled by CPPA.

WPPO is positioned as an institution performing works on behalf of NTDC. While IPPs controlled by WPPO include Hubco founded in 1996, major IPPs were founded in 1999-2000. The contracts with IPPs will terminate in series during the timeframe between 2021 and 2026.

WPPO will also control start-up IPPs dealing with hydropower.

PPIB will provide founders of IPP with LOI (Letter of Intent) and LOS (Letter of Support), providing engineers at WPPO on loan to PPIB, where they will examine Feasibly Study (FS) on foundation of IPP.

The Policy 1994 provides Up-front Tariff, while the Policy 2002 defines Cost Plus.

The latter Policy not only guarantees 17%IRR in dollar, but gives preferential treatment for inflation including indexation with USCPI (US Consumer Price Index). All the projects of IPPs will be promoted by means of BOOT (build–own–operate–transfer).

As many generation plants were not operated due to a problem of the Circular Debt, however, the Government provides hydropower IPPs with 17% IRR in dollar and other various incentives.

NEW-BONG hydropower plant has started operation in March, 2013 for the first time as a hydropower IPP.

3) Workforce of WPPO

A total headcount at WPPO is hundred or so, in which twenty engineers are included.

A headcount of hydropower engineers, however, is only three. Their main responsibility is to control the existing IPPs and/or solve major problems.

4) Development of cascade hydropower

An optimization study of utilizing water resources conducted by PPIB at Jehlam River considers an optimal operation of a riverine system so that no conflict may take place among projects at upstream and downstream, respectively.

5) Hydropower in AJK[32]

AJK is an area over which no control of the Government of Pakistan reaches, and out of NEPRA's purview.

However, as the Government of AJK agrees to the Power Policy 2002 executed by the Government of Pakistan, the area is treated as one of the Provinces of Pakistan. Payment for the right of water usage is made to Pakistan in the same manner as other Provinces of Pakistan. For this reason, Patrind and Kohala, both hydropower IPPs, are generating hydropower in the area. Note, however, that the Government of AJK is, as a matter of form, regarded as a separate "state", an implementation party of the IPP Contract is the Government of AJK. IPP Tariff is determined by NEPRA as per normal, and thereafter the Government of Pakistan notifies the Government of AJK of the NEPRA-Determined Tariff.

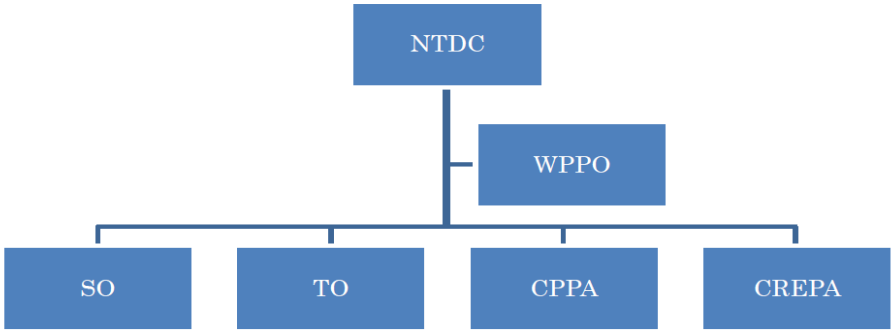
4.1.2.3 CPPA

4.1.2.3.1 Organizational Structure

As of 2013, CPPA is one of the four organizations under Managing Director (MD) of NTDC. Personnel positioning in the organization will be specifically determined in future.

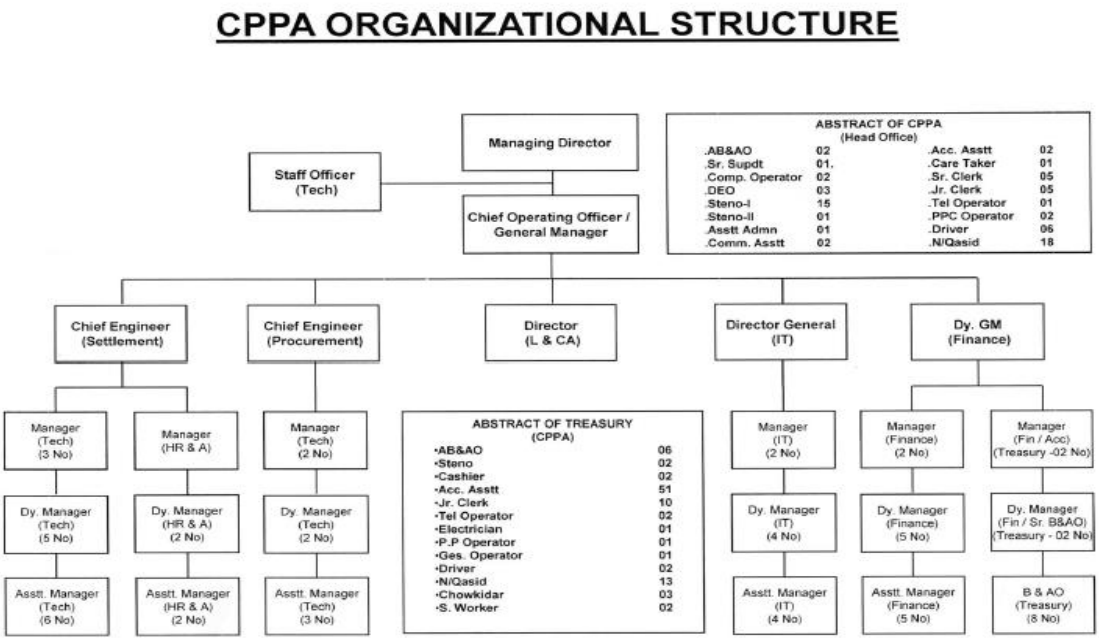
The employees as of August, 2013 are comprised of DG (Director General)-IT, DG-Finance, two chief engineers and sixteen engineers responsible for technical verification and capacity testing, and administration staff negotiating PPA.

[32] Azad Kashmir (abbreviated AJK) is a self governing territory controlled by Pakistan.
It shares border with Gilgit Baltistan, which to be called " Pakistan-administered Kashmir ".Azad Jammu and Kashmir borders the Indian-controlled state of Jammu and Kashmir to the east (separated from it by the Line of Control), With its capital at Muzaffarabad.AJK is a controlled by Pakistan, Azad Kashmir has a parliamentary form of Government. The president is the constitutional head of the state, while the prime minister, supported by a Council of Ministers, is the chief executive. Azad Jammu and Kashmir Legislative Assembly elects both the prime minister and president.



Note: SO: System Operator
TO: Transmission Operator
CREPA: Contract Registrar and Power Exchange Administrator
NTDC: National Transmission and Dispatch Company
WPPO: WAPDA Power Privatization Organization
Source：Obtained data from CPPA on Sep 24,2013

Table 4.1-7 Organogram of NTDC



Source：Obtained data from CPPA on Sep 24,2013

Table 4.1-8 Organogram of CPPA

4.1.2.3.2 Business of CPPA

CPPA makes a contract with IPPs founded according to the Policy 2002 and RE (Renewable Energy) operators dealing with more than 50MW capacity (Upfront Tariff for wind power has been implemented).

CPPA, although still under consideration, hold a thought of making an IPP contract with RE operators on behalf of DISCOs, because they have not won the confidence yet.

Power Supply Agreement with DISCOs and PPA with IPPs have already been executed.

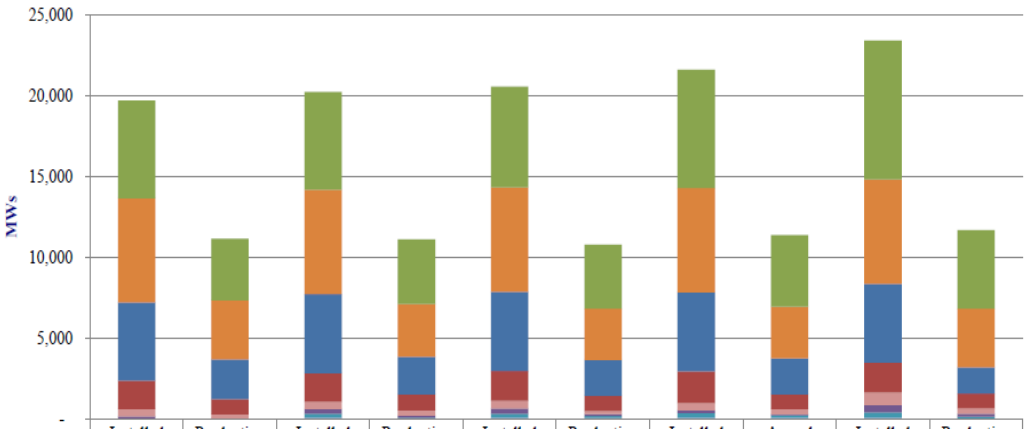
What CPPA can change is limited to the clauses of which template already have been developed, whereas tariff is determined by NEPRA.

4.1.2.3.3 Accounts Receivable (AR) and Accounts Payable (AP)

AR of CPPA amounted to 440 billion Rs. at the end of July, 2013, and AP to 164 billion Rs. as of September 24th, 2013.

4.1.2.4 GENCO

Table 4.1-9 shows Installed Capacity by the type of generation business and the generated capacity (MW) of GENCOs in the time frame between 2007 and 2011. Particularly, the difference between the installed capacity and power production is large.

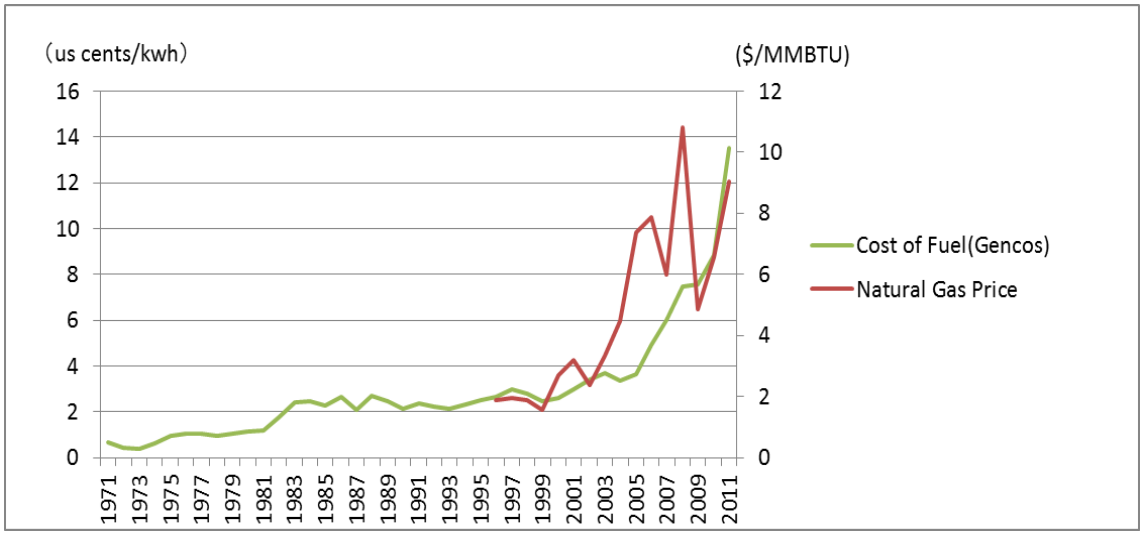


	2007		2008		2009		2010		2011	
	Installed	Production	Installed	Production	Installed	Production	Installed	Annual	Installed	Production
Thermal IPPs	6,016	3,815	6,035	3,989	6,218	3,974	7,322	4,433	8,587	4,845
Hydel WAPDA	6,444	3,635	6,444	3,258	6,444	3,155	6,444	3,188	6,444	3,643
Thermal GENCOs	4,832	2,468	4,899	2,341	4,900	2,230	4,885	2,239	4,885	1,611
Thermal KESC	1,756	933	1,756	989	1,846	943	1,946	909	1,821	893
Nuclear Two Nuclear plants	462	240	462	323	462	170	462	305	787	346
Thermal RPPs	150	24	286	107	336	123	172	78	453	192
Thermal Others (CPPs/SPPs)	-	20	239	72	239	119	272	152	324	100
Hydel IPPs	30	11	111	15	111	62	111	64	111	35
Import Mainly from Iran	-	20	-	30	-	30	-	31	-	34

Source：Knowledge Session Power Paradigm Series of Ⅲ by Samiya Mukhtar(Assistant Manager - Business Development, PACRA) 20-01-12

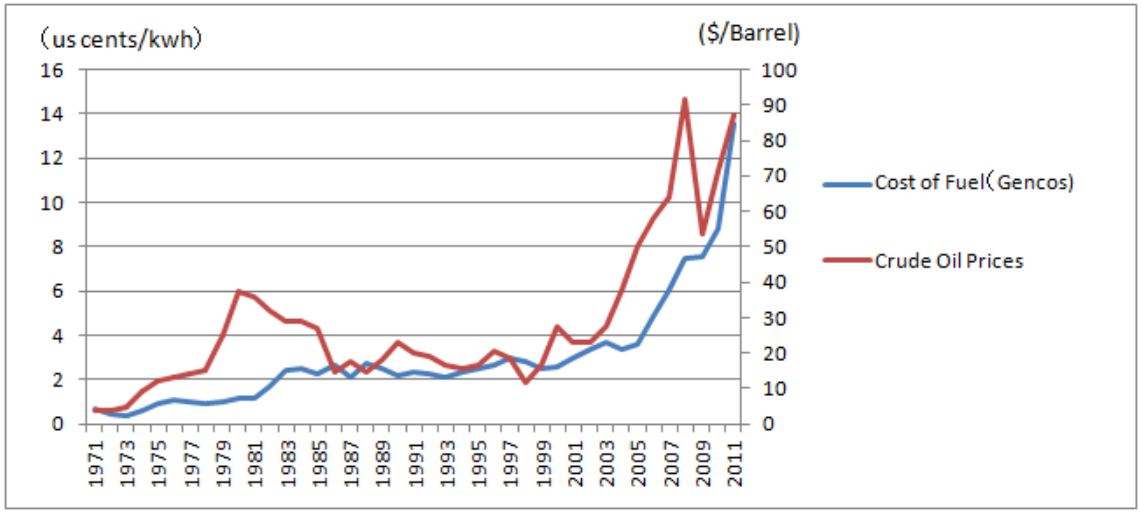
Table 4.1-9 Installed Capacity and Operational Status by Energy Plant Owner

The average fuel cost has a strong correlation with crude oil and gas price.



Source：PEPCO Electricity Marketing Data
TABLE G-11 Average Fuel Cost
BP—Natural Gas Prices, Historical Data
http://www.bp.com/en/global/corporate/about-bp/energy-economics/statistical-review-of-world-energy-2013/review-by-energy-type/natural-gas/natural-gas-prices.html

Table 4.1-10 Average Fuel Cost in GENCOs and (Annual) Transition of Natural Gas Price in London



Source：JICA Survey Team using material from PEPCO Electricity Marketing Data
TABLE G-11 Average Fuel Cost
InflationData.com
http://inflationdata.com/Inflation/Inflation_Rate/Historical_Oil_Prices_Table.asp

Table 4.1-11 Average Fuel Cost in GENCOs and (Annual) Transition of Crude Oil

4.1.2.5 PEPCO/WAPDA

- Since October 2007, WAPDA has been bifurcated into two distinct entities i.e. WAPDA and Pakistan Electric Power Company (PEPCO). WAPDA is responsible for water and hydropower development, whereas PEPCO is vested with the responsibility of thermal power generation, transmission, distribution and billing.

Source: http://wapda.gov.pk/htmls/auth-index.html (Referred in September 6th, 2013)

- The following fourteen Corporate Entities were formed:
  - Four Thermal Power Generation Companies (GENCOs)
  - National Transmission & Power Dispatch Company (NTDC)
  - Nine Distribution Companies (DISCOs)

Source: http://wapda.gov.pk/htmls/investors-index.html (Referred in September 6th, 2013)

4.1.2.5.1 PEPCO

In 1998, PEPCO made a Five-Year Management Contract with each company under its umbrella because it would be dissolved in 2003. Thereafter a three-year Renewal Contract was made, followed by switching to an annual renewal.

The members are comprised of MD (Managing Director) and Executive Director (responsible for Finance, Planning, HR and Legal).

In 2007, PEPCO was founded to promote the energy sector reform by the direct order of Nawaz Sharif, then Prime Minister.

The employee distribution of PEPCO (as of 2013) is as shown below.

Table 4.1-12 Employee Distribution in PEPCO

	Position	Number
1	MD-PEPCO	10
2	CFO-PEPCO	08
3	GM(Fin)-PEPCO	05
4	GM(Thermal)-PEPCO	100
5	GM(C&M)-PEPCO	16
	・CE(Operation)	23
	・DG(EM&C)	18
	・CE(RE)	22
	・Director(Stat)	06
6	GM(HR)-PEPCO	15
7	GM(M&S)-PEPCO	35
8	GM(R&CO)/DG(Comm)-PEPCO	12
9	CE/PD(PMU)-PEPCO	10
10	Legal Advisor(LA)- PEPCO	04
11	DG(CPCC)-PEPCO	15
12	Chief Auditor-PEPCO	58
13	CE(Admn)Power-PEPCO	05
	i). Director(PA)	12
	ii). DAP	25
	iii). Director(CM-Ⅱ)	11
	iv). Director(Services)	74
14	DGF(B&C)-PEPCO	12
15	WAPDA Eng. Academy	14
16	Director(CCC)	04
17	Director Fin(P)	16
18	WMC-PEPCO	10
19	Director(L&W)	06
Total		546

Note : MD- Managing Director, CFO-Chief Financial Officer, GM- General Manager, CE-Chief Manager, DG-Director General, Comm-Commercial, CPCC- Corporate Planning & Control Cell, CCC- Central Contract Cell, WMC-Water Maintenance and Conservation, L&W- Land & Water

Source: PEPCO

Table 4.1-13 Existing Installed Capacity & Capability of PEPCO System as of June 30th, 2012 (1)

		Sr. No.	Name of Power Station	Fuel	Installed Capacity (MW)	Derated Capacity / Capability[1] (MW)		Capability[2] (MW) with Planned Outages		Capability[3] (MW) with Forced Outages		Capability[4] (MW) with gas unavailability	
						Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
Public Sector	Hydel	1	Tarbela	Water	3478	3633	829	3633	829	3633	829	3633	829
		2	Mangla	Water	1000	960	350	960	350	960	350	960	350
		3	Ghazi Barotha	Water	1450	1357	794	1357	794	1357	794	1357	794
		4	Warsak	Water	243	200	139	200	139	200	139	200	139
		5	Chashma Low Head	Water	184	157	67	157	67	157	67	157	67
		6	Small Hydels	Water	89	64	20	64	20	64	20	64	20
		7	Khan Khwar HPP	Water	72	72	15	72	15	72	15	72	15
			Sub-Total (WAPDA Hydel)		6516	6443	2214	6443	2214	6443	2214	6443	2214
	Thermal (GENCOs)	8	TPS Jamshoro #1-4	Gas/FO	850	700		669	633	585	549	585	549
		9	GTPS Kotri #1-7	Gas	174	140		134	127	117	110	117	110
			Sub-Total GENCO-I		**1024**	**840**		**802**	**759**	**701**	**659**	**701**	**659**
		10	TPS Guddu Steam #1-4	FO	640	270		258	244	225	212	225	212
		11	TPS Guddu C.C. #5-13	Gas	1015	885		845	800	739	694	739	694
		12	TPS Quetta	Gas	35	25		24	23	21	20	21	20
			Sub-Total GENCO-II		**1690**	**1180**		**1127**	**1067**	**985**	**925**	**985**	**925**
		13	TPS Muzaffargarh #1-6	Gas/FO	1350	1130		1079	1022	944	886	944	886
		14	NGPS Multan #1&2	Gas/FO	195	60		57	54	50	47	50	47
		15	GTPS Faisalabad #1-9	Gas/HSD / FO	244	210		201	190	175	165	175	165
		16	SPS Faisalabad #1&2	FO	132	100		96	90	84	78	84	78
		17	Shahdra G.T.	Gas	44	30		29	27	25	24	25	24
			Sub-Total GENCO-III		**1965**	**1530**		**1461**	**1383**	**1278**	**1200**	**1278**	**1200**
		18	FBC Lakhra	Coal	150	30		29	27	25	24	25	24
			Sub-Total GENCO-IV		**150**	**30**		**29**	**27**	**25**	**24**	**25**	**24**
			Sub Total GENCOs		4829	3580		3419	3236	2989	2807	2989	2807
			Sub Total (WAPDA+GENCOs)		11345	10023	5794	9862	5450	9432	5021	9432	5021
	Nucl		**Nuclear Plants**										
		19	Chashma Nuclear (PAEC)	Uranium	325	300		287	271	251	235	251	235
		20	Chashma Nuclear (PAEC)-II	Uranium	340	315		301	285	263	247	263	247
			Total Capacity (Public)		12010	10638	6409	10148	5722	9683	5256	9683	5256

Source : ENERGY SECTOR CRISIS ISSUES & REFORMS WAY FORWARD SHAHID SATTAR Member(Energy) PLANNING COMMISSION May 23rd, 2013

Table 4.1-14 Existing Installed Capacity & Capability of PEPCO System as of June 30th, 2012 (2)

		Sr. No.	Name of Power Station	Fuel	Installed Capacity (MW)	Derated Capacity / Capability[1] (MW)		Capability[2] (MW) with Planned Outages		Capability[3] (MW) with Forced Outages		Capability[4] (MW) with gas unavailability	
						Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
Private Sector	Hydel	21	Jagran Hydel	Water	30	30	10	30	10	30	10	30	10
		22	Malakand-III Hydel	Water	81	81	20	81	20	81	20	81	20
			Sub-Total (Hydel IPPs)		111	111	30	111	30	111	30	111	30
	Thermal	23	KAPCO	Gas/FO	1638	1386		1324	1253	1240	1170	1240	1170
		24	Hub Power Project (HUBCO)	FO	1292	1200		1146	1085	1074	1013	1074	1013
		25	Kohinoor Energy Ltd. (KEL)	FO	131	124		118	112	111	105	111	105
		26	AES Lalpir Ltd.	FO	362	350		334	316	313	295	313	295
		27	AES Pak Gen (Pvt) Ltd.	FO	365	350		334	316	313	295	313	295
		28	SEPCOL	FO	135	119		114	108	107	100	107	100
		29	Habibullah Energy Ltd. (HCPC)	Gas	140	129		123	117	115	109	115	109
		30	Uch Power Project	Gas	586	551		526	498	493	465	493	465
		31	Rouch (Pak) Power Ltd.	Gas	450	395		377	357	354	333	354	333
		32	Fauji Kabirwala (FKPCL)	Gas	157	151		144	137	135	127	135	127
		33	Saba Power Company	FO	134	125		119	113	112	106	112	106
		34	Japan Power Generation Ltd.	FO	135	120		115	108	107	101	107	101
		35	Liberty Power Project	Gas	235	211		202	191	189	178	189	178
		36	Altern Energy Ltd. (AEL)	Gas	31	31		30	28	28	26	28	0
		37	Attock Generation PP	FO	163	156		149	141	140	132	140	132
		38	ATLAS Power	RFO	219	219		209	198	196	185	196	185
		39	Engro P.P. Daharki, Sindh	Gas	226	217		207	196	194	183	194	183
		40	Saif P.P. Sahiwal, Punjab	Diesel/Gas	225	225		215	203	201	190	201	0
		41	Orient P.P. Balloki, Punjab	Diesel/Gas	225	225		215	203	201	190	201	0
		42	Nishat P.P. Near Lahore	RFO	200	200		191	181	179	169	179	169
		43	Nishat Chunian Proj. Lahore	RFO	200	200		191	181	179	169	179	169
		44	Foundation Power	Gas	175	175		167	158	157	148	157	148
		45	Saphire Muridke	Diesel/Gas	225	209		200	189	187	176	187	0
		46	Liberty Tech	RFO	200	196		187	177	175	165	175	165
		47	Hubco Narowal	RFO	220	214		204	193	192	181	192	181
		48	Halmore Bhikki	Diesel/Gas	225	209		200	189	187	176	187	0
			Sub-Total (Thermal IPPs)		8294	7687		7341	6949	6880	6488	6880	5729
			Total Thermal (IPPs)		8294	7687		7341	6949	6880	6488	6880	5729
			Total Capacity (Private)		8405	7798	7717	7452	6979	6991	6518	6991	5759
			Total Hydel (Public+Private)		6627	6554	2244	6554	2244	6554	2244	6554	2244
			Total Thermal (Public+Private)		13788	11882		11347	10741	10383	9777	10383	9018
			Total (PEPCO System)		20415	18436	14126	17600	12701	16674	11774	16674	11015

Note1 : Hydro Capacity is based on last 5 years' average
Note2 : Planned outages for Summer(June) are taken as 4.5% and for Winter(December) are taken as 9.6% for all thermal plants
Note3 : Forced outages for GENCOs plants are taken as 12% and for IPPs thermal as 6%
Note4 : The plants with 9 months gas contracts are not available in winter
Source : ENERGY SECTOR CRISIS ISSUES & REFORMS WAY FORWARD SHAHID SATTAR Member(Energy) PLANNING COMMISSION May 23rd,2013

4.1.2.5.2 WAPDA

The electricity supply service in Pakistan, initially, was undertaken by different agencies, both in public and private sectors, in different areas. In order to provide for the unified and coordinated development of the water and power resources, Water and Power Development Authority (WAPDA) was founded in 1958 through WAPDA Act, 1958.

Source: http://www.lesco.gov.pk/Organization/1000077.asp(Referred in September 6th, 2013)

WAPDA, the Pakistan Water and Power Development Authority, was created in 1958 as a Semi-Autonomous Body for the purpose of coordinating and giving a unified direction to the development of schemes in Water and Power Sectors, which were previously being dealt with, by the respective Electricity and Irrigation Department of the Provinces.

WAPDA is now fully responsible for the development of Hydel Power and Water Sector Projects.

The Charter of Duties of WAPDA is to investigate, plan and execute schemes for the following fields:

1. Generation, Transmission and Distribution of Power.
2. Irrigation, Water Supply and Drainage.
3. Prevention of Water logging and Reclamation of Waterlogged and Saline Lands.
4. Flood Management.
5. Inland Navigation.

Source: http://wapda.gov.pk/htmls/auth-index.html (Referred in September 6th, 2013)

WAPDA hydel power stations were generated as much as 28,235 GWH during the year under report (2011-2012).

Source: http://wapda.gov.pk/htmls/auth-index.html, annual report 2012, P.9 (Referred in September 6th, 2013)

4.1.3 Investment Promotion

4.1.3.1 PPIB

4.1.3.1.1 Task Overview of PPIB

The Private Power and Infrastructure Board (PPIB) was founded in 1994 as "One Window Facilitator" to promote private sector participation in the power sector of Pakistan.

Source: http://www.mowp.gov.pk/gop/index.php?q=aHR0cDovL3d3dy5wcGliLmdvdi5way9OX2Fib3V0X3BwaWIuaHRt (Referred in September 6th, 2013)

It successfully managed to induct 29 independent private power projects totaling 8.657 MW.

IPPs account for approx. 50% of the country's present installed generation capacity.

New Bong Hydropower Project with a generation capacity of 84MW, the first hydro IPP in AJ & K, Pakistan/, started operation.

Source: http://www.mowp.gov.pk/gop/index.php?q=aHR0cDovL3d3dy5wcGliLmdvdi5way9pbmRle C5odG0%3D "Achievements" (Referred in September 6th, 2013)

PPIB supports the Cascade Hydro project that private companies cannot deal with, due to overlapped interests of upstream and downstream.

The headcount of PPIB is forty employees including those responsible for IT, nineteen of them, however, are loaned from the Government and/or each Provincial Government.

Source: http://www.mowp.gov.pk/gop/index.php?q=aHR0cDovL3d3dy5wcGliLmdvdi5way9OX2ZhcXMuaHRt "How many IPPs facilitated by PPIB are functional in Pakistan?" (Referred in September 6th, 2013)

4.1.3.1.2 Main Income of PPIB

- Income of PPIB is mainly comprised of regulation fee and process fee. Income of PPIB is processing fee for a proposal of 20,000 USD plus registration fee of 200 USD. The registration procedures are shown as below:

・An applicant is required to be registered to PPIB with a letter of request and registration fee of 200USD as a deposit.

・In accordance with the pre-determined guidelines, an applicant is required to submit a proposal to PPIB with payment of 20,000USD.

Approximately 9.4 Billion USD investment was successfully raised for twenty-nine (29) Independent Power Producers (hereinafter called "IPP") generating a total capacity of 8,657MW.

IPPs account for approx. 50% of the country's present installed generation capacity.

Furthermore, a new policy was developed to the effect that an upfront payment system would be implemented in a project converting the existing private sector project to a project using less inexpensive fuel.

A guarantee fee of 1,000USD per 1MW power generated by IPPs will be collected (one time collection).

- Power source

Fifteen hydropower projects with a capacity of 6,000MW are planned.

・The Provinces are encouraged to develop hydropower by region with a generation

capacity smaller than 50MW.

・PPIB (Private Power and Infrastructure Board) considers smal or medium capacity power plants with a generation capacity larger than 50MW to be important.

4.1.3.2 AEDB

AEDB was formed in 2003 and is one stop shop for renewable energy. They have 110 people as staff, out of which 25 are engineers. They have a policy under which they will deal with all forms of energy (wind, solar, geo thermal, bio energy and hydro). The government announced incentives for investors such as: 17% Return on Equity, duty free import of all equipment, tax exemptions, repatriation of profits, sovereign guarantee plus a guarantee purchase of power by government. Furthermore, there is Feed in Tariff for wind and solar energy for which NEPRA determines the tariff. AEDB has obtained Letter of Intent for 22 companies in solar energy (700MW), 44 in wind energy (3000MW), hydropower (18MW up to 50MW) and Biogas energy (Bagasse) (300MW) which are in the process of installation. For renwable energy, it is expected that 10,000MW will be generated by 2030.

AEDB is assumed to develop sunlight, wind and bio energy by its mandate, while no priority is set on smaller hydropower as other items.

4.1.4 Energy Conservation

4.1.4.1 ENERCON

4.1.4.1.1 Organization Summary

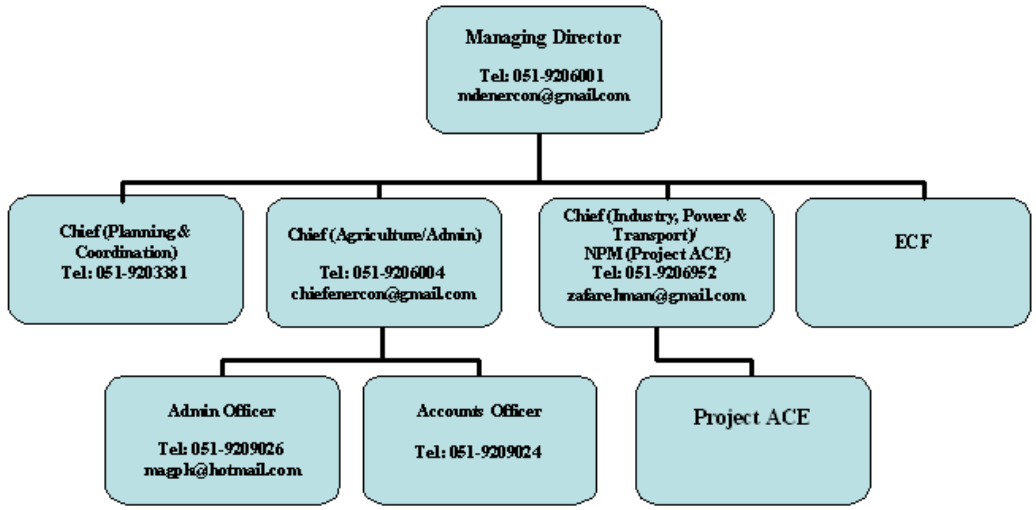
National Energy Conservation Centre (ENERCON) was established in 1987. The draft Energy Efficiency and Conservation Bill 2013 now under consideration shows an organizational positioning of ENERCON.

The Energy Conservation Center is one of the centers under MOWP, staffing twelve engineers. The headquarters is located in a building donated by USAID.
As the Center itself is not allowed to do commercial business due to a part of the Government organization, it has formed a separate organization called Energy Conservation Fund (hereinafter referred to as ECF as a lower organization). The Fund has seven staff members, doing commercial business.

◦ Founded in December 1986 under the Ministry of Planning & Development.
◦ Transferred to the Ministry of Water & Power on October 19th, 1993.
◦ Transferred to the Ministry of Environment on January 24th, 1996.
◦ Became one of the Departments on February 26th, 1997.
◦ Administrative Power of ENERCON was transferred to the Ministry of Water & Power on July 2nd, 2011.

Vision
“To Steer Pakistan towards an Energy Efficient and Environment Friendly Tomorrow”

Mission
"Cultivating a new energy culture focusing on achieving sustainable development through conservation and efficient use of energy resources"
Source: http://www.enercon.gov.pk/index.php?option=com_content&view=article&id=49&Itemid=21(Referred in September 9th, 2013)



I& I&P= Industry and Power
P&C = Policy and Coordination
TPT = Transport
T&O = Training & Outreach
ACE = National Awareness Campaign on E.C

A&A = Agriculture & Administration
ECF = Energy Conservation Fund
PE = Program Evaluation
Bldgs = Buildings

Source：http://www.enercon.gov.pk/index.php?option=com_content&view=article&id=26&Itemid=25

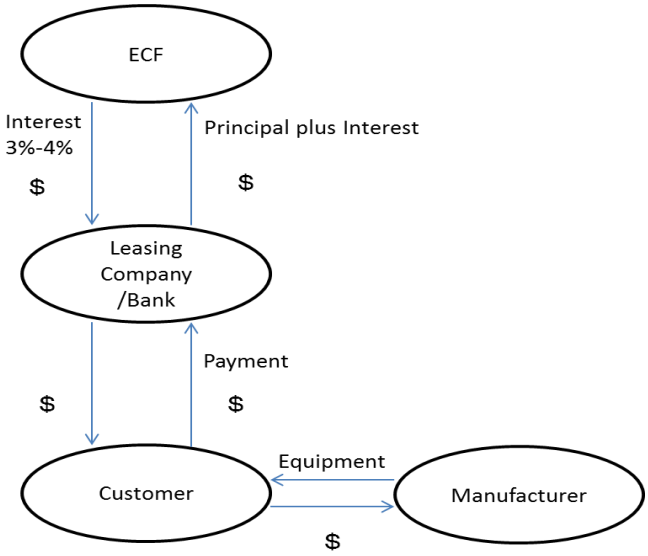
Table 4.1-15 Organizational Framework of ENERCON

4.1.4.1.2 Business of ENERCON

The actual business activities are conducted by the existing banks and/or leasing companies. ENERCON develops an energy conservation standard and/or a list of devices, equipment and machines that should save energy (including Automobile Tuning Machine, Textile Machinery and Wheel Balancing Machines).

4.1.4.1.3 Energy Conservation Fund

ECF runs Revolving Fund of 300 million Rs. ECF loans the fund with management fee of 3-4% to leasing companies. In addition, in the case where the fee is lower than the interest rate of any banks, ECF loans the fund with adding 10% margin. The fund of ECF is safely retained, not by directly loaning but by loaning to leasing companies.



- Relationship with International organization

  Energy conservation in Pakistan is given cooperation of ESMAP, UNDP and GIZ (Germany).

  As a manual used for energy conservation, an English textbook previously prepared by Hagler Bailly Pakistan is available.

- At present, no certification system is shaped for energy manager, energy consultant or energy auditor.

  However, with the passage of the Energy Conservation Bill or "Pakistan Energy Efficiency and Conservation Bill**",** it is considered that necessity for such certification system will arise, and a request for the certification system will become greater, because Building Code was established in March, 2013.

- Future activities

  For example, conversion from incandescent lamp to CFL (compact fluorescent lamp) and/or introduction of a finance mechanism prompting energy conservation are introduced under consideration.

Source: JICA Survey Team using material from Interview ENERCON

4.1.4.2 PSQCA(Pakistan Standards and Quality Control Authority)

- Pakistan Standards and Quality Control Authority (PSQCA) is a national standard authority.

  PSQCA is governed by the PSQCA Act, 1996. Bodies including ENERCON have to authenticate their documents from PSQCA. PSQCA is a member of

International Organization for Standardization (ISO), International Electro-technical Commission (IEC), and International Organization of Legal Metrology (OIML). PSQCA has been established to advise the Government on standardization policies, programs and activities to promote industrial efficiency and development, as well as for consumer protection. They have the different departments including Standards Development Centre (SDC), Quality Control Centre (QCC), Technical Services Centre (TSC) and System Certification Centre (SCC).

PSQCA also issues the certificate, including, for example, PSQCA certificate for 2- wheeler and 3-wheeler automobiles. They define standards for Automobile and almost all industry products.

PSQCA has a total of 536 staff members.

Substantial revenue source of PSQCA is marking fees charged for a unit of equipment manufactured every three months at the fourth quarter of the fist year. In addition, inspection commission and certification fees generate funds. The Authority is a self-financed organization.

PSQCA works on One Standard, following the MEPS methodology.

The Authority provides a certificate for quality, based on Pakistan Standards and Quality Control Authority Act No. VI of 1996. There are mandatory and voluntary certificates.

Mandatory inspections conducted in the energy field mainly include the following:

- ✓ Tungsten Filament Lamps for General Services (Electric Bulbs)
- ✓ Tubular Fluorescent Lamps for General Lighting Services (Tube light)
- ✓ PVC Insulated Cable (Non Armored) for Electric Power & Lighting
- ✓ Induction Motor
- ✓ Methods for measuring the performance of Electric Kettles jugs
- ✓ Methods for measuring the performance of Electric Toaster
- ✓ Ballast for fluorescent Lamps
- ✓ Two Wheeler Auto Vehicles
- ✓ Three Wheeler Auto Vehicle

- The Authority develops Pakistan Standards for various sectors ranging from food product, agriculture, chemistry, civil engineering, electronic device, electric machinery, machinery, textile and meteorological standard to information technology, information communication technology and health control.

Pakistan has been an initial member of the World Trade Organization (WTO) since its foundation, and PSQCA was founded as a result of the Act of the Parliament (effective from March 17th, 1996). This Act brings a legal and fundamental base to provide service through a single unified window for standardization and quality control that conforms to the global requirements.

Source：obtained data from PSQCA Oct 23,2013

Source: JICA Survey Team using material from onsite interview

Table 4.1-16 PSQCA Inspection Process

The testing center is located in Karachi and Lahore, respesctively.

PSQCA takes samples, which are sent by companies to their Lahore Lab first, and approves if the samples comform to PSQCA standards for boosting import.

At present, Energy Saving is important concern of the Government. Several products are marked in the list of Compulsory Products for Energy Conservation including Air Conditioner, Refrigerator and Fluorescent Lamp and CFL. They have ISO1705 accredited Laboratories in Karachi and Lahore where equipment are tested according to the International Specifications, before issuing a certificate (for Energy Conservation).

Clients of PSQCA include manufactures and importers, such as Philips, a manufacture of electric and home appliance.

The Authority deals with CFL lamps that the Gocernment imported from China.

Accreditation is performed by PNAC (Pakistan National Accreditation Council) and BVQI (Bureau Veritas Quality International) under MOST, and Moody (Moody International Certification Limited), each of which is an international ISO accreditation body.

Relationship between PSQCA and international standard development organizations

PSQCA, an international standard authority, is a member of the following organizations:

1. ISO (International Organization for Standardization)
   (The headquarter is located in Geneva, Switzerland)
2. IEC (International Electro-technical Commission)
   (The headquarter is located in Geneva, Switzerland)
3. OIML (International Organization of Legal Metrology
   (The headquarter is located in Paris, France)

Source：obtained data from PSQCA Oct 23,2013

4.1.5 Private Sectors

4.1.5.1 HUBCO

4.1.5.1.1 Overview of HUBCO

- The Hub power plant was one of the first and largest Independent Power Producer (IPP) in Pakistan to be financed by the private sector in Southern Asia and one of the largest private power projects in the newly industrialized world.
- In 1991, HUBCO was incorporated in Pakistan as a limited liability company for the purpose of implementing the project.
- The Company owns an oil-fired power station with an installed net capacity of 1,200 MW at Mouza Kund, Hub, in the Balochistan Province and 214 MW net capacity oil-fired power station at Mouza Poong, Narowal in the Punjab Province.
- The Company also has 75% controlling interest in Laraib Energy Ltd, its subsidiary, that is developing a 84 MW Hydel power plant in th suburbs of New Bong Escape, 8 km downstream of Mangla Dam in the Azad Kashmir Province.
- HUBCO (oil-based plant) has the operating rate of 64% and efficiency of 38%.
- The Hub Power Plant consists of four generating units, each of which has gross output power rated at 323 MW.
- The net available output power is transmitted to WAPDA's national grid via 500kv switchyard of HUBCO.

Maintenance work is outsourced toTenaga National Berhad (TNB) in Malaysia.

Source: http://www.hubpower.com/about-hubco/ (Referred in September 6th, 2013)
Source: http://www.hubpower.com/our-business/ (Referred in September 6th, 2013)
Source: http://www.hubpower.com/our-business/hub-power-station/ (Referred in September 6th, 2013)

4.1.5.1.2 Conversion of Fuel to Coal

It is estimated that the facilities alone cost 800MUSD, while the development cost including jetty amounts to 1,200MUSD (1.2 billion USD) for converting fule to coal.
Although imported coal will be used for the time being, it is planned to burn coal of the same quality, bringing future use of Thar coalfield into view.
An international bidding is underway and EPC qualification is conducted. EIA is also performed concurrently.
Although commercialization by means of SPV was once studied, it is intended that conversion of fuel will be done without changing the current framework now in place.
The current PPA is a thirty-year contract covering 1996 – 2025, but it is intended that PPA price defined in the contract will be revised.
(Financing for PPA (comprised of fixed price (capacity) and variable price (energy) will be done not only by means of own fund but long-term loan (the borrowing period is ten years). If the financing is realized, the fuel cost of 16.7 cents/kWh

included in the generation cost of 19.7 cents/kWh will reduce to as low as 5.6 cents/kWh.

The procedure of conversion to coal is done in the follwong manner:

The Government determines Conversion Policy →EAD→ECC Approval→Law→ NEPRA determines Tariff→PPA→Financial close

4.1.5.1.3 LNG

Two LNG generation sites are considered: one at Port Qasim and the other at Hubco (current location).

The cost of LNG is 14 cents/kWh, which will be easily financed (by EX-IM Bank).

The Government will call bids for the LNG projects.

4.1.5.1.4 Circular Debt

Out of the current Circular Debt of 115 billion Rs., the amount of 75 billion Rs. was paid by the Government in June, 2013. Thereafter, however, the circular debt of 30 billion Rs. have been accumulated by 3 month.

Payment from CPPA develops no problems, because the payment is precisely made, based on the Heat Rate Contract (payment is gradually raised.) with NTDC.

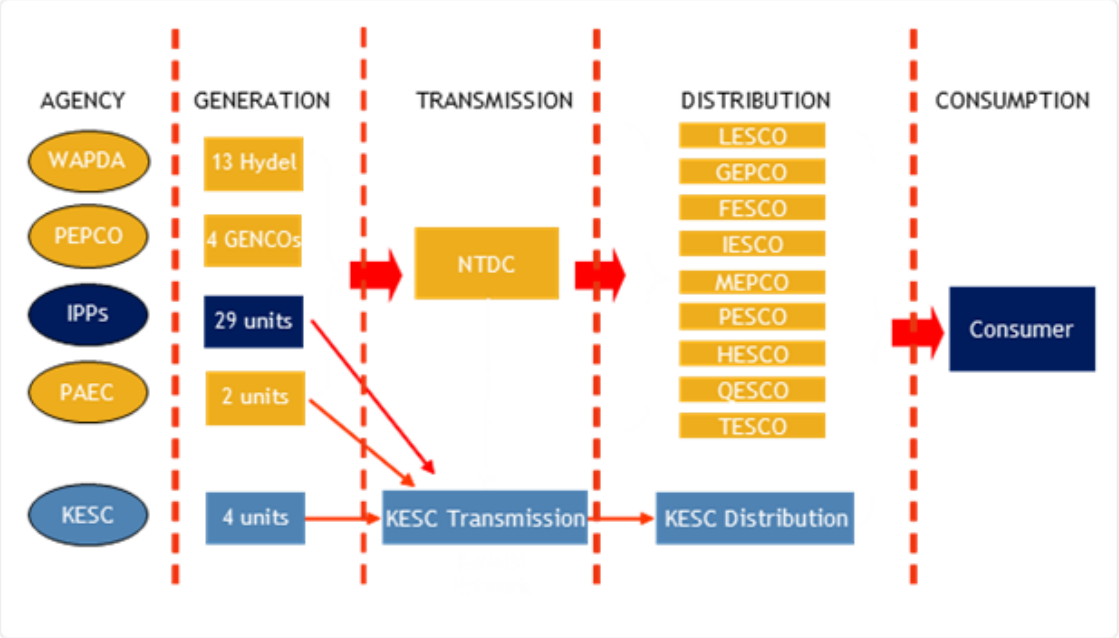
4.1.5.2 KESC

4.1.5.2.1 Overview of KESC

- KESC is one of the city's largest employers consisting of around 11,000 employees currently working for the company.
- KESC generates electric power in Karachi, a central city with a population of over 20 million, to provide electricity to more than 2.2 million consumers as of 2013.
- The service territory covers Karachi, Dhabeji, Gharo, Hub, Uthal, Vindhar and Bela.
- KESC is at present the only vertically-integrated power utility in Pakistan that manages the generation, transmission and distribution.
- KESC covers a vast area of 6,500 square kilometers and provides electricity to all the industrial, commercial, agricultural and residential areas that fall under its network.
- KESC has installed generation facilities with a installed caspacity of 2,341 MW, as well as concluded a power purchase agreement for 1,021 MW in addition to importing power from IPPs.

- KESC owns Bin Qasim-1 Power Station, Korangi Combined Cycle Power Plant, 560 MW BQPS-2 Combined Cycle Power Plant, Korangi Thermal Power Plant, Korangi Gas Engine Power Plant and Site Gas Engine Power Plant.
- KESC's transmission system comprises of a total 1,249kV with 62 grid lines consisting of 220kV, 132kV and 66 kV transmission lines.

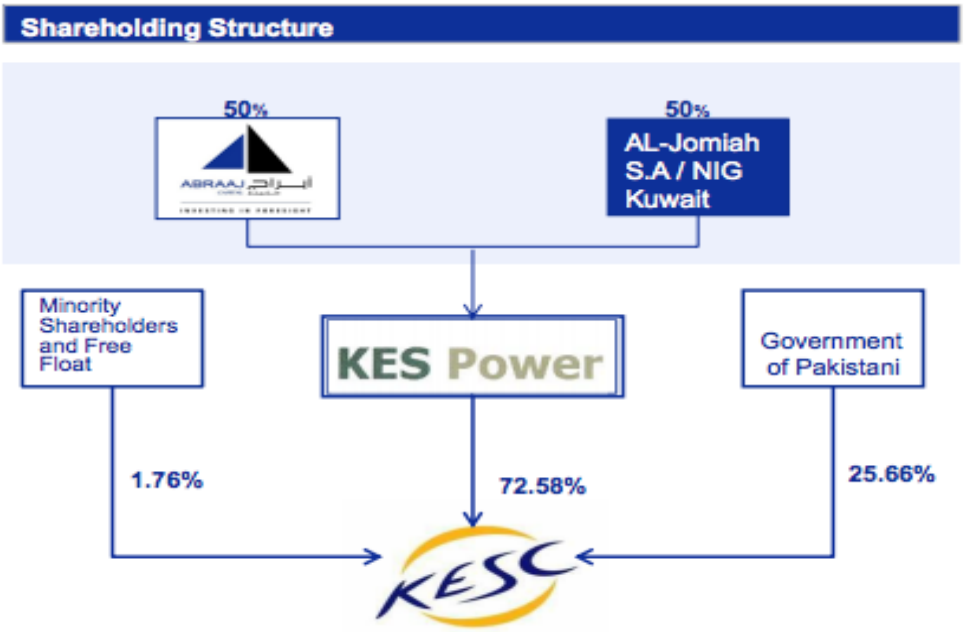
Source：http://www.kesc.com.pk/en/article/ourcompany/whoweare-1.html (Referred in September 6th, 2013)



Source: http://www.nishat.net/ncpl/structure-59

Table 4.1-17 The Diagram Below Exhibits the Power Industry Structure in Pakistan

The capital formation includes investment from KES Power (72.5%), the government of Pakistan (25.6%) and the rest through the stock market (1.76%) (Table4.1-18).



Source：http://www.kesc.com.pk/en/media/get/20110311_kesc-analyst-briefing.pdf

Table 4.1-18 Capital Formation of KESC

4.1.5.2.2 History of KESC

KESC was founded in 1913 and nationalized in 1952. In the 1990's, its management was aggravated, followed the privatization completed in 2005 after its process gradually progressing from 1996 to 2006 with keeping KESC as a vertically integrated business entity. In 2005, KESC was sold out to KES Power founded by "Hassan Associates", a consortium of Al-Jomaih (Al-Jumaiah/ Al-Jumaiah group in Saudi Arabia) and NIG (National Industries Holding of Kuwait), which purchased 72.58% of stock owned by KESC. As a result, other shareholders remained as minority at KESC.

Table 4.1-19 History of KESC

Year	Major Events	Major Shareholders	
		KESC	KES Power Note) KES Power is holding company of KESC
1913	KESC incorporated		
1952	KESC nationalized		
1990s	KESC's performance started to be deteriorated.		
1996	Privatization of KESC suggested in efforts to restructure the power sector		
1999	A strict regime for management was implemented to improve the situation of collection ratio and electricity theft.		
2001	The federal gov. finalized the plan for restructuring KESC on Nov 21.		
2002	KESC filed a tariff petition on Feb 12		
2002	MOWP requested NEPRA to consider the summary of the Federal Cabinet chaired by the then Chief Executive of GoP approved and recommended the implementation of MYT for KESC on Mar 29. Ref) Multi-Year Tariff is a tariff determination mechanism by which a Power Company submits trajectory of expected revenue, expenditure and losses for the future time period in advance.		

Source : JICA Survey Team using material from SDPI 'Pakistan Power Sector Outlook:Appraisal of KESC in Post Privatization period'
Karachi Electric Supply Company- Business Update, March 10, 2011

2002	Incentives were introduced in preparation for privatization. — Introduction of multi-year tariff — USD 826 million write off of capital to eliminate accumulated losses — USD 1.2 billion of debt converted to equity — Financial Improvement Plan(FIP) initiated to help reduce system losses and improve T&D network: GOP to provide USD 199 million		
2002	NEPRA had approved MYT on Sept 10.		
2005	— 73% transfer of ownership to a consortium of Al-Jomaih and NIG for USD 293 million (PKR 20,200 million) — The privatization of KESC was finalized on November 29, 2005 with a 73 percent transfer of ownership to Hassan Associates at a total cost of Rs 15.859.7 billion to consortium of Hasan Associates, Saudi Al-Jomaih Group of Companies and Kuwait's NIG, with the government still retaining 27 percent stake. — Average annual operational subsidy from GOP of USD 123 million revoked — GOP has doled out approximately 186 million to date as part of the FIP.	2005 — 73% owned by Hassan Associates (Hassan Associates is a consortium of Al-Jomaih and NIG) — 27% owned by GOP	2005 — 60% owned by Al-Jomaih Holding Co. — 40% by National Industries Holding of Kuwait through its subsidiary Denham Investment Ltd
2005	KES Power chose Siemens of as O&M partner for KESC. Due to the lack of experience of Siemens, core problems remained unsolved.		
2005-2008	Average annual operational subsidy from GOP of USD 123 million revoked		
2005-2008	GOP has doled out approximately USD 186 million to date as part of the Financial Improvement Plan.		

Source : JICA Survey Team using material from SDPI 'Pakistan Power Sector Outlook:Appraisal of KESC in Post Privatization period'
Karachi Electric Supply Company- Business Update, March 10, 2011

2008	The main partner of consortium, Al-Jomaih, approached Abraaj Capital with a proposal for a potential stake in KESC after failing to stabilize the company.		
2008	Management team under Abraaj took over KESC with full management control in Sept 16 Cf) Abraaj Capital became a majority shareholder of KESC's holdings company, KES Power		—50% Al-Jomaih S.A/ NIG Kuwait —50% Abraaj Capital
2008	Abraaj approached GOP to amend the Implementation Agreement signed by the government in 2005.		
2009	The Amendment Agreement by Abraaj was signed by the government and the CEO of KESC on Apr 13.		
2009	— Legal Transaction close on May 5, 2009 — Commitment to inject USD 361 million over the next 3 years		
		2012 — 72.58% KES Power Limited — 25.66% GOP — 1.76% Other minor shareholders	

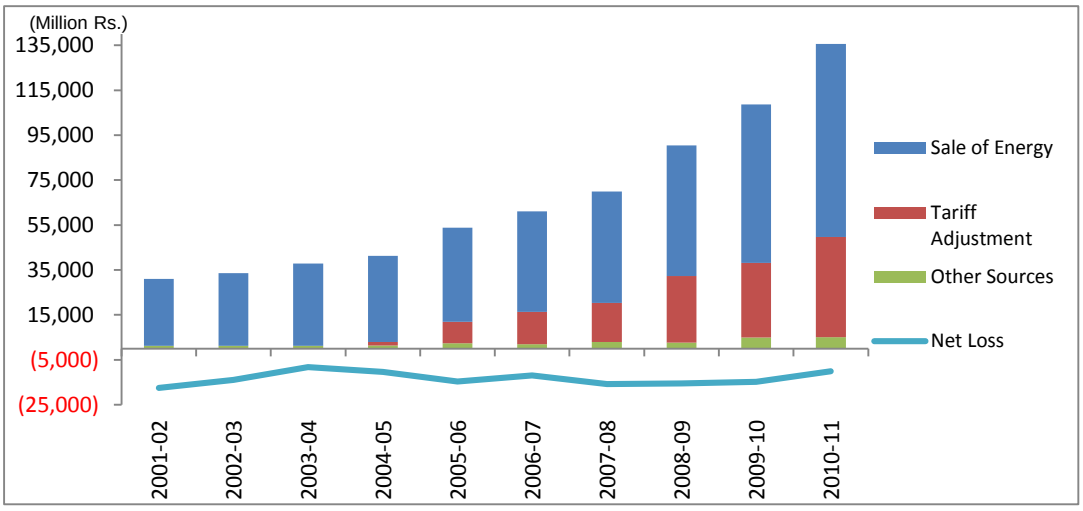
Source : JICA Survey Team using material from SDPI 'Pakistan Power Sector Outlook:Appraisal of KESC in Post Privatization period'
Karachi Electric Supply Company- Business Update, March 10, 2011

4.1.5.2.3 Financial Condition

KESC suffered deficit of 14.0 billion Rs. in 2010, 90 billion Rs. in 2011, but yielded slight profit in 2012 and a profit of 18 Million Rs. in 2013 as well. What KESC interests the most is in Tariff.

Multi-Year Tariff has already been authorized for KESC. After completion of privatization in 2005, KESC gained recognition of the efficiency that the company should achieve. Many of Key Pefromance Indicators (KPIs) applied to KESC are not IRR, ROI or ROA, but are related to efficiency. However, Composite Index

(equivalent to collection ratio minus T&D loss) at KESC is at a level below 50%. This is because there are seven untouchable spots in its service areas.



Source: http://www.kesc.com.pk/en/media/get/20120411_Financial-Highlights.pdf, September 13, 2013

Table 4.1-20 Transition of Sales and Profits at KESC

4.1.5.2.4 Generation Facilities and Capacity of KESC

KESC built in the most efficient plant in May, 2012. Gas turbines with a capacity of 220MW and 575MW by means of Combined-Cycle Generating Technology (CCGT) have been implemented at Korangi Thermal Power Station (TPS) in Korangi Creek and at a TPS in Bin Qasim, respectively. They have increased efficiency due to CCGT.

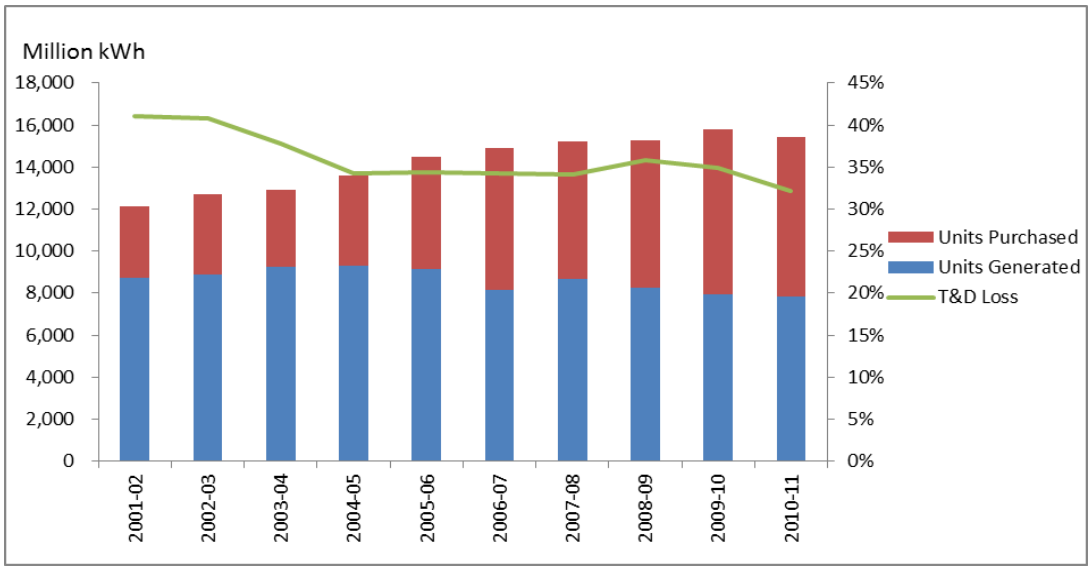
For example, 40MMcfd gas generates 80MW, while the same volume of natural gas generates 180MW at present, because Jenbacher gas engines (Ge-Jb) with a capacity of 3.6MW×64 were installed at two sites due to lack of natural gas.

Table 4.1-21 Existing Unit – KESC System

No.	Plant Name	Unit Type	Number of Units	Plant Capacity		Primary Fuel Type
				Nominal (MW)	De-rated (MW)	
	KESC Thermal					
1	Bin Qasim	Steam Turbine	6	6 x 210	1,120	Gas/HFO
2	SGTPS	Reciprocating Gas Engines	32	32 x 2.739	88	Gas
3	KGTPS	Reciprocating Gas Engines	32	32 x 2.739	88	Gas
4	KCCPP	Combined Cycle GT	4 GTs, 1 ST	4 x 48.4 + 1x26	167	Gas
	KESC IPP Thermal					
5	Gul Ahmed Energy	Engines	9	128.5	128	HSFO
6	Tapal Energy Ltd	Engines	12	127	124	HSFO
7	DHA Cogen	CC	1	80	71	Gas
8	IIL (19 MW)	Engines	6	19	19	Gas
9	Anoud Power	Engines	2 Oil, 1 Gas	12	12	Gas
10	KANUP	Nuclear	1	136	122	Uranium
	Total (KESC and IPPs)			**2,158**	**1,938**	

Note: Existing Unit-KESC System
Source: NTDC, National Power System Expansion Plan Main Report 2011-2030 P.6-11

KESC purchases half of its required energy from NTDC as well. Natural gas is being converted to coal, by which Tariff is expected to be reduced from the current 20 cents/kWh to 9 cents/kWh.



Source: http://www.kesc.com.pk/en/media/get/20120411_Financial-Highlights.pdf, September 13, 2013

Table 4.1-22 Transition of Unit Generation Capacity at KESC

4.1.5.2.5 Conversion of FO to Coal

Bin Qasim Power Plant has a plan to convert FO (fuel oil) fired capacity of 200MW to coal-fired capacity. After the conversion, the coal plants will be expanded to a capacity of 6-700MW and start operation in 2015.

For Bin Qasim Power Plant, KESC will found K-Energy Pvt. Ltd., a Special Purpose Vehicle, to which a leasing scheme for facilities will be applied by KESC.

The investors in K-Energy, consisting of a consortium of an Indonesian business conglomerate and Hong Kong and Korea based private equity companies, founded an offshore entity by the name of Bright Eagle Enterprises Group Investments Limited (BBEGIL). K-Energy is a Special Purpose Vehicle that BEEGIL had formed under the laws of Pakistan, of which business purpose is to undertake the coal conversion project. Currently, K-Energy was in the process of acquiring all the approvals to function as an IPP.

Source : http://www.pakistantoday.com.pk/2013/10/07/city/karachi/coal-conversion-project-to-benefit- common-consumers-by-lowering-tariff-kesc/?printType=article(Referred in November 27th, 2013)

Environment Assessment is performed based on NEQS (National Environment Quality Standard). Vessels for transporting imported coals will come alongside offshore facilities, because they cannot be directly brought to the pier. Improvement of a route for transporting coals from a port in the western part to Karachi and installation of transmission line linking to 500kV transmission line of NTDC are delayed for a long time due to necessity of huge investment in them.

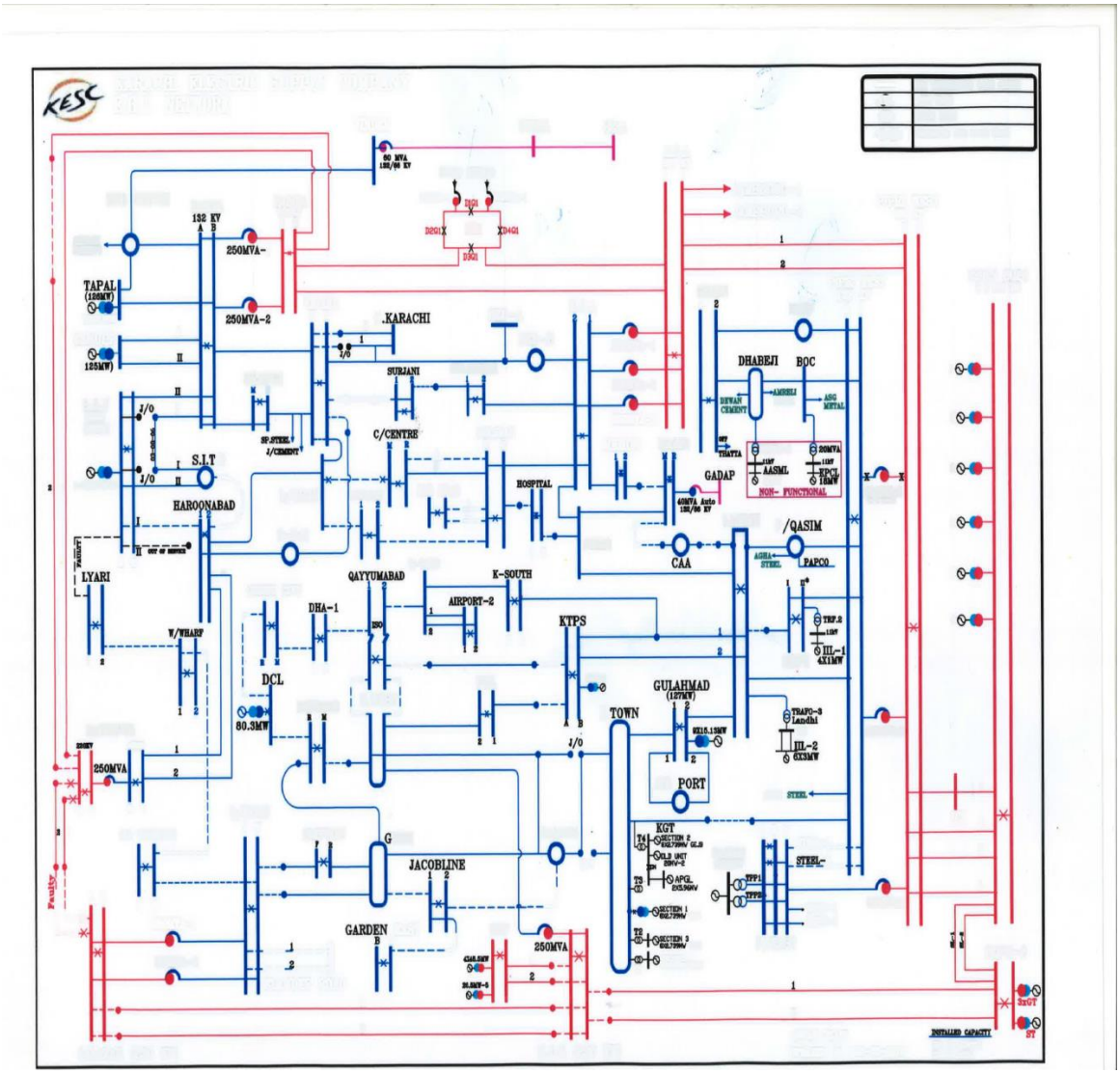
The most difficult problem at KESC developed in using coal fuel is that general knowledge about coal-based thermal plant is lacking, and coal may emit toxic substance that may give influence on environment. What is necessary for handling coal is maintenance technology on boilers. Without doing appropriate maintenance, adverse impact would be given to environment. As conversion of the existing plants to coal-based plants is planned, appropriate maintenance of boilers and turbines is under consideration.

Coal-based plants are under study, using sub-critical technology.

4.1.5.2.6 Transmission and Distribution Network of KESC

Table 4.1-22 shows 220kV EHT (Extra High Tension) network and 132kV transmission network of KESC, where red lines indicate 220kV lines and blue lines indicate 132kV.

The networks transmit energy to all of KESC's service territory (Karachi and its neighboring areas), which is transformed to 0.4kV lines for distribution.



Source：Karachi Electric Supply Company E.H.T. Network KESC Sep.30, 2013

Table 4.1-23 Transmission and Distribution Network of KESC in Karachi City

The following two facilities should be added as the future operating facilities of KESC.

1) More capacity (generation capacity)

For which, IPP is required in a franchise area of KESC.

2) 220kkV lines and more transformer stations

Energy is taken from the nearest point to 132kV line coming from Gadani Power Plant.

New investment in distribution is expected to be recovered in 7 – 10 years with 17 – 20% IRR.

Although smart meters are not installed at present, it is planned to introduce them on a trial basis, designating a number of areas and inviting 70,000 to 80,000 participants. This project requires cost of approx. 50,000USD.

Introduction of HV lines make it possible to boost voltage for reducing technical loss.

While transmission and distribution losses ten years before were not at 30% but at 40%, they have reduced to 27.9% as of 2013. This improvement is brought by installation of capacitors installed every several kilometers followed by migrating from LT (higher loss) to HT line (lower loss).

Transmission grid of KESC wiil expanded to 2,000MW in the time frame between 2013 and 2020.

4.1.5.2.7 Reasons for successful privatization of KESC

Ther reasons for success of KESC is due to the policies including, in particular, dismissal of redundant employees, suspention of power supply for unpaid consumers. In addition, the follwong three measures are considered as success.

1. SAP based CRM (Customer Relationship Management) system (SDPI 2012 Page 36)
    - SAP based customer relationship management system was introduced
    - Goals: to improve the effectiveness and efficiency of its billings, business intelligence and customer relationship management functions
    - Results: reduction of 48% in medical expenses in 2010-11 compared to 2009-2010

2. Energy Conservation Initiative (SDPI 2012 page 36)
    - Established Energy Conservation Department in 2009
    - Launched seminars and events to raise awareness of sustainable energy technology
    - Goals: electric load optimization in industrial areas, which may help to conserve energy in industrial area

3. Introduction of Multi-Year tariff (SDPI 2012 page 73-74)

- MYT was a radical shift from a rate of return regime to a performance based regulation.
- Advantage: facility of an automatic fuel adjustment formula to compensate KESC for changes in fuel price for KESC's own-generation and on purchased electricity of external sources, in the form of adjustment to the average rate of sale

Source : Pakistan Power Sector Outlook: Appraisal of KESC in Post Privatization Period, Sustainable Development Policy Institute, Engineer Arshad H Abbasi Adviser SDPI Islamabad, Pakistan, Aug 10, 2013

4.1.6 IPPs

4.1.6.1 Japan Power

4.1.6.1.1 Business Overview of Japan Power

Japan Power Generation Limited is a public limited company incorporated on September 29, 1994.

Source: http://www.jpglpk.com/brief%20history.htm (Referred in September 6th, 2013)

- Commecial Operation Date on Marth 14th, 2000

  The power plant is located at Jia Bagga Railway Station in Lahore.Raiwind Road, District Lahore-Pakistan, It has 24 diesel generators with a capacity of 5.65MW and an installed capacity of 135.6 MW (a dependable capacity of 120.5MW), designed to use heavy furnace oil (HFO) for operation and high speed diesel oil (HSD) for startup and shutdown operations.

Source: http://www.jpglpk.com/index.htm (Referred in September 6th, 2013)

Table 4.1-24 Basic Information on Japan Power Generation Ltd (JPGL)

Plant Location:	Jia Bagga, Off-Raiwind Road-Lahore, established under 1994 Power Policy
Technology:	Diesel Engines, using RFO (also run on HSD)
Plant Description:	24 generators of 5.65MW each (Mitsubishi)
Plant Condition:	Completely overhauled in 2011 - tested in Mar-2011 at 121.833MW and in Aug 2012 at 123.103MW
Plant value:	Plant valuation in Jun-2011 was Rs..9.6 Billion (106 million) - New plant of similar capacity could cost around US$ 150 million
Contracted Capacity:	Gross 135 MW - Net 107 MW+13.5 MW =120.5MW
O&M Contractor:	Descon

Interconnection:	Plant feeds power directly to Lahore city - NO Line Losses
Sponsors':	PakOman-19%, NLC-17%, SaudiPak-7.4%, Patagonia-2.7%, Remaining 54% is owned by general public and is traded on stock exchanges
Financing:	Consortium of 8 banks led by Faysal Bank
GoP Ownership in sponsors and Lenders:	NLC is 100%, Pak Oman 50%, Saudi Pak 50% - NBP and Askari are also directly or indirectly owned by GOP - Total GOP exposure is around Rs. 2 Billion

Source: obtained data from Japan Power Sep 26,2013

4.1.6.1.2 Present Situation of Business

Based on the Policy 1994, Japan Power was founded in the suburbs of the area of demand (load cost) in Lahore. The actual COD (Commercial Operation Date) was in March, 2000. Operation started with 250 employees, and reduced to 75 (almost all are Pakistani engineers) at present when the operation is suspended.

While an initial PPA was set at 5.5 cents/kWh based on the leveled Tariff for 30 years, political pressure due to an abrupt change in the Government policy in 1998 and 1999 forced to adjust the Tariff, because of favoravle treatment of IPPs brought by the Policy 1999. Japan Power was forced to reduce 5.5 cents/kWh to 4.3 cents/kWh, which required re-signing of the Thirty-Year Contract.

PPA applied to the other IPPs was reduced to 5.3 cents/kWh, a modest reduction of 1-2%. For this reason, Japan Power continued to suffer deficit every year, while operation cost is low.

4.1.6.2 Kohinor KEL: Kohinoor Energy Limited

4.1.6.2.1 Business Overview

KEL was incorporated in April 1994.

The principle activities of the Company is to own, operate and maintain a furnace oil power station with the net capacity of 124 MW (gross capacity 131.44 MW).

Source: http://www.kel.com.pk/index.asp (Referred in September 6th, 2013)

- Operation rate: 60%
- After-tax income: 860 Million Rs.
- Capital formation:

Saigols Family	26%
Toyota Tsusho Corporation	20%
Tomen Power (Singapore) Pte Ltd	16%
Wartsila Finland Oy	2%
General Public	36%

(per source from: http://www.kel.com.pk/b_pt.htm(Referred in September 6th, 2013))

Coal is not appropriate in Lahore due to high transportation cost

4.1.6.3 Nishat Chunian

4.1.6.3.1 Overview of Group Business

In 2007, the group diversified into the power sector by setting up a 200 MW Independent Power Producer.

Today, Nishat Chunian Group contains two companies – Nishat Chunian Limited (a textile company) and Nishat Chunian Power Limited (a power generation company).

Source: http://www.nishat.net/ncg/our-history-9 (Referred in September 6th, 2013)

Both companies, listed in the stock exchange, have the main office in Lahore and Karachi.

Textile business is sliding according to business cycle, while power business is stable.

Textile is composed of three products, yarn, fabric and Peko-Tex, most of which are export-bound.

- The plant is combined cycle with 11 reciprocating engines and a heat recovery steam turbine provided by WÄRTSILÄ. Net output of the project is 195.722 MWh. The primary fuel of the plant is Residual Furnace Oil (RFO). The plant site is located at 66 Km Multan Road, Lahore.

  AES Lalpir and AES PakGen were purchased by one of the same group companies.

  The contract with WÄRTSILÄ includes ninety (90) stuff members (for O&M) and eight (8) to ten (10) engineers of the group company.

- Turnover for the FY 2012 is recorded at US$ 228 million while the Net profit recorded at US$ 21.42 million.

Source: http://www.nishat.net/ncpl/ncpl-at-a-glance-57 (Referred in September 6th, 2013)

4.1.6.3.2 Energy Business

Under the Policy 2002, Nishat Chunian was granted a generation license by NEPRA in September, 2007. The company commenced operation (at 200MW) in July, 2010. Capital formation includes its parent company (51%) and the rest, publicly-traded stock (Floating).

The company made a Twenty-Five Year Selling Contract with NTDC.

The company has outsourced EPC and O&M to WÄRTSILÄ. Other operators in the same Group have also outsourced EPC and O&M to WÄRTSILÄ, while they perform management including fuel purchase and parts replacement by themselves. Guaranteed IRR is 15% in dollar.

They have eleven diesels and one ST (Steam Turbine) (total capacity amounts to 200MW.).

Textile Business uses Gas/Oil, while they have an idea of conversion to coal.

4.1.6.3.3 Circular Debt

The government payment resolved the accumulated arrears caused by CPPA in June, 2013. Thereafter, the payment from WAPDA has been made on every 30 days, while the payment from WAPDA has been made on every month (no problem is found on WAPDA payment).

The overdue bill amounted to 2,200 USD.

4.1.6.3.4 Joint Negotiation

The company formed a committee with other eight companies founded under the Policy 2002, jointly negotiating with WAPDA.

The company has paid no tax, either (Energy IPPs are exempted from paying tax related to the energy business).

(Tax payment related to other income in the Annual Report is also reversed.)

4.1.7 Distribution Companies

4.1.7.1 IESCO

4.1.7.1.1 Business Overview of IESCO

- IESCO was incorporated on 25th April, 1998 (vide company registration No. L09499 of 1997-98) under section 32 and certificate for commencement of business was obtained on 1st June, 1998 under section 146(2) of Companies Ordinance 1984.
- The main objective of the company is to acquire/take over those properties, rights and liabilities of Pakistan, Water and Power Development Authority comprising of administrative division formally known as the Islamabad Area Electricity Board (AEB) and to carry on, expand and extend the business and activities.

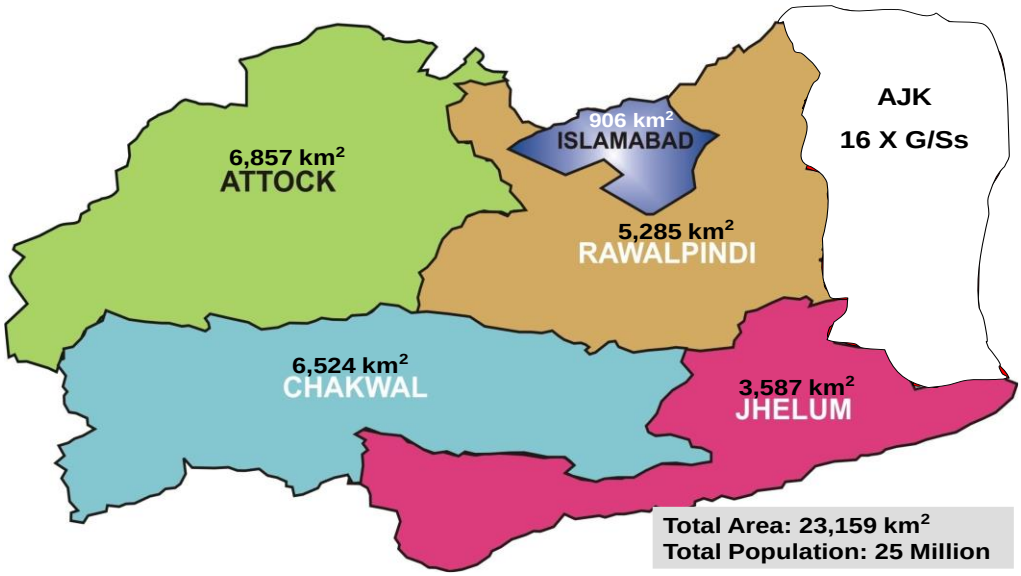
Source: http://www.mowp.gov.pk/gop/index.php?q=aHR0cDovL3d3dy5pZXNjby5jb20ucGsvaW5kZXgucGhwL29yZ2FuaXNhdGlvbi9hYm91dC11cw%3D%3D (Referred in September 6th, 2013)

- IESCO was formed in 1998 to take over the assets, functions and responsibilities of the erstwhile Islamabad Area Electricity Board, which was then a division of WAPDA.
- IESCO's core function is to supply, distribute and sell power (electricity) in the area from Attock to Jheleum, and from the river Indus to River Neelum in Kashmir.
- It services 2.1 million consumers directly, but touches the lives of more than 25 million people living in the 6 districts its services.

Source: http://www.mowp.gov.pk/gop/index.php?q=aHR0cDovL3d3dy5pZXNjby5jb20ucGsv (Referred in September 6th, 2013)

- IESCO has 78 Grids with a total capacity of 1,950 MVA and distributes the power through 581 feeders.
- It looks after the electricity distribution network in the administrative districts of Rawalpindi, Chakwal, Attock, Jhelum and Federal Capital Islamabad.

Source:http://www.mowp.gov.pk/gop/index.php?q=aHR0cDovL3d3dy5pZXNjby5jb20ucGsvaW5kZXgucGhwL29yZ2FuaXNhdGlvbi9hYm91dC1vcmdhbmlzYXRpb24%3D (Referred in September 6th, 2013)



Source：IESCO Presentation to JICA 19 Sep 2013

Table 4.1-25 Area of Responsibility

In the service territory of IESCO, distribution lines are operated at a level below 132kV. The head count is 13,500, while 5% of them are contract employees.

Table 4.1-26 Manpower - June 13th, 2013

Manpower	Sanct	Working	Vacant	%age
Officers	459	373	86	81 %
Officials	16,366	13,344	3,022	82 %
Total	16,825	13,717	3,108	82 %

Category	Regular	Contract	Daily Wages	Work Charge	Total
Officers					
Technical	264	10	-	-	274
Non-Technical	92	7	-	-	99
Total	356	17	-	-	373
Officials					
Technical	8,242	337	133	2	8,714
Non-Technical	3,950	289	189	202	4,630
Total	12,192	626	322	204	13,344
Grand Total					13,717

Source：IESCO Presentation to JICA 19 Sep 2013

4.1.7.1.2 History of IESCO

Area Electricity Board Islamabad (AEB) was one of eight AEBs constituted through amendments in WAPDA Act.

In 1998, Eight Distribution Companies (DISCOs), one National Transmission and Distribution Company (NTDC) and three Generation Companies (GENCOs) were formed.

On 25 April 1998, Islamabad Electric Supply Company Ltd (IESCO) was incorporated.

On 1 Jun 1998, certificate for commencement of business was obtained under section 146(2) of Companies Ordinance 1984.

Source：IESCO Presentation to JICA 19 Sep 2013

4.1.7.1.3 Customer Profile of IESCO

As Table 4.1-27 shows, Domestic (Resident) accounts for 84.67% of all the customers in IESCO service areas.

Table 4.1-27 Profile – Tariff wise

Tariff		Ending Jun 09	Ending Jun 10	Ending Jun 11	Ending Jun 13
Domestic	A 1	1,671,381	1,738,987	1,809,525	1,952,892
Commercial	A 2	286,139	298,242	308,524	329,166
Industrial	B 1	9,331	6,803	9,691	10,292
	B 2	2,429	5,470	2,985	3,548
	B 3	107	106	107	113
	B 4	13	13	14	14
Total Industrial		11,800	12,392	12,797	13,967
Bulk		776	802	815	842
Tube Well		7,005	7,263	7,466	7,933
St. Light		1,300	1,397	1,470	1,607
Colonies (Fact)		40	40	41	40
Tariff K		81	84	90	104
Grand Total		1,978,602	2,059,207	2,140,728	2,306,551

Note：Tariff K is Special Contracts. Only IESCO has this category, and AJK/RWAT is included.
Source：IESCO Presentation to JICA 19 Sep 2013

Table 4.1-28 Composition of IESCO (%)

%Figures

Tariff	Customers		Consumption MkWh		Revenue Million Rs.		Consumption/ Customers kWh	Revenue/ Customers Rs.	Revenue/ Consumption kWh
Domestic	1,952,892	84.67%	3,410	43.93%	31,135	37.01%	1.75	15,943	9.13
Commercial	329,166	14.27%	862	11.11%	14,758	17.54%	2.62	44,833	17.11
Industrial	13,967	0.61%	1,656	21.33%	19,594	23.29%	118.56	1,402,845	11.83
Tariff-K	104	0.01%	978	12.60%	7,605	9.04%	9,408.62	73,121,442	7.77
Others	10,422	0.45%	857	11.03%	11,033	13.11%	82.20	1,058,580	12.88
Total	2,306,551	100.00%	7,764	100.00%	84,124	100.00%	3.37	36,472	10.84

Source：JICA Survey Team using material from IESCO Presentation to JICA 19 Sep 2013

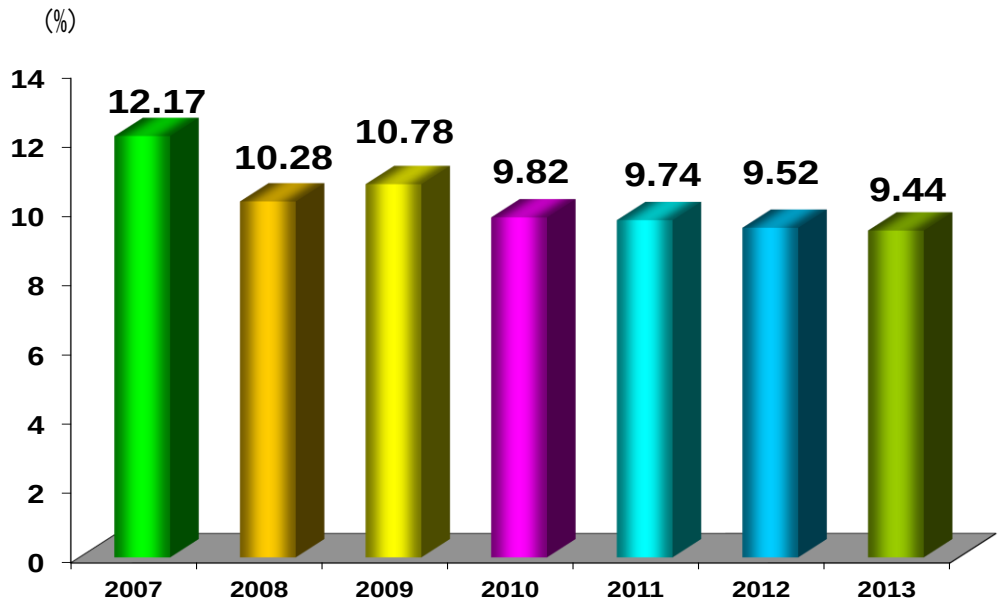
4.1.7.1.4 Distribution Loss

While IESCO found transmission loss of 3.59% in 2007, the loss has reduced to 1.76% at present, as a result of investment in the existing transmission lines in corporation with the World Bank and National Bank. Therefore, IESCO has reduced the loss by 1.6% only through reduction of transmission loss. For the company, loss of 1% is equivalent to 1Bilion Rs.

Transmission and distribution loss (FY2012-13)
-NEPRA target: 9.5%
-Actual transmission and distribution loss: 9.4% (breakdown shows 1.5% in the transmission sector, 7.9% in the distribution sector)
(They are the lowest of all the DISCOs)

Loss in 11kV transmission line is the largest.
Losses in the distribution sector include those included in Load Shedding.

Transmission loss at IESCO is decreasing year by year.



Source：IESCO Presentation to JICA 19 Sep 2013

Table 4.1-29 Line Losses

Table 4.1-30 Technical & Commercial Losses of IESCO (Private)

Line Losses			
		Jun-12	**Jun-13**
Units Received	MkWh	8,331	8,573
Units Billed	MkWh	7,537	7,764
Units Lost	MkWh	794	809
% Age Loss	**%**	**9.5%**	**9.4%**
Collection Ratio			
Amount Billed	Rs. Million	74,988	84,123
Amount Collected	Rs. Million	71,875	79,445
Non-Cash Adjustments	Rs. Million		
Collection Efficiency	**%**	**95.8%**	**94.4%**
AT&C Losses			
Energy Realized	MkWh	7,224	7,332
AT&C Losses	MkWh	1,107	1,240
AT&C Losses	**%**	**13.3%**	**14.5%**
Composite Efficiency Index		**86.7%**	**85.5%**

Source：IESCO Presentation to JICA 19 Sep 2013

4.1.7.1.5 Tariff Collection

Payment is 100% recovered at IESCO. However, payment from the governmental institutions may be delayed. They are categorized in Domestic Category K.

Payment recovery (FY2012-13) shows:

- Private consumers:100%
- Government consumers:103%, both excluding consumers in AJK
- Consumers including those in AJK:82%

Table 4.1-31 Status of Billing Collection & %Age payment (F.Y 2013)

Amount in Million

Month	Billing			Payment			%age Collection of Billing		
	Govt	Pvt	Total	Govt	Pvt	Total	Govt	PVT	Total
Jul-13	1,996	8,444	10,440	1,279	6,773	8,052	64%	80%	77%
Aug-13	2,087	8,318	10,405	1,240	7,676	8,916	59%	92%	86%
Sep-13	2,234	7,919	10,153	1,240	7,920	9,160	56%	100%	90%
Prog Ending 9/2013	6,316	24,682	30,998	3,759	22,369	26,128	60%	91%	84%
Prog Ending 9/2012	6,469	20,486	26,955	3,479	19,915	23,395	54%	97%	87%
AFTER GIVING IMPACT OF AJK (T/D) Rs. 1655 Million									
Prog Ending 9/2013	4,661	24,682	29,343	3,759	22,369	26,128	81%	91%	89%

Source：IESCO Presentation to JICA 19 Sep 2013

4.1.7.1.6 Financial Condition

KEY PERFORMANCE INDICATORS are comprised of the following four factors:

- T&D losses
- Recovery of billed amount
- Financial Viability
- Customer Services

Table 4.1-32 Profit and Loss

Million Rs.

	2013 Un-Audited	2012 Audited
Sale of electricity	70,225	62,716
Subsidy from Government of Pakistan on sale of electricity	38,008	10,160
	108,223	72,877
Rental and service income	31	32
	108,264	72,909
Amortization of deferred credit	895	736
	109,160	73,645
OPERATING COST		
Cost of electricity	(81,966)	(80,313)
Other operating cost excluding depreciation	(8,568)	(6,130)
Depreciation on property, plant and equipment	(1,634)	(1,528)
	(92,169)	(87,971)
	16,991	(14,326)
Other income	1,401	1,260
Net (loss)/profit Before taxation	18,392	(13,066)

Note: Other income: Other income includes what IESCO cannot use and sales of scraps.
Source：IESCO Presentation to JICA 19 Sep 2013

Financial Viability (FY2012-13)

RORB (Return on Rate Base): 10.5%

As a result of rating of PACRA (Pakistan Credit Rating Agency)[33], Long-term is rated as A and short-term as A1[34].

At present, no commercial loan is taken out, while it is planned to take out a loan.

IESCO has made proforma calculation for what impact delay in Tariff determination will give on each DISCO to show them to MOWP. According to this calculation, the impact amount reached approx.115 Billion Rs. in this fiscal year, and 145 Billion in FY2012-2013.

Average cost is 13.64Rs./kWh, while average selling price is 14.17Rs./ kWh. If profit of aprox.

Village electrification

-FY2012-13:658

-FY2011-12:485

-FY2010-11:988

Customer service center: 12

[33] PACRA is a Credit Rating Agency founded as a result of signing a joint venture agreement between International Finance Corporation (IFC), Fitch Ratings and Lahore Stock Exchange on June 15th, 1994.

[34] For Long Term Rating, it includes: AAA: Higherst credit quality, AA: Very high credit quality, A: High quality, BBB: Good credit, BB: Speculative, B: Highly speculative and CCC, CC, C: High default rsik, while for Short Term Rating: A1+, A1, A2, A3, B, C and D.

4.1.7.1.7 Marketing for Consumer

The company has twelve Consumer Centers in the service areas to receive customer complaints.

Number of consumers using customer service:

-End of June, 2013: 2,306,511

-End of June, 2012: 2,224,865

-End of June, 2011: 2,140,728

ToD (Time of Day) is applied to domestic customers and industry customers. Using CDP (Customer Data Processing), the Center tries to grasp characteristics of each consumer, and conduct optimization of load by Feeder, thereby reducing loss of the whole system.

4.1.7.1.8 Investment

1) Investment planning

An investment plan for within five years is under preparation.

Investment amount in AJK will be 15-16 Billion Rs.

RoA of 11% becomes a norm.

2) Investment procedures

IRR of 20-30% or above will be adopted.

As STG (Secondary Transmission Grid) PC-2[35] was not conducted, ADB loans were not authorized. In the case of the projects that the World Bank authorized, PC-1[36] will not be required, but PC-1 is required in the case.

4.1.7.1.9 Future challenges in managing IESCO

IESCO Presentation to JICA 19 Sep 2013 points out the following issues.

- IESCO is operating in tariff regulated environment.
- Tariff determination is delayed by 7 – 9 months every year.
- Funds availability for energy loss program is delayed due to abnormal delays in tariff notification.
- All strategic and diplomatic installations in IESCO region
- Loss making village electrification schemes

OTHER ISSUE

- (Delayed Tariff Determinations)

[35] PC-1: Application for Social Sector case
PC-2: Survey and feasibility studies

[36] Approximately 6 months are required until PC-1 alone is approved.

- Government Department Collection
- Geographical and Cultural Issues
- Hilly Areas
- Sale Mix Favors the Domestic Consumers causing negative impact on revenue.
- Unfavorable generation mix
- Un-match rehabilitation program
- Un-automated environment

4.1.7.2 LESCO (Lahore Electric Supply Company)

4.1.7.2.1 Business Overview and History of LESCO

Lahore Area Electricity Board was reorganized into a corporate entity under the name of Lahore Electric Supply Company (LESCO) effective from 22-03-1998, with the aim of commercialization and eventually privatization.

Source: http://www.lesco.gov.pk/Organization/1000077.asp (Referred in September 6th, 2013)

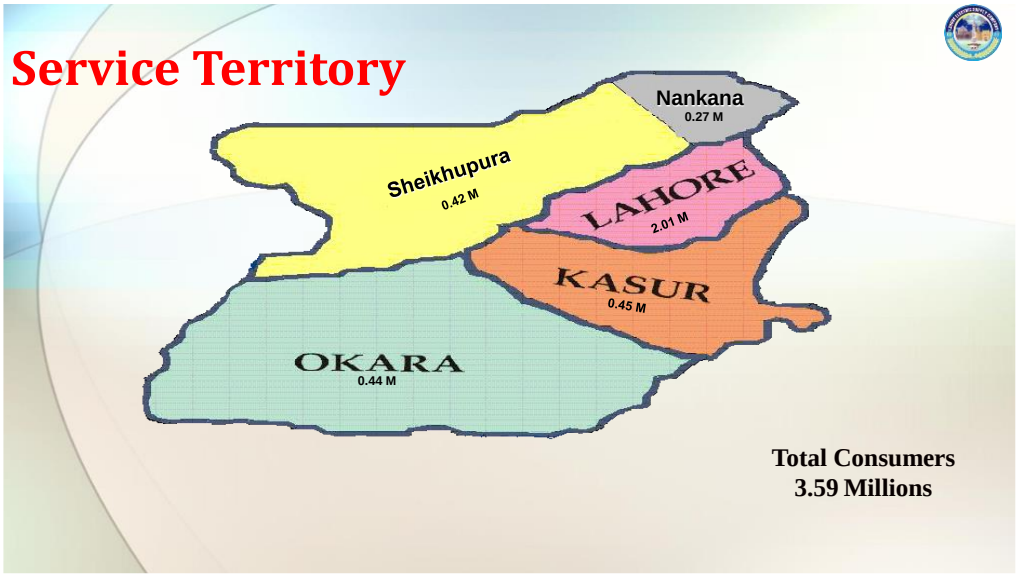
Secondary transmission voltage[37] is 220kV or higher in Pakistan, while LESCO is responsible for operating 132kV or lower (no 11kV or 66kV is available).

There are 90 base stations: 7 transmission grids at NTDC, 10 IPPs supplying energy to LESCO, 26 relay stations located in the area of base stations, 2 small power hydro stations.
Total length of HT (High Tension) lines and LT (Low Tension) lines amounts to approx.26, 000km and 15,000km, respectively.

An organizational framework of LESCO is comprised of 7 area distribution operation units, 1 construction unit and 1GSO (Grid System Operation).
The organization of LESCO is comprised of representative director, board member responsible for treasury, executive officers, each responsible for legal, technology and management and two other executive officers and their subordinates and employees, with 20,636 permanent employees, covering five service areas totaling 19,000km^2, while providing energy to 3.59 million consumers.

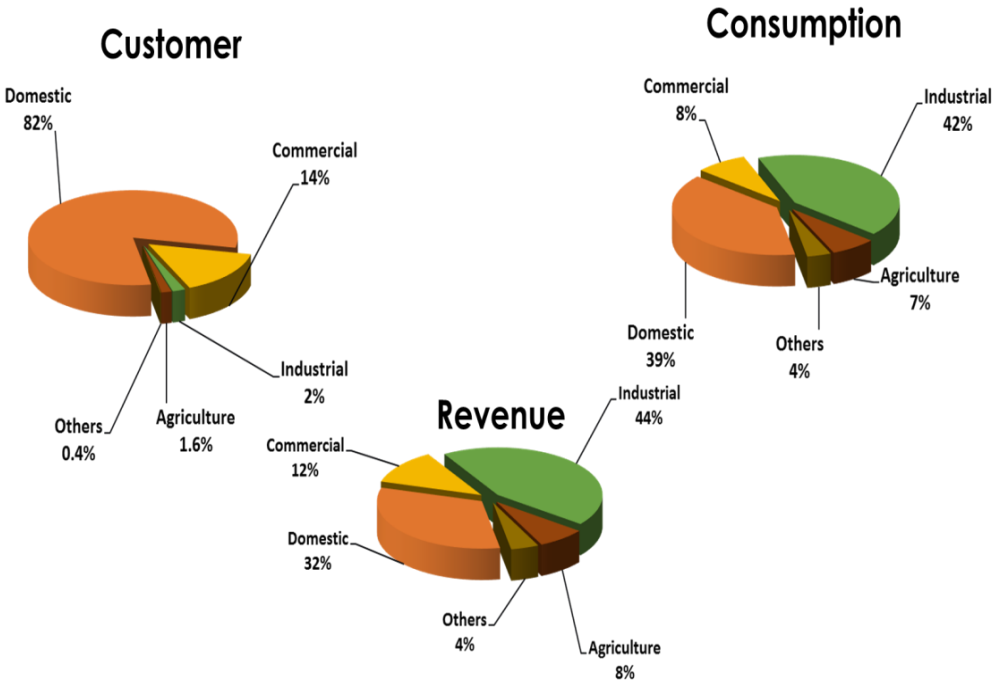
The territory for which LESCO is responsible include Lahore, Kasur, Okara and Sheikhupura.

[37] Secondary transmission voltage: Low tension voltage transmitted to the secondary transmission grid from the base transmission grid, after lowering its high tension voltage.



Source: LESCO Company overview 2013

Table 4.1-33 Service Territory



Note: Industry users, Textile sector
Source: LESCO Company overview 2013

Table 4.1-34 Commercial Overview

Table 4.1-35 Consumers, Consumption & Revenue (2012-2013)

Tariff	No of Consumers	Consumption MkWh	Revenue Mln. Rs.	Consumption kWh/ No of Consumers	Revenue Rs./ No of Consumers	Revenue Rs./ Consumption kWh
Domestic	2,936,951	5,566	54,542	1.90	18,570.96	9.80
Commercial	510,604	1,115	19,781	2.18	38,740.39	17.74
Industrial	72,699	6,062	72,043	83.38	990,976.49	11.88
Bulk	486	427	5,492	878.60	11,300,411.52	12.86
Agriculture	56,140	1,009	11,551	17.97	205,753.47	11.45
Others	2,295	106	456	46.19	198,692.81	4.30
TOTAL	3,579,175	14,285	163,866	3.99	45,783.18	11.47

Source：JICA Survey Team using material from LESCO Company overview 2013

4.1.7.2.2 Distribution Loss

- The same KPI is applied to all DISCOs. They are controlled by the Combined Indicator, integrating Loss and Collection ratio.
- KPI does not always coordinate with Compensation.
- Target loss for transmission and distribution set by NEPRA is at 12%, while LESCO's is at 13.2%, most of which is due to loss generated in the 11kV line.
- Smart meters are installed on anything more than a trial basis.

4.1.7.2.3 Present Situation of Facilities

It is considered to renew the existing LT (Low Tension) systems. A ring-shaped system has been implemented to make power routing easier for preventing partial transmission suspension. Overload of a line will not make power routing to other line.

4.1.7.2.4 Consumer Center

- A couple of employees are staffed at each Consumer Center. In addition to the Centers, seven Mobile Customer Centers are available.
- Consumers are allowed to pay on installment for a maximum of one year.

4.1.7.2.5 Tariff Collection

For individual consumers, collection ratio is very high, reaching no less than 95% every year. For government-related institutions, however, there are some years when payment may be delayed Billing targets are approx. 3.1Million, while billing amount reaches 136 Billion Rs., out of which collection expenses accounted for as much as 135 Billion Rs. last year.

Table 4.1-36 Billing and Collection

FY	Billing			Collection			% Age		
	Govt. [Bln. Rs]	Pvt. [Bln. Rs]	Total [Bln. Rs]	Govt. [Bln. Rs]	Pvt. [Bln. Rs]	Total [Bln. Rs]	Govt.	Pvt.	Total
2008-09	6.6	85.4	**92.0**	6.5	81.8	**88.3**	98.3%	95.7%	**95.9%**
2009-10	8.8	108.5	**117.3**	5.9	103.5	**109.3**	67.0%	95.3%	**93.2%**
2010-11	10.3	128.2	**138.5**	8.7	127.1	**135.9**	85.1%	99.1%	**98.1%**
2011-12	11.4	145.7	**157.1**	11.3	139.7	**151.0**	99.2%	95.9%	**96.1%**
2012-13	**8.8**	**155.1**	**163.9**	**10.9**	**149.4**	**160.3**	**124.7%**	**96.3%**	**97.8%**

Note：Pvt: Private
Source：LESCO Company overview 2013

4.1.7.2.6 Financial Arrangements

Table 4.1-37 shows a structure that almost all investment in DOP and/or ELR are made, using revenue by collection and equity capital, while nothing but STG relies on ADB/WB for nearly half of the investment.

Table 4.1-37 Capital Budget

Sr.#	Description	2012-13		2013-14	Inc. From 2012-13
		Approved Budget	Exp. Up-to June (Prov.)	Proposed Budget	
1	DOP	3,576	2,988	4,145	16%
	- Consumer Financing	2,926	2,799	3,495	19%
	- Own Resources	650	189	650	0%
2	ELR	650	326	850	31%
	- Own Resources	650	326	850	31%
	- Saving from ADB/WB	0	0	0	0%
3	6th STG	2,617	1,904	6,859	162%
	- Own Resources	1,934	793	3,825	98%
	- ADB/WB	683	110	3,034	344%
4	TOU Meters/Smart Metering	150	69	150	0%
5	Others	406	309	716	76%
	Total	7,399	5,595	12,720	72%

Note：DOP：Development of Power、ELR：Energy Loss Reduction、STG：Secondary transmission Grid
Source：LESCO Company overview 2013

4.1.7.2.7 Performance Contract

The Performance Contract is signed after the approval of the board meeting at LESCO.

4.2 Governance Issues

Governance issues in Pakistan are shown as below:

- Institutional issues causing the Circular Debt（Institutional Issue）
  Regulation requires securing transparency.
- Setting of Performance Indicator
- In addition, an existed Project Management Office (PMO) conducting the evaluation according to the above Performance Indicator

4.2.1 IMF's Governance, Regulation and Program for Improved Transparency

(Excerpts from IMF Country Report No.13/287 Pakistan 2013 article consultation and request for an extended arrangement under the extended fund facility September 2013)

IMF recommends to improve governance, regulation and transparency of the power sector in Pakistan in the following manner.

We have placed high priority on improving energy sector governance and transparency. To enhance governance, we will augment the independence, accountability, and administrative capacity of the regulatory body, the National Electric Power Regulatory Authority (NEPRA). To reduce Circular Debt accumulation, the period for NEPRA's determination of the base tariff will be reduced from 8–10 months to 90 days by the next determination cycle. Specifically, for FY2013/14 DISCOs will submit the tariff petitions by end-July 2013, and NEPRA will issue the Determined tariff by end-October 2013. The government will notify new Determined tariff within 15 days, and over time determination and notification of tariff will be consolidated with NEPRA. There is also currently a lag of 7 months for the application of fuel price adjustments (FPAs) dictated by NEPRA because of court injunctions. We intend to address these injunctions through the legal system to ensure timely adjustments and to revise the monthly application of FPAs to reflect next quarter's prices to minimize price distortions and improve predictability by end-November 2013. To enhance transparency, a web-based reporting of dispatching, merit order of all power plants, and payment records to stakeholders will be introduced by end-July 2013. Second, the Central Power Purchasing Agency (CPPA) should be made operational by separating it from the National Transmission and Dispatch Company (NTDC), hiring key staff, issuing CPPA rules and guidelines, and taking over the payment and settlement system by end-December 2013 (structural benchmark). Dissolution of PEPCO should also be finalized by end-December 2013 and its remaining functions should be devolved.

(End of excerpts)

Source: IMF Country Report No.13/287 Pakistan 2013 article consultation and request for an extended arrangement under the extended fund facility September 2013

4.2.2 Performance Evaluation Standard

NEPRA Act Section 34 stipulates Performance Standards, as provided in the following maner.

NEPRA shall prescribe performance standards for generation, transmission and distribution companies to encourage safe, efficient and reliable service, including standards for:

(i) service characteristics such as voltage and stability;

(ii) scheduled and unscheduled outages;

(iii) reserve margins where applicable;

(iv) time required to connect new customers; and

(v) principles and priorities of load shedding.

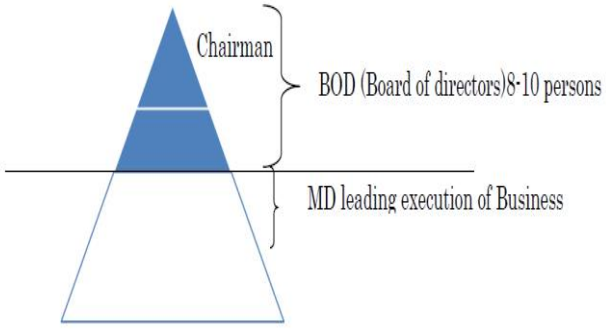
There is a strong opinion that NEPRA is required to abolish cross subsidy found between the efficient and inefficient DISCOs, increasing tariff with introduction of targeted performance-based tariff to all DISCOs. For details, see the foot note 20.

Source: The Causes and Impacts of Power Sector Circular Debt in Pakistan March 2013

4.2.3 Performance-based Contracts

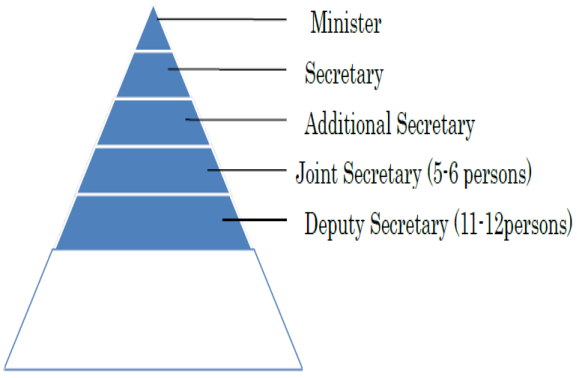
Performance-based Contract has two types: One between the Government (NEPRA) and BOD (Board of Directors), and the other between BOD and Bureaucratic Organization (including employees) under MD (Managing Director).

The term of office of BOD is two to three years. Remuneration for Non-Executive Directors is paid on the basis of a system different from a normal payroll system. On the other hand, Bureaucratic Organization (employees) as an actual working unit is protected by a lifetime employment system without downside risk, including dismissal, demotion and salary cut.



Source: JICA Survey Team using material from onsite Interview

Table 4.2-1 Organizational Upper Echelon at Public Sector



Source: JICA Survey Team using material from onsite Interview

Table 4.2-2 Organizational Upper Echelon at Government Office

4.2.4 PMO

PMO (Project Management Office) will be supervised so that it may have visibility from outside by monitoring its activity process.

While PMO is a consultative body under the direct control of Prime Minister, of which members are not disclosed, it is in place at each Ministry.

PMO will take stock every week and conduct a report to Prime Minister every month.

PMO is at the same level as Deputy Secretary (DS) level, being conscious of ownership of a project. At the Ministry Level, Joint Secretary (JS) will take final responsibility, and input an explanation to the Minister by himself.

PMO recruits Pakistani specialists on a subject.

4.2.5 Structure for Dealing with Energy

On two organizations for dealing with energy, the government's view is shown in the following:

Two organizations will not hamper the energy issues. What is important is alignment between the two organizations. As problems on practical operations will be solved through informal discussions within each of the organization, substantive problems will not occur. While a number of administrative institutions may put the same operation under its own control, including renewable energy (biomass) under the control of MAFF (Ministry of Agriculture, Forestry and Fisheries of Japan), clear-cut strategy and accountability will suffice for operations on its own.

Chapter 5
Support Situation of International Donor Institutions

Chapter 5 Support Situation of International Donor Institutions

5.1 Outline of Support Trends of International Donor Institutions in Pakistan

Major development institutions active in Pakistan's energy sector are Asian Development Bank (ADB), Agence Française de Développement (AFD), Islamic Development Bank (IsDB), Japan International Cooperation Agency (JICA), Kreditanstalt for Wiederaufbau (KMI), United States Agency for International Development (USA ID), and the World Bank.

Source: http://www.erra.pk/Reports/Donors/2_List%20of%20Donors%20and%20Sponsors.pdf, reference day September 17,2013

The aid to the Islamic Republic of Pakistan (hereinafter called "Pakistan") provided by the World Bank, ADB and USAID focuses on improving the infrastructure (power, irrigation, road, port and harbor) essential for the growth of the country, and provides support for educational reform to reduce the differences between villages and cities in terms of reduction of poverty and gender discrimination, and increase the school enrollment ratio.

Furthermore, these donor institutions, reducing the possibilities of future conflict, provide support for dealing with the consequences of conflict through participating in the development of boarder areas.

JICA funded the modernization of the Load Dispatch Center at National Power Control Center (NPCC) by upgrading its data processing system.

Friends of Democratic Pakistan (FODP[38]) Energy Sector Task Force in 2010 made recommendations for a sustainable recovery of Pakistan's energy sector.

Source: http://www.afd.fr/lang/en/home/pays/asie/geo-asie/agence-pakistan/afd-pakistan/amis-pakistan-democratique (Referred in September 6th, 2013)

AFD is a partner of ADB that provides co-finance for the Energy Efficiency Investment Program

Source: http://www.afd.fr/lang/en/home/pays/asie/geo-asie/agence-pakistan/afd-pakistan/amis-pakistan-democratique (Referred in September 6th, 2013)

5.2 World Bank Donation for Energy Sector in Pakistan

Loans for Energy Sector in Pakistan by the World Bank has been provided for augmentation of the facilities and improvement of transmission and distribution grid, in order to reduce transmission and distribution loss, and address to serious energy shortage.

[38] FODP consists of 26 members. Apart from Pakistan, these are the Asian Development Bank, Australia, Canada, China, Denmark, Egypt, France, Germany, Iran, the Islamic Development Bank, the European Union, Italy, Japan, the Netherlands, Norway, the Republic of Korea, Saudi Arabia, Spain, Sweden, Turkey, the United Arab Emirates, the United Kingdom, the United States of America, the United Nations, and the World Bank.

In addition, the World Bank has recently been supporting promotion of private investment in the energy sector.

In 2012, the World Bank decided to provide loans totaling 1.8 Billion USD for development projects in Pakistan, most of which is assumed to be directed to the energy sector, including this project.

5.3 ADB Donation for Energy Sector in Pakistan

Aid to the Energy Sector in Pakistan by ADB has been provided for promoting sustainable economic growth by means of refurbishment and augmentation of the existing generation plants, improvement of transmission and distribution grid and diversification of power source, and has been supporting promotion of private investment in the renewable energy and energy sector.

Aid to Bhasha Dam and Jamshoro (600MW/unit) were approved by the Board held on December 9th, 2013.

5.4 USAID Donation for Energy Sector in Pakistan

Aid to the power sector in Pakistan by USAID has been provided in support of converting oil-fired generation plant to coal-fired one.

Furthermore, USAID particularly has provided the power sector with strategic subsidy aid (18,700USD), as loans in support of the capacity augmentation project. In 2010, USAID started to provide loans for repair and maintenance of the Government-owned generation plant.

Table 5.4-1 Projects Implemented by the World Bank/ADB (1990～2006)

	World Bank(WB)		ADB		
	Capacity Building Financial Support	Generation	Generation	Transmission/ Distribution	Capacity Building
1990		1992.6.30-1998.6.30 Domestic Energy Resources Development Project			
		1994.6.23-2001.3.1 Power Sector Development Project			
1995		1995.12.19-2003.10.31 Ghazi Barotha Hydropower			
		1996.5.14~ Uch Power Project			
2000			2000.12.14- Power Sector Restructuring Program loan		2000.3.6- Capacity Building of the National Electric Power Regulatory Authority(NEPRA)
			2000.12.14- Support TA loan		2003.6.20- Institutional Capacity Building of the National Transmission and Despatch Co., Ltd.(NTDC)
			2004.11.5- Renewable Energy Development		
2005			2005.11.21- NEW BONG ESCAPE HYDROPOWER		2004.12.17- Capacity Building for Alternative Energy Developent Bord1
			2005.7.14- Operational Support to the Office of the Energy Advisor		
2006			2006.12.13- Renewable Energy Development Sector Investment Program-Project	2006.11.27- Preparing the Power Distribution Enhancement Multitranche Financing Facility	
			2006.11.17- Establishment and Commencement of Operations for the Central Power Purchasing Agency	2006.1212- MFF-Power Transmission Enhancement	
			2006.12.1- MFF-Renewable Energy Development Sector Investment Program	2006.12.13- Power Transmission Enhancement Investment Program,Tranche 1	

Table 5.4-2 Projects Implemented by the World Bank/ADB/USAID(2007～)

	World Bank(WB)			ADB		USAID
	Capacity Building Financial Support	Generation	Transmission/ Distribution	Generation	Transmission/ Distribution	Energy Project
2007				2007.7.30- DAHARKI POWER PROJECT 2007.10.25- Integrated Energy Model	2007.12.17- MFF-Power Transmission Enhancement Investment Program PFR2 2007.5.29- KESC POST-PRIVIZATION REHABILITATION	
2008			2008.6~2014.2 Electricity Distribution and Transmission Improvement Project	2008.2.5- Sustainable Energy Efficiency Development Program	2008.9.3- MFF-Power Distribution Enhancement Investment Program 2008.9.12- Power Distribution Enhancement Investment Program -Project 1	2008-2015 Energy Policy Project
2009				2009.9.17- Energy Efficiency Investment Program 2009.12.10- Energy Sector Task Force 2009.9.30- Energy Efficiency Investment Program – Tranche1		2009-2012 Energy Efficiency Project
2010				2010.11.24- ZORLU ENERJI POWER PROJECT 2010.12.13- Uch-2 Power Project 2013 CFL Project	2010.12.14- Power Distribution Enhancement Investment Program – Tranche 2	2010.1-2014.12 FATA Infrastructure Project (Capacity Building) 2010-2015 Power Distribution Program 2010-2012 Tarbela Dam Project 2010-2012 Guddu Power Station Project 2010-2012 Jamshoro Power Station Project

Chapter 6
Feasibility Analysis of Japan's Support to Energy Sector Reform

Chapter 6 Feasibility Analysis of Japan's Support for Energy Sector Reform

6.1 Challenges and Recommendation in Energy Policy

According to ENERGY SECTOR CRISIS ISSUES & REFORMS WAY FORWARD by SHAHID SATTAR Member (Energy) PLANNING COMISSION May 23rd, 2013), what follows is pointed out in terms of Power policy.

The field of generation-Plan

Expected Outcome

- Federal MOE setup as a single entity for the development of integrated policies, plans and strategies for the energy sector - functions (now divided between MoWP and MPNR) consolidated in one organization.
- Provincial energy departments setup with clarity on ownership, control, approvals, roles, authorities and responsibilities for energy assets and operations – ambiguity and blame game minimized.
- Consistent organizational structures for the energy sector at federal and provincial levels – proper expertise and compensation mechanism – professional approach in resolving energy issues.
- Good governance and robust monitoring with improved accountability for plan implementation – effective energy sector regulation - affordable and timely energy supplies to the economy.
- Proper incentives and direction for the private sector with clarity and vision – economic pricing of fuels with increased participation of the private sector.
- Improved efficiency of public enterprises governed by independent BODs.
- Improved energy supplies, collection of tariff and minimization of losses.

Source : ENERGY SECTOR CRISIS ISSUES & REFORMS WAY FORWARD by SHAHID SATTAR Member (Energy) PLANNING COMISSION May 23rd , 2013

6.2 Organizational Issues

According to ENERGY SECTOR CRISIS ISSUES & REFORMS WAY FORWARD by SHAHID SATTAR Member (Energy) PLANNING COMISSION May 23rd, 2013), what follows is pointed out in terms of governance.

- Institutional shortcomings have contributed to the ongoing energy crisis - The option to strengthen the existing institutional setup will not lead to sustainable solutions.
- The two energy ministries, Ministry of Water and Power (MoWP) and Ministry of Petroleum and Natural Resources (MPNR) are not fully coordinated.
- There is an immediate need for stronger integration and harmonization of functions

in the power, oil and gas, coal and renewable energy sub-sectors.

- Pakistan would benefit from consolidating energy functions into one Ministry of Energy (MOE) at federal level. Similar ministries exist in many countries, for example Afghanistan, Angola, Azerbaijan, Canada, Israel, Kosovo, Nepal, Philippines, South Africa and the United States.
- The current water wing of MOWP can be retained as a stand-alone ministry focusing on water resource policy, planning and management.
- The creation of MOE was also recommended by the Friends of Democratic Pakistan (FODP) in the 'Energy Sector Recovery Report & Plan' - Oct. 2010.
- Impact of the 18th Amendment on the organizational setup, ownership of assets and operational autonomy in the energy sector (federal and provincial level) needs to be properly addressed i.e. setting up provincial energy departments.

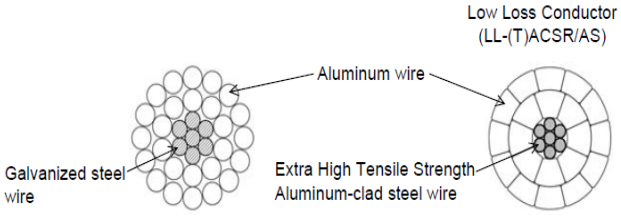
Source : ENERGY SECTOR CRISIS ISSUES & REFORMS WAY FORWARD by SHAHID SATTAR Member (Energy) PLANNING COMISSION May 23rd, 2013

6.3 Challenges and Recommendation in Technical Aspects

Based on the survey, the Survey Team would like to make the following four proposals to the energy power sector in Pakistan.

6.3.1 Low-loss Transmission Lines

1. Design Concept
   - Increase cross-sectional area of aluminum part without change in outer diameter of transmission line
   - Increase cross-sectional area of aluminum part, while decreasing cross-sectional area of steel wires
   - Reduce iron loss



Source : JICA Survey Team using material from J- Power Systems Corporation

2. Past record of introduction in Japan
   - Introduced as the standard at Tohoku Electric Power Co., Inc. and Shikoku Electric Power Co., Inc.
3. Past record of introduction overseas
   - Introduced as the standard in Malaysia
4. Advantage (Why do we now need to consider introduction of low loss transmission line in Pakistan?)
   - Transmission loss can be reduced by 25%.

- Existing transmission lines can be replaced, using the existing transmission towers as they are.
- The current main grid in Pakistan doesn't have duplicated T/L.
- Implementation of low loss transmission lines will make it possible to reduce cost.

5. Possibility of induction
   - Duplicated T/L will solve major power outages due to failures involving electrical substation equipment.
   - Low loss transmission line may deal with this investment need at the least cost in a medium term.

Transmission line of 270km extended to Thar and Mit fileyarid as PC-1 has already been approved. In the case that this scope changes, if the specification can be amended (example: length, location and materials change, or cost increase can be controlled within 15%), it can be so amended. However, such amendment will be disapproved without due justification.

6.3.2 Training Institute for Electric Power Technology

1. Thermal & Hydropower Training Institute at WAPDA/GENCO

① Understand the current training status for generation facilities at WAPDA and GENCO, and identify expectations for a new structure, determining, in addition, whether to be integrated with the existing institute or to find a new one.

② Determine the basic framework of the role, basic policy, organization and facilities of the institute, and start construction.

③ Select all the facilities and trainers in preparation for completion and opening of the institute in the next fiscal year.

④ Open a training institute, admit the first trainees and send off them as the first graduates.

⑤ Make on-site evaluation to ascertain the efficacy, and make good use of it for future.

2. Transmission Line Training Institute at NTDC

① Identify the current training status of power lines and expectations for a new structure and determine whether to include the distribution unit.

② Determine a basic framework of the role, basic policy, organization and facilities of the institute, and start construction.

③ Select all the facilities and trainers in preparation for completion and opening of the institute in the next fiscal year.

④ Open a training institute, admit the first trainees and send off them as the first graduates.

⑤ Make on-site evaluation to ascertain the efficacy, and make good use of it for future.

3. Small Hydropower Training Institute

① Determine the role, basic policy, system of the training institute, and select promoters for primary small hydropower. Increase the promoters 6 months later.

② In meeting commencement of the training, collect data about feasible location in the Punjab Province and the Khyber-Pakhtunkhwa Province. Start development of local manufactures and cultivation of them.

③ The promoters to do enlightenment activities locally and dig up potential projects
Start generation using a number of units in this project. Evaluate this training system, work on it continuously and link to development in other Provinces.

6.3.3 Training Center for Energy Conservation Technology

As for energy efficiency and conservation, it is considered to be supporting preparation of a master plan for energy efficiency and conservation and founding a training center for energy conservation technology. As "Development Study on Energy Efficiency and Conservation for the Philippines (2012)" (JICA) shows, the master plans will comprise survey on the present situation and future possibilities, including an energy management system, energy diagnostics, a labelling system, dissemination and enlightenment activities, database for energy efficiency and conservation, a finance mechanism, ESCO and energy efficiency and conservation for buildings.

Furthermore, JICA's aid to founding a training center for energy conservation technology is provided in Vietnam as of 2013, taking the following procedures.

1. Develop a roadmap for energy efficiency and conservation (2008 – 2009), based on the master plan for energy efficiency and conservation.
2. Enact the energy efficiency and conservation bill (enacted on January, 2011).
   The Ministry of Commerce and Industry will develop a basis of founding a training center for cultivating energy manager and energy consultant.
3. The training center will be reflected to the ministerial ordinance for qualification criterion to establish its legal position.
4. Selection of a site
5. Donation of machines
6. Commencement of cultivating training instructors

Similar needs may be high in Pakistan.

6.3.4 Dispatch of experts based on a mid-term generation plan

A generation plan has been developed to date using SYPCO (System Production Costing), it is considered, however, that training for software including WASP (Wien Automatic System Planning Package), widely used in the world, will be high in demand in future.

Chapter 7
Reference Materials

Chapter 7 Reference Materials

1. List of IPP

Status of Installed and Available Generation Capacity in September-2013 (MW)						27.September,2013				
S.No	Project Name^	Location	Company/Agency	Fuel		Installed(MW)	Availablity(MW)	Overhead investments ($bn)	Current Status	under 2002 Policy
	GENCOs					**3,550**	**1,380**			
1	Lakhra	Hyderabad, Sindh		Coal	ST	30	-			
2	GTPS Faisalabad	Faisalabad, Punjab		Gas	GTCC	210	-			
3	Kotri	Kotri, Sindh		Gas	GTCC	140	-			
4	Quetta	Quetta, Balochistan		Gas	ST	25	-			
5	Muzaffargarh	Muzaffargarh, Punjab		RFO	ST	1,130	480		shut down/near coal mines	
6	SPS Faisalabad	Faisalabad, Punjab		RFO	ST	100	-			
7	Guddu	Jacobabad, Sindh		RFO/Gas	Diesel	1,155	620			
8	Jamshro	Jamshoro, Sindh		RFO/Gas	ST	700	280	0.6	Rehabilitation by USAID	
9	Multan	Multan, Punjab		RFO/Gas	GTCC	60	-		GE	
	IPPs					**7,487**	**3,915**			
1	Uch Power Limited	Dera Murad Jamali, Nasirabad District, Baluchistan,	WB, Import-export bank, Nissho Iwai Corp. GDF Suez(France)	Gas	GTCC	586	-	6.2		
2	Engro Energy Limited (Engro Powergen)	Qadirpur, Sindh		Gas	GTCC	213	218	1.7		O
3	Orient Power Limited	District Kasur, Punjab	Oman Oil Company S.A.O.C	Gas	GTCC	212	-			O
4	TNB Liberty Power	District Ghotki, Sindh		Gas	GTCC	212	-			
5	Saif Power Limited	Sahiwal District, Punjab		Gas	GTCC	205	-			O
6	Sapphire Electric Company Ltd.	District Sheikhupura, Punjab		Gas	GTCC	204	-			O
7	Liberty Power Tech Limited	Faisalabad, Punjab		RFO		196	177	2.5		
8	Fauji Kabirwala Power Company	District Khanewal, Punjab	ADB, Veterans Foundation	Gas	GTCC	157	121			
9	Habibullah Coastal	Quetta, Baloachistan	Coastal Saba Power Ltd.	Gas	GTCC	140	64	1.6	GE/GT,MHI/ST(Aircraft)	
10	Altern Energy		Altern	Gas	GTCC	29	-	0.09	DESCON(Pakistan)	
11	CHASHNUPP(Chashma Nuclear Power Plant)	Chashma city, Punjab		Nuclear		300	304			
12	Rousch Power Limited	District Khanewal, Punjab	WB, JBIC, Siemens	RFO	GT	450	205	5.0		
13	AES Lalpir	Muzaffargarh, Punjab	Coastal Saba Power Company Limited（Mauritius）、Cogen Technologies Saba Capital Company（USA）、Capco Resources Inc.（Canada）	RFO	ST	362	342	3.4		
14	AES Pak Gen	Muzaffargarh, Punjab	AES, IFC, Nichimen Corp., Mitsubishi Heavy Industries, Ltd., JBIC<Loan guarantee 18 billion two hundred million JPY>, NEXI	RFO	ST	365	-	3.6		
15	Atlas Power Limited	Sheikhupura, Punjab	Man Diesel & Turbo(Germany)	RFO	Diesel	213	193			O
16	Nishat Chunian Power Limited	District Kasur, Punjab		RFO	Diesel	196	195			O
17	Nishat Power Limited	District Kasur, Punjab		RFO	Diesel	195	196			O
18	Attock Gen Limited	Rawalpindi, Punjab		RFO	Diesel	157	102			O
19	Saba Power	Shiekhupura, Punjab	Sojitz Corp.,Coastal Saba Power Ltd.	RFO	ST	125	-	1.4	stop operation	
20	Kohinoor Energy Limited	Lahore, Punjab	Saigols,Corporation, Wärtsilä Oyj Abp Toyota Tsusho	RFO		131	92	1.4		
21	Southern Electric	Lahore, Punjab	WB, Sojitz Corp., BC Hydro	RFO	Diesel	136	-	1.2	stop operation	
22	Japan Power Generation	Jia Bagga, Punjab	Toyota Tsusho Corporation, , Pak Oman(19%),NLC(17%),Saudi Pak(7.4%),etc 54% is traded at stock exchange	RFO	Diesel	135	23	1.2	Less sharing due to Oil Shortage. stop operation since June 2012	
23	Gulf Rental	Gujranwala,Punjab		RFO	Diesel	62	62			
24	Techno Power	Faisalabad, Punjab		RFO	Diesel	60	-			
25	KAPCO(Kot Addu Power Company Limited)	Muzaffargarh,Punjab	U.S.Sithe(Marubeni Corporation) International Power	RFO/Gas	GTCC	1,638	680	n.a.		
26	Hub Power (HUBCO)	Lasbela District, Balochistan	WB, NEXI, JBIC, Mitsui & Co., Ltd, IHI Corporation,National Power , Xenel	RFO/Gas	ST	213	900	17.0		
27	Malakand-III	Pekhawa,Khyber Pakhtunkhwa		Run-of-River		81	41			
28	Jagran	Muzaffarabad, Punjab		Run-of-River		30	-			
29	Laraib Energy Limited	Mangla,AJK	Hub Power(HUBCO) TNB Remaco(Maleysia)	Run-of-River		84				
30	Gul Ahmed Energy Ltd.(GAEL)	Karachi, Shindh		RFO		136				
31	Foundation Power Company (Daharki) Limited	Daharki,Shindh		Gas		172				
32	Halmore Power Generation Company Limited	Seikhupura, Punjab		Gas/Die+E68sel	GTCC	201				
	WAPDA Hydropower					**6,444**	**4,889**			
1	Tarbela	Khyber Pakhtonkhwa				3,478	2,345	0.7		
2	Mangla	Azad Kashmir				1,000	776			
3	Chashma Hydro	Mianwali District, Punjab				184	128			
4	Ghazi Barotha	Attock district, Punjab				1,450	1,450			
5	Warsak	Khyber Pakhtunkhwa				243	150			
6	Small Hydel					89	40			
	Total					**17,481**	**10,184**			

Source: Ministry of Water and Power, State Bank of Pakistan Annual Report 2010-2011, PPIB SUCCESS STORY 1994 TO 2010, on site interview Sep 10,2013

2. Brief Summary of NEPRA Act

NEPRA ACT
CHAPTER I
GENERAL
1.Short title, extent and commencement.
2. Definitions
CHAPTER II
ESTABLISHMENT OF AUTHORITY
3. Establishment of the Authority.
4. Resignation and removal of Chairman, etc.
5. Meetings of the Authority, etc.
6. Decisions of the Authority
7. Powers and functions of the Authority.
8. Remuneration, etc., of Chairman and members.
9. Chairman, etc. to be public servant.
10. Staff and advisers, etc.
11. Tribunals.
12. Delegation.
12A. Appeal.
13. Funds.
14. Accounts.
CHAPTER III
LICENCES
15. Generation license.
16. Transmission license.
17. National Grid Company.
18. Responsibilities of National Grid Company
19. Special purpose transmission.
20. Distribution licenses.
21. Duties and responsibilities of distribution licensees

22. Sale to bulk power consumers.
23. Sale of electric power to other distribution companies.
24. Licensees to be companies.
25. Licenses of Territory Served by KESC.
26. Modifications.
27. Assignment of license prohibited.
28. Suspension and revocation.
29. Penalties.
30. WAPDA and SHYDO[39] to be licensees.
31. Tariff. (1)
32. Investment and power acquisition programmers.
33. Organizational matters.
34. Performance standards.
35. Industry standards and codes of conduct.
36. Uniform system of accounts.
37. Review of public sector projects.
CHAPTER -IV
ADMINISTRATION
38. Provincial offices of inspection
39. Complaints.
40. Enforcement of orders of the Authority.
41. Sums payable to the Authority to be recoverable as land revenue.
42. Reports of the Authority.
43. Inspection by public.
44. Information.
45. Relationship to other laws.
46. Rules.
47. Regulations.

[39] SHYDO: Sarhad Hydro Development Organization

NEPRA rule

REGULATORY INSTRUMENTS

Within the broader framework of its Act, NEPRA has prescribed Rules and Regulations as regulatory tools

- NEPRA tariff Standards & Procedure Rules, 1988
- NEPRA Application & Modification Procedure Regulation, 1999
- NEPRA Licensing (Distribution) Rules, 1999
- NEPRA Licensing (Generation) Rules, 2000
- NEPRA Fees & Fine Rules, 2002
- NEPRA Fees Pertaining to Tariff Standards & Procedure Regulations, 2002
- NEPRA Eligibility Criteria for Consumers of (Distribution) Companies, 2003
- NEPRA (Resolution of Disputes between Independent Power Producers and other Licensees) Regulations, 2003
- NEPRA Performance Standards (Transmission) Rules, 2005
- NEPRA Performance Standards (Distribution) Rules, 2005
- NEPRA Interim Power Procurement (Procedure & Standards) Regulations, 2005
- NEPRA Competitive Bidding Tariff (Approval Procedure) Regulations, 2008
- NEPRA Performance Standards (Generation) Rules, 2009
- NEPRA Uniform System of Accounts Rules, 2009
- NEPRA (Review Procedure) Regulations, 2009
- Uniform System of Accounts Rules, 2009
- NEPRA Financial Regulations, 2010
- NEPRA Upfront Tariff (Approval & Procedure) Regulations, 2011

3. Brief Summary of Electricity Act 1910

ELECRICTY ACT, 1910
PART II Supply of Energy Licenses
Works
Supply
PART III Supply, Transmission and Use of Energy by Non-Licensees
PART IV General Protective Clauses
Administration and Rules
Criminal Offences and Procedure
Supplementary
THE SCHEDULE
Security and Accounts
Compulsory works and supply
Charges
Testing and Inspection
Plans
Additional notice of certain works

4. Building Code

Statutory Notifications (S.R.O.)
Government of Pakistan
Ministry of Science and Technology
Notification
Islamabad, the 28th March,2013

S.R.O.249(I)/2013

S.R.O.249(I)/2013.—In exercise of the powers conferred by Section 25 of the Pakistan Engineering Council Act, 1975 (V of 1976) , the Governing Body of the Pakistan Engineering Council, with the previous sanction of the Federal Government, is pleased to direct that the following further amendment shall be made in the Pakistan Engineering Council (Conduct and Practices of Consulting Engineers) Bye-laws, 1986, namely:—

In the aforesaid Bye-laws, after bye-law 10, the following new bye-law shall be added, namely:—

" Ⅱ.Application of Building Code of Pakistan (Energy Provisions-2011).—

(1) The provisions of the Building Code of Pakistan(Energy Provisions-2011) shall apply for engineering design of buildings and building clusters that have a total connected load of 100 Kilo Watts or greater, or a contract demand of 125 KVA or greater, or a conditioned area of 900 ㎡ or greater, or un-conditioned buildings of covered area of 1,200 ㎡ or more.

(2)The scope of the energy provisions is applicable to the following to provide minimum energy-efficient requirements for the design and construction of:—

(a) new building and their systems:
(b) new portions of existing buildings and their systems, if the conditioned area or connected load exceeds the limit prescribed under sub-bye-law(1);
(c) new systems and new equipment in existing buildings; and
(d) increase in the electricity load beyond the limit mentioned in sub-bye-law(1).

(3) Construction and retrofitting of building or building clusters in violation of the Building Code of Pakistan (Energy Provisions-2011) shall be considered as violation of professional engineering work as specified under clause(xxv) of section 2 of the Pakistan Engineering Council Act 1975 (V of 1976)

(4) The provisions of the Building Code shall be revised by the Pakistan Engineering Council initially after one year of implementation and thereafter every three years.

Source: http://www.pec.org.pk/sro/28march.pdf (Referred in February 9th, 2014)

Building Code Of Pakistan(Energy Provisions-2011)

Mandatory-Voluntary-Ahj

Code is carried out by local authority having jurisdiction. This authority can be responsible for specifying permit requirements, code interpretations, approved calculation methods, work sheets, compliance methods, manufacturing literature, right of appeal and other data to demonstrate compliance

SECTION-1(PURPOSE)

THE PURPOSE OF THESE PROVISIONS IS TO PROVIDE MINIMUM REQUIREMENTS FOR THE ENERGY EFFICIENT DESIGN AND CONSTRUCTION OF BUILDINGS

SECTION-2(TITLE, CODE, SCOPE, APPLICATION, EXEMPTION, LIMITATIONS

□TITLE－BUILDING　CODE OF PAKISTAN –ENERGY PROVISIONS 2011

□SCOPE

Shall apply to buildings and building clusters that have a total load of 100 kW or greater or contract demand of 125 kVa or a conditioned area of 900 sqm or un-conditioned buildings of covered area of 1200 sq.m or more

Source：Overview of Building Energy Code of Pakistan – Energy Provision 2011 by Eng. Faiz Mohammad Bhutta, General Manager Business Development

5. ECC

The Lahore Journal of Economics (Oct 24, 2013)

Special Edition

Institutional Machinery for Managing the Pakistan Economy

Pervez Tahir

Source:http://www.lahoreschoolofeconomics.edu.pk/JOURNAL/Special%20Edition%2005/Pervez%20Tahir.pdf(Referred in November 8th, 2013)

Economic Coordination Committee

The ECC is not only the most frequented but also the most frequently convened Cabinet Committee (Annex III). Meeting every fortnight, it is the main coordination point for economic policies, especially fiscal, monetary, trade and tariff policies. It also adjusts these policies to the events requiring urgent corrective action. The forum has been used for the approval of some important policies as well. These include power policy and on-lending policy for foreign credits. As the watchdog for prices and inflation, the ECC takes remedial actions whenever and wherever necessary.

Annexure-III

Functions

1. Consideration of all urgent economic matter and coordination of economic policies initiated by various Divisions of Government.
2. To identify and propose measures for the gradual attainment of a welfare state.
3. To keep a vigilance on the monetary and credit situation and make proposals for the regulation of credit in order to maximize production and exports and to prevent inflation.
4. To determine the future pattern of growth of major industries.
5. To review from time to time the country's import policy and its effect on production and Investment.
6. To evaluate export performance from time to time in relation to specific policies and measures for the promotion of exports.
7. To watch the current price situation with a view to ensuring the stability of the prices of goods used by the common man.
8. Implementation of any other task assigned by the Cabinet from time to time.
9. Cases of agreement and licensing for oil prospecting and exploration.
10. Six monthly/Annual reports on Autonomous Bodies.
11. Cases of non-repatriable foreign investment. .
12. Private sector schemes based on more than 50% imported raw material.
13. Cases involving fiscal anomalies.
14. Review of foreign aid utilization

6. Council of Common Interests (CCI)

CCI:

Council of Common Interests': The Constitution of 1973 introduced a new institution known as the 'Council of Common Interests' consisting of Chief Ministers of the provinces and an equal number of Ministers of the Federal Government nominated by the Prime Minister. The Council could formulate and regulate the policy in the Part II of the Legislative List. In case of complaint of interference in water supply by any province the Council would look into the complaint.

Source: http://www.pakistani.org/pakistan/constitution/part5.ch3.html (Referred in October 23rd, 2013)

Council of Common Interests (CCI)

(1) There shall be a Council of Common Interests, in this Chapter referred to as the Council, to
be appointed by the President.

[40][(2) The Council shall consist of

(a) The Prime Minister who shall be the Chairman of the Council;

(b) The Chief Ministers of the Provinces; and

(c) Three members from the Federal Government to be nominated by the Prime

40 The following Article 153(2) substituted by the Constitution (Eighteenth Amendment) Act 10 of 2010.
(2) The members of the Council shall be-
(a) The Chief Ministers of the Provinces, and
(b) An equal number of members from the Federal Government to be nominated by the Prime Minister from time to time.

Minister from time to time.]

(3) [41][***]

(4) The Council shall be responsible to Majlis-e-Shoora (Parliament) [42][and shall submit an Annual Report to both House of Majlis-e-Shoora (Parliament)].

Functions and rules of procedure

[43][(1) The Council shall formulate and regulate policies in relation to matters in Part II of the Federal Legislative List and shall exercise supervision and control over related institutions.] [44][(2) The Council shall be constituted within thirty days of the Prime Minister taking oath of office.

(3) The Council shall have a permanent Secretariat and shall meet at least once in ninety days:

Provided that the Prime Minister may convene a meeting on the request of a Province on an urgent matter.]

(4) The decisions of the Council shall be expressed in terms of the opinion of the majority.

(5) Until Majlis-e-Shoora (Parliament) makes provision by law in this behalf, the Council may make its rules of procedure.

(6) Majlis-e-Shoora (Parliament)] in joint sit ting may from time to time by resolution issue directions through the Federal Government to the Council generally or in a particular matter to take action as Majlis-e-Shoora (Parliament)] may deem just and proper and such directions shall be binding on the Council.

(7) If the Federal Government or a Provincial Government is dissatisfied with a decision of the council, it may refer the matter to Majlis-e-Shoora (Parliament) in a joint sitting whose decision in this behalf shall be final.

Source:http://www.lawsofpakistan.com/wp-content/uploads/2013/04/Constitution-of-Pakistan-1973-pdf.pdf
reference day Oct 24 2013

41 The following Article 153(3) omitted by the Constitution (Eighteenth Amendment) Act 10 of 2010.
(3) The Prime Minister, if he is a member of the Council, shall be the Chairman of the Council but, if at any time he is not a member, the President may nominate a Federal Minister who is a member of the Council to be its Chairman.]

42 Added by the Constitution (Eighteenth Amendment) Act 10 of 2010.

43 The following Article 154(1) substituted by the Constitution (Eighteenth Amendment) Act 10 of 2010.
(1) The Council shall formulate and regulate policies in relation to matters in Part II of the Federal Legislative List and, in so far as it is in relation to the affairs of the Federation, the matter in entry 34 (electricity) in the Concurrent Legislative List, and shall exercise supervision and control over related institutions.

44 Inserted by the Constitution (Eighteenth Amendment) Act 10 of 2010.)

7. IMF Country Report No.13/287 Pakistan 2013 article consultation and request for an extended arrangement under the extended fund facility September 2013, P84

Table 2. Pakistan : Prior Actions and Structural Benchmarks Under Extended Fund Facility		
Item	Measure	Time Frame (by End of Period)
Prior Actions(implemented before Board consideration of the program)		
2	Develop and approve a three-year plan by the Government for phasing out Tariff Differential Subsidy(TDS), and implement the first step by (i) the notification of new tariff for FY2012/13; the (ii) increasing the weighted average tariff by 50 percent on industrial, commercial bulk and AJ&K consumers electricity consumption; and (iii) announcing a reduction of the subsidy on second group of consumers (as defined in the TMU) through increasing the weighted average Notified tariff by 30 percent that will be in effect from October 1ST, 2013.	5 days prior to the Board meeting
Structural Benchmarks Structure Policies		
7	Develop and approve PSE reform strategy for thirty firms among the 65 PSEs approved for privatization by the Council of Common Interest(CCI)	end-September 2013
8	Hire a professional audit firm to conduct a technicalfinancial audit of the system to identify the stock and fl and ow of payables at all levels of the energy sector (including Power Sector Holding Company Limited).	end-November 2013
9	Make Central Power Purchasing Agency (CPPA) operational by separating it from the National Transmission and Dispatch Company (NTDC), hire key staff, issue CPPA rules and Company (NTDC), hire key staff, issue CPPA rules and Guidelines, and initiate the payment and settlement system.	end-December 2013

8. Major Projects by Year of the World Bank/ADB

1) Support project of World Bank

Support project of World Bank (1)

■ Tarbela Fourth Extension Hydropower Project (March, 2012～December, 2018)

- Objective: The overall development objective of the Tarbela Fourth Extension Hydropower Project is to facilitate a sustainable expansion in Pakistan's electricity generation capacity. The Project will also strengthen Water and Power Development Authority's (WAPDA's) capacity to develop the country's hydropower resources. The project includes the following components:
  - ・Construction of power house and modification to the tunnel.
  - ・Power units and ancillary equipment.
  - ・Social action and environmental management plans, dam monitoring and surveillance.
  - ・Construction supervision, monitoring and evaluation of the project impacts and social action and environmental management plans.
  - ・Project management support, capacity building of WAPDA, technical assistance and training.
- Project cost: USD 914.00 million

http://www.worldbank.org/projects/P115893/tarbela-fourth-extension-hydropower-project?lang=en (Referred in September 5th, 2013)

Support project of World Bank (2)

■ Electricity Distribution and Transmission Improvement Project (June 17, 2008～February 28, 2014)

- Objective: The objectives of the Electricity Distribution and Transmission Improvement Project for Pakistan are to strengthen the capacity of the distribution and transmission networks to meet increasing electricity demand in the selected areas more efficiently and with better reliability and quality; and strengthen institutional capacity of the selected distribution companies and support other priority areas of the power sector reform. The project includes the following components:
  - ・Physical strengthening of distribution networks operated by four distribution companies (Hyderabad Electric Supply Company (HESCO), Islamabad Electric Supply Company (IESCO), Lahore Electric Supply Company (LESCO), and Multan Electric Power Supply Company (MEPCO).
  - ・Removing some bottlenecks in the transmission grid, operated by National Transmission and Dispatch Company (NTDC).
  - ・Technical assistance for capacity building, specialized studies, energy efficiency, and sector reform.
  - ・A pilot energy efficiency program, involving installation of energy saving equipment at the customer level.
- Project cost: USD 309.90 million

http://www.worldbank.org/projects/P095982/electricity-distribution-transmission-improvement-

project?lang=en(Referred in September 5th, 2013)

Support project of World Bank (3)

■ Uch Power Project (May 14,1996～)

- Objective: The proposed project promotes private sector participation in the power sector, and helps alleviate electricity shortages through the efficient use of domestic resources. The project includes the following components:
  - ・A conventional combined cycle plant with an installed capacity of 586 MW to be located in the Baluchistan province of Pakistan.
  - ・The plant will comprise three gas turbine generators and one steam turbine generator.
  - ・An electric substation will connect the plant to the WAPDA transmission grid, initially through 220 kV lines.
  - ・The power generated will be sold to WAPDA.
  - ・The power station will use medium-Btu natural gas from the nearby Uch gas field to be supplied by the Oil and Gas Development Corporation (OGDC).
  - ・OGDC will be responsible for financing the development of the Uch field as well as supplying the natural gas to the plant through a 50-km pipeline.
- Project cost: USD 690.00 million

http://www.worldbank.org/projects/P040547/uch-power-project?lang=en (Referred in September 5th, 2013)

Support project of World Bank (4)

■ Ghazi Barotha Hydropower Project (December 19, 1995～October 31, 2003)

- Objective: To assist the government of Pakistan (GOP) in its efforts.
  - ・Develop domestic energy resources and reduce load-shedding in a cost-effective and environmentally sustainable manner, thereby supporting the country's long-term energy development objectives.
  - ・Reform program for the power sector.
  - ・Strengthen the Water and Power Development Authority's (WAPDA) capability to address environmental and resettlement issues related to hydropower projects.
  - ・Further rationalize the use of electricity.

  The project includes the following components:
  - ・A barrage and its ancillary works.
  - ・A 52 km long concrete-lined power channel cumecs and its ancillary works.
  - ・A power complex and its ancillary works
  - ・The construction of power transmission facilities to connect GBHP to the interconnected grid.
  - ・A resettlement action plan (RAP) and integrated regional development plan (IRDP)
- Project cost：USD 2250.00 million

http://www.worldbank.org/projects/P039281/ghazi-barotha-hydropower-project?lang=en (Referred in September 5th, 2013)

Support project of World Bank (5)

■ Power Sector Development Project（June 23,1994～March 1,2001）

- Objective: The Power Sector Development Project.
  - ・The reorganization and corporatization of the Water and Power Development Authority (WAPDA) into a holding company with decentralized power generation, transmission and distribution subsidiaries operating as discrete autonomous profit centers.
  - ・The establishment of a National Electric Power Regulatory Authority to set standards and regulate a largely privately operated power sector, the adoption of a pricing policy which will provide the incentives needed to support the project's privatization objectives.
  - ・The development of a labor transition program that will allow the privatization of the power sector.
  - ・The initial offering for sale to the private sector of parts of WAPDA's assets.
  - ・WAPDA's investment program.
  - ・A technical assistance component and training for strengthening WAPDA.
- Project cost： USD 4470.00 million

http://www.worldbank.org/projects/P010458/power-sector-development-project?lang=en (Referred in September 5th, 2013)

Support project of World Bank (6)

■ Domestic Energy Resources Development Project（June 30, 1992～June 30,1998）

- Objective: Accelerate the development of indigenous hydrocarbons, utilizing private sector resources to the maximum extent possible, ensure that such indigenously developed hydrocarbons reach the end consumers in an efficient manner, enhance the commercial orientation and operational autonomy of the public sector entities in the subsector to pave the way for a larger private sector role and strengthen the regulatory and policy making functions of governmental agencies in the subsector to facilitate larger private investments.
- Project cost: USD 551.80 million

http://www.worldbank.org/projects/P010401/domestic-energy-resources-development-project?lang=en (Referred in September 5th, 2013)

Support project of World Bank (7)

■ Rural Electrification Project（December 18, 1989 ~June 30, 1999）

- Objective: Improving rural productivity and Infrastructure development. The project consists of following components.
  - ・Extending electricity supply to new villages, connecting to grid settlements of already electrified villages, expanding consumer connections, reinforcing the network, and extending the supply to tube wells.
  - ・Technical assistance which would provide for mapping of villages.
- Project cost： USD 160.00 million

http://www.worldbank.org/projects/P010344/rural-electrification-project?lang=en (Referred in September 5th, 2013)

Support project of World Bank (8)

■ Transmission Extension & Reinforcement Project (December 18, 1989 ~December 31, 1996)

- Objective： The Transmission Extension and Reinforcement
  - ・Installation of two single 500 kV circuit transmission lines, connecting Hab Power Complex (HPC) and Jamshoro
  - ・Installation of a third single-circuit 500 kV line between Guddu and Multan
  - ・A second single-circuit 500 kV line between Multan and Lahore via Gatti
  - ・Extension and reinforcement of existing 500 kV substations at Lahore, Gatti, Multan, Guddu with associated facilities (including reactive compensation, telecommunications and control equipment
  - ・Consulting services to assist and train the Water and Power Development Authority's (WAPDA) staff in the design, construction, operation and maintenance of the 500 kV network.
- Project cost：USD 162.00 million

http://www.worldbank.org/projects/P010345/transmission-extension-reinforcement-project?lang=en (Referred in September 5th, 2013)

Support project of World Bank (9)

■ Private Sector Energy Development Project (June 29, 1988~ November 30, 1998)

- Objective：Support the private sector energy development project
  - ・ Up to 2300 MW of power generation capacity, 2 million tons per year of domestic coal and 132 million cubic feet per day (MMCFD) of natural gas, financed through a newly established Energy Development Fund, consulting services to train and support the staff of the institutions responsible for the approval of private sector proposals, and the Fund in the appraisal, finance of subprojects and the supervision of their implementation.
  - ・Attracting the participation of the Private Sector (PS) in the development of energy.
  - ・ Facilitate the achievement of the objectives of the Seventh Plan.

(1) An installed capacity of 1,292 MW, comprises for conventional oil-fired power generating units of 323 MW each and asset facilities (including a 500 kV switch yard, access road, and fuel oil tanks).

(2) Two single circuit 500 kV lines of 200 kilometer each, to be constructed by WAPDA under the Transmission Extension and Reinforcement Project (Loan 3147-PAK) will connect the project to the transmission grid.

- Project cost：USD 1808.00 million

http://www.worldbank.org/projects/P010313/private-sector-energy-development-project?lang=en (Referred in September 5th, 2013)

Support project of World Bank (10)

■ Power-WAPDA Project(07)（April 7, 1987～June 30, 1994）

- Objective： To improve the efficiency of the existing power stations and make available additional generating capacity needed to minimize the anticipated shortfalls in electricity

at least cost to the economy.

・About 120 megawatts (MW) of generating capacity through rehabilitation.

・About 80 MW through conversion of combustion turbines to combined cycle operation.

・promote more efficient use of energy by reducing the consumption of fuel per kilowatt hour (kWh) of power generated.

- Project cost：USD 70.00 million

http://www.worldbank.org/projects/P010275/power-wapda-project-07?lang=en
(Referred in September 5th, 2013)

■ Power-WAPDA Project(06)（May 22, 1986～June 30, 1993）

- Objective：The Kot Addu Combined Cycle Power Project
  - ・ the conversion of two 100 megawatt (MW) and two 125 MW combustion turbines under construction at Kot Addu into combined cycle units with the addition of four heat recovery boilers and two steam turbo-generators of about 100 MW each as well as the construction of about 104 km of 220 kV transmission lines from Kot Addu to Multan and the addition of connecting bays at these grid substations.
  - ・ The station is expected to operate on high speed diesel oil; however, provision is being made for the use of alternate fuel (gas, furnace oil, crude oil) if and when this is available.
  - ・The fuel will be supplied through an existing pipeline from Karachi to Gujrat, which will be extended to Kot Addu with a 30 km spur pipeline.
- Project cost：USD 90.00 million

http://www.worldbank.org/projects/P010260/power-wapda-project-06?lang=en
(Referred in September 5th, 2013)

■ Power-WAPDA Project(05)（May 28, 1985～December 31, 1993）

- Objective： assist the Water and Power Development Authority (WAPDA) in the expansion of the extra high voltage power transmission network, thereby permitting the optimal operation of interconnected generation facilities and contributing to reduced transmission losses. The project consists of:
  - ・ the installation of 1,100 km of 500-kV transmission line
  - ・ the installation of two new 500-kV substations and the extension and reinforcement of four existing 500-kV substations,
  - ・consulting services for

  (i) implementing a system for the collection, storage and retrieval of data on power

  (ii) a load research and demand management study

  (iii) a feasibility study and detailed engineering for a power generation complex based on imported coal.
- Project cost：USD 100.00 million

http://www.worldbank.org/projects/P010219/power-wapda-project-05?lang=en
(Referred in September 5th, 2013)

■ Power-WAPDA Project(04)（March 7, 1985～December 31, 1992）

- Objective： Assist WAPDA in the further reinforcement and expansion of the secondary power transmission network and thereby reduce transmission losses. It consists of:
  - ・ The erection of about 3,815 km of transmission lines
  - ・ The construction of 139 new substations
  - ・The extension and reinforcement of another 86 existing substations
  - ・Studies, technical assistance and training.
  - ・Preparing an investment program for reducing losses in the transmission network
  - ・Preparing a program of action to improve power plant efficiency
  - ・Developing a least cost national power plan
  - ・Modernizing WAPDA's internal audit system and strengthening its accounting capabilities.
- Project cost：USD 100.00 million

http://www.worldbank.org/projects/P010212/power-wapda-project-04?lang=en
(Referred in September 5th, 2013)

■ Power-WAPDA Project(03)（December 20, 1979～December 31, 1985）

- Objective : Providing for the transmission and distribution of power from existing or planned generating facilities and for improving system efficiency. The project comprises:
  - ・the construction of about 2,700 miles of 220 kV, 132 kV and 66 kV transmission lines
  - ・the construction, expansion and conversion of about 210 substations of 220/132 kV and 132/66/11 kV
  - ・storage facilities for project materials and equipment.
  - ・conversion of the 220 kV Karachi-Tarbela transmission system to 500 kV operation.
- Project cost：USD 45.00 million

http://www.worldbank.org/projects/P010137/power-wapda-project-03?lang=en
(Referred in September 5th, 2013)

■ Power-WAPDA Project(02)（February 10, 1976～September 30, 1982）

- Objective：Construction the transformer substation at 220kV in Multan
  - ・expansion of WAPDA's power transmission facilities by construction of approximately 336 miles of a 500 kV single circuit transmission line between Lyallpur, Multan and Guddau.
- Project cost：USD 50.00 million

http://www.worldbank.org/projects/P010092/wapda-power-project-02?lang=en
(Referred in September 5th, 2013)

■ Power-WAPDA Project（August 11, 1970～December 31, 1978）

- Objective : the expansion of substations, including additions to transformer capacity, switchgear, and voltage control equipment, the increase in transmission capacity in Upper Sind through the addition of a second circuit to the 132 Kv line from Dharki to Rohri and

the rehabilitation of existing substation transformers.

- Project cost：USD 23.00 million

http://www.worldbank.org/projects/P010068/power-project-wapda?lang=en
(Referred in September 5th, 2013)

Support project of World Bank (11)

■ Karachi Power Project (04)（March 15, 1967～June 30, 1971）

- Objective： An extension of KESC's generating facilities by the addition of a 125 MW generating unit to the existing Korangi power station, the extension of the existing transmission and distribution system, the purchase of certain construction, maintenance and accounting equipment, and the provision of consulting services.
- Project cost：USD 21.50 million

http://www.worldbank.org/projects/P010042/karachi-power-project-04?lang=en
(Referred in September 5th, 2013)

■ Karachi Power Project (03)（August 13, 1959～December 31, 1976）

- Project cost：USD 2.40 million

http://www.worldbank.org/projects/P010013/karachi-power-project-03?lang=en
(Referred in September 5th, 2013)

■ Karachi Power Project (02)（April 23, 1958～December 31, 1965）

- Objective： To assist in the expansion of a steam station as well as additions to the transmission and distribution network.
  A steam generating plant, installation of protective equipment, extension of the 66 KV transmission system, and expansion of the distribution system.
- Project cost：USD 14.00 million

http://www.worldbank.org/projects/P010011/karachi-power-project-02?lang=en
(Referred in September 5th, 2013)

■ Karachi Power Project （June 20, 1955～December 31, 1959）

- Objective：The Karachi Electric Supply Corporation Power Plant Project
  ・The construction of a new 30,000 kw steam station
  ・Substantial additions to the transmission and distribution systems.
- Project cost：USD 13.80 million

http://www.worldbank.org/projects/P010006/karachi-power-project?lang=en
(Referred in September 5th, 2013)

2) **Support project of ADB**

Support project of ADB（1）

■ Power Distribution Enhancement Investment Program-Tranche 3 (December 14, 2012～)

- Objective： Augmentation replacement of power transformers with higher capacity

transformer, extension addition of power transformers, conversion of existing 66-kV substations to 132-kV substations with enhanced transformation and current carrying capacity and addition of new 132-kV grid station.

Conversion of existing 66-kV transmission lines to 132-kV transmission lines, replacement of existing transmission lines to increase load carrying capacity and extension addition of transmission lines.

- Project cost：USD 245,000 (thousand)

http://www.adb.org/projects/38456-034/details(Referred in September 5th, 2013)

■ Power Distribution Enhancement Investment Program-Tranche 2（December 14, 2010~）

- Objective：The immediate priority for investment in the distribution systems is to address the capacity shortfalls that currently result in regular system outages and supply interruptions to customers.
- Project cost：USD 172,300(thousand)

http://www.adb.org/projects/38456-033/details(Referred in September 5th, 2013)

Support project of ADB（2）

■ Capacity Building for Enhanced Safeguards Management(December 10, 2012~)

- Objective： Financing to the National Highway Authority (NHA) and the Water and Power Development Authority (WAPDA).

Technical skill reinforcement of the Water and Power Development Authority (WAPDA) staff

- Project cost：USD 550(thousand)

http://www.adb.org/projects/46428-001/main(Referred in September 5th, 2013)

Support project of ADB（3）

■ Power Transmission Enhancement Investment Program-Tranche 3(December 22, 2011～)

- Objective： Power transmission system development plan. enhance the efficiency of the overall power transmission system and provide an adequate and reliable power supply to a greater number of industrial, commercial and residential consumers.
- Project cost：USD 243,240(thousand)

http://www.adb.org/projects/37192-043/main(Referred in September 5th, 2013)

Support project of ADB（4）

■ PAK:FOUNDATION WIND ENERGY 1 AND 2 PROJECTS (December 8, 2011～)

- Objective：The project involves construction, erection and operation of 50 MW of wind generation capacity, at Kutti Kun, close to the port city of Karachi. The project will sell electricity to the national grid under 20-year take-or-pay offtake contracts.
- Project cost: USD 65,200(thousand) (Approved amount)

http://www.adb.org/projects/45905-014/details(Referred in September 5th, 2013)

Support project of ADB（5）

- PATRIND HYDROPOWER PROJECT (October 11, 2011～December 1, 2016)
  - Objective : The Project addresses Pakistan's growing energy deficit by adding 147 MW power generation capacity and promote more efficient use of indigenous and renewable energy resources. The Project will also promote private sector participation in the country s hydropower sector under the Power Policy 2002. In addition, the Project stimulates local employment and economic activities.
  - Project cost: USD 97,000(thousand) (Approved amount)

http://www.adb.org/projects/44914-014/details(Referred in September 5th, 2013)

Support project of ADB（6）

- Renewable Energy Development sector Investment Program –Tranche 2 (December 13, 2010)
  - Objective : Focus on wind and other renewable energy projects, will provide power supply to consumers in the region. Specifically the guarantee would help mobilize long-term debt and equity from domestic and international investors needed to fund wind and other renewable energy power plants operated by independent power producers (IPPs).
  - Project cost: USD 200,000 (thousand) (Approved amount)

http://www.adb.org/projects/34339-033/main(Referred in September 5th, 2013)

Support project of ADB（7）

- Uch-2 Power Project (December 13, 2010)
  - Objective : The Project involves construction, erection and operation of a 404 MW low British thermal unit (BTU) combined cycle power plant adjacent to the 586 MW Uch power plant (Uch-I, operational since 2000) at Dera Murad Jamali, Balochistan, located 47 km away from the Uch gas reservoir.
  - Project cost: USD 150,000 (thousand) (Approved amount)

http://www.adb.org/projects/43903-014/main(Referred in September 5th, 2013)

Support project of ADB（8）

- PAK: ZORLU ENERRJI POWER PROJECT(November 24, 2010 ~July 7, 2013)
  - Objective：The project involves construction, erection, and operation of a 56.4 MW wind power farm in Southern Sindh, Pakistan.
  - Project cost: USD 36,800(thousand)(Approved amount)

http://www.adb.org/projects/43937-014/main(Referred in September 5th, 2013)

Support project of ADB（9）

- Energy Sector Task Force(December 10, 2009~)
  - Objective：Support the Pakistan Energy Sector Task Force to prepare a report and action plan on the energy sector in Pakistan.
  - Project cost：USD 225(thousand)

http://www.adb.org/projects/43565-012/main(Referred in September 5th, 2013)

Support project of ADB（10）

■ Energy Efficiency Investment Program - Tranche 1 (September 30, 2009~)

- Contents : On 13 August 2009, the Government of Pakistan entered into a Framework Financing Agreement with ADB to implement MFF 0031. On 22 September 2009, ADB approved financing for up to $780 million for MFF 0031, and up to $85 million for Tranche 1.
- Project cost：USD60,000(thousand)

http://www.adb.org/projects/42051-023/details(Referred in September 5th, 2013)

Support project of ADB（11）

■ Energy Efficiency Investment Program(September 17, 2009～)

- Objective：The Energy Efficiency Investment Program is the first initiative in Pakistan to integrate energy security and climate change into a common strategic platform. It will establish a dynamic business environment for clean energy technology and finance priority projects.
- Project cost：USD 780,000 (thousand)

http://www.adb.org/projects/42051-013/main(Referred in September 5th, 2013)

Support project of ADB（12）

■ Power Distribution Enhancement Investment Program-Project 1(September 12, 2008～)

- Contents：The reinforcement of the ability for supply of electric power.
- Project cost：USD 210,826(thousand)

http://www.adb.org/projects/38456-023/main(Referred in September 5th, 2013)

Support project of ADB（13）

■ MFF-Power Distribution Enhancement Investment Program(September 3, 2008～)

- Objective : The Investment Program will enhance the efficiency of the overall power distribution system and provide an adequate and reliable power supply to a greater number of industrial, commercial and residential customers, through funding of investment requirements within each of the eight power distribution companies in Pakistan
- Project cost: USD 810,000(USD thousand)

http://www.adb.org/projects/38456-013/main(Referred in September 5th, 2013)

Support project of ADB（14）

■ Sustainable Energy Efficiency Development Program (February 5, 2008～)

- Objective : The Government of Pakistan (the Government) is planning to acquire and implement a phased strategy for undertaking a systematic, broad-based national energy efficiency program. The TA will enable the Government to develop and implement a comprehensive energy efficiency sector development and investment program.
- Project cost: USD 600(USD thousand)

http://www.adb.org/projects/42051-012/main(Referred in September 5th, 2013)

Support project of ADB（15）

- MFF-Power Transmission Enhancement Investment Program PFR2 (December 17, 2007～)
  - Objective：Pakistan's power system continues to operate under stressed conditions. The transmission network, the power system's backbone, requires renovation and expansion in order to meet the objective to supply reliable and high-quality power and meet rising demand from industrial, commercial, agricultural, and domestic customers.
  - Project cost: USD 170,000(thousand)

http://www.adb.org/projects/37192-033/main(Referred in September 5th, 2013)

Support project of ADB（16）

- Integrated Energy Model (October 25, 2007～)
  - Objective：The proposed project will assist the Government of Pakistan (GoP) to establish a national energy model for analyzing the impacts of various strategies for meeting energy requirements.
  - Project cost：USD 2000(thousand)

http://www.adb.org/projects/41129-012/main(Referred in September 5th, 2013)

Support project of ADB（17）

- PAK:KARACHI ELECTRIC SUPPLY COMPANY LTD. (KESC) POST-PRIVATIZATIO REHABILITATION, UPGRADE & EXPANSION (May 29, 2007～March 31, 2010)
  - Objective：Financing to KESC
  - Project cost：USD 150,000(Approved amount)

http://www.adb.org/projects/40943-014/main(Referred in September 5th, 2013)

Support project of ADB（18）

- Renewable Energy Development Sector Investment Program – Project (December 13, 200～)
  - Objective：To develop indigenous, nonpolluting, and renewable sources of energy to help meet Pakistan's power shortage and diversify the power sources.
  - Project cost：USD 115,000 (thousand)

http://www.adb.org/projects/34339-023/main(Referred in September 5th, 2013)

Support project of ADB（19）

- Power Transmission Enhancement Investment Program, Tranche 1(December 13, 2006～)
  - Objective： Strengthen the capacity of NTDC in project management, planning, design, implementation and operation and maintenance activities.
  - Project cost：USD 138,747 (thousand)

http://www.adb.org/projects/37192-023/main(Referred in September 5th, 2013)

Support project of ADB（20）

- MFF-Power Transmission Enhancement (December 12, 2006～)
  - Objective : The inadequate supply of electricity has become a bottleneck for economic growth, affecting all consumer groups and social classes. The investment program will

address current bottlenecks, improve future performance, and increase efficiency and effectiveness through technical and non-technical improvements.

- Project cost：USD 800,000 (thousand)

http://www.adb.org/projects/37192-013/main(Referred in September 5th, 2013)

Support project of ADB（21）

■ MFF-Renewable Energy Development Sector Investment Program (formerly Renewable Energy Development Facility (December 1, 2006～)

- Objective：To develop indigenous, nonpolluting, and renewable sources of energy to help meet Pakistan's power shortage and diversify the power sources.
- Project cost：USD 510,800 (thousand)

http://www.adb.org/projects/34339-013/main(Referred in September 5th, 2013)

Support project of ADB（22）

■ Preparing the Power Distribution Enhancement Multi-tranche Financing Facility (November 27, 2006～)

- Objective：To support the Government’s strategy for continued poverty reduction through sustained economic growth by assisting in the preparation of a power distribution enhancement project to ensure a sufficient and stable power supply through the distribution system in Pakistan.
- Project cost: USD 900 (thousand)

http://www.adb.org/projects/38456-012/main(Referred in September 5th, 2013)

Support project of ADB（23）

■ Establishment and Commencement of Operations for the Central Power Purchasing Agency (November 17, 2006～)

- Objective：Establishment and commencement of CPPA would assist in realizing the efficiency and cost savings envisioned through unbundling of the power sector.
- Project cost: USD 950 (thousand)

http://www.adb.org/projects/40576-012/main(Referred in September 5th, 2013)

Support project of ADB（24）

■ NEW BONG ESCAPE HYDROPOWER (November 21, 2005～August 5, 2013)

- Objective：The Project constructed a run-of-the-river, low head, 84 MW hydel power generating complex.
- Project cost: USD 37,300 (Approved amount)

http://www.adb.org/projects/38928-014/main(Referred in September 5th, 2013)

Support project of ADB（25）

■ Capacity Building for Alternative Energy Development Board (December 17, 2004～)

- Objective： To strengthen the institutional capacity and technical capability of AEDB to facilitate and coordinate the GOP's efforts to promote the development of RE.
- Project cost: USD 150 (Approved amount)

http://www.adb.org/projects/38585-012/main(Referred in September 5th, 2013)

Support project of ADB（26）

■ Renewable Energy Development (November 5, 2004～August 5, 2013)

- Objective：Only 50% of the population has access to electric power. The remaining 50% of the population without electricity lives in rural and mountainous areas. Because of the remoteness and rough terrain, the extension of the national grid to these areas is uneconomical. Development of renewable energy sources will be environmentally friendly and will provide electricity to the remote areas and less-developed regions of the country.
- Project cost：USD 550 (thousand)

http://www.adb.org/projects/34339-012/main(Referred in September 5th, 2013)

Support project of ADB（27）

■ Institutional Capacity Building of the National Transmission and Dispatch Co. Ltd. (June 20, 2003～)

- Objective：The purpose of the proposed TA is to undertake institutional capacity of NTDC with the objective of preparing NTDC to undertake power transmission, dispatch, and trading activities as per its license.

http://www.adb.org/projects/34325-012/main(Referred in September 5th, 2013)

Support project of ADB（28）

■ Operational Support to the Office of the Energy Advisor (July 14, 2005～)

- Objective：To strengthen the institutional capacity and technical capability of the Office of the Energy Advisor (OEA) to enable it to perform its functions effectively.
- Project cost：USD 150(thousand)

http://www.adb.org/projects/39353-012/main(Referred in September 5th, 2013)

Support project of ADB（29）

■ Power Sector Restructuring Program Loan (December 14, 2000～)

- Contents ：The long-term goal of the Bank's intervention is to ensure a self-sustaining, efficient and competitive power sector that can provide required quantities of quality power at least cost to the consumer. In order to achieve this, there is a need for financial restructuring of the utilities and to improve existing pricing and cost-recovery mechanisms, to improve operation efficiencies and enhance competitive industry structure, and to strengthen the market regulation to ensure investors' confidence and consumer protection.

http://www.adb.org/projects/32146-013/details(Referred in September 5th, 2013)

Support project of ADB（30）

- Power Sector Restructuring Support TA Loan (December 14, 2000～)
  - Objective：The TA loan will be used to undertake (i) a Poverty Impact Assessment (PIA) to monitor and evaluate impacts on residential and commercial consumers, with special attention to the poorest segment of consumers; and (ii) a Labor Impact Assessment (LIA) and mitigation measures to reduce vulnerability of redundant workers.

http://www.adb.org/projects/33143-013/details(Referred in September 5th, 2013)

Support project of ADB（31）

- Capacity Building of the National Electric Power Regulatory Authority(NEPRA) (March 6, 2000～)
  - Objective： To strengthen NEPRA's regulatory capacity

http://www.adb.org/projects/32381-012/main(Referred in September 5th, 2013)

Support project of ADB（32）

- Distribution Loss Reduction Project

The first term: It has finished on September of 2013　USD 228 million (USD)

The second term : Under discussion 229.5 million of 50 million（USD）has disbursed.

The third term: Loan Agreement was signed. 245 million (USD)

The forth term: Under preparation

F/S PC-1（Documents of the business approval procedure in Government of Pakistan）
140 million (USD)

The third and fourth term is under F/S on September, 2013.

Support project of ADB（33）

- CFL Project
  - The project was signed on December 31, 2013 and will close but it will distribute CFL of 30 million to nine DISCO stores by the end of 2013.

20.7 million units to five DISCOs (FESCO, GEPCO, IESCO, LESCO, MEPCO) in Punjab.

3.9 million units to PESCO in KPK, 0.6 million units to QESCO in Baluchistan, 2.7 million units to KESC in Sindh, 2.1 million units to HESCO and SEPCO.

As for the CFL project, ADB finance 40 million (USD), AFD (France) finance 20 million (EURO) Government of Pakistan finance the total 85 million (USD) to this project. A period of the loans is 15 years

It is expected 32 million (USD) CDM in 2020. (The approval of CDM Board has approved September of 2013)

Support project of USAID

Support project of USAID (1)

- Energy Policy Project (October, 2008～January, 2015)
  - Objective: To strengthen Pakistan's power generation and transmission systems and promote relevant policy reform. By investing in selected energy infrastructure, the project is helping the Government of Pakistan put more power on the national grid, decrease losses in revenues and increase cost recovery.
  - Project cost：16,336,559 USD

http://transition.usaid.gov/pk/db/sectors/energy/project_37.html
(Referred in September 5th, 2013)

Support project of USAID (2)

- Guddu Power Station Project (May, 2010～November, 2012)
  - Objective: The Guddu Power Station Project project seeks to bring the Guddu Power station in northern Sindh to a more efficient level of operation by funding the repair and maintenance of operation by the power station. The project expects the station's generation capacity to increase by at least 75 megawatts enough power to supply electricity to about 100,000 households.
  - Project cost：18,068,000 USD

http://transition.usaid.gov/pk/db/sectors/energy/project_7.html
(Referred in September 5th, 2013)

Support project of USAID (3)

- Jamshoro Power Station Project (May, 2010～November, 2012)
  - Objective：The Jamshoro Power Station Project funds the repair and maintenance. The project regain lost capacity at the station by at least 150 MW and increase the availability and reliability of electricity supply to the national grid by an additional 598 million KW hours per year-enough power to supply electricity to about 215,000 households.
  - Project cost：18,360,000 USD

http://transition.usaid.gov/pk/db/sectors/energy/project_185.html
(Referred in September 5th, 2013)

Support project of USAID (4)

- Muzaffargarh Power Station Project (May, 2010～November, 2012)
  - Objective：Repair and rehabilitation of Muzaffargarh Power Station. 475 MW increase the generation capacity of the power station and adds 1,893 million KW per year to a national power network. It supplies electricity to approximately 680,00 households.
  - Project cost：15,193,00 USD

http://transition.usaid.gov/pk/db/sectors/energy/project_9.html
(Referred in September 5th, 2013)

Support project of USAID (5)

■ Gomal Zam Dam Project (January, 2011～September, 2013)

- Objective : The Gomal Zam Dam Project supports the construction of Gomal Zam, a multipurpose dam located in the Federally Administered Tribal Areas, or FATA, near the border with Afghanistan. The project supports completion of construction of the dam, electricity transmission lines, and the hydropower plant. Gomal Zam will provide 17.4 MW to the national grid. The dam will also help control flooding in FATA and Khyber Pakhtunkhwa and will provide water from a 1.14 million acre-feet reservoir for downstream irrigation of 163,000 acres of farmland in Khyber Pakhtunkhwa Province, benefiting 30,000 households.
- Project cost：40,000,000 USD

http://transition.usaid.gov/pk/db/sectors/energy/project_6.html
(Referred in September 5th, 2013)

Support project of USAID (6)

■ Satpara Multipurpose Dam Project (January, 2011～April, 2013)

- Objective: The Satpara Dam and Irrigation Project funds the construction of Satpara Dam, a multipurpose dam in Gilgit construction of Satpara Dam, a multipurpose dam in Gilgit¬Baltistan near the border with China and India. The project supports the completion of the dam, power houses, and an irrigation system. When completed, Satpara Dam will provide 17.7 megawatts to the local power grid enough power to supply electricity to about 30,000 households. The dam will also mitigate flooding in the region, store enough water to irrigate 15,500 acres of land, and provide 3.1 million gallonsper day of water for domestic use.
- Project cost：19,000,000 USD

http://transition.usaid.gov/pk/db/sectors/energy/project_11.html
(Referred in September 5th, 2013)

Support project of USAID (7)

■ Tarbela Dam Project (April, 2010～November, 2012)

- Objective: The Tarbela Dam Project is funding the rehabilitation of Tarbela Dam, located in Khyber Pakhtunkhwa Province near the border with Afghanistan. By upgrading three generator units, the project will restore 128 megawatts of power-generating capacity and add 481 million kilowatt hours of energy to the national grid per year. The Tarbela Dam Project is also providing spare parts for preventive maintenance and is building the capacity of plant staff to oversee operations and maintenance in accordance with Pakistan's Water and Power Development Authority's standards.
- Project cost：16,500,000 USD

http://transition.usaid.gov/pk/db/sectors/energy/project_10.html
(Referred in September 5th, 2013)

Support project of USAID (8)

■ Energy Efficiency Project (March, 2009～July, 2012)

- Objective : The energy efficiency project reduces the electric peak demand of a person targeted for the agriculture subsidy through the exchange of an inefficient well pump set. The project changes old pumps in a good model of new energy efficiency. Cooperate with a farmer participating in 50% of cost. Link an farmer to a bank and other financial institutions. Reduce an electricity bill by raising effectiveness of the electricity usage in the world's largest irrigation-based agriculture system and thereby improve the income of the participation farmhouse.
- Project cost：28,500,000 USD

http://transition.usaid.gov/pk/db/sectors/energy/project_39.html
(Referred in September 5th, 2013)

Support project of USAID (9)

■ Power Distribution Program (September, 2010～ March, 2015)

- Objective: The Power Distribution Program works with Pakistan's nine government-owned electric power distribution companies to improve their operational and financial performance. The program focuses on reducing losses, increasing revenues, and improving customer service, so that the companies can achieve a level of performance commensurate with that of a well-run utilities company. The project works with the power distribution companies and Pakistan's Ministry of Water and Power to improve governance and management systems, increase the efficiency of revenue collection, reform the regulatory framework, and improve customer service. With a short-term goal of reducing losses in the distribution of power, the project ultimately hopes to eliminate the need for subsidy and mitigate pressures contributing to the country's current energy crisis.
- Project cost：29,499,409 USD

http://transition.usaid.gov/pk/db/sectors/energy/project_38.html
(Referred in September 5th, 2013)

Support project of USAID (10)

■ FATA Infrastructure Project (January 2010～December, 2014)

- Objective：The improvement of the service that is important daily life of community which is indispensable for local society economic development such as the transportation, agriculture and energy etc. Particularly, improve a traffic condition and reformation Kundjwan dam and Dana irrigation system and then intended to restore a power transmission line.
- Project cost：291,986,537 USD

http://transition.usaid.gov/pk/db/sectors/stabilization/project_15.html
(Referred in September 5th, 2013)

Table 7.8-1 Projects Implement by the world bank/ADB/USAID (2010～2013)

	World Bank(WB)			ADB			USAID
	Capacity Building Financial Support	Generation	Transmission/ Distribution	Generation	Transmission/ Distribution	Capacity Building	Energy Project
2010				2010.12.13- Renewable Energy Development sector Investment Program – Tranche 2			2010-2012 Muzaffargarh Power Station Project
2011				2011.12.1-2024.5.18 PAK: FOUNDATION WIND ENERGY 1 AND 2 Project 2011.10.11- PATRIND HYDROPOWER PROJECT FOUNDATION	2011.12.22- Power Transmission Enhancement Investment Program Tranche-3		2011-2013 Gomal Zam Dam Project 2011-2013 Satpara Multipurpose Dam Project
2012		2012~ Tarbela Fourth Extension Hydropower Project			2012.12.14- Power Distribution Enhancement Investment Program Tranche-3	2012.12.10-Capacity Building for Enhanced Safeguards Management	
2013			Under Planning: Project for Transmission & Distribution Loss	CFL Project	Under Planning: Distribution loss reduction project		

9 WAPDA Engineering Academy

Source：http://www.wapda.gov.pk/htmls/newfsd2011.htm, reference day Oct 12 2013.

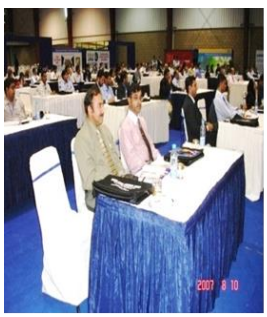
WAPDA Engineering Academy is located about 10 Km from the Faisalabad city center on Sheikhupura Road. The academy spreads over an area of 32.5 aces. Established in 1962 as Tech. Training Institute (Electrical) at Lahore. Shifted to Faisalabad in 1967 & in present WAPDA building in 1971.

WAPDA Engineering Academy (WEA), Faisalabad Constitutes a land mark for the dissemination of professional knowledge, strengthening the bondage between theory and practice.

WAPDA Engineering Academy has emerged as the sole agency for imparting technical trainings to the respective Engineers and Staff of WAPDA/PEPCO & Private/ Public sector in the fields of Transmission/Distribution, Thermal/Hydel Generation, Civil Engineering & Information Technology.

Source：http://www.wapda.gov.pk/htmls/newfsd2011.htm, reference day Oct 12 2013

EXISTING FACILITIES




Source：http://www.wapda.gov.pk/htmls/newfsd2011.htm, reference day Oct 12 2013.

LABORATORIES/WORKSHOPS

The Academy consists of 03 Directorates i.e. Transmission & Distribution, Generation & Civil Engineering. The Academy consists of following Electrical, Mechanical and Civil Laboratories

& Workshops to carry out various practical training courses directly related to the sphere of duties of the Engineering staff.

Laboratories

Instrumentation and Control/PLC.	Distribution Transformer
Cable Jointing and Testing	High Voltage
Electronic Control Circuitry	Grid System Operation
Electrical Machines	Meter Testing
Information Technology	Switchgear
Soil & Concrete Testing	

Source：http://www.wapda.gov.pk/htmls/newfsd2011.htm, reference day Oct 12 2013.

1. Occupational Training System in Pakistan

KAPCO and KESC dispatch trainees to WAPDA Engineering Academy, because a training institute at each company does not function at present.

2. Identification of WAPDA Engineering Academy

Senior members of the staff in the power companies will be assigned to General Manager of Training in WAPDA Engineering Academy.

3. Management Responsibilities

(1) Overall Control

Chief Engineer (Principal: Head of WAPDA Academy):	1

(2)Transmission & Distribution Directorate

Director:	1
Deputy Director:	4
Senior Engineer:	1
Junior Engineer:	1

(3) Civil Directorate

Director:	1
Deputy Director:	2
Assistant Director:	1
Assistant Research Officer:	1

(4) Information Technology

Director:	1
Assistant Director:	1
Additional Director:	1

(5) Generation Directorate

Deputy Director:	3
Junior Engineer:	2

(6) Research Laboratories:

Research Officer:	1

4. Budgetary Compilation and Allocation

The budget for this fiscal year amounts to Rs.193.631 Million to be allocated by WAPDA. The tuition fees are basically free of charge for trainees dispatched from WAPDA, government agencies and public agencies, while Rs.10, 000 per trainee is collected from those dispatched from private companies.

5. Faculty at WAPDA Engineering Academy, Faisalabad.

The Academy's faculty consists of a multidisciplinary group of highly qualified and trained Instructors having a blend of academic and operational experience. They are experts in their fields of specialization many of whom hold advanced qualification. The full time faculty is supported by a group of eminent guest speakers from WAPDA and private / public sector who are authority in their fields Deputy Director and Assistant Director are responsible for operational control, while it is Senior Engineer and Junior Engineer who are in charge of training instruction.

Source：http://www.wapda.gov.pk/htmls/newfsd2011.htm, reference day Oct 12 2013

Table 7-9-1 Detailed Facilities-1

Director (T&D/G)

Sr.No	Item Description	Qty.	Total Qty.
Multimedia Projector			
01	Toshiba M.N TDPT9	01	
02	Dell Multimedia Projector 1510X	01	02
Printer			
01	Samsung Laser Printer (ML-3470D)	01	
02	Samsung Laser Printer (ML-3470D)	01	
03	Laser jet HP- 2015	01	03
Laptop Computer			
01	Toshiba Techra A8 (Branded)	01	01
Computer			
01	HP Compaq 8000 Rliyr P.C Desktop	01	
02	P C P-IV, Non Branded with 17// Monitor1.8694 With CD writer	01	
03	P C P-IV, Non Branded with 17// Monitor1.8694 With CD writer	01	
04	Micro Computer P-IV (Branded) Model HP Compaq DX-2100	01	
05	Micro Computer P-IV (Branded) Model HP Compaq DX-2100	01	
06	Pentium IV with 15” Monitor Key Board & Mouse	01	06

Director (Gen)

Sr.No	Item Description	Qty.	Total Qty.
Multimedia Projector			
01	Acer XD-1170 D	01	
02	Acer XD-1170 D	01	02
Printer			
01	Samsung Laser Printer (ML-3470D)	01	
02	Inkjet Colored (Printer)	01	
03	Laser Printer HP 2015	01	03
Laptop Computer			
01	Toshiba Techra A8 (Branded)	01	
02	Dell Laptop Computer	01	02
Computer			
01	P C P-IV, Non Branded with 17// Monitor1.8694 With CD writer	01	
02	Dell Optiplex 980 MT System	02	
03	Micro Computer P-IV (Branded) Model HP Compaq DX-2100	02	
04	Pentium IV with 15” Monitor Key Board & Mouse Non Branded	06	
05	CPU Monitor Key Board	01	
06	PC 486 DX 50 MH	01	13

Director (Civil)

Sr.No.	Item Description	Qty.	Total Qty.
Multimedia Projector			
01	Dell Multimedia Projector 1510 X	01	
02	Acer XD-1170 D	01	02
Printer			
01	Laser jet Hp 1300 (Printer)	01	
02	Samsung Laser Printer (ML-3470D)	01	02
Laptop Computer			
01	Toshiba Techra A8 (Branded)	01	01
Computer			
01	Dell Optiplex 980 MT System	01	
02	Dell Optiplex 980 MT System	01	
03	Dell Optiplex 980 MT System	01	
Sr.No.	**Item Description**	**Qty.**	**Total Qty.**
04	Dell Optiplex 980 MT System	01	
05	HP Compaq 8000 Elite P.C Desktop	01	
06	P-IV with Colored Monitor 15”	01	06

Common Services

Sr.No.	Item Description	Qty.	Total Qty.
Printer			
01	Samsung Laser Printer (ML-3470D)	01	
02	Samsung Laser Printer (ML-3470D)	01	
03	HP 2015 Laser Printer	01	
04	Laser jet Hp 1300 (Printer)	01	
05	Laser jet Hp 1300 (Printer)	01	05
Computer			
01	HP Compaq 8000 Elite P.C Desktop	01	
02	Dell Optiplex 980 MT System	01	
03	HP Compaq 8000 Elite P.C Desktop	01	
04	P-IV with Colored Monitor 15”	01	
05	HP Compaq Dc 7900 Series Desktop Computer	01	
06	HP Compaq Dc 7900 Series Desktop Computer	01	
07	HP Compaq Dc 7900 Series Desktop Computer	01	
08	P-IV with Colored Monitor 15”	01	
09	P-IV with Colored Monitor 15”	01	09

Computer Lab.

Sr.No.	Item Description	Qty.	Total Qty.
Multimedia Projector			
01	LP 350 Infocus	01	
02	ACER XD-1170 D	03	
03	Panasonic	01	
04	View Sonic PS560 D	01	06
Printer			
01	HP 2035 Laser	02	
02	HP Laser jet 1320	01	
03	HP Color LJ 2025	02	
04	Ink jet colored	01	06
Laptop Computer			
01	Compaq	01	
02	Dell	02	
03	Dell	01	04
Computer			
01	HP Compaq 8000 Elite P.C Desktop	05	
02	Dell Optiplex 980 MT System	04	
03	Micro Computer P-IV (Branded) Model HP Compaq DX-2100	06	
04	P C P-IV, Non Branded with 17”Monitor1.8694 With CD writer	03	18

Source：JICA Survey Team - obtained data from WAPDA Engineering Academy, Nov 1,2013

Table 7-9-2 Detailed Facilities-2

T&D LABS、GSO labs、SWITCH GEAR LAB.

EXISTING ITEMS:

Sr.No.	Description	Qty.
01	Model of Grid Station showing double bus bar scheme.	01 No.
02	Cut way model of 66KV CT & 132KV PT.	01 No. each
03	Model of on load tap changer.	01 No.
04	Solid state relay panel.	01 No.
05	11 KV Minimum oil circuit Breaker panel.	01 No.
06	11 KV vacuum Circuit Breaker panel.	01 No.
07	Electro Mechanical relay panel.	01 No.
08	AC to DC Generator Set.	01 No.
09	11 KV fault simulation board.	01 No.
10	500kv CVT	01 No.
11	220kv Lightning Arrester	01 No.

REQUIRED ITEMS:

Sr.No.	Description	Qty.
01	Model of GIS grid station showing double bus bar scheme.	01
02	Model of Conventional Grid Station showing 1 ½ Bus Bar Scheme.	01
03	Up grading of on load tap changer with automatic voltage regulator (AVR), control/auxiliary panel along with 400V /220 V model transformer having 10 aps, rating 5 KVA.	01
04	Up grading of 11 KV fault simulation board provision of solid state over current relay, bus bar Differentiated relay and T/F Differentiated relay (while performing the different vector groups of transformer)	01
05	Leakage current monitor for lightening arrestor.	01
06	C&DF Test set.	01
07	Vacuum tester.	01
08	Event recorder.	01
09	Fault Locator	01
10	Relay Test Set. FREJA	01
11	Programmable Over Current relay.	01
12	Programmable Distance relay.	01
13	Programmable Differentiated relay	01
14	Air conditioner 2 Tons.	01
15	110 volts battery Impedance Test Set.	01
16	Multi media.	01
17	Thermo vision Gun	01
18	Digital Harmonic Analyzer	01
19	Sweep Frequency Response Analyzer	01

ANALOGUE SIMULATOR

EXISTING ITEMS:

Sr.No.	Description	Qty.
01	Analogue Simulator of 132 KV Network on different panels	01

REQUIRED ITEMS:

Sr.No.	Description	Qty.
01	For parallel operation of transformers It is required to equip the 220/132 KV Transformer of panel line feed-2(NE-2) with Differentiated, over current and Earth fault relay. (Siemens)	01 No.each
02	Auto Recloser Relay for variety of experiments should be installed in 132KV network.	01 No.
03	Solid link jumpers(U-Shaped)	12 Nos.
04	Connecting leads. Different sizes	60 Nos.

05	Fuse elements 2, 6, 16 & 35 Amps.	24 Nos.
06	Necessary tools and parts for primary Maint. (Tool Kit.)	01 No.
07	Cable connecting test unit (7VP-1801-0) Voltage test unit (7VP-4901-0) & protective Relay.	
08	Spare pin plugs for solid state relays(Siemens)	24 Nos.
09	Programmable Micro processor Based relay – (i) System, (ii) Generator	 01 No. 01 No.
10	PC (P-4) (2.5 GHz) processor Along with Laser Printer & Scanner	01 No.

NEW GSO LAB.

EXISTING ITEMS:

Sr.No.	Description	Qty.
01	66 KV air blast circuit breaker cut way model (BBC).	01 No.
02	66 KV Minimum oil circuit breaker(Magrini) single pole.	01 No.
03	66 KV oil circuit breaker 3 poles DELLE ALSTHOM.	01 No.
04	11 KV minimum oil circuit breaker (Siemens).	01 No.
05	11 KV bulk oil circuit breaker trolley (REYROLLE).	01 No.
06	11KV bulk oil circuit breaker trolley.	01 No.
07	11 KV Sf6 circuit breaker trolley (MG).	01 No.
08	132 KV current transformer (SOFIA).	01 Pole
09	132 KV potential transformer (LK-NES).	01 Pole
10	CDG over current / Ef relay (GEC).	01 No.
11	Primary Injection Test Set (ZENITH, England).	01 No.
12	High Current Test Set (ONTARIO, CANADA).	01 No.
13	Distance Relay E-3 (Siemens).	01 No.
14	Over Current Relay F-4 (Siemens).	01 No.
15	Secondary Injection Test Set.	01 No.
16	11 KV Live Line Tester.	01 No.

REQUIRED ITEMS:

Sr.No.	Description	Qty.
01	SF-6 Gas Leakage Detector	01 No.
02	Moisture contents analyzer.	01 No.
03	Circuit breaker analyzer (TM-18)	01 No.
04	Primary Injection test set.	01 No.
05	Insulation Tester 5 KV crank operated.	01 No.
06	Insulation tester AC operated 15 KV.	01 No.
07	MCGG over current relay.	01 No.
08	Current transformer 800: 400/5/5A	02 Nos.
09	Overhead slide projector	01 No.
10	132 KV live line tester.	01 No.

AUDIO VISUAL SECTION

EXISTING ITEMS:

Sr.No.	Description	Qty.
01	Projection Screen	18 Nos.
02	Overhead Projector (LUX)	09 Nos.
03	VCR- VS 120	02 Nos.
04	VCR- VS 265	04 Nos.
05	TV - 26 inches, color	03 Nos.
06	Amplifier (Tele Watt) E 120 with speakers	01 No.
07	Camera (Electro - 35)	02 No.
08	Grdg Video cameras	03 Nos.
09	Video Beam Projector (SONY)	03 Nos.

REQUIRED ITEMS:

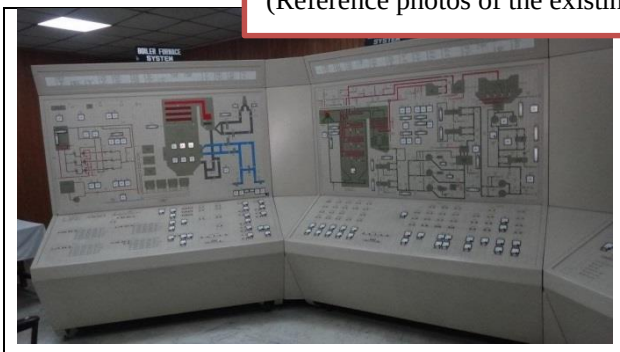
Sr.No.	Description	Qty.
01	Digital LED Color 54 Television.	04 Nos.
02	DVD Player System.	01 No.
03	VCR.	02 Nos.
04	DVD Recorder.	01 No.
05	Laser Pointing Light.	05 Nos.
06	Chord less Mic- Amplifier System.	02 Nos.
07	Video camera	02 Nos.

DISTRIBUTION LABS.

Sr.No.	Item Description	Available	New Required
TRANSFORMER LAB.			
01	Clip-on Multimeter.	02 Nos.	02 Nos.
02	Resistance Testing Set.	01 No.	01 No.
MACHINE LAB.			
03	Capacitor bank 40uf (3 phase) 400V.	01 No. set	01 No. set
04	Digital clip on Ampere meter to measure. Inrush current of Induction Motor 400V, 200 Amperes.	01 No.	01 No.
ELECTRICAL INSTRUMENTATION/ELECTRONIC LAB.			
05	Duel power supply + DC24V variable with Over voltage protection.	-	08 Nos.
06	Experimental panel Board.	04 Nos.	04 Nos.
07	Integrated Circuit Tester.	-	01 No.
08	Transistor Tester.	-	01 No.
ELECTRICAL MOTOR WINDING LAB.			
09	Winding Coil machine.	01 No.	01 No.
10	Baking Oven(for drying newly wound motor)	01 No.	01 No.
HIGH VOLTAGE LAB.			
11	140KV Impulse Generator for impulse testing of distn. transformer.	-	01 No.
CABLE JOINTING & TESTING LAB.			
12	Computer system for fault analysis recorder including all accessories to pin point fault location in 132KV cable And can locate high resistance intermittent fault.	-	01 No.
13	Heat shrinkable outdoor termination kits- for 3/C 11 KV, PVC, XLPE, 4/0 AWG cable. 3/C 11 KV, PVC, XLPE, 4/0 AWG cable.	-	10 Nos.
14	3/C 11 KV, PVC, XLPE,4/0 AWG cable.	-	50 Mtrs.
METER TESTING LAB.			
15	Meter Testing Bench with stand.	-	01 No.
16	Energy Analyzer.	-	01 No.
17	Power Analyzer.	-	01 No.

Source : JICA Survey Team - obtained data from WAPDA Engineering Academy, Nov 1,2013

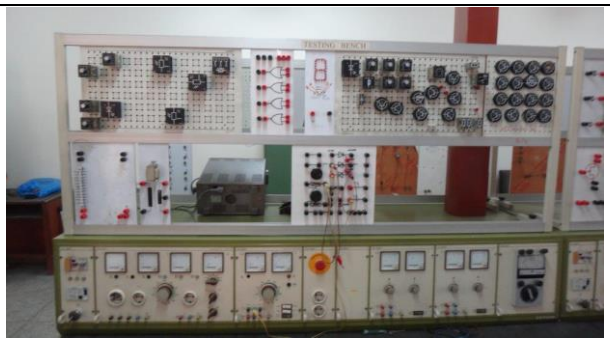
(Reference photos of the existing facilities at WAPDA Academy)



Simulator Provided by Germany

Simulator Provided by Germany

Simulator made by WAPDA



Simulator made by WAPDA

Simulator Training Room

Switchgear Simulator

Voltage Testing Laboratory

Counter weights

Motor Training

Cable Joint Training

6. Training Courses Offered

Training courses at WAPDA Engineering Academy Faisalabad are currently offered in Generation,

Transmission and Distribution of Power and development and management of Water Resources. Staff being trained includes; Superintending Engineers, Executive Engineers, Junior Engineers, newly recruited Engineers and supporting vocational staff.

The training courses offered by the Academy mainly focus on practical training, while text books and technical books are available in the library.

Source：http://www.wapda.gov.pk/htmls/newfsd2011.htm, reference day Oct 12 2013.

Training Courses offered by Transmission and Distribution Section of the Academy

In total, nine courses for various categories of staff are offered each year by the Transmission and Distribution Section of the Engineering Academy. The refresher courses are offered to Engineers & technical staff. On-job trainings are also offered to the staff of power supply companies an staff of public and private organizations. The details of these courses are given in Table below.

S.#	Name of Course	Staff Category	Duration (Weeks)	Intake Capacity	Frequency
1.	Refresher Courses (Pre-Promotion)	S.Es / Directors / R.Es Common Services	3	25	1
2.	Refresher Courses (Pre-Promotion)	Sr. Engineers (D/T&G)	4	25	2
3.	Sector Specific Courses (Pre-Promotion)	Jr. Engineers (D/T&G)	6	38	3
4.	Technical Induction Courses	Jr.Engineers (D/T&G)	8	24	2
5.	Upper Technical Staff Courses (Pre-Promotion)	LS/SSO	4	30	2
6.	Practical Training	Line Superintendents	1	30	13
7.	Grid Station Operation & Maintenance Training	Private/Public Sector Engineers	2	10	1
8.	Internship	Engineering University Students	4	40	1
9.	Practical's & Instructional Programs for Faisalabad University & NFC Institute of Engineering & Fertilizers Faisalabad	Students	--	40	--

Training Courses offered by Generation Section of the Academy

Each year, Eleven training courses are regularly offered by the training Academy to the staff of Power Generation Companies, public and private agencies. The detail of the courses is given in Table below.

S.#	Name of Course	Staff Category	Duration (Weeks)	Intake Capacity	Frequency
1.	Refresher Courses (Pre-Promotion)	S.Es/Directors/R.Es/Common Services	3	25	1
2.	Refresh Courses (Pre-Promotion)	Sr. Engineers (Th. Gen)	4	15	1
3.	Sector Specific Courses (Pre-Promotion)	Junior Engineers (Th. Gen)	6	20	2
4.	Technical Induction Courses	Jr. Engineers (Th. Gen)	8	20	1
5.	Upper Technical Subordinate Staff Courses (Pre-Promotion)	Foremen/Operators to JEs	4	20	2
6.	Steam/Gas Power Plant Simulator Operation Course with Fault Analysis	Junior Engineers	4	12	1
7.	Steam/Gas Power Plant Simulator Operation Course with Fault Analysis	Operators/Attendants	5	12	1
8.	Micro Controller & PLC Course	Sr./Jr. Engineers	3	16	1
9.	Micro Controller & PLC Course	WAPDA Staff Public/Private Sector	2	16	2
10.	Process Instrumentation & Control Course	Sr./Jr. Engineers	3	16	1
11.	Process Instrumentation & Control Course	WAPDA Staff Public/Private Sector	3	16	1
12.	Internship	Engineering University Students	4	20	1

Training Courses offered by Civil Section of the Academy

The Civil Section of the Academy offers twelve (12) courses to the Water Wing professionals each year. The detail of courses being offered is given in Table below.

S.#	Name of Course	Staff Category	Duration (Weeks)	Intake Capacity	Frequency
1.	Refresher Courses (Pre-Promotion)	S.Es/Directors/R.Es Common Services	3	25	1
2.	Refresh Courses (Pre-Promotion)	Sr. Engineer	4	20	2
3.	Quality in the Constructed Projects	Sr. Engineer	3	15	1
4.	Geo-Technical & Rock Mechanics Aspects of Hydro Power Projects	Sr. Engineer	3	15	1
5.	Hydropower Projects	Sr. Engineer	4	15	1
6.	Sector Specific Course (Pre-Promotion)	Jr. Engineers	6	20	1
7.	Technical Induction Course	Jr. Engineers	8	30	1
8.	Hydroogy & Applied Hydraulics for Water Resources Management	Jr. Engineers	4	15	1
9.	Irrigation & Drainage Project	Jr. Engineers	4	15	1
10.	Groundwater Projects	Jr. Engineers	3	15	1
11.	Technical Refresh Course	Sub-Engineers	4	20	2
12.	Internship	Engineering University Students	2	20	1

Source：http://www.wapda.gov.pk/htmls/newfsd2011.htm, reference day Oct 12 2013.

7. No. of Trainees

No. of Trainees who completed Training during last five years in WAPDA Engineering Academy, Faisalabad.

Year	PEPCO		WAPDA		Total
	T&D	THER.GEN	WATER	POWER (Hydel Gen)	
2009	530	148	124	24	826
2010	395	126	211	0	732
2011	541	199	170	0	910
2012	642	230	137	0	1009
2013 (Jan-Sep)	447	86	118	0	676
G-Total	**2555**	**789**	**76**	**24**	**4153**

Source：http://www.wapda.gov.pk/htmls/newfsd2011.htm, reference day Oct 12 2013.

During the year under report 1,009 Engineers & Technicians of WAPDA GOVT/Semi GOVT: departments and private sectors were trained in this Academy.

8. Training Facilities

The training facilities include five (5) research facilities, twenty-two (22) training rooms, three (3) laboratory offices and three (3) accommodation facilities (313 rooms). The equipment and machines used for training is comprised of general-purpose machine tool, spot welding and argon machine, high-voltage experimental apparatus, concrete strength testing equipment, cable connection training apparatus, generation simulator, transmission simulator, distribution simulator and computer, while all of them were introduced more than 30 years ago. (See Table 7.21-1 and 7.12-2.)

9. On behalf the Engineering Academy, Chief Engineer has a strong desire to renew the existing old facilities to modern installation in accord with newly introduced coal-fired thermal generation facilities.

It will be necessary, however, that the existing training facilities should be also maintained for the training of maintenance and inspection of the existing generation plants, substations and distribution facilities.

At present, no training courses for coal-fired thermal generation facilities are available. For this reason, the existing simulators are used for simulating gas and oil fired steam power generation.

It was requested that a coal-fired thermal power should be introduced in future, and after which the on-site operation training for the facilities would be taken in Japan, or by Japanese trainers coming to Pakistan.

10. Training by Japanese Instructors

In the case where the latest training facilities are introduced due to Japan's support, re-education of the trainers in the Engineering Academy will be required. In this case, it is desired that the trainers dispatched from Japan train should give lectures on theoretical education and operation of facilities in Faisalabad, while on-site education should be provided in Japan.

The trainers dispatched from Japan are to give lectures under the instruction of Chief Engineer. The guest house or hostel is available in the premises of the Academy, while any requests of Japan will be met by the Academy.

11. Difference in Training Subjects between coal-fired thermal power and oil and gas-fired thermal power

The training of the function and maintenance technology for the following facilities is indispensable, because they are important for coal-fired power.

① Coal pulverizer for improved combustion efficiency

② Flue-gas desulfurization equipment and flue-gas desulfurization equipment used for reduction measures against SOx and NOx, respectively

③ Electrostatic precipitator and chimney pipe used for measures against soot dust

④ Efficient use of coal ash

Schedule for Training Courses in 2013 at WAPDA Engineering Academy (Table 7.9-3~5)

Table 7.9-3 Transmission & Distribution Training Schedule – Year 2014

TRANSMISSION & DISTRIBUTION
TRAINING SCHEDULE - YEAR 2014

(1)

Sr. No.	Courses	BPS	Code	Capacity	Duration (Weeks)	Frequency	TST days	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	Refresher Course (Pre-Promotion) for S.Es/Directors/R.Es/Common Services.	19	T-900	25	3	1	05									1 19			
2	Refresher Course (Pre-Promotion) for Senior Engineer (Distribution/T&G).	18	T-800	25	4	2	04		24	21							13	7	
3	Sector Specific Course (Pre-Promotion) for JEs Dist. / T&G.	17	T-123	38	6	3	04	20	28			19	27					10	19
4	Technical Induction Course for Junior Engineers (Distn. / T&G).	17	T-110	24	8	2	05			17		9						10	
5	Upper Technical Subordinate Staff Course (Pre-Promotion) from L.S/SSO to Jr. Engrs.	12-16	_	50	4	3	04	6 31	17	14					4 29				
6	Practicals for Line Superintendents.	11-16	T-500	30	2	13	-		10 14 QESCO 10 14 LESCO	17 21 31 PESCO	4 GEPCO	21 25 MEPCO	5 9 LESCO 19 23 IESCO			1 5 LESCO 15 26 AJK	29 3 GEPCO 27 31 PESCO	17 21 IESCO	1 5 FESCO
7	Grid Station Operation/Maintenance Course for Private/Public Sector.	**	_	10	2	1	-												8 19 PM
8	Internship of Engineering University Students.	_	_	40	2+2	1	-						9 4						
9	Parcticals & Instructional Programe for Faisalabad University and NFC, Institute of Engineering & Fertilizer, Faisalabad.	_	_	40	_	_	-	1		15		2				12	15		31

Source：http://www.wapda.gov.pk/htmls/newfsd2011.htm, reference day Oct 12 2013

Table 7.9-4 Generation Training Schedule – Year 2014

GENERATION

TRAINING SCHEDULE - YEAR 2014

2

Sr. No.	Courses	BPS	Code	Capacity	Duration (Weeks)	Frequency	TST days	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	Refresher Course (Pre-Promotion) for S.Es/Directors/R.Es/Common Services.	19	T-900	25	03	1	05									1 19			
2	Refresher Course (Pre-Promotion) for Senior Engineers (Thermal Generation).	18		15	04	01	04	13	7										
3	Sector Specific Course (Pre-Promotion) for Jr. Engrs. (Thermal Generation).	17		20	06	02	04			3	11				25		3		
4	Technical Induction Course for Junior Engineers (Thermal Generation).	17	T-110	20	08	01	05											3	26
5	Upper Technical Subordinate Staff Course (Pre-Promotion) from Foremen/Operators to Junior Engineers (Thermal Generation).	12-16		20	04	02	04				21	16						10	5
6	Steam/Gas Power Plant Simulator Operation Course with fault analysis for Junior Engineers.	17	T-125	12	03	01	03									8 26			
7	Steam / Gas Power Plant Simulator Operation Course with fault analysis for Operators/Attendants.	11-16	T-130	12	05	01	04						2 4						
8	Micro Controller & P.L.C. Course for Senior/Junior Engineers.	17-18	T-143	16	03	01	03										13 31		
9	Micro Controller & P.L.C. Course for WAPDA Staff & Private/Public Sector.	05-16		16	02	02	_		10 21						18 29				
10	Process Instrumentation & Control Course for Sr. Engineers/Jr. Engineers.	17-18		16	03	01	03			24	11								
11	Process Instrumentation & Control Course for WAPDA Staff & Private/Public Sector.	05-16		16	02	01	_					19 30							
12	Internship of Engineering University Students.			20	2 + 2	01	_						9 4						

Source：http://www.wapda.gov.pk/htmls/newfsd2011.htm, reference day Oct 12 2013

Table 7.9-5 Civil Engineering Training Schedule – Year 2014

CIVIL ENGINEERING

TRAINING SCHEDULE - YEAR 2014

3

Sr. No.	Courses	BPS	Code	Capacity	Duration (Weeks)	Frequency	TST days	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	Refresher Course (Pre-Promotion) for S.Es/Directors/R.Es/Common Services	19	W-200	25	3	01	05									1 19			
2	Refresher Course (Pre-Promotion) for Senior Engineers.	18	W-135	20	4	02	05			24	18				4 29				
3	Quality in the Constructed Projects for Senior Engineers.	18	W-125	15	3	01	03												8 26
4	Geotechnical & Rock, Mechanics Aspects of Hydropower Projects for Senior Engineers.	18	W-115	15	3	01	03					19 6							
5	Hydro-Power Projects for Senior Engineers.	18	W-120	15	4	01	04											10 5	
6	Sector Specific Course (Pre-Promotion) for Junior Engineers.	17	W-140	20	6	01	05	6	14										
7	Technical Induction Course for Junior Engineers.	17	W-130	30	8	01	06			24	18								
8	Hydrology & Applied Hydraulics for Water Resources Management for Jr. Engineers.	17	W-101	15	4	01	04								25	19			
9	Irrigation & Drainage Projects for Junior Engineers.	17	W-105	15	4	01	04				21	16							
10	Ground Water Projects for Junior Engineers.	17	W-110	15	3	01	03										13 31		
11	Technical Refresher Course for Sub Engineers.	11-16	W-100	20	4	02	04				7	2							1 26
12	Internship of Students (University of Engineering & Technology)			20	2	01	-						9 20						

Source：http://www.wapda.gov.pk/htmls/newfsd2011.htm, reference day Oct 12 2013

10. Comparison between 'Electricity Act 1910' and 'Electricity Rules 1937'

Clause	Differences
Preliminary	In Electricity Rules 1937, Authorization was newly added as section 3, including: Repairs apparatus (Section 43), General precautions applicable to supply at medium voltage or high pressure (Section 60), High pressure electric supply-lines and apparatus placed above ground (Section 64), Responsibility for observance (Section 96(2)), Switchgear and terminals (105(i)), Flexible cables (Section108 (4)) as well as Portable machines (Section109).
Inspector	Electricity Act 1910 merely established the Sections, including Appointment of electric inspectors (Section 36), Delegation of certain functions of provisional government to electric inspectors (Section 55), Notice to electric inspector (Additional notice of certain works XVII), while Electricity Rules 1937 newly established Chapter II "Inspectors", including: Qualification of Inspector (Section 4), Entry and Inspection (Section 5), Limitation of appeals (Section 6), Amount of fees (Section 7), Payment responsibility for the inspection Incidence of fees (Section 8), submission of records (Section 9) and of consumers (Section 10).
License	Electricity Act 1910 established the Sections, including: Grant of licenses (Section 3), cancellation or correction of business authorization (Section 4), Provisions where license of local authority is revoked (Section 6), Purchase of undertaking (Section 7), alteration of purchase requirement by government General power for Government to vary terms of purchase (Section 10), while Electricity Rules 1937 newly established Chapter III, including: Application for licenses (Section 11), Copies of map and draft license for public inspection (Section 12), contents of draft license (Section 13), Advertisement of application and contents thereof (Section 15), Amendment of draft license (Section 16), Local inquiries (Section 17), Approval of draft license (Section 18), Notification of grant of license (Section 19) and Date of commencement of license (Section 20).
Newly added articles in Electricity Rules 1937, but not provided in Electricity Act 1910	

Chapter IV	Section 25 to 37 stipulates terms of supply of electricity by licensed operator.
Chapter V	Section 38 to 48 stipulates precautions for the safety of users General Precautions act…
Chapter VI	Section 49 to 59 stipulates earthling condition of feeder and facilities to be used and conditions of junction box.
Chapter VII	Section 60 to 64 stipulates terms of supplying medium voltage and high voltage power …
Chapter VIII	Section 65 to 80 stipulates terms of supplying power through aerial lines ….
Chapter IX	Section 81 to 94 stipulates rules for electric traction….
Chapter X	Section 95 to 116 stipulates additional terms for using power at mines and oil-fields….
Chapter XI	Section 117 to 125 stipulates Alleviating measures by government and alleviating measures by Inspector and penal regulations

Source: Electricity Act, 1910:http://www.kpkep.com/documents/Electricity%20Act%201910.pdf (Referred in February 9th, 2014)
Electricity Rules, 1937:http://faolex.fao.org/docs/pdf/pak70906.pdf (Referred in February 9th, 2014)

11. Reference: Return on Rate Base (RORB)

As a calculation method for Cost of Equity, the concept of CAPM (Capital Asset Pricing Model) is frequently used. CAPM is an expected rate of return on securities, expressed as the following formula.

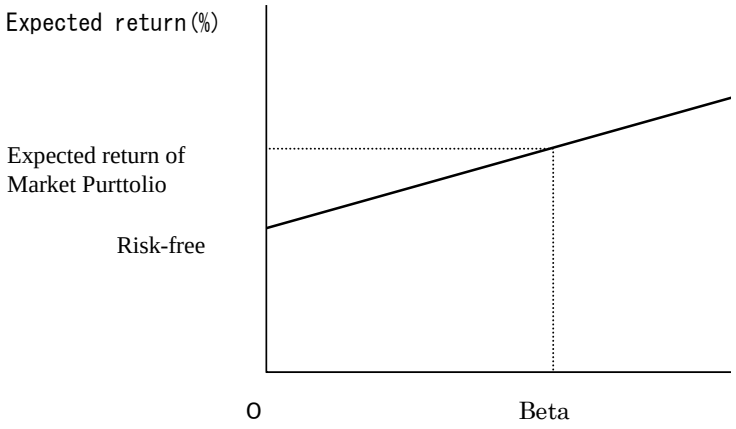
Cost of Equity = Risk-free Rate ＋ (Equity Beta×Market Risk Premium)

Equity Beta = measure of the risk of the business in relation to the risk of the equity market as a whole

Market Risk Premium = difference between the expected return and the risk-free rate :

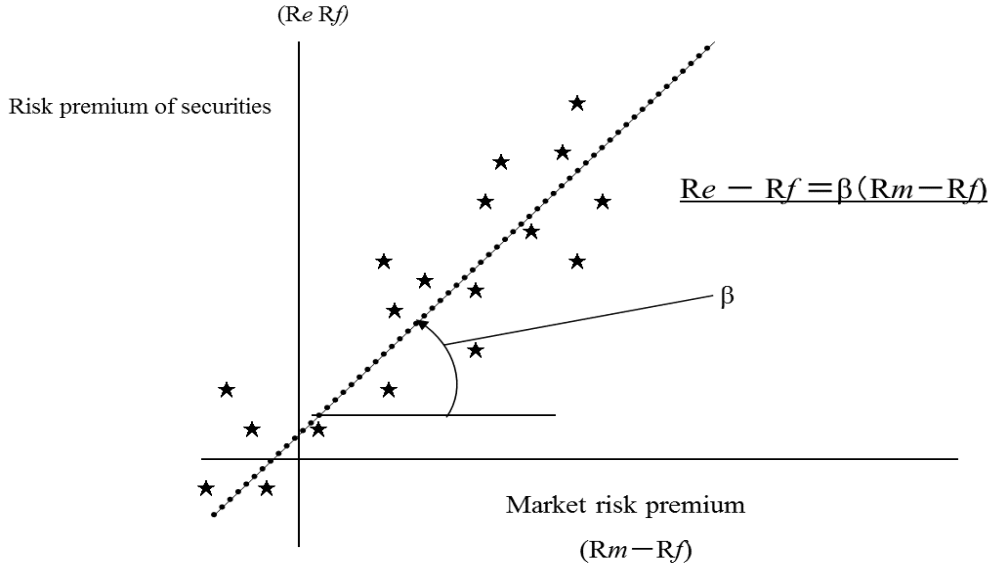
Re(Cost of Equity)＝ R f ＋β （ Rm – R f ）

Expected Rate of Return on Securities=Risk-free Profit Rate+Beta x (Expected Rate of Return on Portfolio –Risk-free Profit Rate)



$$\underbrace{E(r_t)-r_t}_{\text{Risk premium of securities}} = \underbrace{\beta\times(E(r_t)-r_t)}_{\text{Market risk premium}}$$

r ...Expected return of securities　　r_m...Expected market return



Total risk for securities
① Market risk: Portion described by gradient of the characteristic line
② Individual risk: Distance between the characteristic line and a point showing the earning rate

The gradient shows a tendency (sensitivity) that when the entire market grows by 1%, how much percentage the share related to the market rises or falls, and has the following property：

When beta (β) of the securities is greater than one (1), they have a tendency to fluctuate larger than the market.
When beta (β) of the securities is smaller than one (1), they have a tendency to fluctuate smaller than the market.
When beta (β) of the securities is negative, they have a tendency to move in the opposite direction from the market forces.

Bi=[Covariance of (Earning rate of securities) and (Earning rate of stock market)]/[Variance of (Earning rate of stock market)]

The beta of portfolio is represented as a weight average of the beta of individual securities.

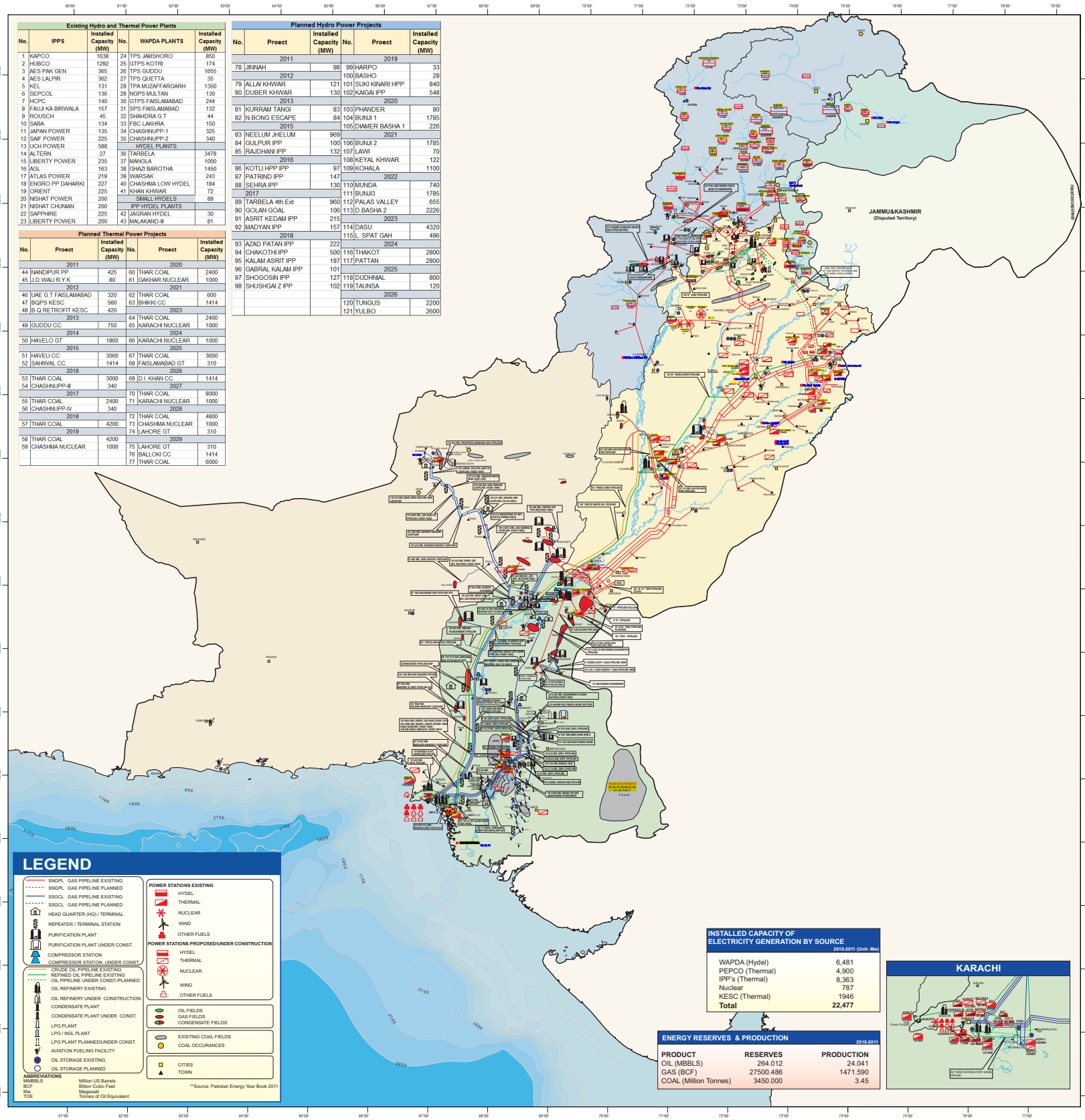
The beta value is set at 0.7 for Tokyo Electric Power Company in 2008.

12. Base Case Generation Additions

Existing Hydro and Thermal Power Plants					
No.	IPPS	Installed Capacity (MW)	No.	WAPDA PLANTS	Installed Capacity (MW)
1	KAPCO	1638	24	TPS JAMSHORO	850
2	HUBCO	1292	25	GTPS KOTRI	174
3	AES PAK GEN	365	26	TPS GUDDU	1655
4	AES LALPIR	362	27	TPS QUETTA	35
5	KEL	131	28	TPA MUZAFFARGARH	1350
6	SEPCOL	136	29	NGPS MULTAN	130
7	HCPC	140	30	GTPS FAISLAMABAD	244
8	FAUJI KA BIRWALA	157	31	SPS FAISLAMABAD	132
9	ROUSCH	45	32	SHAHDRA G.T	44
10	SABA	134	33	FBC LAKHRA	150
11	JAPAN POWER	135	34	CHASHNUPP-1	325
12	SAIF POWER	225	35	CHASHNUPP-2	340
13	UCH POWER	588		HYDEL PLANTS	
14	ALTERN	27	36	TARBELA	3478
15	LIBERTY POWER	235	37	MANGLA	1000
16	AGL	163	38	GHAZI BAROTHA	1450
17	ATLAS POWER	219	39	WARSAK	243
18	ENGRO PP DAHARKI	227	40	CHASHMA LOW HYDEL	184
19	ORIENT	225	41	KHAN KHWAR	72
20	NISHAT POWER	200		SMALL HYDELS	89
21	NISHAT CHUNIAN	200		IPP HYDEL PLANTS	
22	SAPPHIRE	225	42	JAGRAN HYDEL	30
23	LIBERTY POWER	200	43	MALAKAND-III	81

Planned Thermal Power Projects					
No.	Proect	Installed Capacity (MW)	No.	Proect	Installed Capacity (MW)
	2011			2020	
44	NANDIPUR PP	425	60	THAR COAL	2400
45	J.D. WALI R.Y.K	80	61	GAKHAR NUCLEAR	1000
	2012			2021	
46	UAE G.T FAISLAMABAD	320	62	THAR COAL	600
47	BQPS KESC	560	63	BHIKKI CC	1414
48	B.Q RETROFIT KESC	420		2023	
	2013		64	THAR COAL	2400
49	GUDDU CC	750	65	KARACHI NUCLEAR	1000
	2014			2024	
50	HAVELO GT	1860	66	KARACHI NUCLEAR	1000
	2015			2025	
51	HAVELI CC	3060	67	THAR COAL	3600
52	SAHIWAL CC	1414	68	FAISLAMABAD GT	310
	2018			2026	
53	THAR COAL	3000	69	D.I. KHAN CC	1414
54	CHASHNUPP-III	340		2027	
	2017		70	THAR COAL	8000
55	THAR COAL	2400	71	KARACHI NUCLEAR	1000
56	CHASHNUPP-IV	340		2028	
	2018		72	THAR COAL	4800
57	THAR COAL	4200	73	CHASHMA NUCLEAR	1000
	2019		74	LAHORE GT	310
58	THAR COAL	4200		2029	
59	CHASHMA NUCLEAR	1000	75	LAHORE GT	310
			76	BALLOKI CC	1414
			77	THAR COAL	6000

Planned Hydro Power Projects					
No.	Proect	Installed Capacity (MW)	No.	Proect	Installed Capacity (MW)
	2011			2019	
78	JINNAH	98	99	HARPO	33
	2012		100	BASHO	28
79	ALLAI KHWAR	121	101	SUKI KINARI HPP	840
80	DUBER KHWAR	130	102	KAIGAI IPP	548
	2013			2020	
81	KURRAM TANGI	83	103	PHANDER	80
82	N.BONG ESCAPE	84	104	BUNJI 1	1785
	2015		105	DIAMER BASHA 1	226
83	NEELUM JHELUM	969		2021	
84	GULPUR IPP	100	106	BUNJI 2	1785
85	RAJDHANI IPP	132	107	LAWI	70
	2016		108	KEYAL KHWAR	122
86	KOTLI HPP IPP	97	109	KOHALA	1100
87	PATRIND IPP	147		2022	
88	SEHRA IPP	130	110	MUNDA	740
	2017		111	BUNJI3	1785
89	TARBELA 4th Ext	960	112	PALAS VALLEY	655
90	GOLAN GOAL	106	113	D.BASHA 2	2226
91	ASRIT KEDAM IPP	215		2023	
92	MADYAN IPP	157	114	DASU	4320
	2018		115	L. SPAT GAH	496
93	AZAD PATAN IPP	222		2024	
94	CHAKOTHI IPP	500	116	THAKOT	2800
95	KALAM ASRIT IPP	197	117	PATTAN	2800
96	GABRAL KALAM IPP	101		2025	
97	SHOGOSIN IPP	127	118	DUDHNIAL	800
98	SHUSHGAI Z IPP	102	119	TAUNSA	120
				2026	
			120	TUNGUS	2200
			121	YULBO	2600



Source: JICA Survey team using material from NTDC, National Power System Expansion Plan Main Report 2011-2030
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