Islamic Republic of Pakistan

Data Collection Survey
on
Infrastructure Improvement of Energy Sector
in
Pakistan
by
Japan International Cooperation Agency (JICA)

Final Report

February 2014

Japan International Cooperation Agency (JICA)

Nippon Koei Co., Ltd.

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Location Map

Source: Prepared by the JICA Survey Team based on the map on http://www.freemap.jp/.

Summary

Objectives and Scope of the Survey

This survey aims to collect data and information in order to explore the possibility of cooperation with Japan for the improvement of the power sector in Pakistan.

The scope of the survey is:

- ✓ Survey on Pakistan's current power supply situation and review of its demand forecast;
- ✓ Survey on the power development policy, plan, and institution of the Government of Pakistan (GOP) and its related companies;
- ✓ Survey on the primary energy in Pakistan;
- ✓ Survey on transmission/distribution and grid connection; and
- ✓ Survey on activities of other donors and the private sector.

The target areas of the survey are:

- ✓ Islamabad Capital Territory;
- ✓ Punjab Province; and
- ✓ Sindh Province.

Issues of National Grid

The total generation capacity available in the national system remains at 75% of the total installed capacity (20,839 MW), which is 15,629 MW, throughout the year. There is a gap of 6,000 MW in available power supply and demand. This is a main issue of the national grid. However, this situation will not be improved anytime soon.

Issues of Distribution

All Distribution Companies (DISCOs) are fighting to control their losses. Many of them have high losses in the distribution network. The State of Industry Report 2012 provides a breakdown of losses. From that, it is clear that each DISCO has high losses in lines under the "11 kV and below" category.

Water pumping sets are widely used in Pakistan in order to draw water from deep tube wells. In rural areas, tube well pumps are used for irrigation purpose. Most of these pumps belong to farmers that do not consider the efficiency of the pumps. DISCOs believe that the electricity connections provided to tube well consumers are not metered properly. Due to the use of electric motors with less efficiency and low power factor, tube well loads contribute in increasing the losses of the distribution system.

Load Shedding

There is a huge imbalance between the supply and demand of electricity in the national grid. Around 30% of the electricity demand is not sufficient for regular supply of electricity to all the consumers. With the current expansion plans and progress on the implementation of ongoing

projects, it is expected that the crisis in the power sector would continue well beyond 2020, unless major hydropower plants and base load power generation on coal are introduced along with the development of coal mines in the country. Load shedding has become a part of life and will remain for quite a long period.

Primary Energy for Electric Power Generation

The total primary energy supply in Pakistan was 64,727,000 ton of oil equivalent (TOE) in the year 2011/12. The final energy consumption was 40,026,000 TOE and out of that the consumption of electricity was 6,251,000 TOE in the same year. In order to supply this electricity to the end consumers, the total input of energy, including the transformation losses, the own use, and the transmission and distribution losses, is calculated as 22,312,000 TOE. This means that only 28% of the total input energy was received by the end consumers of electricity.

The total supply of oil in 2011/12 was 21,240,000 TOE. The share of domestic oil production to the total supply in the same year remains only at 16%.

The total domestic gas production in 2011/12 stood at 32,000,000 TOE. At present, natural gas is not imported from any countries. The total estimated natural gas potential of the country is 282,000 billion cubic feet (BCF), of which only 24,000 BCF is recoverable. During the year 2011/12, the total gas production was 1,559 BCF. Even if the production remains at the level in 2011/12, the recoverable potential of domestic natural gas: 24,000 BCF will be dried up within 15 years.

The imported coal is more than locally produced coal; imported coal is 2,669,000 TOE and local coal is 1,616,000 TOE in 2011/12. The major users of coal are the cement and brick kiln sectors. About 58% of the total coal was consumed by cement sector while 41% was consumed by the brick kiln industry in 2011/12. The electric power sector share in consumption is small: 1.4% in 2011/12.

The hydropower potential of Pakistan is estimated at around 60,000 MW while the installed capacity is 6,555 MW in 2011/12. The total estimated wind power potential is approximately 340,000 MW. Regarding solar power, the entire Pakistan has a high potential. In particular, Baluchistan, Sindh, and Southern Punjab provinces receive solar radiation of over 2 MWh/m^2 per year.

Recommended Projects for Japanese Official Assistance

The Project of Solar Power Generation Effective for Loss Reduction in Multan Area (hereinafter referred to as the Multan solar project) was selected as the most appropriate to be recommended for Japanese official assistance. This project is scattered solar generation project of which the maximum capacity of one solar generation unit is around 1 MW. The total number of scattered solar generation unit is planned to be around 100. Solar panels are designed to be installed over the irrigation canals and each solar generation unit will be connected to 11 kV feeder of MEPCO's distribution network.

The expected outcomes of this project are:

- ✓ Reducing losses in 11 kV feeders and total distribution network;
- ✓ Increasing voltage profile;
- ✓ Mitigating electricity supply shortage; and
- ✓ Postponing investment timing on overloaded facilities.

Recommendations

The Government of Punjab Province and MEPCO understood the concept of the Multan solar project well and agreed to proceed with the project. Besides, the officials of the Government of Punjab Province and MOWP became aware of the necessity of applying Japanese technology and products for the Multan solar project. In order to maintain this situation, it is recommended to continuously conduct promotional activities.

Solar modules will be installed over canals by the Multan solar project. Electricity generated by the solar modules will be injected to 11 kV feeders. By this project feature, it is essential to identify the exact locations where 11 kV feeders cross over canals or installed as close to canals in the project design. In the preparatory survey of the Multan solar project, it is recommended to create a digital topographic map to identify the exact location of canals and 11 kV feeders from satellite images with the land survey for 11 kV lines by Global Positioning System (GPS).

The installation of PV modules over canals is still not popular around the world and the concept to reduce distribution losses using solar generation is a new idea in Pakistan. Therefore, the design and bid documents should be prepared carefully. Thus, it is recommended to carry out the detailed design under Japanese grant aid program. Besides, in case that the implementation of the project by yen loan is suspended, it is recommended to implement the project by utilizing grant aid program.

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Abbreviation

General

AMR	Automated Meter Reading
ARE	Alternative/Renewable Energy
BCFD	Billion Cubic Feet per Day
BCF	Billion Cubic Feet
BPC	Bulk Purchase Consumer
CDM	Clean Development Mechanism
CEO	Chief Executive Officer
CNG	Compressed Natural Gas
COD	Commercial Operation Date
CPP	Capital Power Plant
D/C	Double Circuit
DISCO	Distribution Company
EIA	Environmental Impact Assessment
ELR	Electricity Loss Reduction
EPP	Energy Purchase Price
FPA	Fuel Price Adjustment
F/S	Feasibility Study
F/F	Feed for
FSRU	Floating, Storage and Re-gasification Units
FY	Fiscal Year
GDP	Gross Domestic Product
GENCO	Generation Company
GOP	Government of Pakistan
GPS	Global Positioning System
G/S	Grid Station
HPP	Hydro Power Plant
HVDC	High-Voltage, Direct Current
IEE	Initial Environment Examination
IMF	International Monetary Fund
IPP	Independent Power Producer
IRR	Internal Rate of Return
LNG	Liquefied Natural Gas
LOI (1)	Letter of Intent
LOI (2)	Letter of Interest
MMCFD	Million Cubic Feet per Day
PPA	Power Purchase Agreement
PPP	Public-Private Partnership
PV	Photovoltaic
RD	Reduced Distance (equivalent to 1,000 feet)

RE	Renewable Energy
RLNG	Re-gasified Liquefied Natural Gas
S/C	Single Circuit
SDT	Single Circuit on Double Circuit Tower
SPP	Small Power Producer
SPV	Special Purpose Vehicle
T/F	Transformer

Name of Organizations

ADB	Asian Development Bank
AEDB	Alternative Energy Development Board
BOI	Board of Investment
CPPA	Central Power Purchase Agency
HDIP	Hydrocarbon Development Institute of Pakistan
ISGS	Inter State Gas Systems
JICA	Japan International Cooperation Agency
KESC	Karachi Electric Supply Company
MOWP	Ministry of Water and Power
MPRN	Ministry of Petroleum and Natural Resources
NEPRA	National Electric Power Regulatory Authority
NPCC	National Power Control Centre
NREL	National Renewable Energy Labs, USA
NTDC	National Transmission and Distribution Company
OGDCL	Oil and Gas Development Company Limited
OGRA	Oil and Gas Regulatory Authority
PC	Planning Commission
PCRET	Pakistan Council of Renewable Energy Technologies
PEC	Pakistan Engineering Council
PEPCO	Pakistan Electric Power Company
PEPA	Pakistan Environmental Protection Agency
PMD	Pakistan Meteorological Department
PPDB	Punjab Power Development Board
PPIB	Private Power & Infrastructure Board
PSO	Pakistan State Oil
Punjab-EPA	Punjab Environmental Protection Agency
PUNJMIN	Punjab Mineral Development Corporation
SBI	Sindh Board of Investment
SEPA	Sindh Environmental Protection Agency
SNGPL	Sui Northern Gas Pipelines Limited
SSGCL	Sui Southern Gas Company Limited
USAID	United States Assistance for International Development
WAPDA	Water and Power Development Authority
WB	World Bank

Name of Distribution Companies

FESCO	Faisalabad Electric Supply Company
GEPCO	Gujranwala Electric Power 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
SEPCO	Sukkur Electric Power Company
TESCO	Tribal Areas Electricity Supply Company

Electrical Terminology / Unit

Solar Power
Wind Power
Hydropower

V	(Volt)	Unit of voltage
kV	(kilovolt)	1,000 V
W	(Watt)	Unit of active power
kW	(kilowatt)	1,000 W
MW	(Megawatt)	1,000 kW
Wh	(watt-hour)	Unit of Energy
kWh	(kilowatt-hour)	1,000 Wh
MWh	(Megawatt-hour)	1,000 kWh
GWh	(Gigawatt-hour)	1,000 MWh
VA	(Volt-ampere)	Unit of apparent power
kVA	(kilovolt-ampere)	1,000 VA
MVA	(Megavolt-ampere)	1,000 kVA
Var	(volt-ampere reactive)	Unit of reactive power

Primary Energy Unit

BTU	(British thermal unit)	Unit of Energy, Equivalent to 1,055.06 J (approximately equal to 0.293 Wh)
MMBTU	(Million BTU)	1,000,000 BTU
TOE	(Ton of oil equivalent)	Unit of Energy, Amount of energy released by burning one tonne of crude oil (approximately equal to 41.84 GJ, 11,622 kW or 39.683 MMBTU)

Place Names

(Administrative Area Name)
Islamabad Capital Territory
Punjab province
Sindh province
Balochistan province
Gilgit-Baltistan
KPK - Khyber Pakhtunkhwa
FATA - Federally Administered Tribal Authority
AJK - Azad Jammu & Kashmir
(Wind Corridor)
Gharo-Keti Bandar
Jhimpir

Fiscal Year

Pakistani Fiscal Year: July 1 to June 30

Currency and Currency Equivalents

Rs.	Unless otherwise defined, it means Pakistan Rupees.
JP¥	Japanese Yen (JP¥1.0 = Rs.1.0242)
US$	United State Dollar (US$1.0 = Rs.104.90)
	Source: National Bank of Pakistan (Selling Rate), as of February 18, 2014

Chapter 1 INTRODUCTION

1.1 Background

Pakistan is facing acute shortage in electricity. The gap between the estimated peak demand and recorded peak supply of electricity in 2011/12 was around 6,000 MW. This gap was the depressed peak demand due to scheduled load shedding.

Total generation capacity of Pakistan is 23,220 MW in 2013. Out of this generation capacity, the capacity of oil thermal power stations shares around 40%, the same of gas thermal power and hydro power shares around 60%, around 30% each. Around 85% of total supply oil in Pakistan was imported oil in 2011/12. Due to the increase of oil price in the international market, the operation cost of oil thermal power stations went up beyond the marginal cost and eventually it became difficult for oil thermal power stations to generate electricity. Thus, oil thermal power is out of option to increase the generation capacity in Pakistan.

In the above context, the Government of Pakistan (GOP) changed the policy for power sector from depending on oil thermal power to developing domestic resources such as hydro power, coal, and renewable energy.

Under the circumstance, in order to formulate the effective Japanese official assistance to mitigate the electricity shortage of Pakistan, this survey is conducted.

1.2 Objectives and Scope of the Survey

Objectives

This survey aims to collect data and information in order to explore the possibility of cooperation with Japan for the improvement of the power sector in Pakistan.

Scope

- ✓ Survey on Pakistan's current power supply situation and review of its demand forecast,
- ✓ Survey on the power development policy, plan, and institution of the Government of Pakistan (GOP) and its related companies,
- ✓ Survey on the primary energy in Pakistan,
- ✓ Survey on transmission/distribution and grid connection, and
- ✓ Survey on activities of other donors and the private sector.

Target Area

- ✓ Islamabad Capital Territory
- ✓ Punjab Province
- ✓ Sindh Province

1.3 Survey Team

The survey team consists of the following four international experts and three national experts.

International Experts

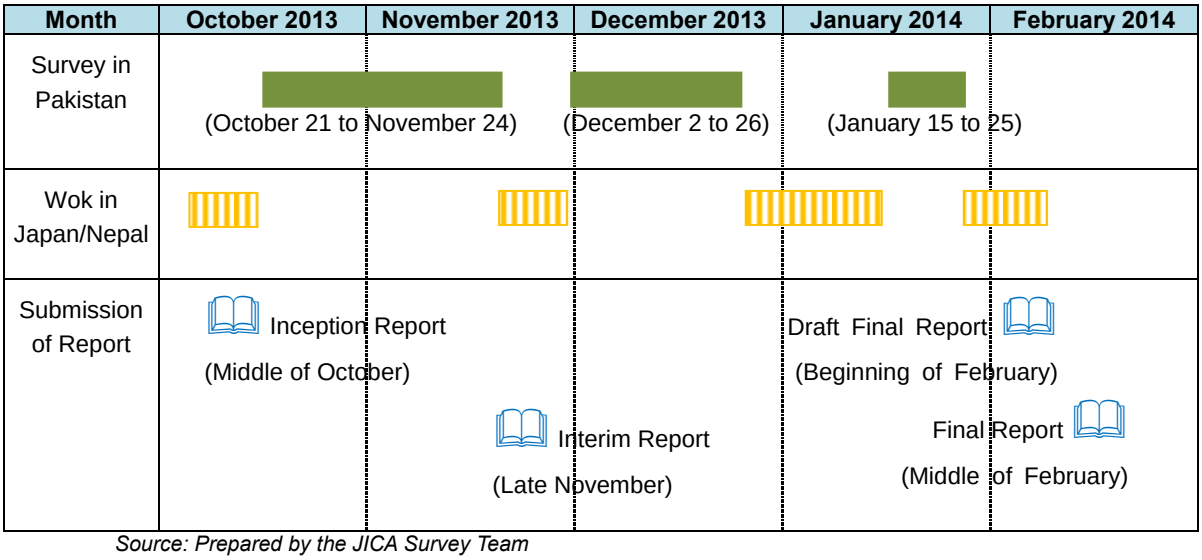
- ✓ Mr. Tomoyasu Fukuchi — Team Leader / Power Policy / Power Development Planning
- ✓ Mr. Ryosuke Ogawa — Primary Energy / Renewable Energy
- ✓ Mr. Shyam Shrestha — Demand Forecast / Power System Planning
- ✓ Mr. Shinji Tanaka — Environment Social Consideration

National Experts

- ✓ Mr. Allah Bux — Demand Forecast / Power System Planning
- ✓ Mr. Babar Mahmood — Power Policy / Power Development Planning / Primary Energy / Renewable Energy
- ✓ Mr. Tahir Nazir — Environment Social Consideration

1.4 Record of Major Activities

The overall schedule of the survey is shown below.



Source: Prepared by the JICA Survey Team

Figure 1.4-1 Overall Schedule of the Survey

Survey in Pakistan

- ✓ First Site Survey:
  Arrival in Islamabad on October 21, 2013
  Departure from Islamabad on November 23, 2013
- ✓ Second Site Survey:
  Arrival in Islamabad on December 2, 2013
  Departure from Islamabad on December 25, 2013

- ✓ Third Site Survey:
  Arrival in Islamabad on January 15, 2014
  Departure from Islamabad on January 24, 2014

Report

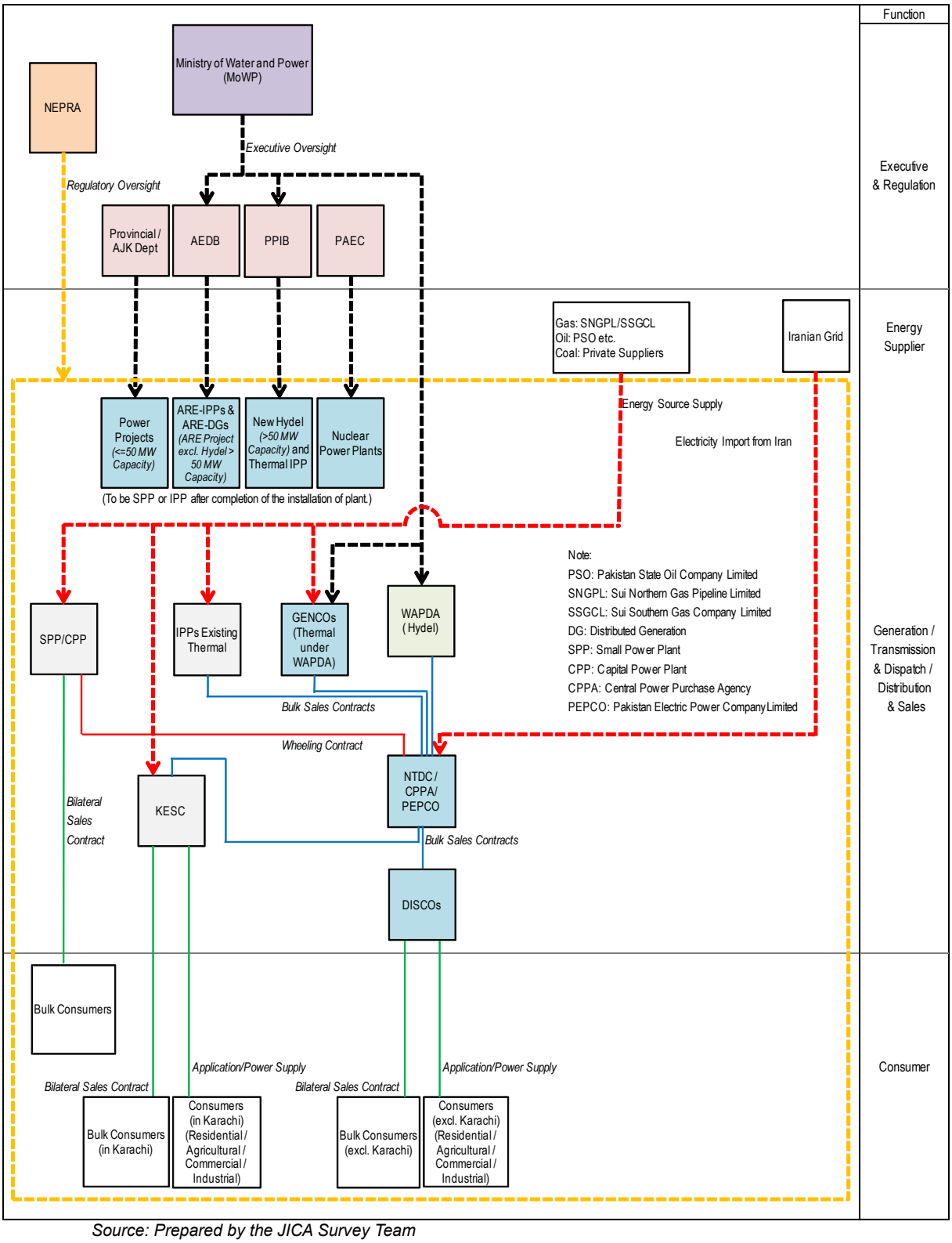
- ✓ Inception Report: Middle of October 2013
- ✓ Interim Report: Late November 2013
- ✓ Draft Final Report: Beginning of February 2014
- ✓ Final Report: Middle of February 2014

Chapter 2 PRESENT SITUATION OF ELECTRICITY SUPPLY

2.1 Related Organizations on Electricity Supply and Fuel Supply for Generation

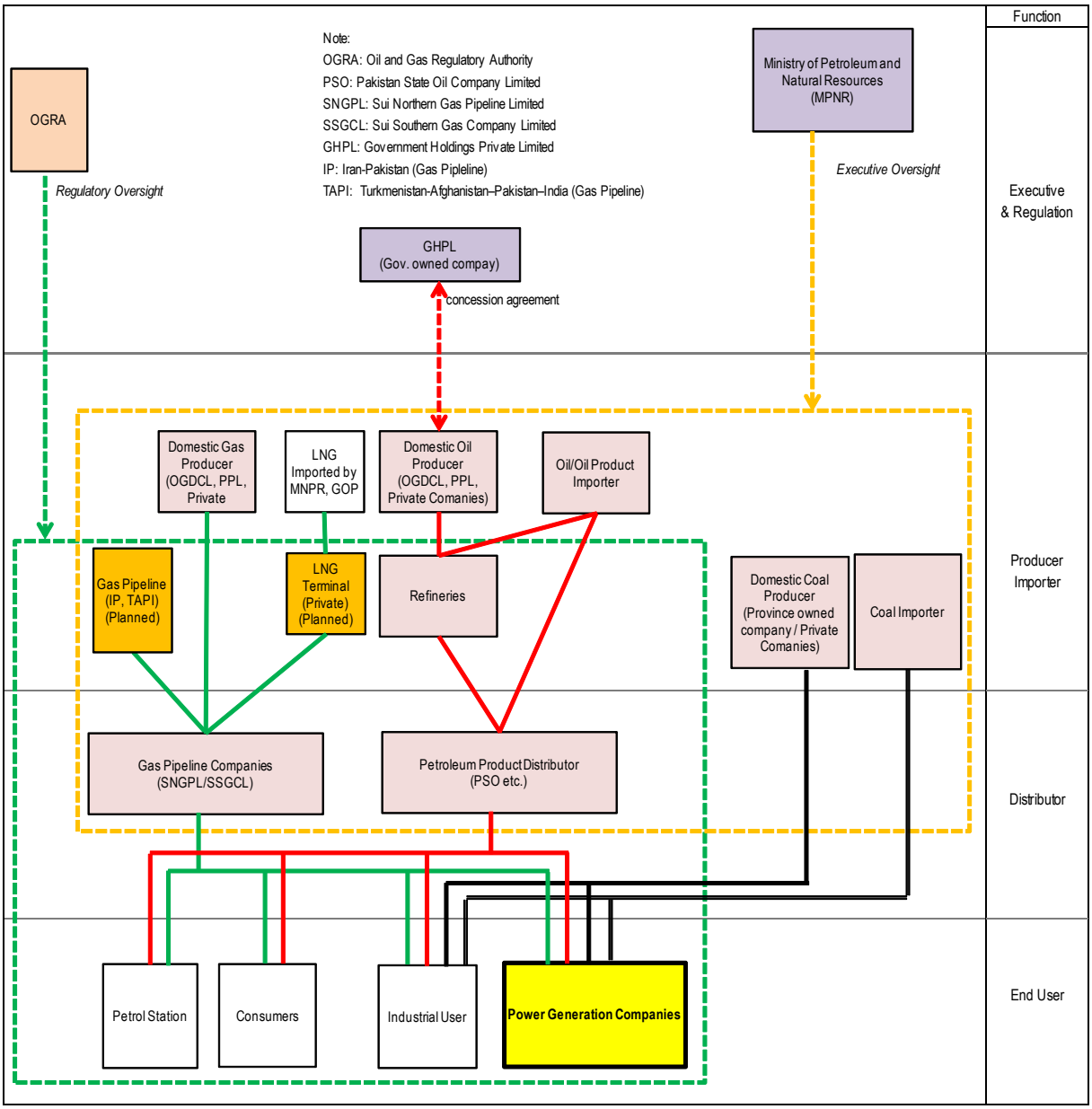
Figure 2.1-1 shows the list of organizations involved in the electric power sector in Pakistan. The figure shows the position of the different organizations and departments according to their role and authority. The Ministry of Water and Power (MOWP) is the executive oversight body of GOP, whereas, the National Electric Power Regulatory Authority (NEPRA) is the country's sole regulatory authority in the power sector.

Figure 2.1-2 shows the list of organizations involved in the supply of various fuels in the country, especially for power generation purposes. The Ministry of Petroleum and Natural Resources (MPNR) is the executive oversight body of GOP, whereas, the Oil and Gas Regulatory Authority (OGRA) functions as the regulator for the fuel sector. For the supply of natural gas, there are only two distribution companies, namely, Sui Southern Gas Company Limited (SSGCL) and Sui Northern Gas Pipelines Limited (SNGPL), which are autonomous corporations owned by GOP. For liquid fuel, the major shareholder is Pakistan State Oil (PSO), which is again owned by GOP.



Source: Prepared by the JICA Survey Team

Figure 2.1-1 Related Organizations for Electricity Supply (Power Sector)



Source: Prepared by the JICA Survey Team

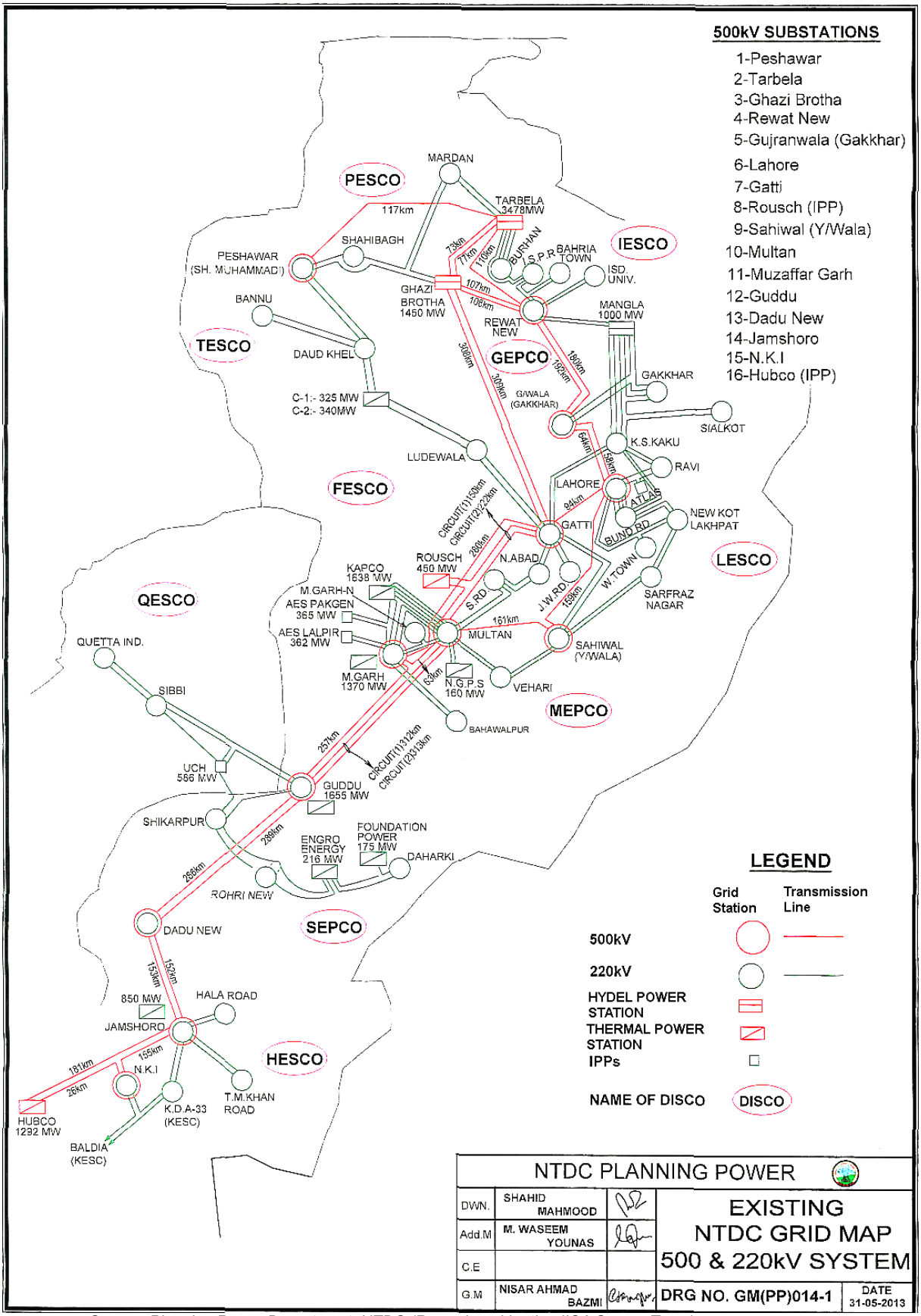
Figure 2.1-2 Related Organizations for Fuel Supply for Generation

2.2 National Grid

2.2.1 Grid Configuration

The national grid of Pakistan consists of 500 kV and 220 kV systems which include 12 500 kV grid station (G/S), 29 220 kV G/S, 5,077 km of 500 kV transmission line, and 7,359 km of 220 kV transmission line. The national grid extends from north to south within the country and connects all the major power stations and network of all ten distribution companies (DISCOs) as well as Karachi Electric Supply Company (KESC). Some areas in the Balochistan Province, located southwest of the country, receive electricity from Iran. This grid is not connected to the national grid of Pakistan.

The system diagram of the national grid, which is being maintained and operated by the National Transmission and Distribution Company (NTDC), is shown in **Figure 2.2.1-1**.



Source: Planning Power Department, NTDC (Reproduced by the JICA Survey Team)

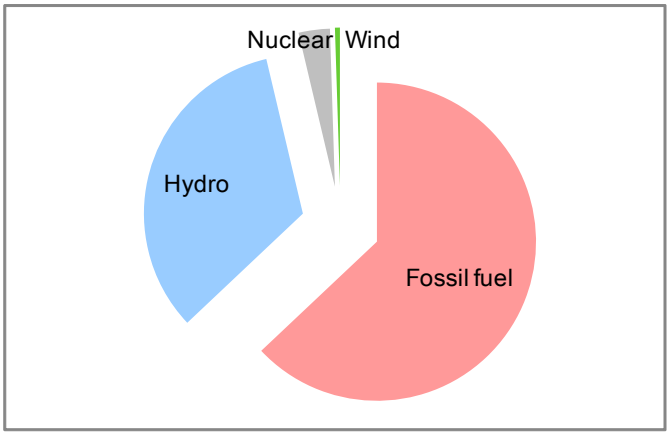
Figure 2.2.1-1 System Diagram of the National Grid

Major power stations such as the Rousch Power Station (450 MW), HUBCO Power Station (1,292 MW), Ghazi Brotha Power Station (1,450 MW) and Tarbella Power Station (3,478 MW) are connected to the 500 kV network of the national grid. The 500 kV network also connects DISCO's entire grid in Punjab, Sindh, and Peshawar provinces. The 220 kV transmission network connects all of the ten DISCOs and KESC. NTDC operates and maintain the national grid.

2.2.2 Power Stations and Substations

(1) Power Stations

The total generation capacity of the national grid is around 20,839 MW as of October 2013. **Figure 2.2.1-1** above does not include the generating capacity of KESC, which is around 2,381 MW. Out of the total generation capacity, the capacities of the thermal, hydro, nuclear, and wind power stations stand at 13,123 MW, 6,945 MW, 665 MW, and 106 MW, respectively. The share of electricity, excluding the generation capacity of KESC, by source is shown in **Figure 2.2.2-1** below.

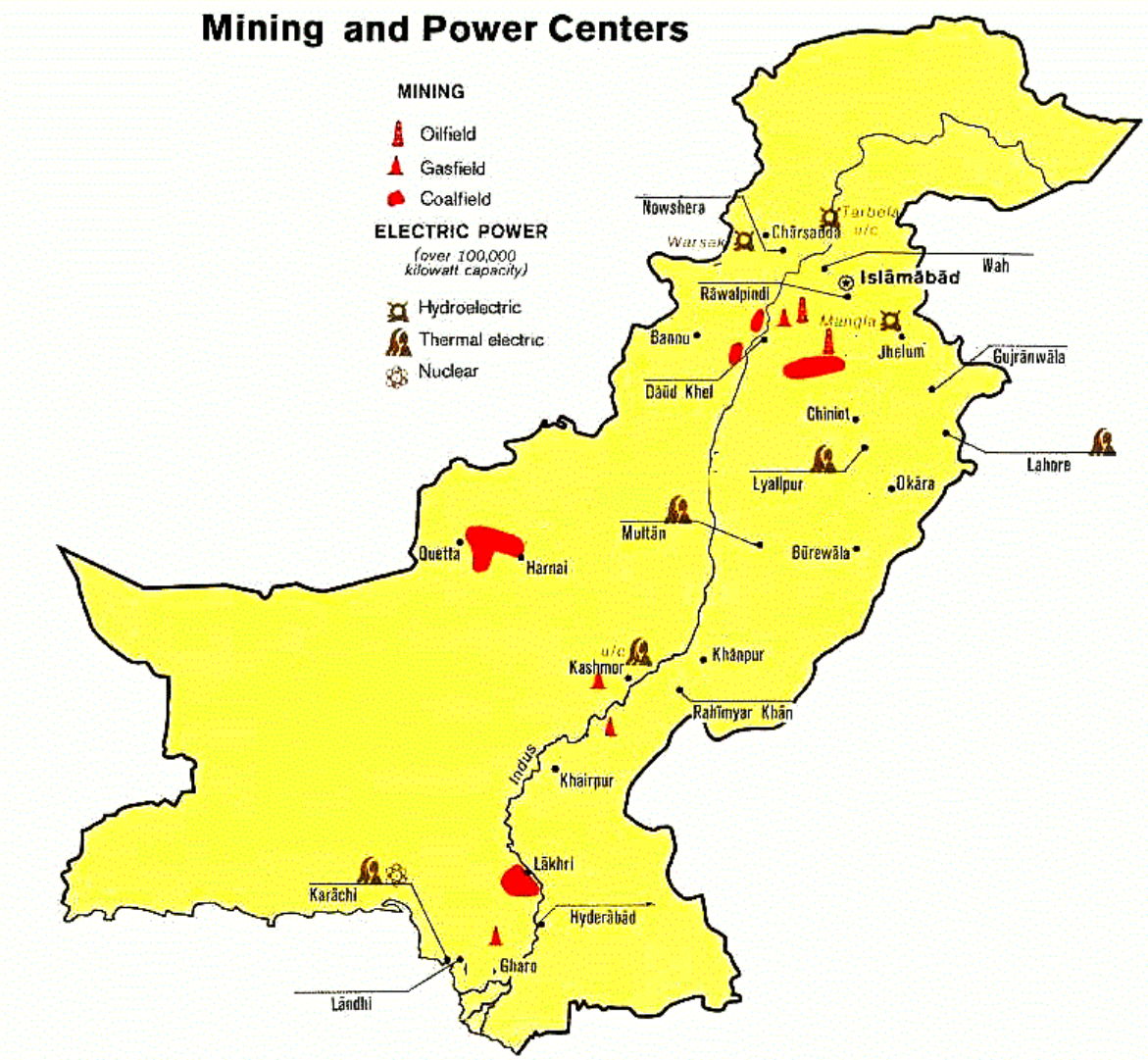


	MW	Percent
Fossil fuel	13,123	62.97%
Hydro	6945	33.33%
Nuclear	665	3.19%
Wind	106	0.51%
Total	**20,839**	**100.00%**

Note: Generation capacity of KESC is not considered since KESC system is not considered as a part of PEPCO system.
Source: Prepared by JICA Survey Team based on Data from NTDC

Figure 2.2.2-1 Electricity Generation of National Grid excluding KESC by Source

Locations of major power plants with generation capacity of over 100 MW are shown in **Figure 2.2.2-2** below.



Source: http://www.pakistanpaedia.com/maps/map_pakistan-resources.html (Reproduced by the JICA Survey Team)

Figure 2.2.2-2 Major Power Stations in Pakistan

A list of power generating stations with their installed capacity is given in **Table 2.2.2-1**.

Table 2.2.2-1 Existing Installed Power Station Capacity and Capability as of October 2013

	Sr. No.	Name of Power Station	Fuel	Installed Capacity (MW)	Derated Capacity / Capability (MW)	
					Summer	Winter
Public Sector	**Hydel WAPDA**					
	1	Tarbela	Water	3,478	3,633	829
	2	Mangla	Water	1,000	960	350
	3	Ghazi Barotha	Water	1,450	1,357	794
	4	Warsak	Water	243	200	139
	5	Chashma Low Head	Water	184	157	67
	6	Allai Khwar HPP	Water	121	121	60
	7	Jinnah Low Head	Water	96	96	40
	8	Small Hydels	Water	106	81	26
	9	Khan Khwar HPP	Water	72	72	15
		Sub Total WAPDA Hydel		**6,750**	**6,677**	**2,320**
	GENCOs					
	10	TPS Jamshoro # 1-4	GAS/ FO/RFO	850	700	
	11	GTPS Kotri #I-7	Gas / HSD	174	140	
		Sub-Total GENCO-I		**1,024**	**840**	
	12	TPS Guddu Steam #1-4	Gas / FO	640	270	
	13	TPS Guddu C.C. #5-13	Gas	1,015	885	
	14	TPS Quetta	Gas	35	25	
		Sub Total GF.NCO-II		**1,690**	**1,180**	
	15	TPS Muzaffargarh #1-6	RFO/ FO/ Gas	1,350	1,130	
	16	NGPS Multan #1&2	Gas/ RFO/HSD / FO	195	60	
	17	GTPS Faisalabad #I-9	Gas liSU	244	210	
	18	SPS Faisalabad # 1&2	FO / Gas / RFO	132	100	
	19	Shahdra G.T.	Gas	44	30	
		Sub-Total GENCO-III		**1,965**	**1,530**	
	20	FBC Lakhra	Coal	150	30	
		Sub-Total GENCO-IV		**150**	**30**	
		Sub-Total GENCOs		**4,829**	**3,580**	
	Nuclear					
	21	Chashma Nuclear (PAEC)-I	Uranium	325	300	
	22	Chashma Nuclear (PAEC)-II	Uranium	340	315	
		Sub-Total (Nuclear)		**665**	**615**	
Private Sector	**Hydel IPPs**					
	23	Jagran Hydel	Water	30	30	10
	24	Malakand-III IHydel	Water	81	81	20
	25	New Bong Escape	Water	84	84	34
		Sub-Total (Hydel IPPs)		**195**	**195**	**64**
	Thermal IPPs					
	26	KAPCO	RFO/Gss/HSD	1,638	1,386	
	27	Hub Power Project HUBCO	RFO	1,292	1,200	
	28	Kohinoor Energy Ltd. (KEL)	RFO	131	124	
	29	AES Lalpir Ltd	RFO	362	350	
	30	AES Pak Gen(Pvt) LTd	RFO	365	350	
	31	SEPCOL	RFO	135	119	
	32	Habibullah Energy Ltd	Gas	140	129	
	33	Uch Power Project	Gas	586	551	
	34	Rouch(Pak) Power Ltd	Gas	450	395	
	35	Fauji Kabirwala	Gas	157	151	
	36	Saba Power Company	RFO	134	125	
	37	Japan Power Generation	RFO	135	120	
	38	Liberty Power Project	Gas	235	211	
	39	Altern Energy Ltd.	Gas	31	31	
	40	Attock Generation PP	RFO	163	156	
	41	Atlas Power	RFO	219	219	
	42	Engro PP, Daharki	HSD/Gas/FO	226	217	
	43	Saif PP Sahiwal	Gas/HSD	225	225	
	44	Orient PP Balloki	Gas/HSD	225	225	
	45	Nishat Power Project	RFO	200	200	
	46	Nishat Chunian Project	RFO	200	200	
	47	Foundation Power	Gas	175	175	
	48	Saphire Muridke	Gas/HSD	225	209	
	49	Liberty Tech	RFO	200	196	
	50	Hubco Narowal	RFO	220	214	
	51	Halmore Bhikki	HSD/Gas	225	209	
		Sub-Total Thermal IPPs		**8,294**	**7,687**	
	Wind Power Projects					
	52	Fauji Wind Power	Wind	50	45	17
	53	Zorlu Energy Wind Power	Wind	56	48	18
		Sub-Total Wind Power Plants		**106**	**93**	**35**
Total		**Total Wind Power Plants**		**106**	**93**	**35**
		Total Thermal (Public+Private)		**13,123**	**11,267**	
		Total Nuclear		**665**	**615**	
		Total Hydel (Public+Private)		**6,945**	**6,872**	**2,384**
		Total (X-WAPDA DISCOS System)		**20,839**	**18,847**	**14,301**

Note: Power Stations of KESC are not included.

Source: NTDC

The Water and Power Development Authority (WAPDA), generating companies (GENCOs), KESC, independent power producers (IPPs), and the Pakistan Atomic Energy Commission (PAEC) operate the power stations in Pakistan. After the disintegration of WAPDA in the 1990s, one wing of WAPDA is now responsible for the planning and construction of hydropower plants, while another wing is responsible for the operation of hydropower plants. The GENCOs, which have been formed after the reform of WAPDA, operate thermal power stations with a total capacity of 4,829 MW. Many IPPs are also involved in generating electricity in Pakistan. The total installed capacity of hydropower and thermal power stations operated by IPPs is 8,489 MW, of which the capacity of thermal power station is 8,294 MW. These thermal power stations are using gas furnace oil (FO) and high speed diesel (HSD) as fuel for generating electricity.

Tarbella and Mangla are major reservoir type power plants with a total capacity of 4,478 MW. During the winter season, the electricity generation capacity of hydropower stations drops down to around 2,500 MW. In winter, the national grid basically depends upon the existing thermal power stations; most of these run on imported oil. As fuel prices rapidly increase, the cost of generation also increases, causing an increase in the circular debt. In this context, GOP had decided to place high priority in the development of domestic resources like coal, hydropower, and renewable energy according to Policy for Power Generation Projects, 2002.

(2) Grid Substations

The NTDC develops, maintains, and operates the substations and transmission lines of the national grid while DISCOs are responsible for substations and transmission networks with capacity of 132 kV and below. The lists of 500 kV and 220 kV substations are shown in **Tables 2.2.2-2** and **2.2.2-3**, respectively.

Table 2.2.2-2 500 kV Grid Substations

S. No.	Name	Capacity	Location as corresponging DISCO	Remarks
1	Sheikh Muhammadi Peshawar	2x450 MVA, 500/220 KV Auto T/F 3x160 MVA, 220/132 KV Power T/F	PESCO	Connected to Tarbela P/H Proposed to connect with Tajikistan at 500 kV DC
2	Rewat	3x450 MVA, 500/200 KV Auto T/F 1x250 MVA and 2x160 MVA, 220/132 KV Auto T/F	IESCO	Connected to Ghazi Barotha P/H &Tarbela P/H
3	Sheikhupura	4x600 MVA, 500/220 kV Auto Power T/F 3x160 MVA, 220/132 kV Power T/F	LESCO	
4	Gatti Faisalabad	3x450 MVA, 500/200 kV Auto T/F 3x117.8 MVAR, 500 kV Shunt Reactors	FESCO	Connected to Ghazi Barotha P/H
5	Nokhar (Gakkhar)	2X600 MVA, 500/220 kV Auto T/F 2X3X37 MVAR, 500 kV Shunt Reactors 3X160 MVA, 220/132 kV Auto T/F	GEPCO	Connected to Ghazi Mangla P/H
6	New Multan	2x450 MVA, 500/220 kV Auto T/F 3X3X37.1 MVAR and 1X 3x54 MVAR 500 kV shunt reactor	MEPCO	Connected to Rousch P/H (IPP)
7	Muzafargarh	2x600 MVA, 500/220 kV and 3x37 MVAR, 500 kV Shunt Reactor	MEPCO	1,370 MW MuzaffarGarh Thermal Power Station
8	Sahiwal (Yousafwala)	2X600 MVA, 500/220 kV Auto T/F 2X3X37 MVAR, 500 kV shunt reactor 4X160 MVA, 220/132 kV Auto T/F	MEPCO	Connected to SAIF P/H
9	Guddu	3X 450 MVA, 500/220 kV. Auto T/F	SEPCO	
10	Dadu	1X450 MVA, 500/220 kV Auto T/F 2 X 3x37 MVAR & 2 X 3x22 MVAR, 500 kV shunt reactors 1X160 MVA, 220/132 kV Power T/F	SEPCO	Connected to Guddu Power House
11	Jamshoro	2x450 MVA, 500/220 kV Auto T/F 4X22x3 MVAR, 500 kV shunt reactors 2x160 MVA, 220/132 Auto T/F	HESCO	Connected to HUBCO P/H (IPP)
12	Grid Station Nki	600 MVA, 500/220 kV Auto T/F	HESCO	Connected to HUBCO P/H

Note: T/F = Transformer, P/H = Power House

Source: NTDC

Table 2.2.2-3 NTDC 220 kV Substations

Sr.	Name	DISCO	Province	No.	MVA	No.	MVA	Total No.	Total MVA
1	Bahawalpur	MEPCO	Punjab	3	160			3	480
2	Bannu(Domail)	PESCO	NWFP	3	160			3	480
3	Bund road	LESCO	Punjab	4	160			4	640
4	Burhan	IESCO	Punjab	4	160			4	640
5	Daudkhel	FESCO	Punjab	2	160			2	320
6	Ghakkar	GEPCO	Punjab	4	160			4	640
7	Hala road	HESCO	Sindh	3	160			3	480
8	Jaranwala	FESCO	Punjab	4	160			4	640
9	Kala shah kaku	LESCO	Punjab	3	160			3	480
10	Ludewala	FESCO	Punjab	3	160			3	480
11	Mardan	PESCO	NWFP	2	160	1	250	3	570
12	New KotLakhpat	LESCO	Punjab	0	160	3	250	3	750
13	Nishatabad	FESCO	Punjab	4	64	1	160	5	414
14	Quetta	QESCO	Baluchistan	3	160			3	480
15	Ravi	LESCO	Punjab			3	250	3	750
16	Samundari road	FESCO	Punjab	3	160			3	480
17	Sangjani	IESCO	Punjab	3	160			3	480
18	Sarfaraznagar	LESCO	Punjab	3	160			3	480
19	Shahibagh	PESCO	NWFP	4	160			4	640
20	Sialkot (Sahowal)	GEPCO	Punjab	3	160			3	480
21	Sibbi	QESCO	Baluchistan	2	160			2	320
22	Shikarpur	HESCO	Sindh	3	160			3	480
23	T.M. Khan	HESCO	Sindh	2	160			2	320
24	Islamabad Univ	IESCO	Punjab			2	250	2	500
25	Vehari	MEPCO	Punjab	3	160			3	480
26	Muzaffargarh	MEPCO	Punjab	2	160			2	320
27	Rohri	SEPCO	Sindh	1	160			1	160
28	WAPDA Town	LESCO	Punjab	3	160			3	480
29	Daharki	SEPCO	Sindh	1	160	1	250	2	410

Source: NTDC

To connect the power stations and substations, 5,077 km of 500 kV and 7,359 km of 220 kV transmission lines are in service within the national grid.

2.2.3 Grid Operation

The national grid is being operated by the National Power Control Centre (NPCC), which is a wing of NTDC. NPCC has a national load dispatch centre in Islamabad. A well-defined grid code for operation is in place that clearly defines the role of NPCC in this respect. Supervisory Control and Data Acquisition System (SCADA) is installed in NPCC. Long-term and short-term planning are being carried out regularly. Daily load forecast is also being carried out and dispatch instructions for the following day are issued to the power stations.

Merit Order Control

Instructions to the power stations are to be based on the availability of the power plants under merit order[1] for power generation plants. The table prepared by NTDC for this purpose is given in **Table 2.2.3-1** below.

[1] The merit order is a way of ranking available power stations in order of marginal generation cost in order to incur the

Table 2.2.3-1 Merit Order for Power Generation Plants

Order in Merit	Plant Groups	Fuel Type	As on June 30, 2012		
			Fuel Cost	O&M Cost	Specific Cost
1	Uch (upto152.375GWh)	Gas	0.29480	0.17573	0.50913
2	Uch (+152.375GWh)	Gas	1.30510	0.17573	1.51943
3	Liberty(upto61.904GWh)	Gas	1.78975	0.26167	2.05142
4	Lakhra	Coal	2.86770	0.19540	3.06310
5	FKPCL	Gas	3.24234	1.56964	3.81198
6	Orient Power	Gas	3.74960	0.17590	3.92550
7	Saphir Electric	Gas	3.74950	0.29600	4.04550
8	Saif Power	Gas	3.74960	0.29930	4.04890
9	Halmore Power	Gas	3.74970	0.30110	4.05080
10	Foundation Power	Gas	3.92880	0.30250	4.23130
11	KAPCO	Gas	4.03475	0.20946	4.24421
12	GTPSFaisalabad5-9	Gas	4.36440	0.02500	4.38940
13	Guddu11-13	Gas	4.33350	0.06890	4.40240
14	Reusch	Gas	4.25470	0.20535	4.46005
15	Energy Energy	Gas	4.22200	0.26350	4.48550
16	HCPC	Gas	4.13784	0.40081	4.53865
17	Altem (Phase-11)	Gas	4.12524	0.51976	4.64500
18	KAPC0-11	Gas	4.42544	0.24501	4.67045
19	Guddu5-10	Gas	4.81490	0.06890	4.88380
20	KAPC0-111	Gas	4.57701	0.47227	5.04928
21	GTPSKotri3-7	Gas	5.19900	0.08990	5.28890
22	Muzaffargarh4	Gas	5.43000	0.02500	5.45500
23	Muzaffargarh1-3	Gas	5.47870	0.02500	5.50370
24	Altem(Phase-1)	Gas	5.30052	0.51976	5.82028
25	Guddu3-4	Gas	5.77780	0.06890	5.84670
26	Muzaffargarh5-6	Gas	6.17440	0.02500	6.19940
27	Guddu1-2	Gas	6.19030	0.06890	6.25920
28	Jamshoro2-4	Gas	6.23220	0.11130	6.34350
29	NGPSMultan1-4	Gas	7.16790	0.02500	7.19290
30	SPS Faisalabad 1-2	Gas	7.29670	0.02500	7.32170
31	GTPSFaisalabadl-4	Gas	7.80370	0.02500	7.82870
32	Liberty(+61.904GWh)	Gas	8.94873	0.26167	9.21040
33	GTPS Kotri1-2	Gas	0.56450	0.08990	0.65440
34	Muzaffargarh4	Mix	1.82370	0.02500	1.84870
35	Muzaffargarh1-3	Mix	1.93005	0.02500	1.95505
36	Engro Power Gen.	Mix	1.71920	0.26720	1.98640
37	Guddu3-4	Mix	2.39695	0.06890	2.46585
38	Jamshoro2-4	Mix	3.21315	0.11130	3.32445
39	Muzaffargarh5-6	Mix	3.44495	0.02500	3.46995
40	KAPC0-1	RFO	3.24213	0.36334	3.60547
41	Nishat Power	RFO	3.39010	0.73770	4.12780
42	NishatChunian	RFO	3.44930	0.73590	4.18520
43	Attock Gen.	RFO	3.48180	0.74910	4.23090
44	Liberty Power Tech.	RFO	3.44000	0.81830	4.25830
45	Atlas Power	RFO	3.68610	0.73770	4.42380
46	KEL	RFO	4.29075	0.45320	4.74395
47	KAPC0-11	RFO	4.53346	0.51145	5.04491
48	Japan Power	RFO	4.61336	0.43274	5.04610
49	SEPCOL	RFO	4.48184	0.75477	5.23661
50	HUBCONarowal	RFO	4.60500	0.68800	5.29300
51	NGPS Multan1-4	Mix M	5.66275	0.02500	5.68775
52	LalPir Power	RFO	5.58806	0.12982	5.71788
53	Pak Gen. Power	RFO	5.58806	0.12982	5.71788
54	HUBCO	RFO	5.60725	0.15942	5.76667
55	Saba Power	RFO	5.76947	0.13534	5.90481
56	SPS Faisalabad 1-2	Mix	5.99675	0.02500	6.02175
57	Jamshoro I	RFO	7.53560	0.11130	7.64690
58	Orient Power	HSD	7.92820	0.28850	8.21670
59	KAPC0-1	HSD	8.02173	0.21063	8.23236
60	Muzaffargarh4	RFO	8.21740	0.02500	8.24240
61	SapphireElectric	HSD	7.83500	0.42720	8.26220
62	Halmore Power	HSD	7.84940	0.43450	8.28390
63	Muzaffargarh1-3	RFO	8.38140	0.02500	8.40640
64	Saif Power	HSD	8.03060	0.43200	8.46260
65	Guddu3-4	RFO	9.01610	0.06890	9.08500
66	Enro Power Gen.	HSD	9.21640	0.27090	9.48730
67	KAPC0-11	HSD	9.77906	0.28318	20.06224
68	Jamshoro2-4	RFO	20.19410	0.11130	20.30540
69	Muzaffargarh5-6	RFO	20.71550	0.02500	20.74050
70	GTPSFaisalabad5-9	HSD	21.13620	0.02500	21.16120
71	KAPC0-111	HSD	20.45576	0.71511	21.17087
72	NGPSMultan1-4	RFO	24.15760	0.02500	24.18260
73	SPS Faisalabad 1-2	RFO	24.69680	0.02500	24.72180
74	GTPSKotri3-7	HSD	24.77840	0.08990	24.86830
75	NGPSMultan1-4	HSD	37.79140	0.02500	37.81640
76	GTPSKotri1-2	HSD	50.35030	0.08990	50.44020

Source: National Power Control Centre (NTDC "State of Industry Report 2012", NEPRA)

Daily allocations of electrical power to the DISCOs are also prepared and dispatched by NPCC. These allocations are in accordance with the fixed percentage sharing of net generation of the national grid.

Table 2.2.3-2 below shows the shares of DISCOs to the net available power from the national grid.

Table 2.2.3-2 DISCO-wise Percent Sharing of Net Generation

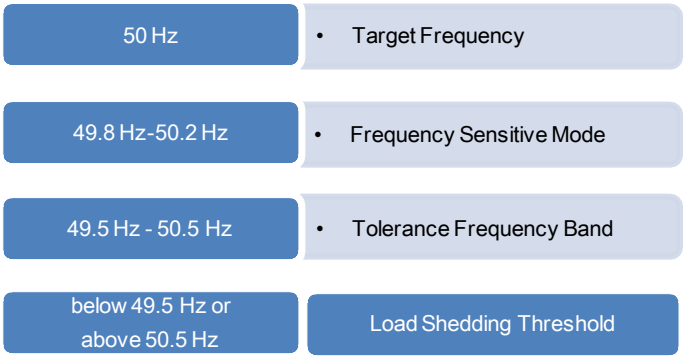
DISCO	Percentage Sharing of Net Generation
LESCO	21.0
FESCO	12.0
GEPCO	8.0
MEPCO	15.0
IESCO	10.0
PESCO& TESCO	16.0
HESCO	6.5
SEPCO	5.5
QESCO	6.0
Total	**100**

Source: PEPCO

System Frequency Control

The NPCC controls all the power stations connected to the national grid in order to maintain the target system frequency of 50 Hz. In practice, the system frequency varies mainly because of the changes in the system load. System operation with frequency in the range from 49.8 Hz to 50.2 Hz is considered as "frequency sensitive mode". System operation with frequency in the range from 49.5 Hz to 50.5 Hz is considered as "tolerance frequency band". Frequency outside the 49.4 Hz to 50.5 Hz range is considered unacceptable and is known as "load shedding threshold" or "contingency frequency band", as shown in **Figure 2.2.3-1**.

During operation, NPCC tries to keep the system within the frequency sensitive mode.



Source: Prepared by the JICA Survey Team

Figure 2.2.3-1 System Frequency Range

2.2.4 Import of Electricity

At present, Pakistan imports electric power from Iran to feed some areas in Balochistan, which have no connection to the national grid. The details of interconnections are as shown below.

- ✓ Mirjawa (Iran) –Taftan (Pakistan) interconnection (20 kV) - capacity of 2 MW.
- ✓ Jalgh (Iran) – Mashkail (Pakistan) interconnection (20 kV) - capacity of 2 MW.
- ✓ Jackigur (Iran) –Mand (Pakistan) interconnection (132 kV) – capacity of 70 MW; power to Makran Division through 132 kV grid station at Mand

Annual electric energy imported from Iran through these connections is given in **Table 2.2.4-1** below.

Table 2.2.4-1 Imported Energy

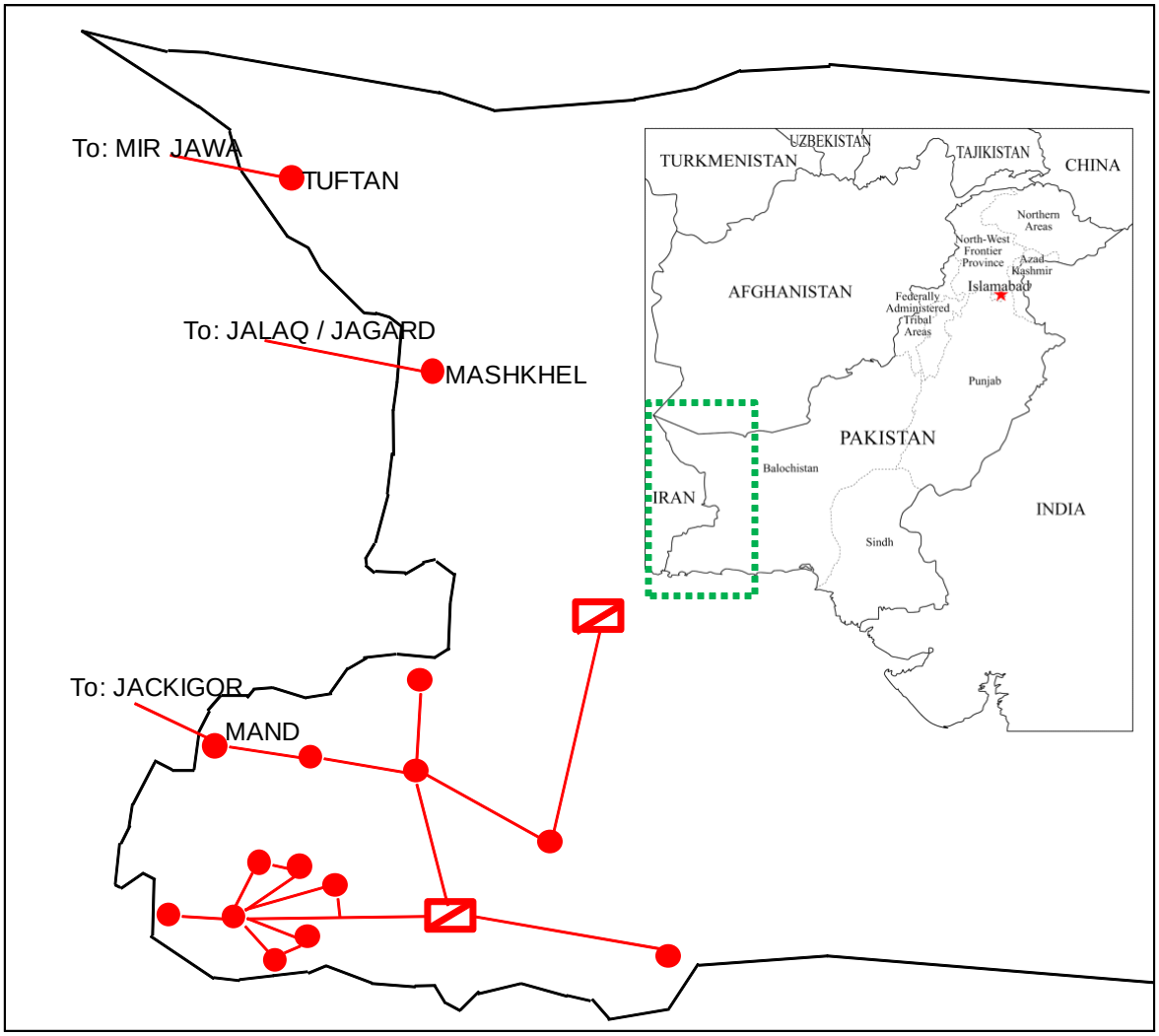
(Unit: GWh)

Year	2007-08	2008-09	2009-10	2010-11	2011-12
Energy imported	199	227	249	269	296

Source: "State of Industry Report 2012" (NEPRA)

The price of the imported energy depends upon the monthly average crude oil price. This may vary within US$0.07-0.10/kWh.

Figure 2.2.4-1 shows the cross-border grid between Pakistan and Iran.



Source: Prepared by the JICA Survey Team base on "QESCO Electricity Demand Forecast", (December, 2012) and the map available on http://www.freemap.jp/

Figure 2.2.4-1 Cross-border Grid between Pakistan and Iran

2.2.5 Issues of National Grid

(1) Large Gap between Supply and Demand

The demand forecast report published by NTDC in December 2012 indicates that the peak demand of the national grid stands at 21,490 MW for 2013-14. The installed capacity of the national grid is around 23,000 MW, including the generation capacity of KESC.

The hydropower generation capacity drops to around 2,500 MW during winter because of the low water flow in the rivers. Since the country requires gas for heating and cooking, its quantity is not sufficient for the production of electricity. Against this circumstance, most of the thermal power plants in Pakistan are using imported furnace oil. Rapid price increase of imported fuel has harmfully affected the budget of this sector which then results in the reduction of electricity generation. This results in the availability of generation plants that have much lower capacity than their installed capacity. Therefore, the total capacity available in the national system remains at 75% (15,629 MW) of the total installed capacity without KESC, which is 20,839 MW, throughout the year. There is a gap of 6,000 MW in available power supply and demand.

The difference between demand and supply remains a main issue of the national grid. However, this situation will not be improved anytime soon.

(2) Aged/Deteriorated Facilities

Most of the power plants are old and inefficient. WAPDA and GENCOs are taking up rehabilitation works, but because of financial constraints, the rehabilitation works carried out so far cannot be considered sufficient. This leads to the decrease in GENCOs' power generation capacity by 600 MW in 2012 (State of Industry Report 2012). Similarly, the WAPDA-owned power stations are also very old. For example, Units 1-4 of the Mangla Hydropower Station are 43 years old. Maintenance of these machines takes longer time and their reliability even after maintenance remains poor.

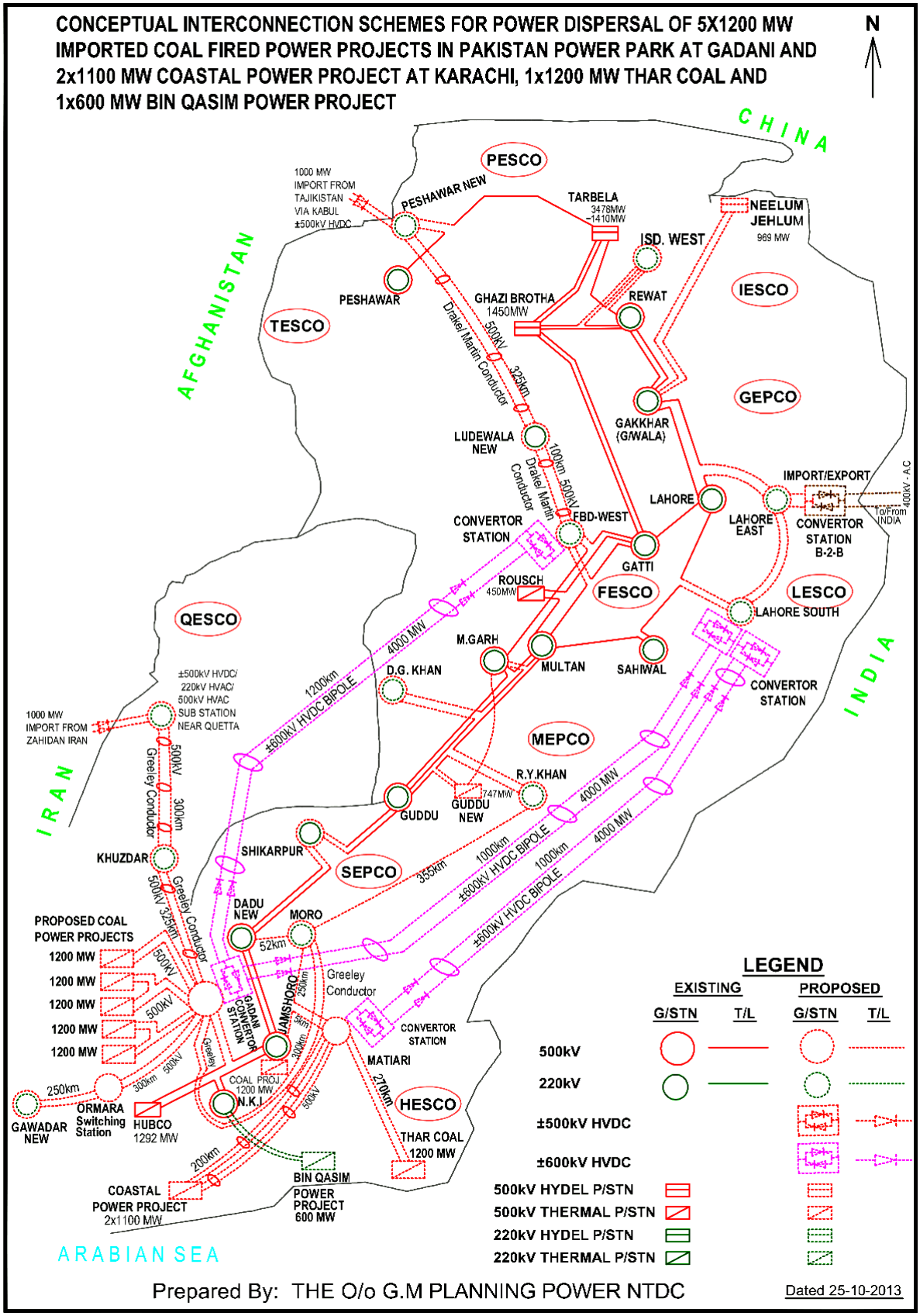
(3) Overloaded Transmission Capacity

The NTDC report indicates that at least two 220 kV transmission lines are facing transmission constraints. Similarly, about twenty 220 kV and five 500 kV transformers are facing overload problems. Augmentation of these transmission lines and transformers in G/Ss are required to satisfy the annual demand growth which is in the range of 6% per year.

(4) Power Evacuation Problem

The IPPs have geared up for the construction of wind generating plants with a total capacity exceeding 1,000 MW in Sindh Province. However, the evacuation of electricity from these wind power generation projects is not fully assured as of this date. The Sindh Provincial Government is exploring the possibility of establishing a private transmission company within the prevailing legal framework for speedy construction of transmission lines that are required for power evacuation from such plants.

New transmission lines are required for evacuating power from ongoing projects, planned generation projects, and planned import of electricity. For the evacuation of electricity from extremely large-scale projects, NTDC has prepared a transmission line expansion plan which is given in **Figure 2.2.5-1** below. However, the financing arrangement for its implementation is not clear.



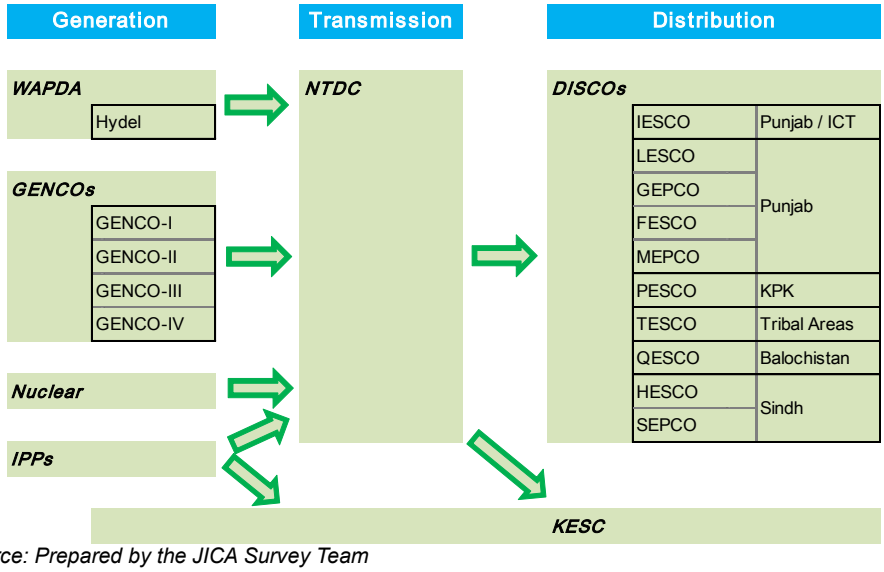
Source: Planning Power Department of NTDC

Figure 2.2.5-1 Transmission Line Expansion Plan of NTDC

2.3 Distribution in Punjab and Sindh Provinces and Islamabad Capital Territory

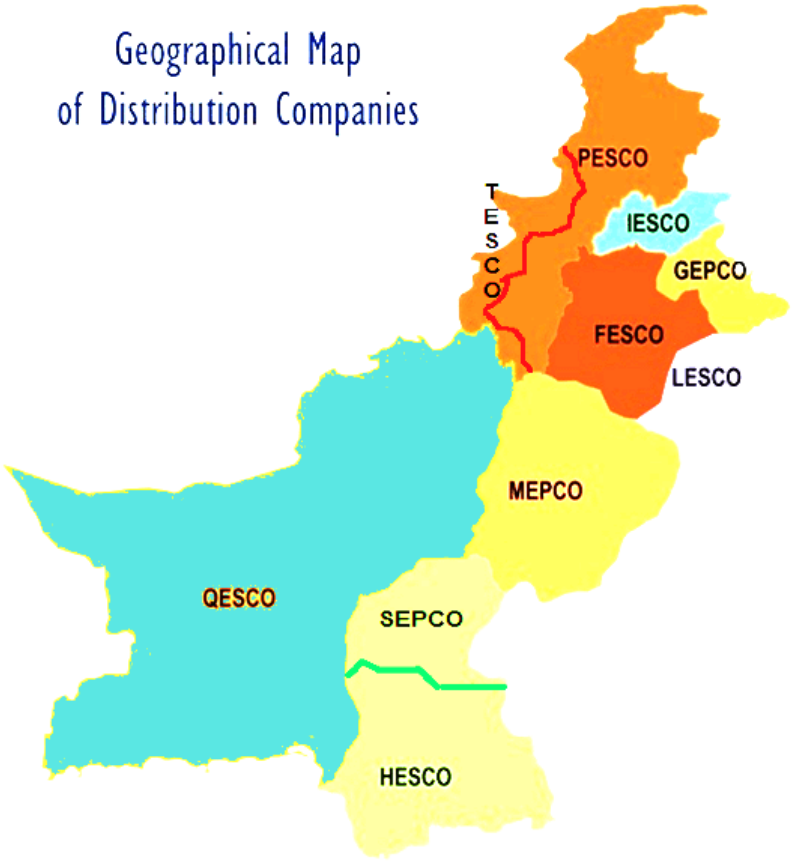
2.3.1 Overview

Ten DISCOs and one vertically integrated company, KESC, are responsible for electricity distribution in Pakistan. **Figure 2.3.1-1** shows the electricity flow from generation to DISCOs and KESC. The service territories of DISCOs and KESC are shown in **Figure 2.3.1-2**.



Source: Prepared by the JICA Survey Team

Figure 2.3.1-1 Electricity Flow from Generation to DISCOs and KESC



Source: Website of USAID Power Distribution Program (Reproduced by the JICA Survey Team)

Figure 2.3.1-2 Geographical Jurisdiction Territories of DISCOs

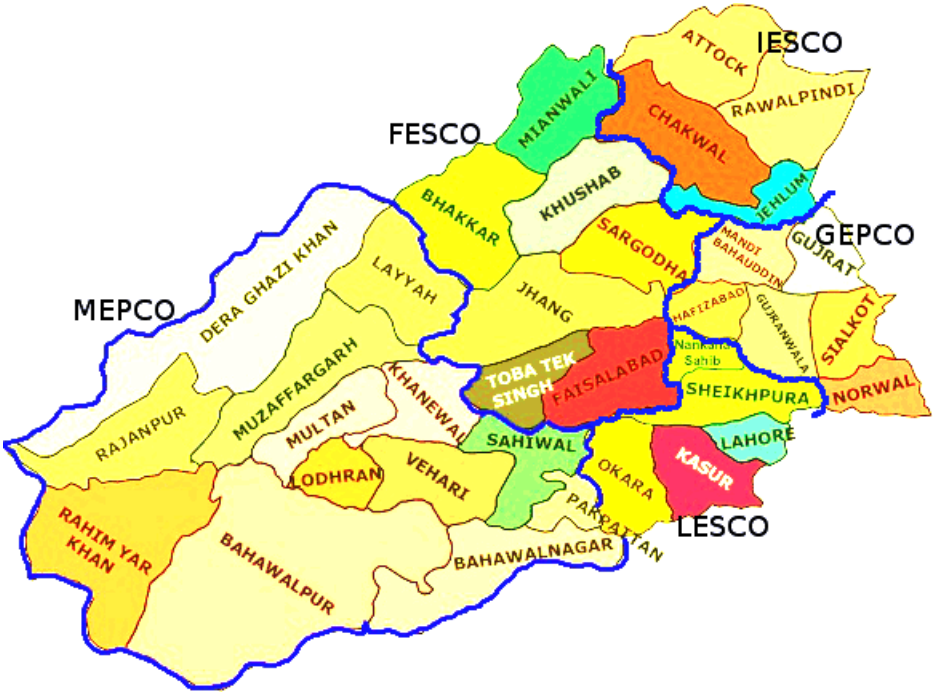
The target areas of this survey are:

- ✓ Islamabad Capital Territory (IESCO)
- ✓ Punjab Province (IESCO, LESCO, GEPCO, FESCO, and MEPCO)
- ✓ Sindh Province (SEPCO, HESCO, and KESC[2])

The DISCOs receive power from NTDC mostly from the 132 kV facilities originated in the 500 kV and 220 kV G/Ss owned by NTDC. DISCOs then transmit electricity to their 132 kV and 66 kV substations within their territory. These 132 kV and 66 kV substations supply electricity to the consumers in their service area mainly through their 11 kV distribution feeders.

2.3.2 Distribution in Punjab Province

Punjab Province covers an area of 205,344 km^2 and is one of the most populated provinces in Pakistan with 101 million people as of 2013. Five DISCOs are operating in this province; they are IESCO, GEPCO, FESCO, LESCO, and MEPCO, as illustrated in **Figure 2.3.2-1** below.



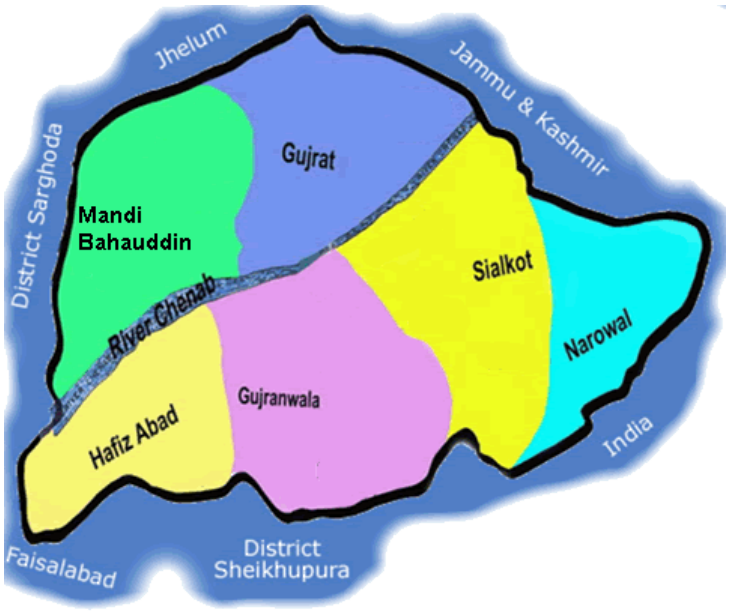
Source: Prepared by the JICA Survey Team based on MEPCO Presentation

Figure 2.3.2-1 Five DISCOs Operating Areas in Punjab Province

(1) GEPCO

Gujranwala Electric Power Company (GEPCO) is supplying electricity to the districts of Gujranwala, Gujrat, Sialkot, Narowal, Mandi Bahauddin, and Hafizabad, as shown in **Figure 2.3.2-2**.

[2] KESC is out of scope of the survey since KESC is a private company.

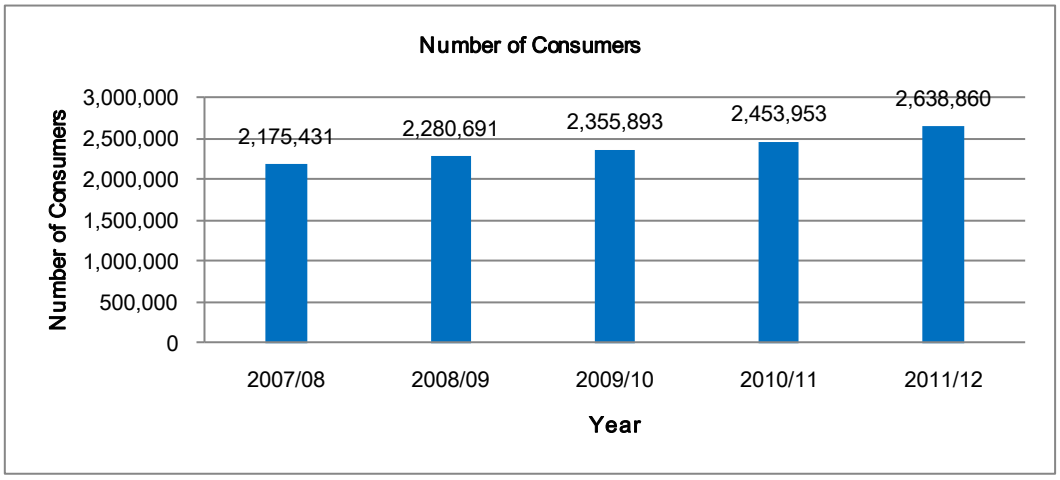


Source: Website of GEPCO (Reproduced by the JICA Survey Team)

Figure 2.3.2-2 Map of the GEPCO Distribution Area

NUMBER OF CONSUMERS

The historical record of the number of consumers within GEPCO jurisdiction is given in **Figure 2.3.2-3**. In 2011/12, GEPCO had 2,638,860 consumers. Out of the total number of consumers, 2.26 million (85.6%) were domestic consumers, 290,000 (11.0%) were commercial consumers, and 37,000 (1.4%) were agricultural consumers.

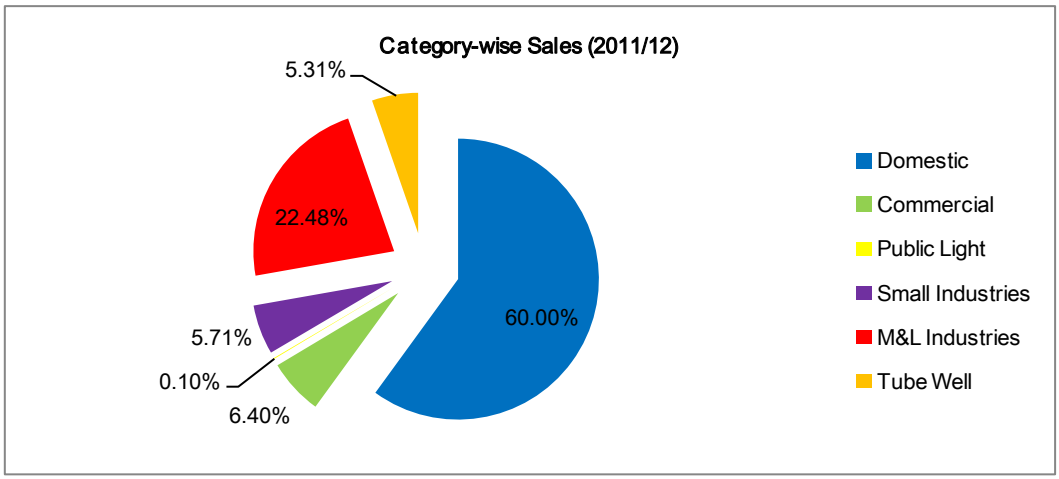


Source: "GEPCO Demand Forecast Report" (December 2012) (Reproduce by the JICA Survey Team)

Figure 2.3.2-3 Number of Consumers of GEPCO

CATEGORY-WISE SALE

In 2011/12, GEPCO's total sale was 6,178 GWh. Out of the total sales, the consumers in the domestic category consumed 3,707 GWh (60.00%). The electricity consumption of medium, large, and small-scale industries was 28.19%, whereas the consumption by tube wells was 5.31%. The category-wise sale in percentage for 2011/12 is given in **Figure 2.3.2-4** below.

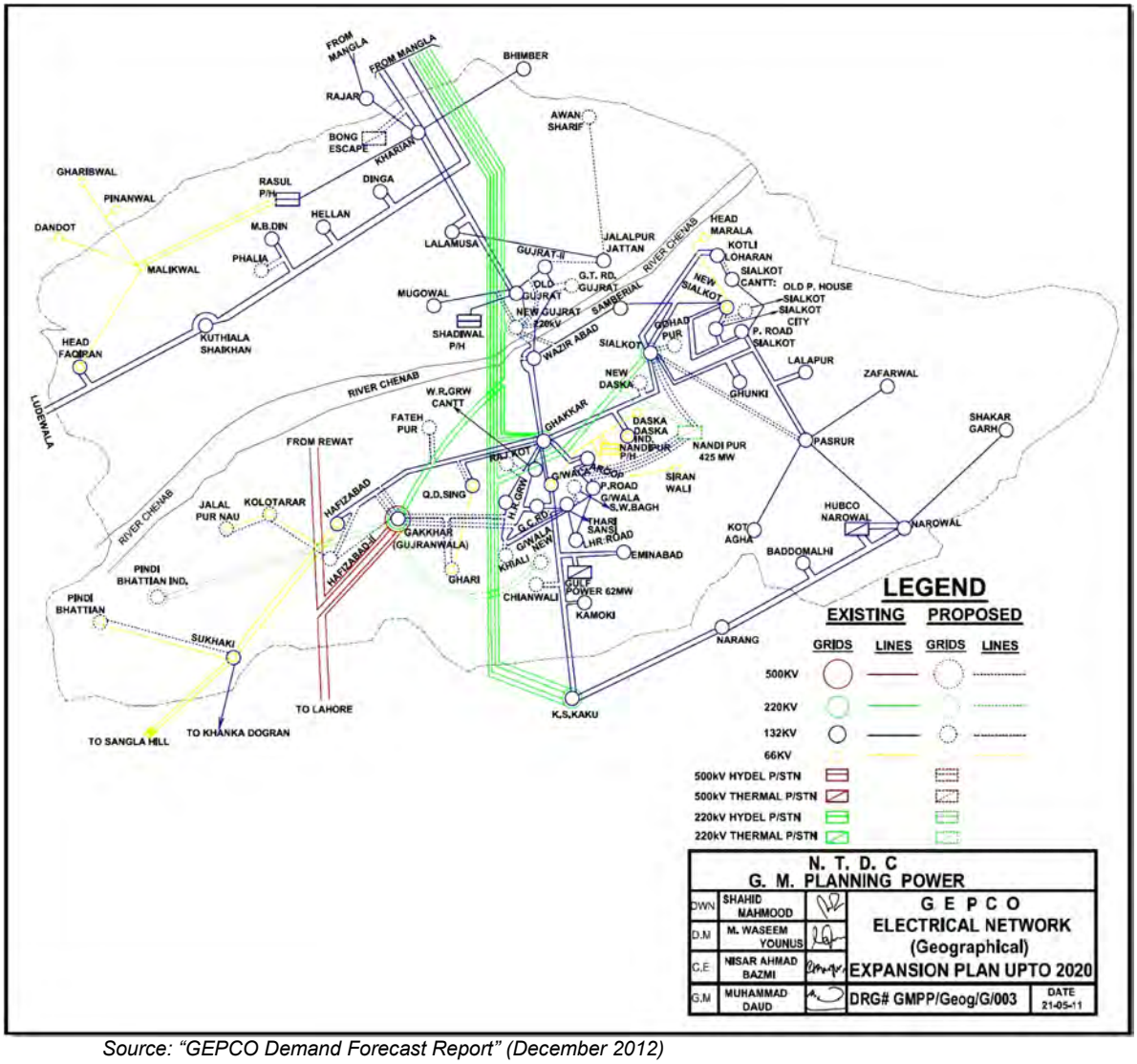


Source: "GEPCO Demand Forecast Report" (December 2012) (Reproduce by the JICA Survey Team)

Figure 2.3.2-4 Category-wise Sale of GEPCO

DISTRIBUTION NETWORK

The distribution network of GEPCO in 2011/12 comprises 42 units of 132 kV substations and seven units of 66 kV substations with 134 power transformers, with a total capacity of 3,255 MVA. GEPCO maintains 1,766 km of 132 kV line and 378 km of 66 kV line. There are more than 12,000 employees working for this company. The distribution network diagram of GEPCO with expansion plan up to 2020 is shown in **Figure 2.3.2-5**.

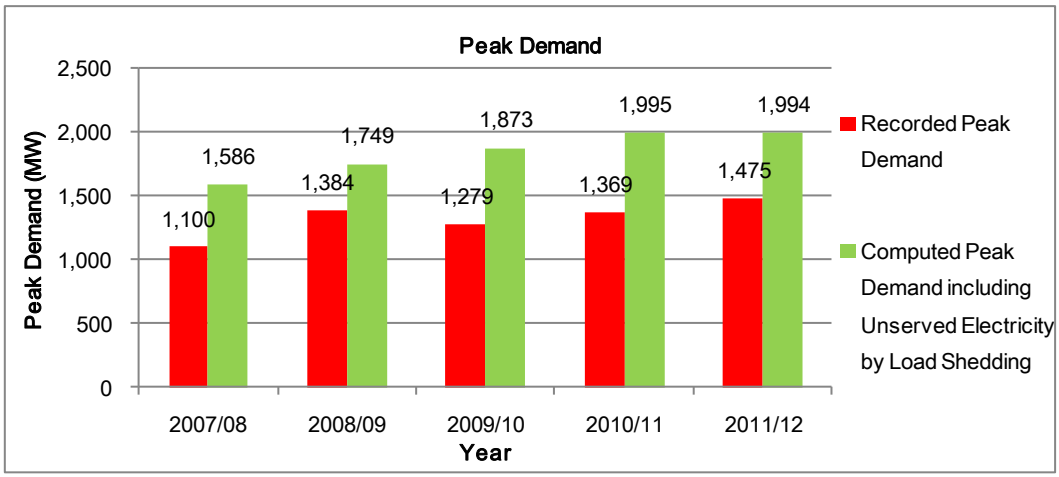


Source: "GEPCO Demand Forecast Report" (December 2012)

Figure 2.3.2-5 GEPCO Distribution Network with Expansion Plan

PEAK DEMAND

Figure 2.3.2-6 below shows GEPCO's recorded and computed peak demand from 2007/08 to 2011/12.



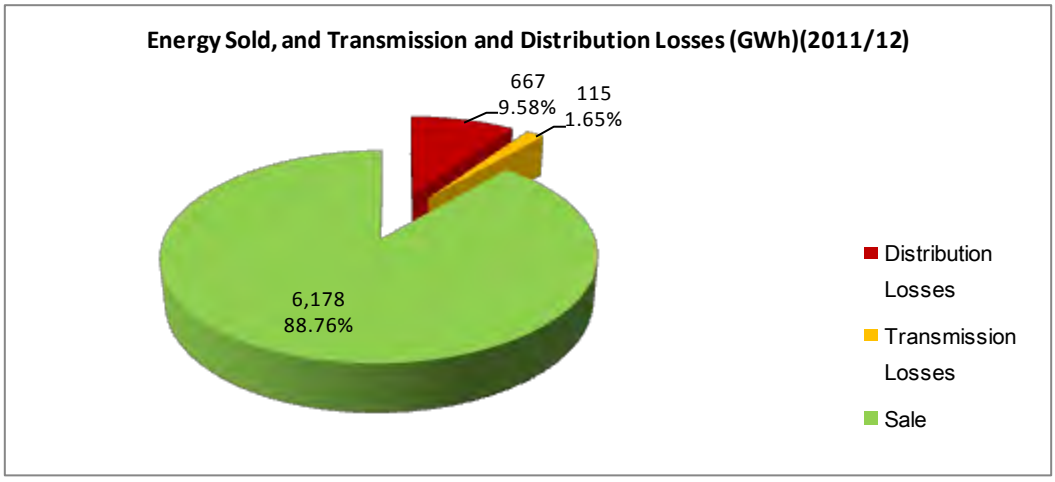
Source: "GEPCO Demand Forecast Report" (December 2012) (Reproduce by the JICA Survey Team)

Figure 2.3.2-6 Historical Recorded and Computed Peak Demand of GEPCO

The GEPCO system has been observing the unbalanced demand and supply for many years. In 2011/12, the system peak supply was recorded at 1,475 MW and the suppressed demand by load shedding has been estimated at 519 MW. The contribution of domestic consumers in the recorded peak of GEPCO was 954 MW. Meanwhile, medium to large industries and small industries contributed 462 MW and 22 MW, respectively.

SOLD ENERGY AND LOSSES

Energy sold to the consumers and losses incurred in distributing the electricity are presented in **Figure 2.3.2-7**. GEPCO's total losses stand at 11.23%. The distribution loss in 2011/12 was 9.58% which is less than that in the previous year (2010/11).

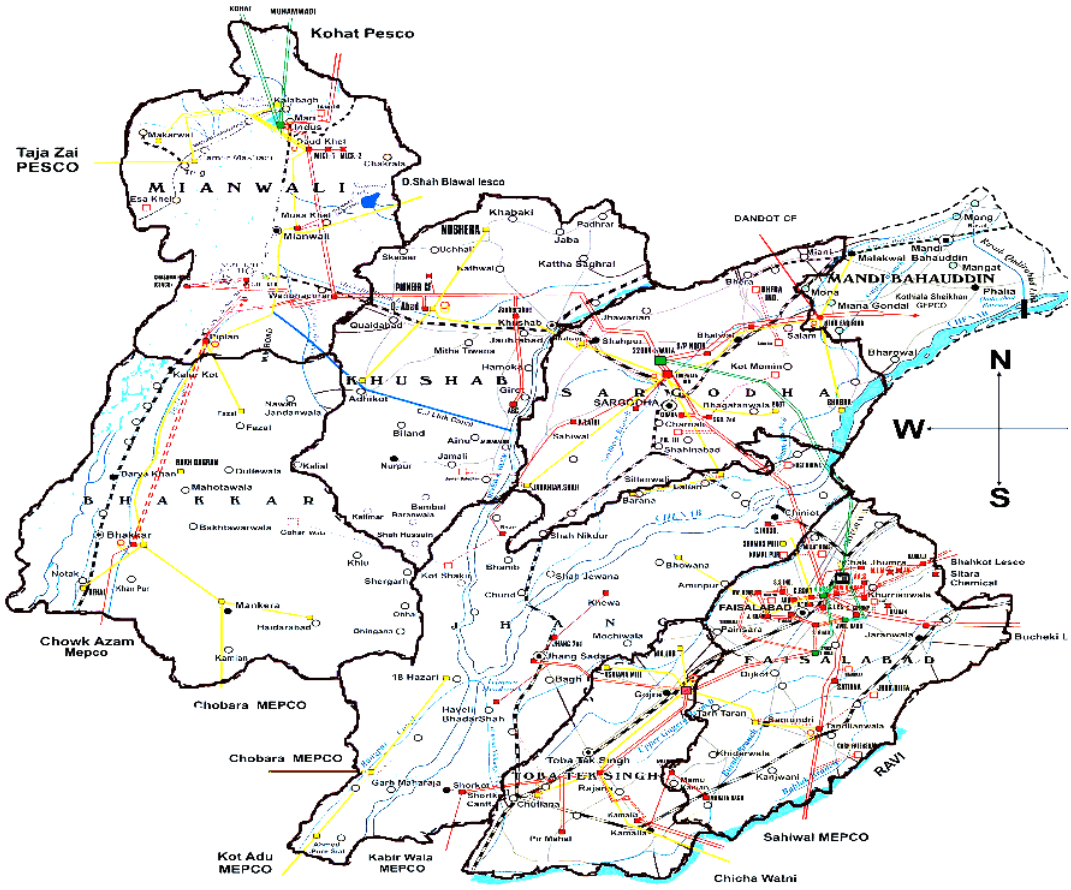


Source: "GEPCO Demand Forecast Report" (December 2012) (Reproduce by the JICA Survey Team)

Figure 2.3.2-7 Energy Sold and Transmission and Distribution Losses of GEPCO

(2) FESCO

Faisalabad Electric Supply Company (FESCO) is supplying electricity to the districts of Faisalabad, Sargodha, Mianwali, Khoshab, Jhang, Bhakhar, Chiniot, and Toba Tak Sing as shown in **Figure 2.3.2-8**.

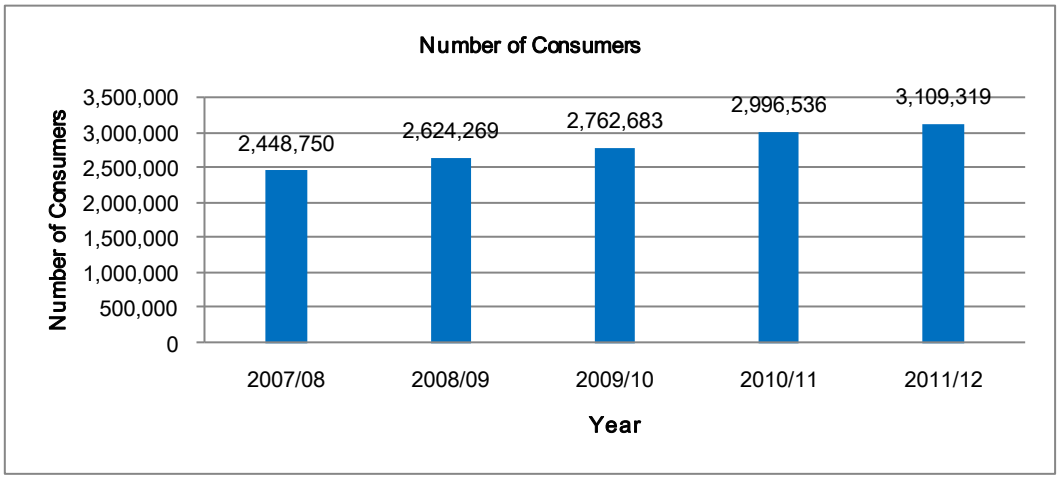


Source: "FESCO Performance Improvement Action Plan 2011", USAID, April 2013

Figure 2.3.2-8 Map of the FESCO Distribution Area

NUMBER OF CONSUMERS

The historical record of the number of consumers within FESCO jurisdiction is given in **Figure 2.3.2-9**. In 2011/12, the number of consumers of this distribution company was 3,109,319. Out of that, 2.71 million (87.2%) were domestic consumers, 316,000 (10.2%) were commercial consumers, and 37,000 (1.2%) were agricultural consumers.

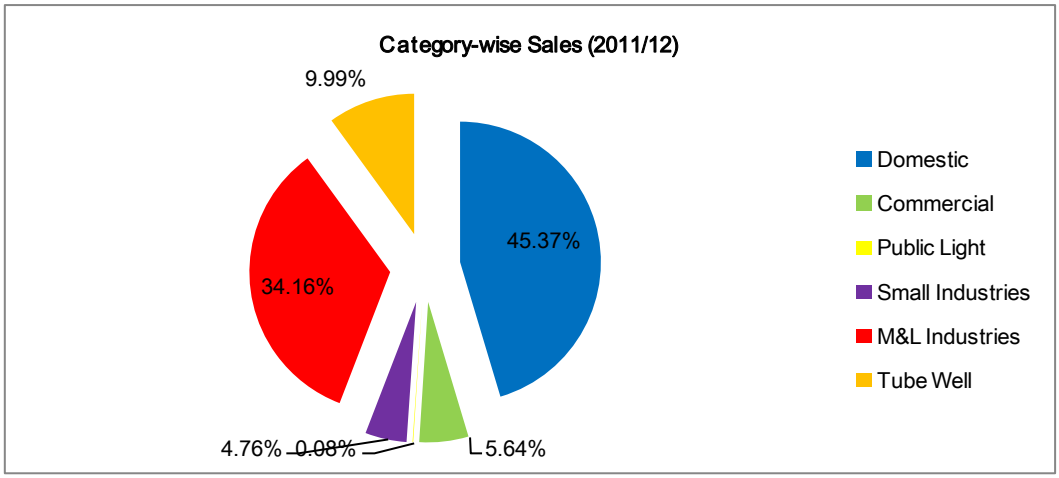


Source: "FESCO Demand Forecast Report" (December 2012) (Reproduce by the JICA Survey Team)

Figure 2.3.2-9 Number of Consumers of FESCO

CATEGORY-WISE SALE

In 2011/12, FESCO's total sale was 8,580 GWh. Out of the total sales, the consumers in the domestic category consumed 3,893 GWh (45.37%). The electricity consumption of medium, large, and small-scale industries was 38.92%, whereas the consumption by tube wells was 9.99%. The category-wise sale in percentage in 2011/12 is given in **Figure 2.3.2-10** below.

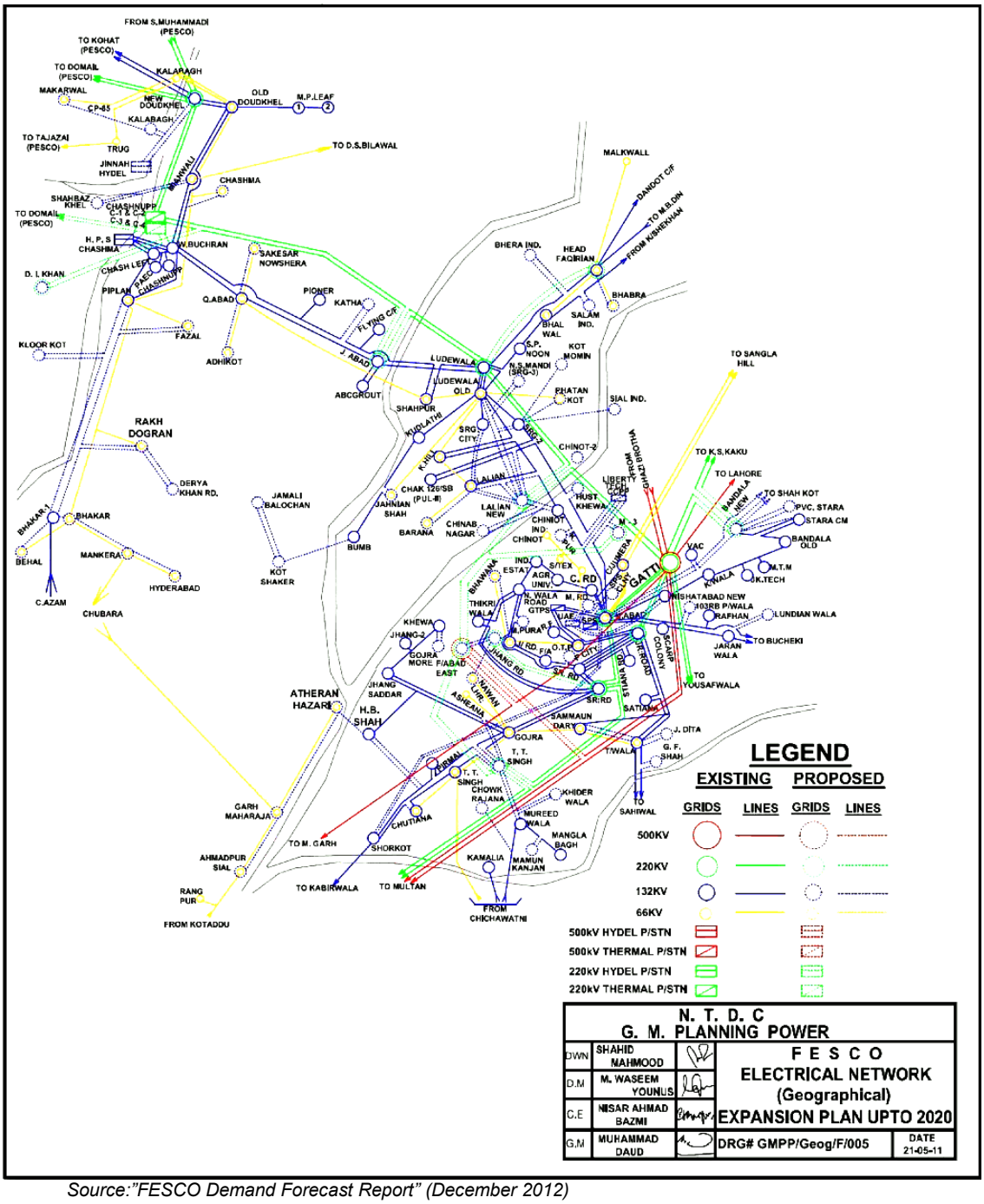


Source: "FESCO Demand Forecast Report" (December 2012) (Reproduce by the JICA Survey Team)

Figure 2.3.2-10 Category-wise Sale of FESCO

DISTRIBUTION NETWORK

The distribution network of FESCO in 2011/12 comprises 55 units of 132 kV substations and 26 units of 66 kV substations. FESCO maintains 1,658 km of 132 kV line and 1,296 km of 66 kV line. There are 16,422 employees working for this company. The distribution network diagram of FESCO, with an expansion plan up to 2020 is shown in **Figure 2.3.2-11**.

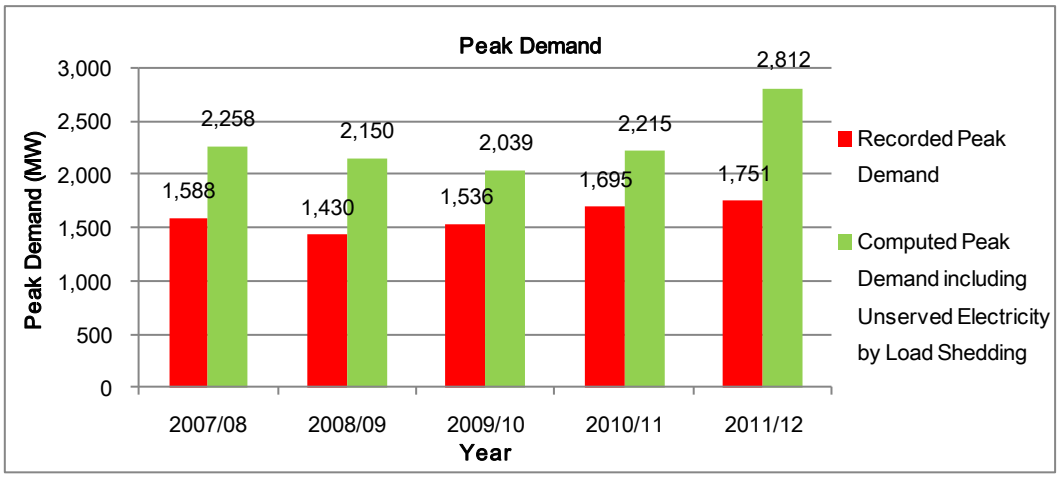


Source:"FESCO Demand Forecast Report" (December 2012)

Figure 2.3.2-11 FESCO Distribution Network with Expansion Plan

PEAK DEMAND

Figure 2.3.2-12 below shows the recorded and computed peak demand of FESCO from 2007/08 to 2011/12.



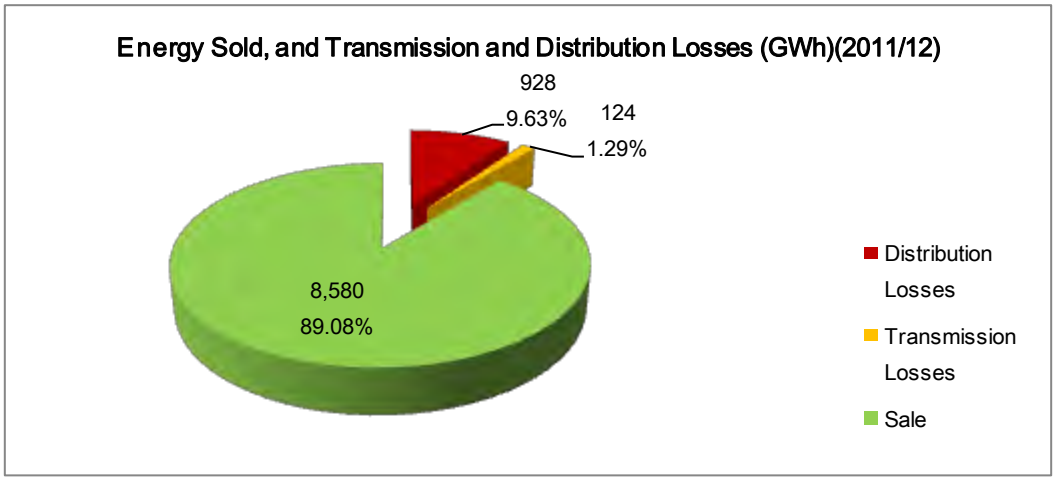
Source: "FESCO Demand Forecast Report" (December 2012) (Reproduce by the JICA Survey Team)

Figure 2.3.2-12 Historical Recorded and Computed Peak Demand of FESCO

The FESCO system has been observing unbalanced demand and supply for many years. In 2011/12, the system peak supply was recorded at 1,751 MW and the suppressed demand by load shedding has been estimated at 1,061 MW. Contribution of domestic consumers, medium and large industries, and small industries in the above recorded peak are 807 MW, 480 MW, and 80 MW, respectively.

SOLD ENERGY AND LOSSES

Energy sold to the consumers and losses incurred in distributing the electricity are presented in **Figure 2.3.2-13**. FESCO's total losses stand at 10.92%. The distribution loss in 2011/12 was 9.63%, which is almost the same as that in the previous year (2010/11).



Source: "FESCO Demand Forecast Report" (December 2012) (Reproduce by the JICA Survey Team)

Figure 2.3.2-13 Energy Sold and Transmission and Distribution Losses of FESCO

(3) LESCO

Lahore Electric Supply Company (LESCO) is supplying electricity to the districts of Lahore, Kasur, Okara, and Sheikhupura as shown in **Figure 2.3.2-14**.

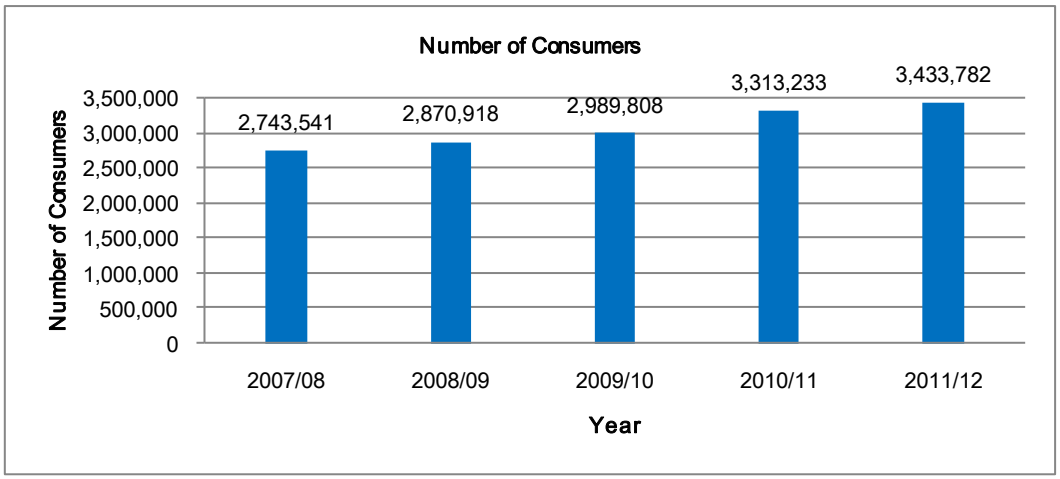
Source: "LESCO Performance Improvement Plan 2011" (page 2) (Reproduced by the JICA Survey Team)

Figure 2.3.2-14 Map of the LESCO Distribution Area

NUMBER OF CONSUMERS

As of September 2013, the number of consumers of LESCO was 3,604,252, which include 2,958,115 domestic consumers, 513,343 commercial consumers, 73,346 industrial consumers, 56,646 tube well consumers, 487 bulk consumers, and 2,315 other consumers.

The historical record of the number of consumers within LESCO jurisdiction is given in **Figure 2.3.2-15**. In 2011/12, the number of consumers was 3,433,782. Out of this total, 2.80 million (81.6%) were domestic consumers, 498,000 (14.5%) were commercial consumers, and 53,000 (1.1%) were agricultural consumers.



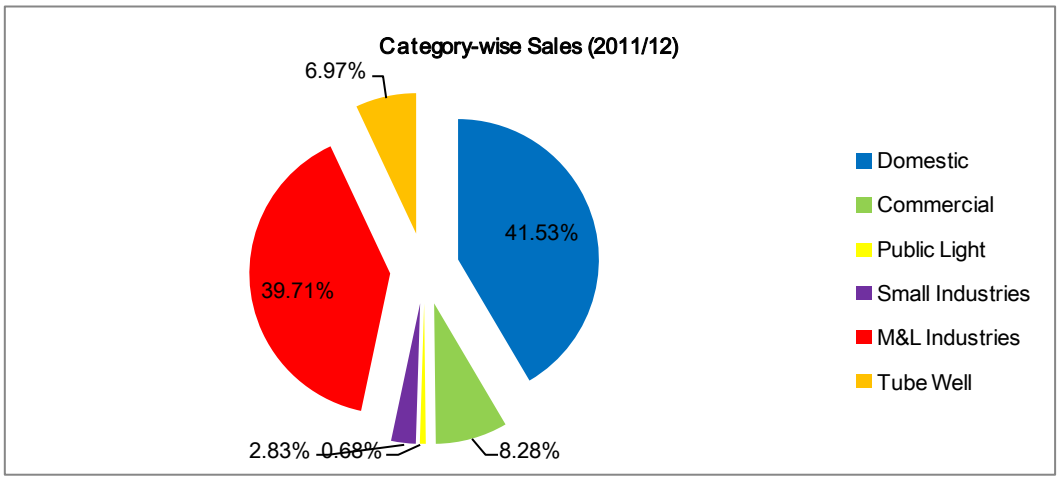
Source: "LESCO Demand Forecast Report" (December 2012) (Reproduce by the JICA Survey Team)

Figure 2.3.2-15 Number of Consumers of LESCO

CATEGORY-WISE SALE

In 2011/12, LESCO's total sale was 14,467 GWh. Out of the total sales, the consumers in the domestic category consumed 6,008 GWh (45.37%). The electricity consumption of medium,

large, and small-scale industries was 42.54%, whereas the consumption by tube wells was 6.97%. The category-wise sale, in percentage, in 2011/12 is given in **Figure 2.3.2-16** below.

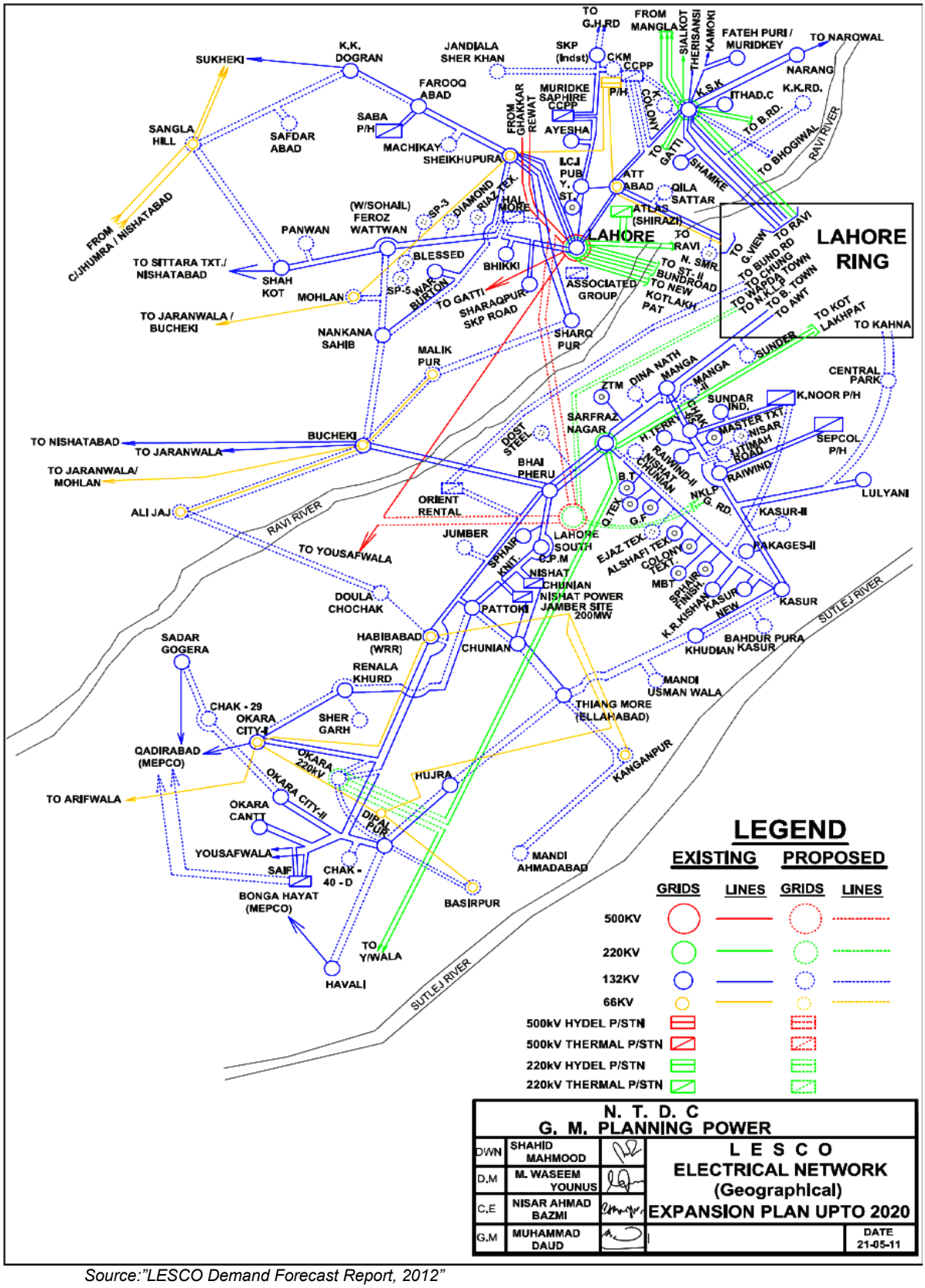


Source: "LESCO Demand Forecast Report" (December 2012) (Reproduce by the JICA Survey Team)

Figure 2.3.2-16 Category-wise Sale of LESCO

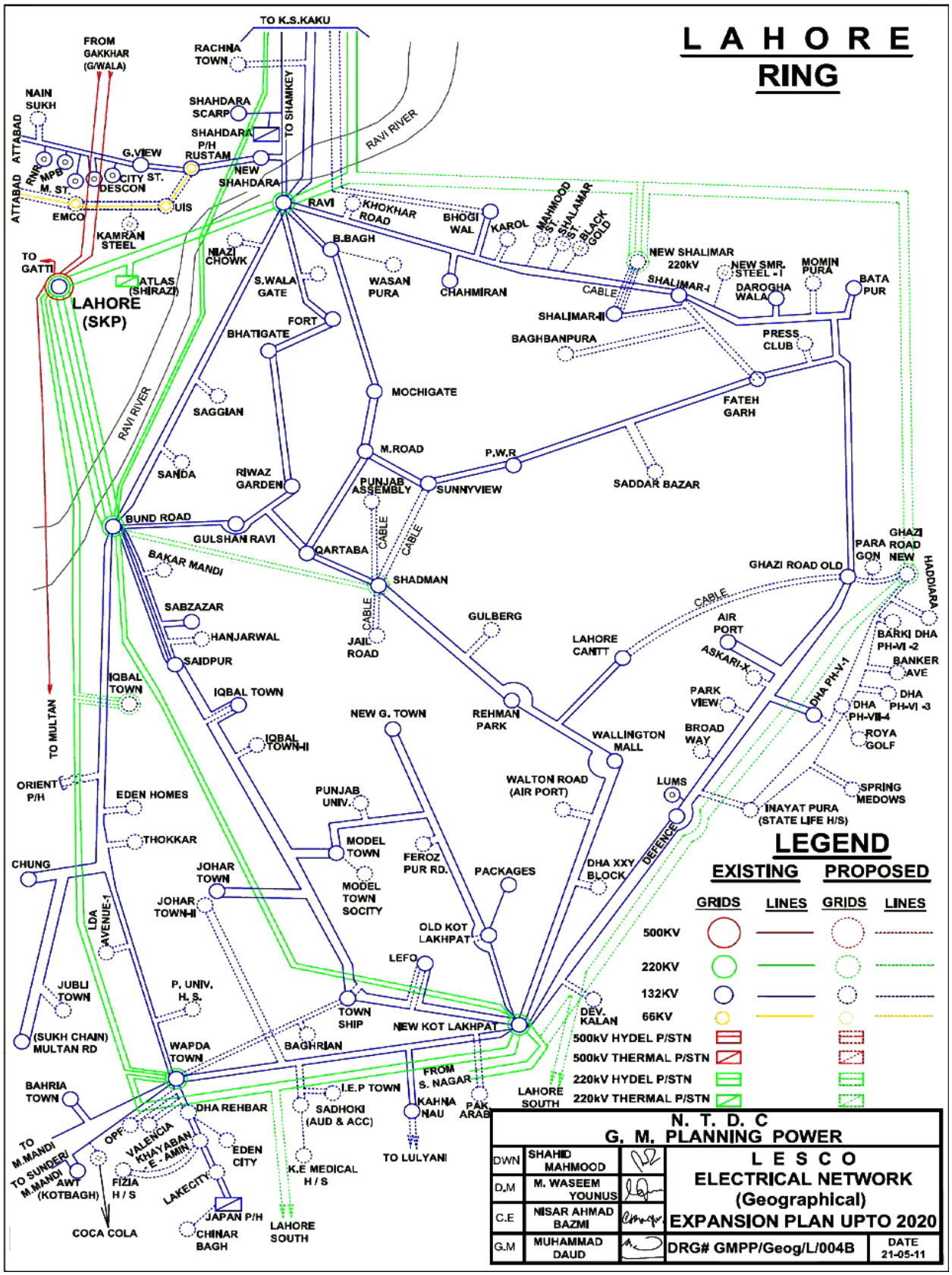
DISTRIBUTION NETWORK

The distribution network of LESCO in 2011/12 comprises 112 units of 132 kV substations and eight units of 66 kV substations. LESCO maintains 1,744 km of 132 kV line and 544 km of 66 kV line. A load monitoring center to supervise and control the network was established in July 2013. There are 19,405 employees working for this company. The distribution network diagram of LESCO, with an expansion plan up to 2020 is shown in **Figure 2.3.2-17** and **Figure 2.3.2-18**.



Source:"LESCO Demand Forecast Report, 2012"

Figure 2.3.2-17 LESCO Distribution Network with Expansion Plan

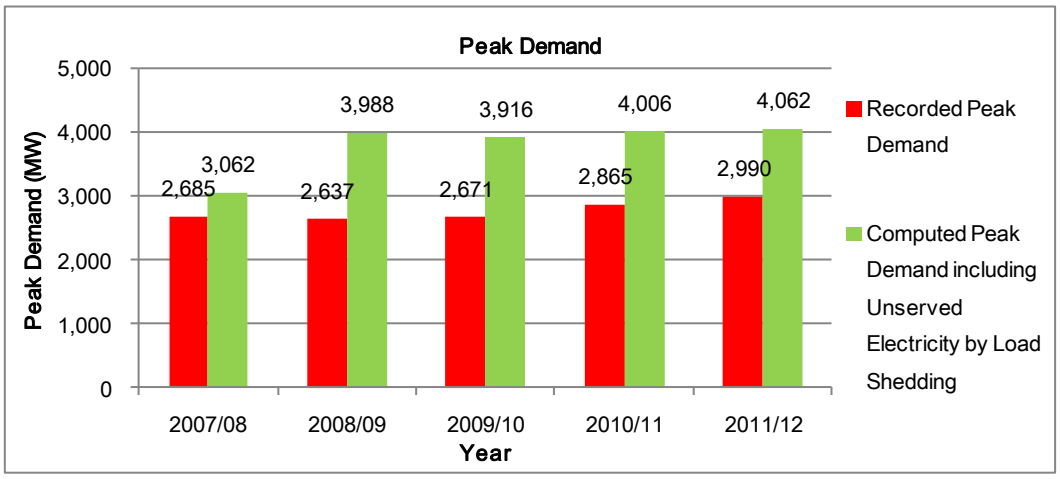


Source:"LESCO Demand Forecast Report, 2012"

Figure 2.3.2-18 LESCO Distribution Network with Expansion Plan (Lahore Ring)

PEAK DEMAND

Figure 2.3.2-19 below shows the recorded and computed peak demand from 2007/08 to 2011/12.



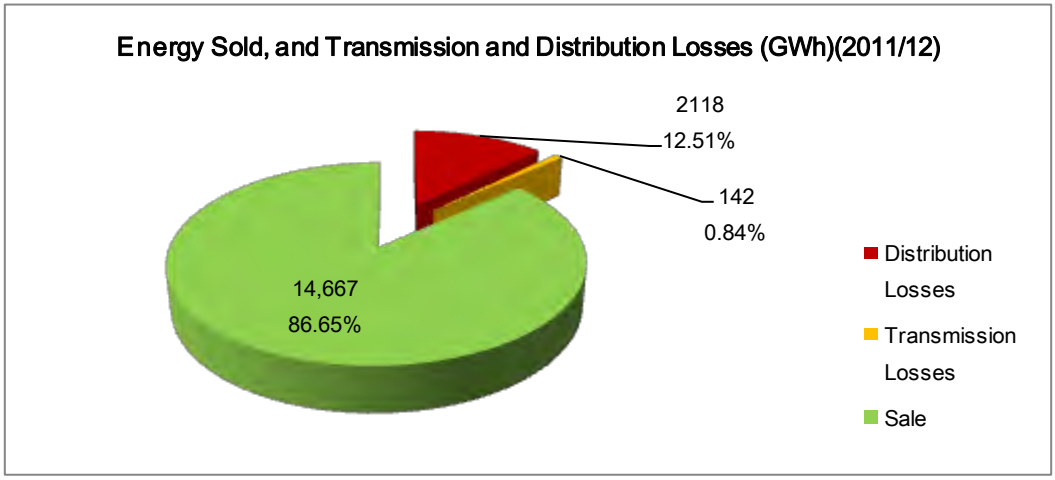
Source: "LESCO Demand Forecast Report" (December 2012) (Reproduce by the JICA Survey Team)

Figure 2.3.2-19 Historical Recorded and Computed Annual Peak Demand of LESCO

The LESCO system has been observing unbalanced demand and supply for many years. In 2011/12, the system peak supply was recorded at 2,990 MW and the suppressed demand by load shedding has been estimated at 1,072 MW. Contribution of domestic consumers, medium and large industries, and small industries in the recorded peak of LESCO are 1,409 MW, 1,204 MW, and 110 MW, respectively.

SOLD ENERGY AND LOSSES

Energy sold to the consumers and losses incurred in distributing the electricity are presented in **Figure 2.3.2-20**. LESCO's total losses stand at 14%. The distribution loss in 2011/12 was 13%, which is almost the same as that in the previous year (2010/11).

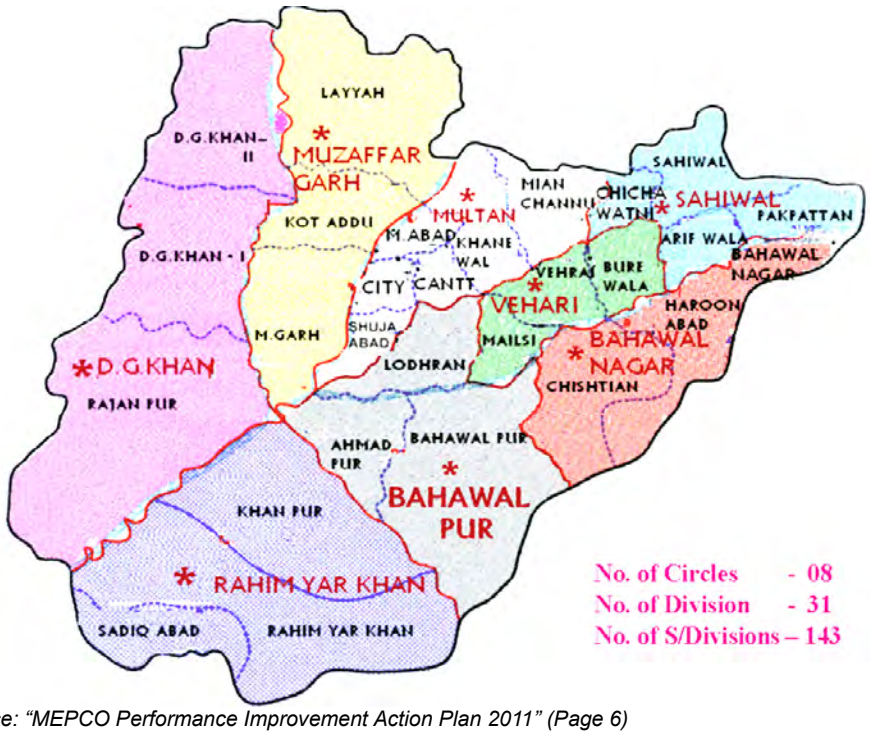


Source: "LESCO Demand Forecast Report" (December 2012) (Reproduce by the JICA Survey Team)

Figure 2.3.2-20 Energy Sold and Transmission and Distribution Losses of LESCO

(4) MEPCO

Multan Electric Power Company (MEPCO) is supplying electricity to the districts of Multan, Sahiwal, Bahawalpur, Bahawal Nagar, Muzzaffargarh, Dera Ghazi Khan, Rahim Yar Khan, and Vehari, as shown in **Figure 2.3.2-21**.

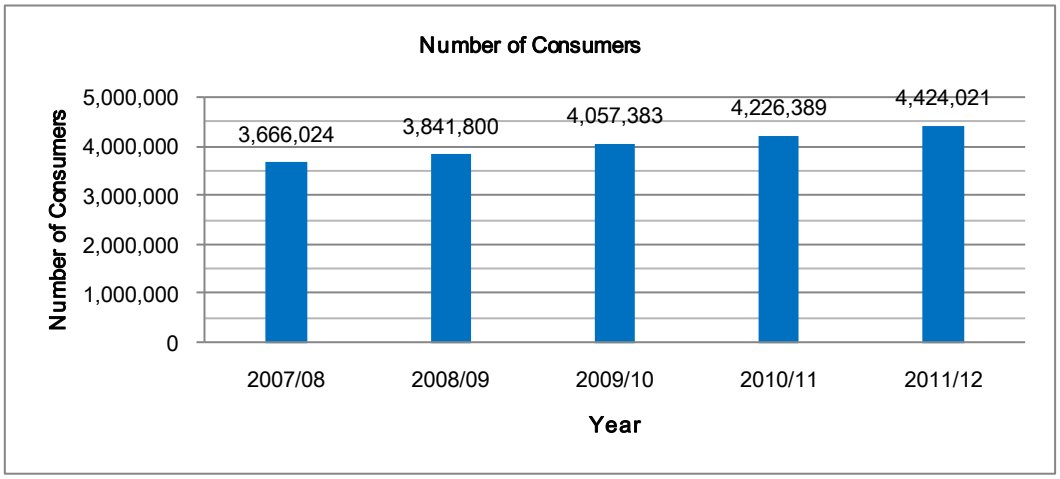


Source: "MEPCO Performance Improvement Action Plan 2011" (Page 6)

Figure 2.3.2-21 Map of the MEPCO Distribution Area

NUMBER OF CONSUMERS

The historical record of the number of consumers within MEPCO jurisdiction is given in **Figure 2.3.2-22**. In 2011/12, the number of consumers of this distribution company was 4,424,021. Out of this total, 3.88 million (87.7%) were domestic consumers, 420,000 (9.5%) were commercial consumers, and 70,000 (1.6%) were agricultural consumers.

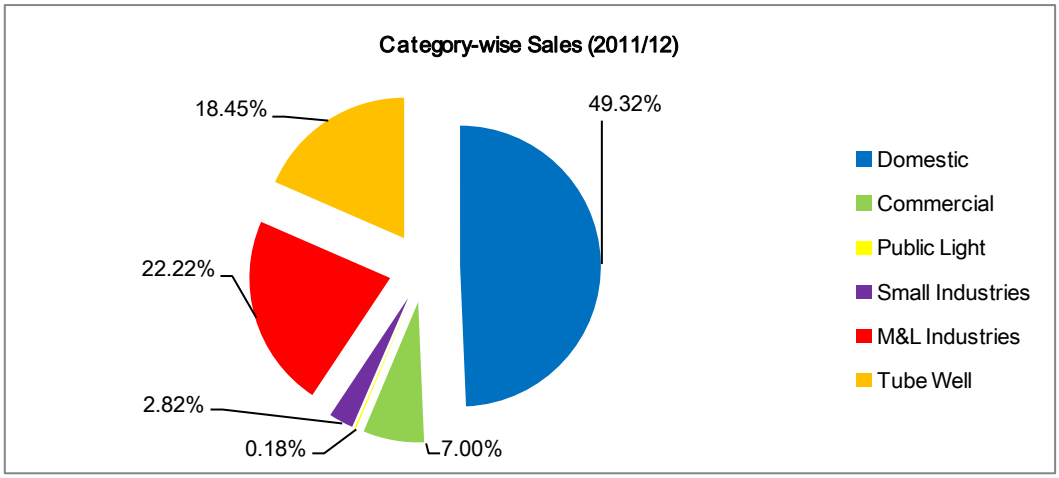


Source: "MEPCO Demand Forecast Report" (December 2012) (Reproduced by the JICA Survey Team)

Figure 2.3.2-22 Number of Consumers of MEPCO

CATEGORY-WISE SALE

In 2011/12, MEPCO's total sale was 10,218 GWh. Out of the total sales, the consumers in the domestic category consumed 5,040 GWh (49.32%). The electricity consumption by medium, large, and small-scale industries was 25.04%, whereas the consumption by tube wells was 18.45%. The category-wise sale, in percentage, in 2011/12 is given in **Figure 2.3.2-23** below.

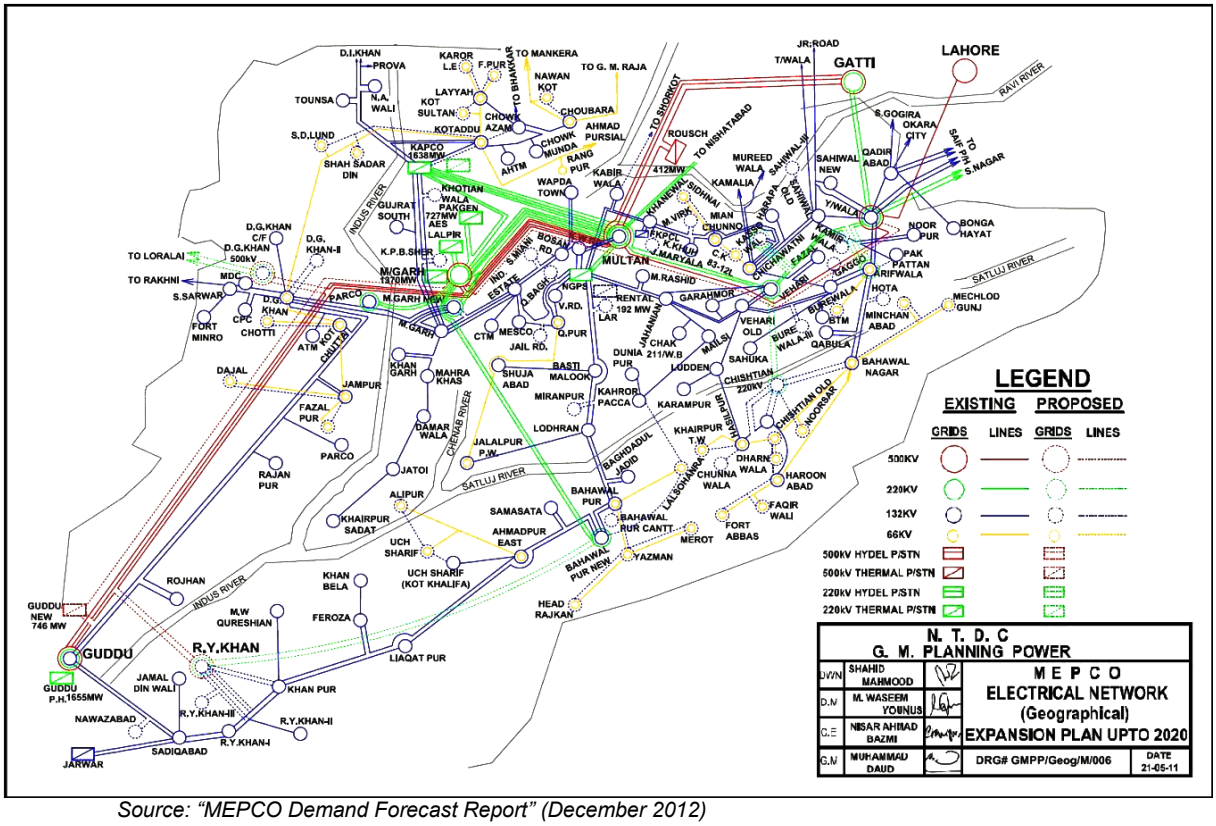


Source: "MEPCO Demand Forecast Report" (December 2012) (Reproduced by the JICA Survey Team)

Figure 2.3.2-23 Category-wise Sale of MEPCO

DISTRIBUTION NETWORK

The distribution network of MEPCO in 2011/12 comprises 86 units of 132 kV substations and 31 units of 66 kV substations. MEPCO maintains 2,937 km of 132 kV line and 1,314 km of 66 kV line. There are 22,967 employees working for this company. The distribution network diagram of MEPCO, with an expansion plan up to year 2020, is shown in **Figure 2.3.2-24**. An overview on MEPCO electricity distribution network is presented in **Appendix A**.

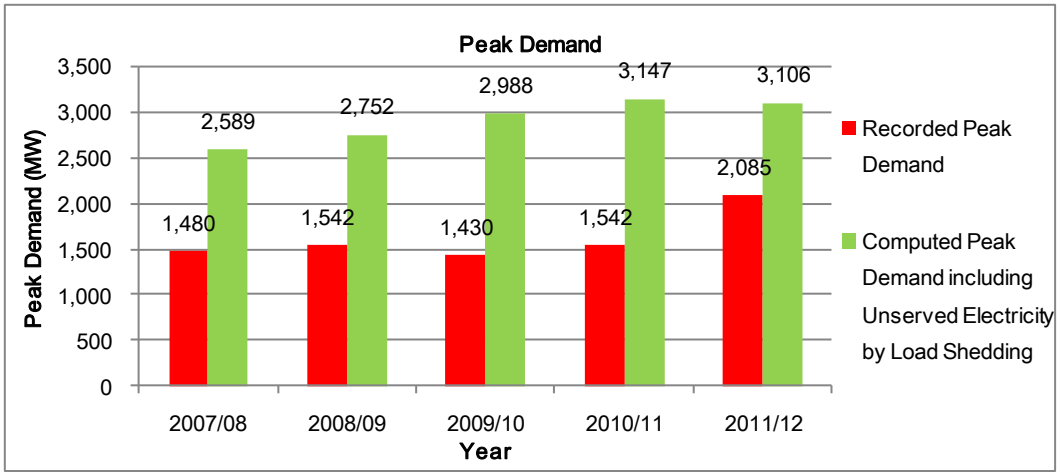


Source: "MEPCO Demand Forecast Report" (December 2012)

Figure 2.3.2-24 MEPCO Distribution Network with Expansion Plan

PEAK DEMAND

Figure 2.3.2-25 below shows the recorded and computed peak demand from 2007/08 to 2011/12.



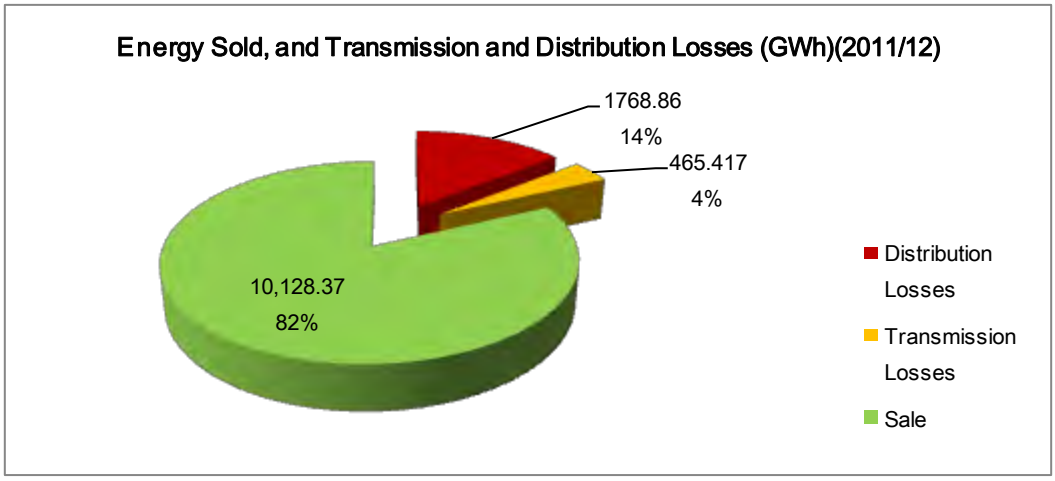
Source: "MEPCO Demand Forecast Report" (December 2012) (Reproduced by the JICA Survey Team)

Figure 2.3.2-25 Historical Recorded and Computed Annual Peak Demand of MEPCO

The MEPCO system has been observing unbalanced demand and supply for many years. In 2011/12, the system peak supply was recorded at 2,085 MW and the suppressed demand by load shedding has been estimated at 1,021 MW. The contribution of domestic consumers in the recorded peak of MEPCO was 1.095 MW while medium and large industries, and small industries contributed 506 MW and 29 MW, respectively.

SOLD ENERGY AND LOSSES

Energy sold to the consumers and losses incurred in distributing the electricity are presented in **Figure 2.3.2-26**. MEPCO's total losses stand at 18%. The distribution loss in 2011/12 was 14%, which was more than that in the previous year (2010/11).



Source: "MEPCO Demand Forecast Report" (December 2012) (Reproduced by the JICA Survey Team)

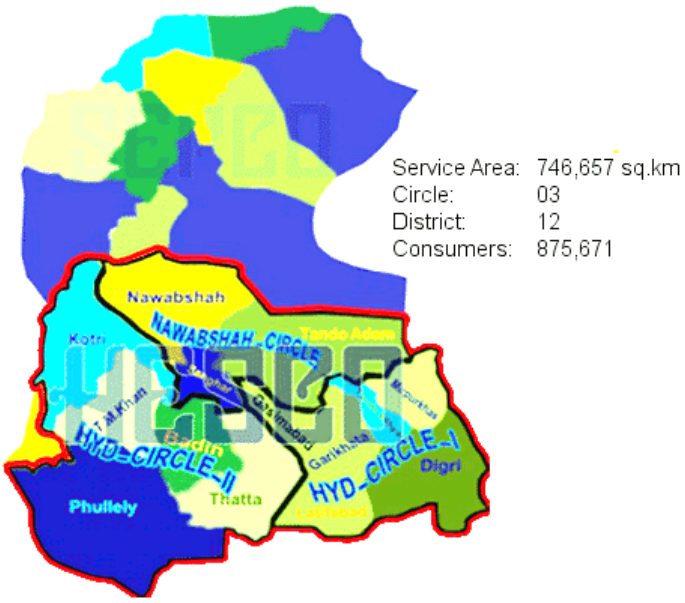
Figure 2.3.2-26 Energy Sold and Transmission and Distribution Losses of MEPCO

2.3.3 Distribution in Sindh Province

Two DISCOs, namely Hyderabad Electric Supply Company (HESCO) and Sukkur Electric Power Company (SEPCO), as well as the generation, transmission, and distribution company, namely, KESC, are operating in this province. KESC is a private company; thus, this survey does not cover its activities.

(1) HESCO

The HESCO is supplying electricity to the districts of Hyderabad, Tando Allah Yar, Thatta, Matiari, Jamshoro, Dadu, Badin, Tando Muhammad Khan, Mir PurKhas, Tharparkar, Umerkot, Sanghar, and Nawab Shah, as shown in **Figure 2.3.3-1**.

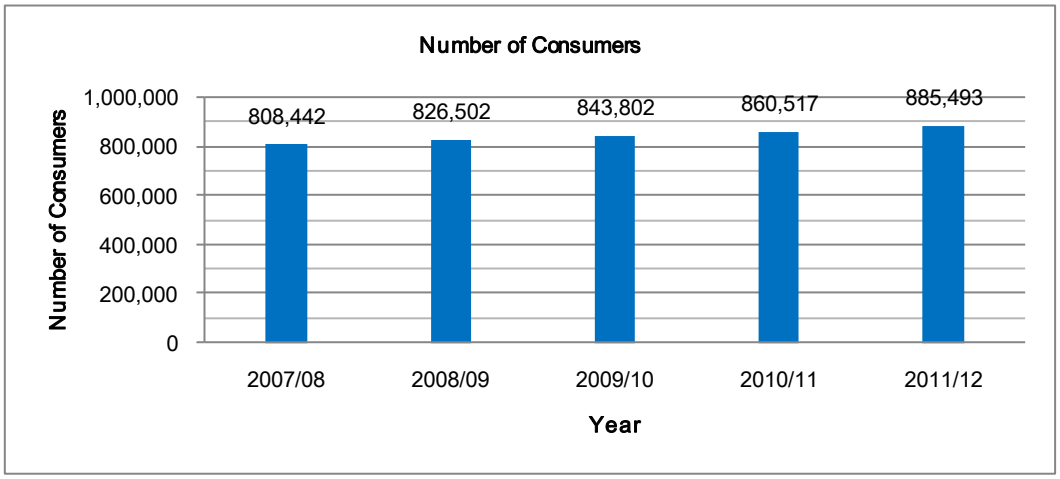


Source: Website of HESCO (Reproduced by the JICA Survey Team)

Figure 2.3.3-1 Map of the HESCO Distribution Area

NUMBER OF CONSUMERS

The historical record of the number of consumers within HESCO jurisdiction is given in **Figure 2.3.3-2**. In 2011/12, the number of consumers of this distribution company was 885,493. Out of this, 710,000 (80.2%) were domestic consumers, 130,000 (14.7%) were commercial consumers, and 15,000 (1.6%) were agricultural consumers.

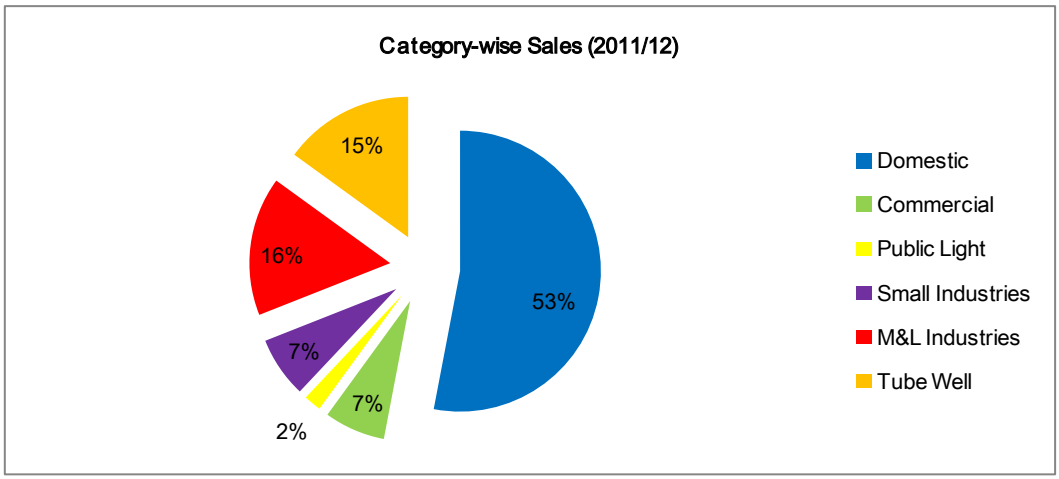


Source: "HESCO Demand Forecast Report" (December 2012) (Reproduced by the JICA Survey Team)

Figure 2.3.3-2 Number of Consumers of HESCO

CATEGORY-WISE SALE

In 2011/12, HESCO's total sale was 3,381 GWh. Out of this total, the consumers in the domestic category consumed 1,803 GWh (53%). Meanwhile, the electricity consumption of medium, large, and small-scale industries was 23%, whereas the consumption by tube wells was 15%. The category-wise sale, in percentage, in 2011/12 is given in **Figure 2.3.3-3** below.

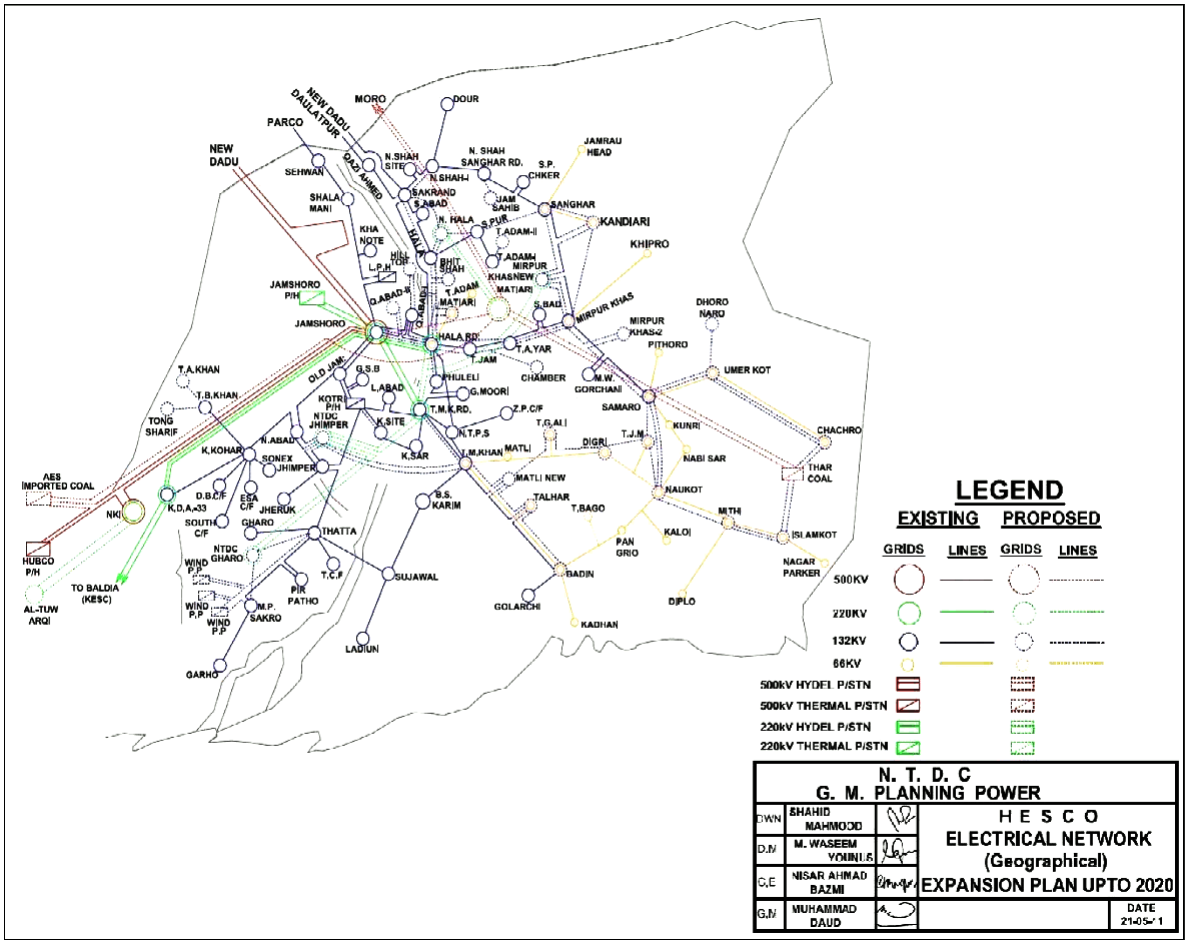


Source: "HESCO Demand Forecast Report" (December 2012) (Reproduced by the JICA Survey Team)

Figure 2.3.3-3 Category-wise Sale of HESCO

DISTRIBUTION NETWORK

The distribution network of HESCO in 2011/12 comprises 72 units of 132 kV substations and 39 units of 66 kV substations. HESCO maintains 1,900 km of 132 kV line and 969 km of 66 kV line. The distribution network diagram of HESCO, with an expansion plan up to 2020, is shown in **Figure 2.3.3-4**.

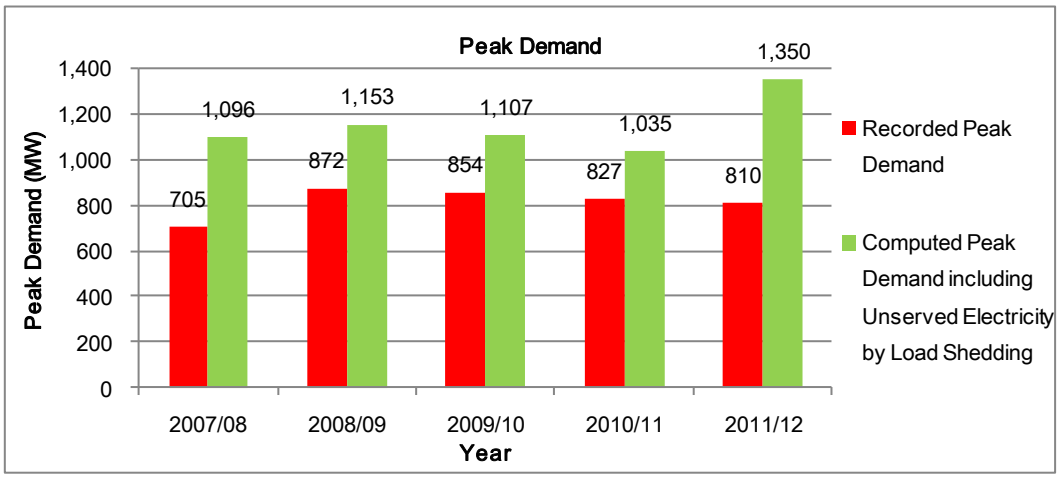


Source:"HESCO Demand Forecast Report" (December 2012)

Figure 2.3.3-4 HESCO Distribution Network with Expansion Plan

PEAK DEMAND

Figure 2.3.3-5 below shows the recorded and computed peak demand from 2007/08 to 2011/12.



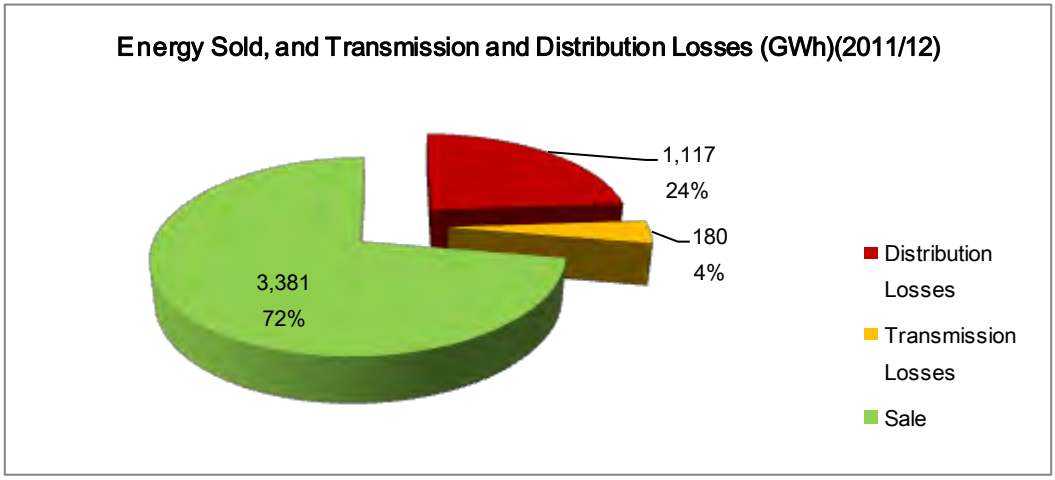
Source: "HESCO Demand Forecast Report" (December 2012) (Reproduced by the JICA Survey Team)

Figure 2.3.3-5 Historical Recorded and Computed Annual Peak Demand of HESCO

The HESCO system has been observing unbalanced demand and supply for many years. In 2011/12, the system peak supply was recorded at 810 MW and the suppressed demand by load shedding has been estimated at 540 MW. The contribution of domestic consumers in the recorded peak of HESCO was 388 MW, while medium and large industries, and small industries contributed 169 MW and 17 MW, respectively.

SOLD ENERGY AND LOSSES

Energy sold to the consumers and losses incurred in distributing the electricity are presented in **Figure 2.3.3-6**. HESCO's total losses stand at 28%. The distribution loss in 2011/12 was 24% which is greater compared to other DISCOs in Pakistan.

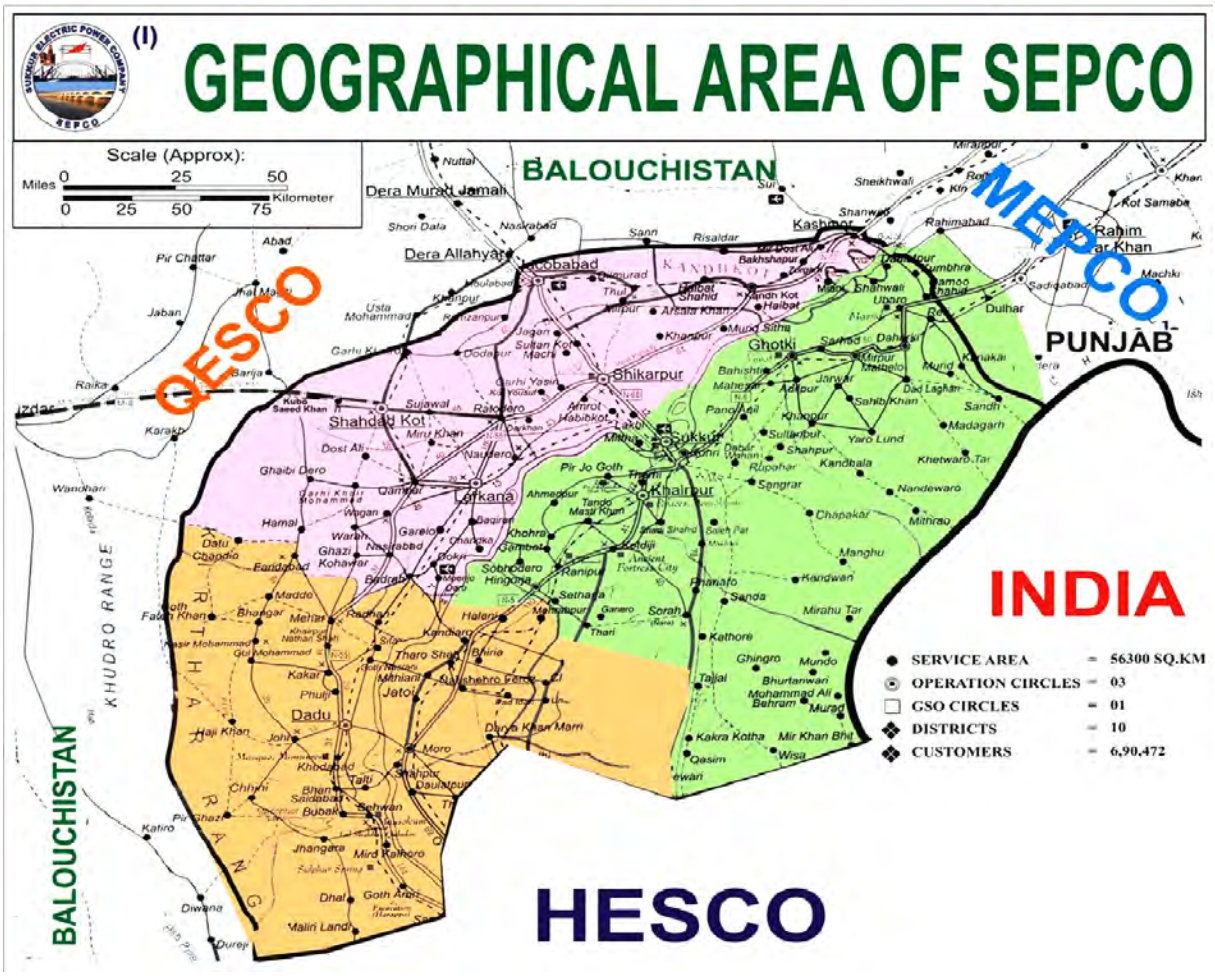


Source: "HESCO Demand Forecast Report" (December 2012) (Reproduced by the JICA Survey Team)

Figure 2.3.3-6 Energy Sold and Transmission and Distribution Losses of HESCO

(2) SEPCO

Sukkur Electric Power Company (SEPCO) is supplying electricity in the districts of Sukkur, Ghotki, Kashmore, Jacobabad, Shikarpur, Kamber Shahdad Kot, Larkana, Dadu, Nowshera Feroze, Khairpur, and Doulatpur Town of Shaheed Benazir-Abad District, as shown in **Figure 2.3.3-7**.

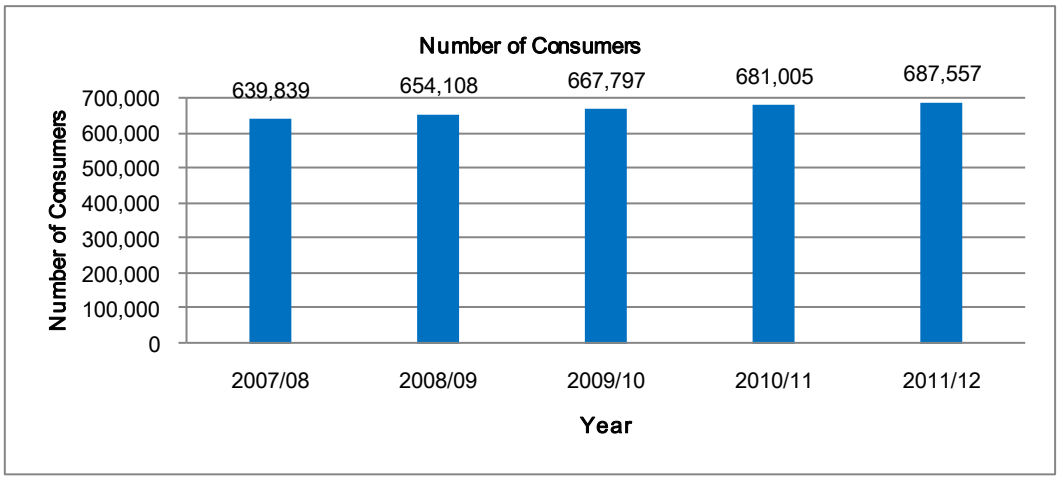


Source: Website of SEPCO (Reproduced by the JICA Survey Team)

Figure 2.3.3-7 Map of the SEPCO Distribution Area

NUMBER OF CONSUMERS

The historical record of the number of consumers within SEPCO jurisdiction is given in **Figure 2.3.3-8**. In 2011/12, the number of consumers of this distribution company was 687,557. Out of this total, 552,000 (80.3%) were domestic consumers, 111,000 (16.1%) were commercial consumers, and 12,000 (1.7%) were agricultural consumers.

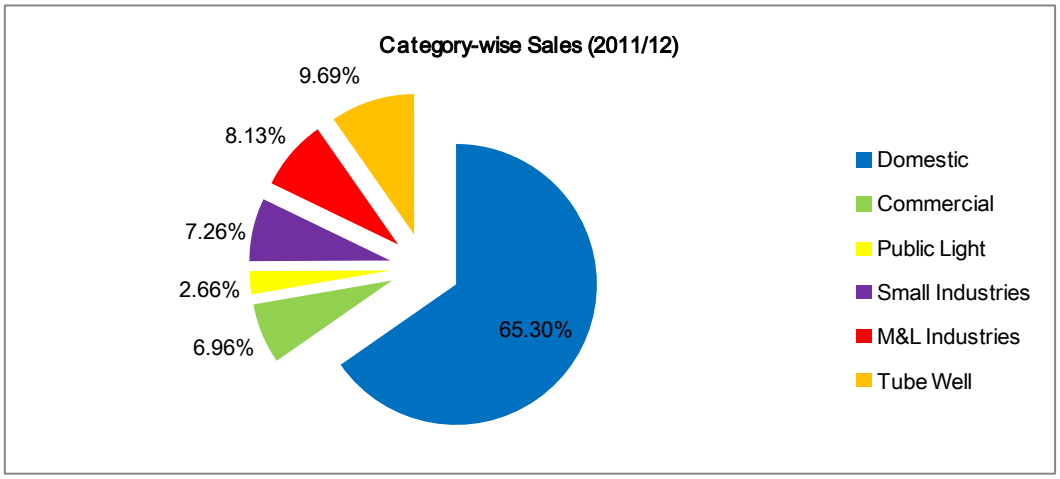


Source: "SEPCO Demand Forecast Report" (December 2012) (Reproduced by the JICA Survey Team)

Figure 2.3.3-8 Number of Consumers of SEPCO

CATEGORY-WISE SALE

In 2011/12, SEPCO's total sale was 2,666 GWh. Out of this total, the consumers in the domestic category consumed 1,741 GWh (65.31%). The electricity consumption by medium, large, and small-scale industries was 15.39%, whereas the consumption by tube wells was 9.69%. The category-wise sale, in percentage, in 2011/12 is given in **Figure 2.3.3-9** below.

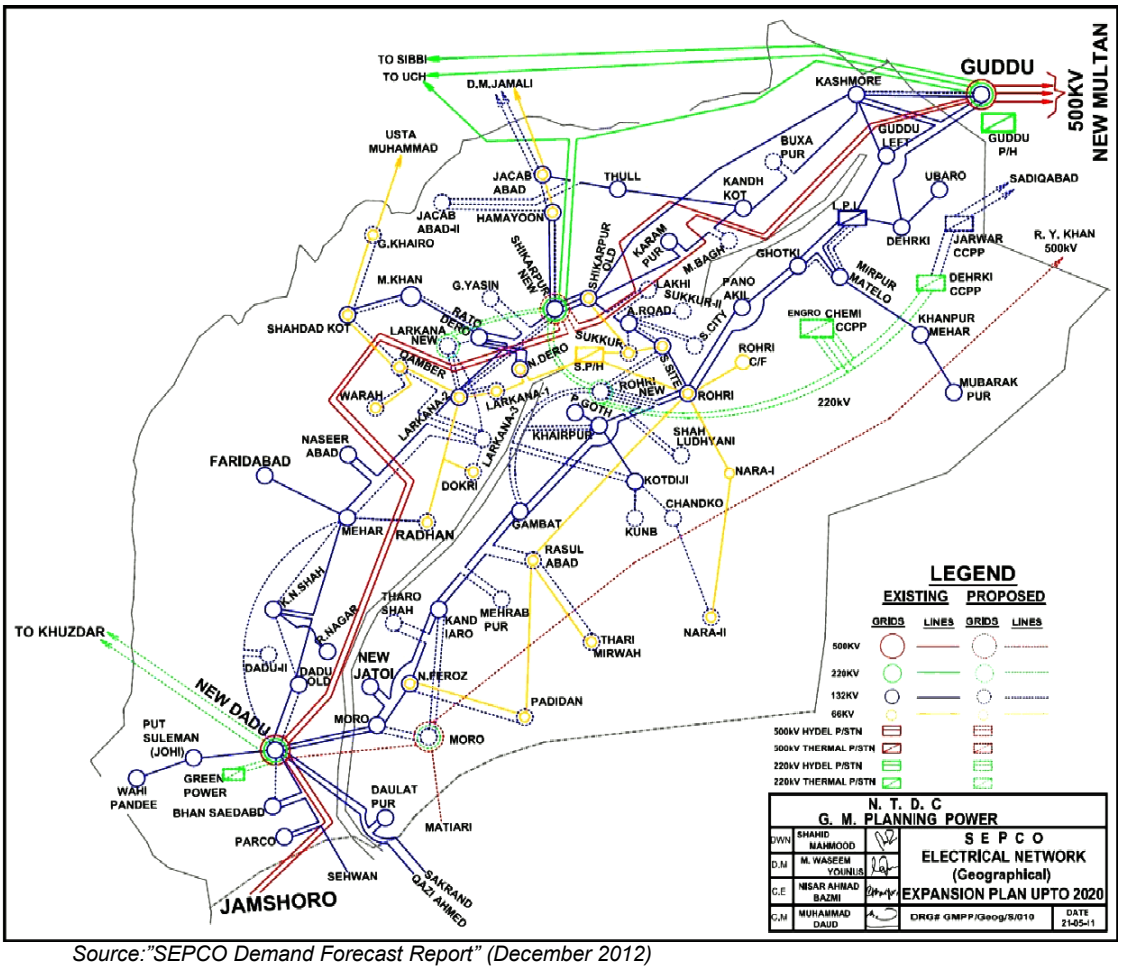


Source: "SEPCO Demand Forecast Report" (December 2012) (Reproduced by the JICA Survey Team)

Figure 2.3.3-9 Category-wise Sale

DISTRIBUTION NETWORK

The distribution network of SEPCO in 2011/12 comprises 43 units of 132 kV substations and 13 units of 66 kV substations. The SEPCO maintains 1,976 km of 132 kV line and 756 km of 66 kV line. The distribution network diagram of SEPCO with an expansion plan up to 2020 is shown in **Figure 2.3.3-10**.

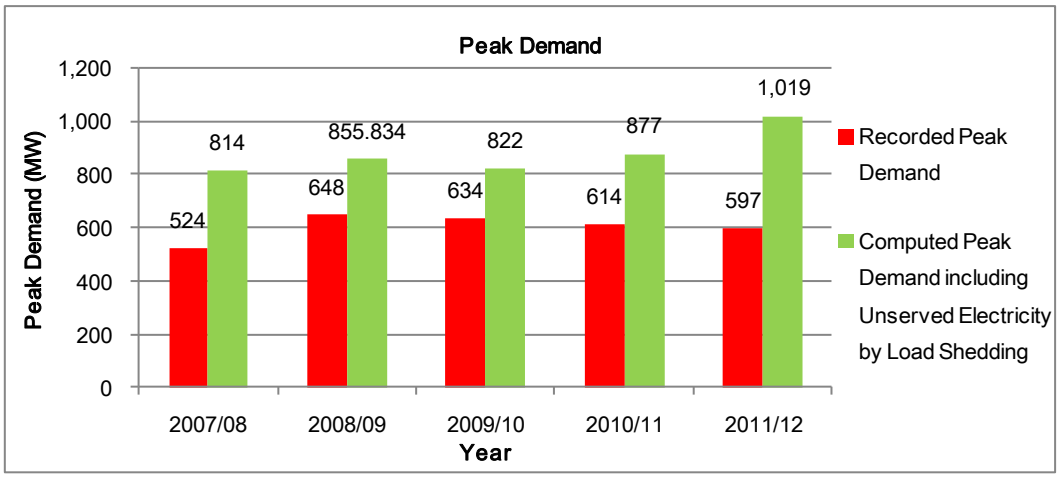


Source:"SEPCO Demand Forecast Report" (December 2012)

Figure 2.3.3-10 SEPCO Distribution Network with Expansion Plan

PEAK DEMAND

Figure 2.3.3-11 below shows the recorded and computed peak demand from 2007/08 to 2011/12.



Source: "SEPCO Demand Forecast Report" (December 2012) (Reproduced by the JICA Survey Team)

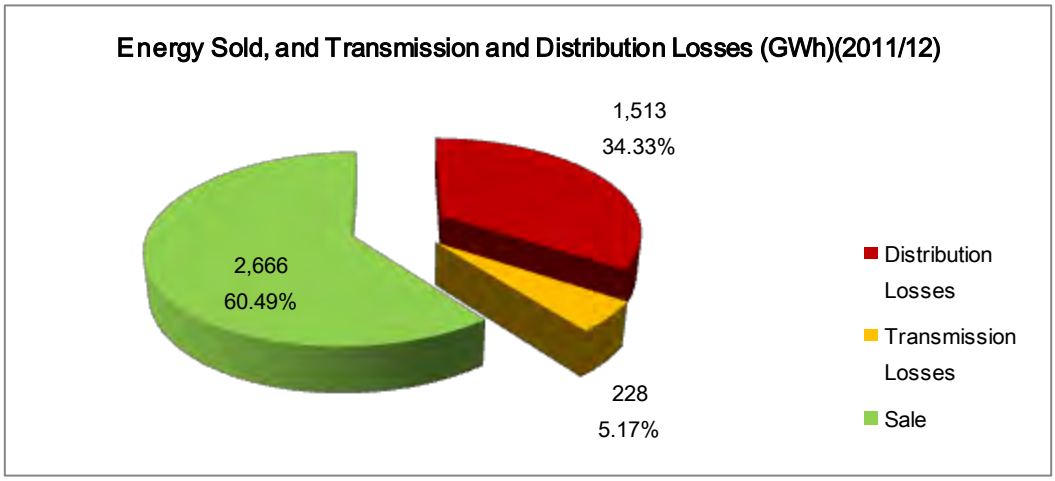
Figure 2.3.3-11 Historical Recorded and Computed Annual Peak Demand of SEPCO

The SEPCO system has been observing unbalanced demand and supply for many years. In 2011/12, the system peak supply was recorded at 597 MW and the suppressed demand by load shedding has been estimated at 422 MW. The contribution of domestic consumers in the recorded

peak of SEPCO was 284 MW while medium and large industries, and small industries contributed 44 MW and 19 MW, respectively.

SOLD ENERGY AND LOSSES

Energy sold to the consumers and losses incurred in distributing the electricity are presented in **Figure 2.3.3-12**. SEPCO's total losses stand at 39.51%. The distribution loss in 2011/12 was 34.33% against 34.21% of the previous year. SEPCO's loss was the highest among the DISCOs considered in this survey.

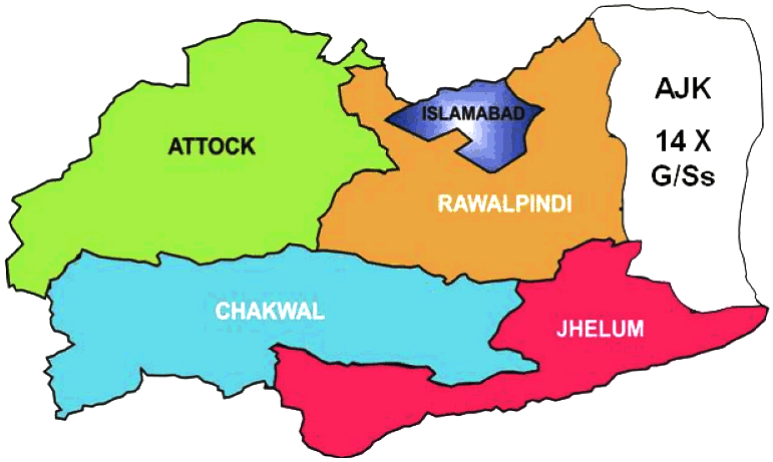


Source: "SEPCO Demand Forecast Report" (December 2012) (Reproduced by the JICA Survey Team)

Figure 2.3.3-12 Energy Sold and Transmission and Distribution Losses of SEPCO

2.3.4 Distribution in Islamabad Capital Territory

Islamabad Electric Supply Company (IESCO) is supplying electricity to the Islamabad Capital Territory and some districts in Punjab Province, namely, Rawalpindi, Attock, Chawkwal, and Jehlum as shown in **Figure 2.3.4-1**.



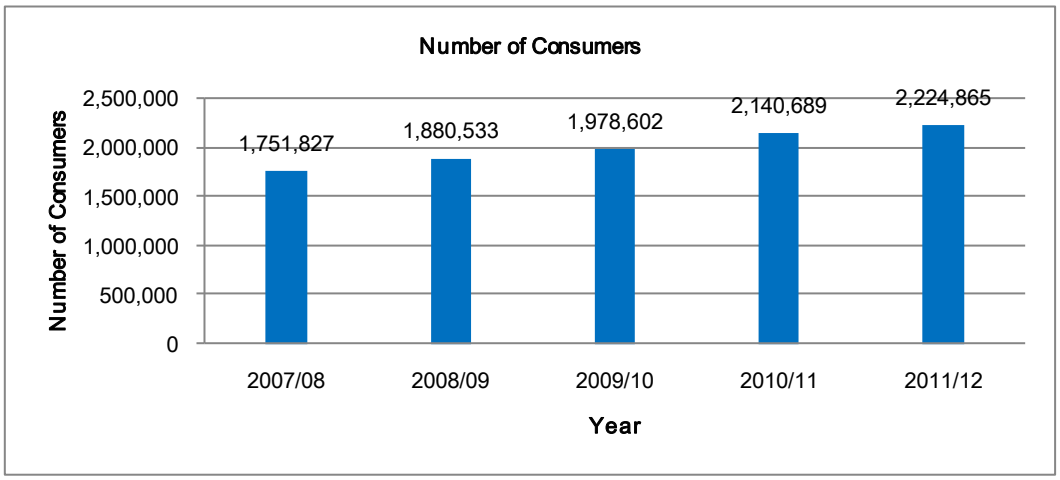
Source:" IESCO Performance Improvement action Plan 2011" (Page 7)

Figure 2.3.4-1 Map of the IESCO Distribution Area

NUMBER OF CONSUMERS

The historical record of the number of consumers within IESCO jurisdiction is given in **Figure 2.3.4-2**. In 2011/12, the number of consumers of this distribution company was 2,224,865. Out of

this, 1.88 million (84.5%) were domestic consumers, 318,000 (14.3%) were commercial consumers, and 7,700 (0.3%) were agricultural consumers.

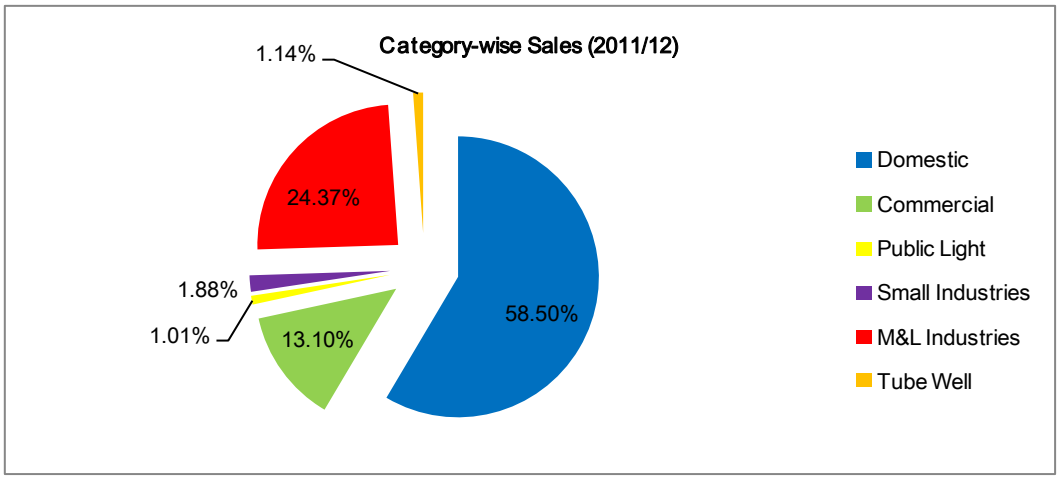


Source: "IESCO Demand Forecast Report" (December 2012) (Reproduced by the JICA Survey Team)

Figure 2.3.4-2 Number of Consumers of IESCO

CATEGORY-WISE SALE

In 2011/12, IESCO's total sale was 7,537 GWh. Out of this total, the consumers in the domestic category consumed 4,409 GWh (58.50%). The electricity consumption by medium, large, and small scale industries was 26.25%, whereas the consumption by tube wells was 1.14%. The category-wise sale in percentage in 2011/12 is given in **Figure 2.3.4-3** below.

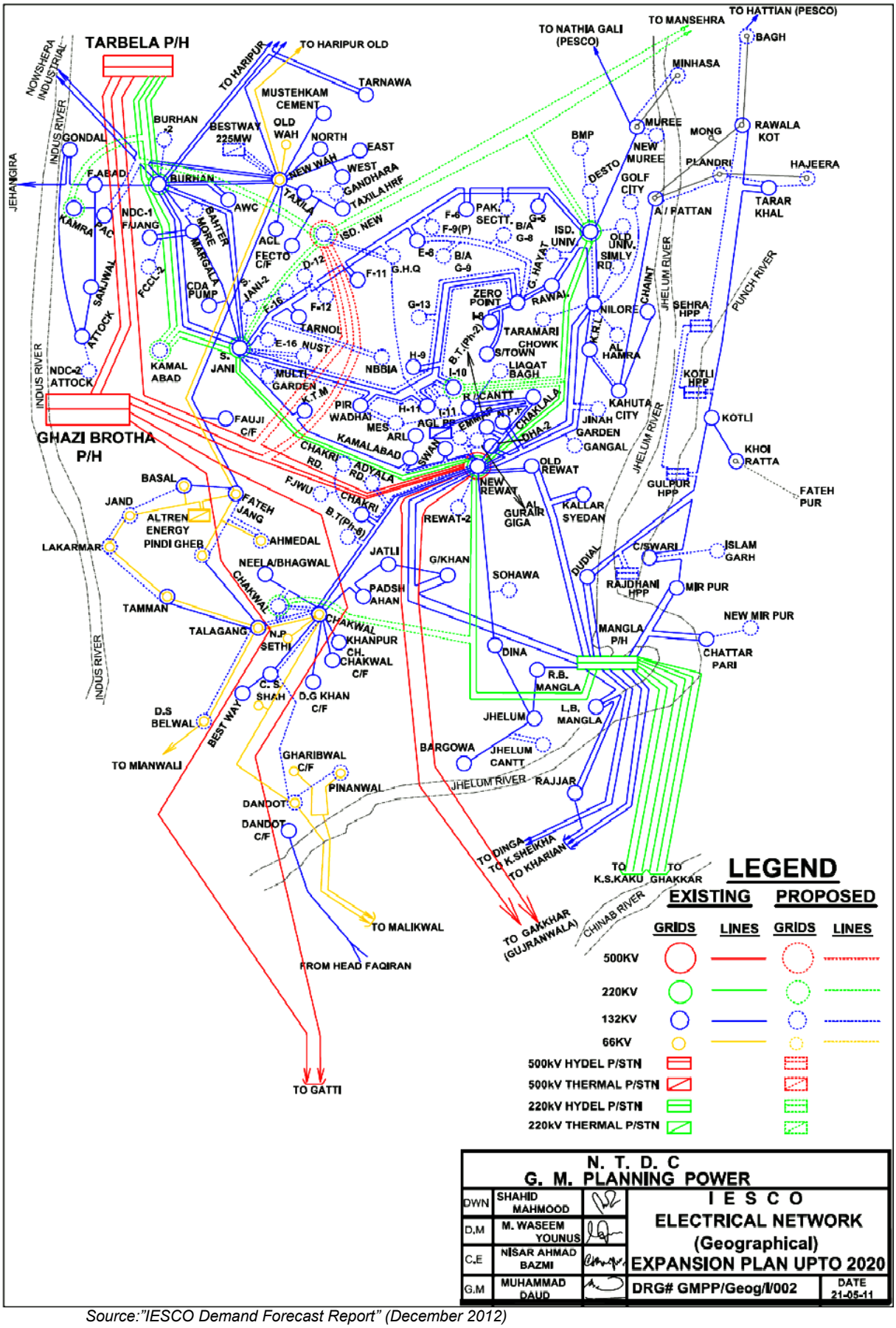


Source: "IESCO Demand Forecast Report" (December 2012) (Reproduced by the JICA Survey Team)

Figure 2.3.4-3 Category-wise Sale of IESCO

DISTRIBUTION NETWORK

The distribution network of IESCO in 2011/12 comprises 77 units of 132 kV substations, 11 units of 66 kV substations, and three units of 33 kV substations. The IESCO maintains 2,480 km of 132 kV line, 581 km of 66 kV line, and 153 km of 33 kV line. The distribution network diagram of IESCO with an expansion plan up to 2020 is shown in **Figure 2.3.4-4**.

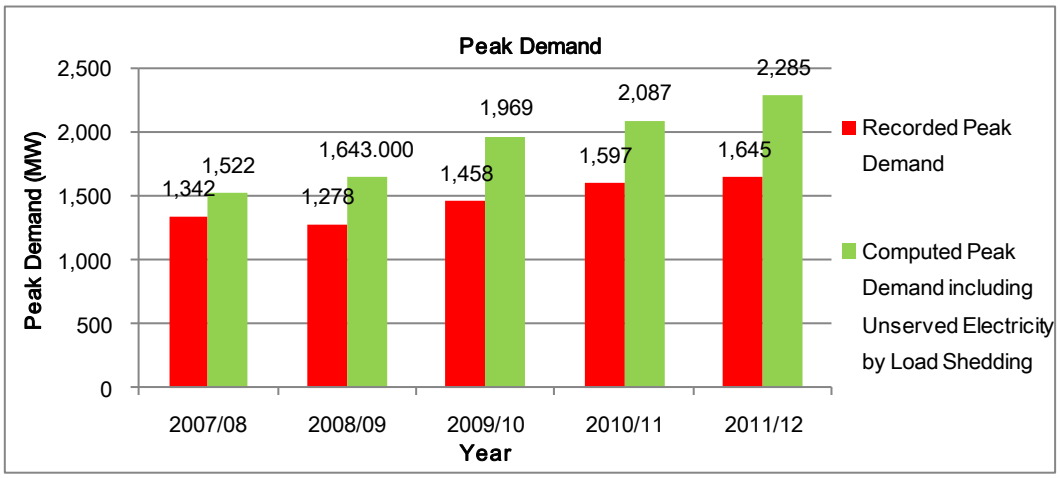


Source:"IESCO Demand Forecast Report" (December 2012)

Figure 2.3.4-4 IESCO Distribution Network with Expansion Plan

PEAK DEMAND

Figure 2.3.4-5 below shows the recorded and computed peak demand from 2007/08 to 2011/12.



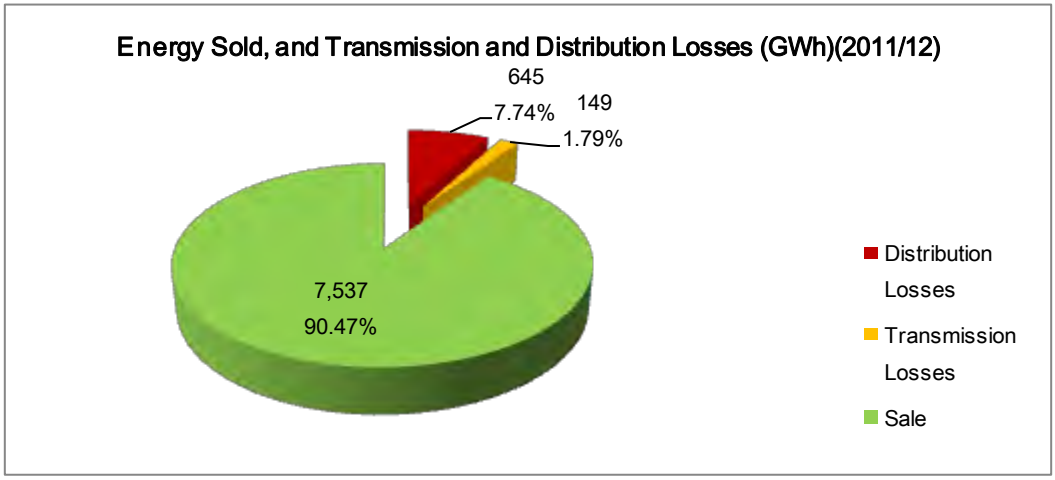
Source: "IESCO Demand Forecast Report" (December 2012) (Reproduced by the JICA Survey Team)

Figure 2.3.4-5 Historical Recorded and Computed Annual Peak Demand of IESCO

The IESCO system has been observing unbalanced demand and supply for many years. In 2011/12, the system peak supply was recorded at 1,645 MW and the suppressed demand by load shedding has been estimated at 640 MW. The contribution of domestic consumers in the recorded peak of IESCO was 898 MW while the medium and large industries, and small industries contributed 423 MW and 28 MW, respectively.

SOLD ENERGY AND LOSSES

Energy sold to the consumers and losses incurred in distributing the electricity are presented in **Figure 2.3.4-6**. IESCO's total losses stand at 9.53% in 2011/12. Compared to the previous year, IESCO has achieved an improvement in the reduction of losses by 2.54%.



Source: "IESCO Demand Forecast Report" (December 2012) (Reproduced by the JICA Survey Team)

Figure 2.3.4-6 Energy Sold and Transmission and Distribution Losses of IESCO

2.3.5 Issues of Distribution

(1) Loss Control

All DISCOs are fighting to control their losses. Many of them have high losses in the distribution network (11 kV and below that voltage). NEPRA sets the target of loss for each DISCO and DISCOs are encouraged to reduce their losses.

The target and actual losses are shown in **Table 2.3.5-1** below.

Table 2.3.5-1 Target and Actual Losses of DISCOs

Description	IESCO	LESCO	GEPCO	FESCO	MEPCO	PESCO	HESCO	QESCO	SEPCO	Total
Target given by NEPRA Losses (%)	9.50	12.00	10.50	10.83	15.00	28.00	22.00	18.00	28.00	**15.95**
Actual Losses (%)	9.52	13.51	11.24	10.91	17.94	35.97	27.73	20.87	39.51	**19.15**

Source: "State of Industry Report 2012" (NEPRA)

The difference between the target and actual losses is more than 1% for all the DISCOs except for IESCO, GEPCO and FESCO.

DISCOs prepare their action plan to reduce the losses. However, such plan primarily emphasizes the control of non-technical losses. The State of Industry Report 2012 provides a breakdown of losses, as listed in **Table 2.3.5-2** below. From the table, it is clear that each DISCO has high losses in lines under the "11 kV and below" category, which includes 11 kV feeders, distribution transformers, and in low tension (LT) lines.

Table 2.3.5-2 Losses in Distribution Network (Voltage Category-wise)

DISCO	132 kV (including 66 & 33 kV)		11 kV and Below		Total	
	2010-11	2011-12	2010-11	2011-12	2010-11	2011-12
IESCO	2.00%	1.80%	7.90%	7.90%	9.70%	9.50%
GEPCO	1.85%	1.64%	10.31%	9.75%	11.97%	11.23%
LESCO	0.20%	0.80%	13.10%	12.80%	13.30%	13.50%
FESCO	1.60%	1.10%	9.80%	9.80%	11.20%	10.80%
MEPCO	3.70%	3.70%	15.00%	14.80%	18.20%	17.90%
HESCO	3.30%	2.90%	25.30%	24.80%	28.60%	27.70%
SEPCO	-	4.24%	-	35.29%	-	36.23%

Source: "State of Industry Report 2012", NEPRA

Losses higher than 15% are considered to be attributed to high non-technical losses. Whereas, the distribution losses in the range of 10-15% are largely because of poor distribution network, i.e. many overloaded distribution transformers, inappropriate conductor sizes, and too long distribution lines.

(2) Overloaded Transformers and Lines

The Quarterly Load Data Report No. 134 of Grid, NTDC and All DISCOs (June 2013) indicates that a large number of power transformers in the grid substations are overloaded or will be overload in the near future. Transformer capacity in these grid substations requires augmentation.

Table 2.3.5-3 Overloaded Transformers in National Grid and Grid of DISCOs

Voltage Ratio	500/220 kV	220/132 kV	132/66 kV	132/33 kV	132/11 kV	66/33 kV	66/11 kV	33/11 kV	Total
Loaded 100% and above	5	27	5	2	62	0	20	2	**123**
Loaded 80 -100%	7	94	36	9	786	1	149	11	**1,093**
Total nos.	109	108	60	16	1,242	4	234	19	**1,792**

Note: Distribution transformers (11/0.4kV) are not included.

Source: "The Quarterly Load Data Report No. 134 of Grid, NTDC and all DISCOs", PEPCO, June 2013

Table 2.3.5-3 above indicates that even if the supply situation has improved, there is no certainty that the DISCOs will be able to supply electricity to the consumers without load shedding. This is because several transformers are already overloaded. Also, transformers which are loaded above 80% are in critical condition of overloading as the annual demand growth rate is above 6%.

Some of the transmission lines are also overloaded. At present, DISCOs are basically concentrating on converting the existing 66 kV lines into 132 kV lines and the addition of transformer capacity in their substations. This will increase the transmission capacity and reduce transmission losses. DISCOs are also planning to construct new lines to overcome the situation of overloading of the existing transmission lines. DISCOs are currently utilizing the financial support given by WB, ADB, USAID, and other donors for such augmentation works.

(3) Village Electrification

According to the State of Industry Report 2012, the status of village electrification is as given in **Table 2.3.5-4** below.

Table 2.3.5-4 Village Electrification

DISCO	No. of Villages Electrified	Total no. of Villages	Percentage of Village Electrification
LESCO	406	410	**99.02%**
FESCO	20,161	21,756	**92.67%**
GEPCO	6,331	6,331	**100.00%**
MEPCO	48,131	69,779	**68.98%**
IESCO	485	518	**93.63%**
HESCO	30,454	46,730	**65.17%**
SEPCO	No data	No data	**No data**

Source: "State of Industry Report 2012", NEPRA

In the areas of MEPCO and HESCO, around one third of the villages are not electrified. The DISCOs are reluctant to electrify these villages by extending distribution lines as they are very far from the grid substations. Long distribution lines have to be constructed. Such construction will increase the distribution losses, which leads to less increase in revenue compared to any investment in the urban area. Therefore, DISCOs insist on providing isolated solar systems to electrify the villages rather than to go for the conventional practice of extending the 11 kV network.

(4) Long Feeder and LT lines

The 11 kV feeders are extended haphazardly for electrification purpose and in many cases such extension violates the prescribed limit of voltage regulation by Distribution Code. The same can be seen in the extension of LT lines. The voltage at the end consumers falls far below the nominal

voltage of supply. This improper treatment within the network increases the losses in the distribution side.

The issue of long distribution feeders and LT lines has been found critical, especially in MEPCO where the average length of 11 kV feeders is 73 km. Such extreme length of the distribution feeders deteriorate the electrical parameters of the electrical supply, thereby accumulating huge losses. New grid substations need to be constructed in these areas.

(5) Tube Well

Water pumping sets are widely used in Pakistan in order to draw water from deep tube wells for the purpose of drinking and irrigation. In the urban area, water is usually drawn from a depth of around 200 m for drinking water supply. Most of the water supply utilities are utilizing surface-mounted pumps. The efficiency of these pumps is very low. On the other hand, in rural areas, tube well pumps are used for irrigation purpose. Most of these pumps belong to farmers that do not consider the efficiency of the pumps. DISCOs believe that the electricity connections provided to tube well consumers are not metered properly. Due to the use of electric motors with less efficiency and low power factor, tube well loads contribute in increasing the losses of the distribution system.

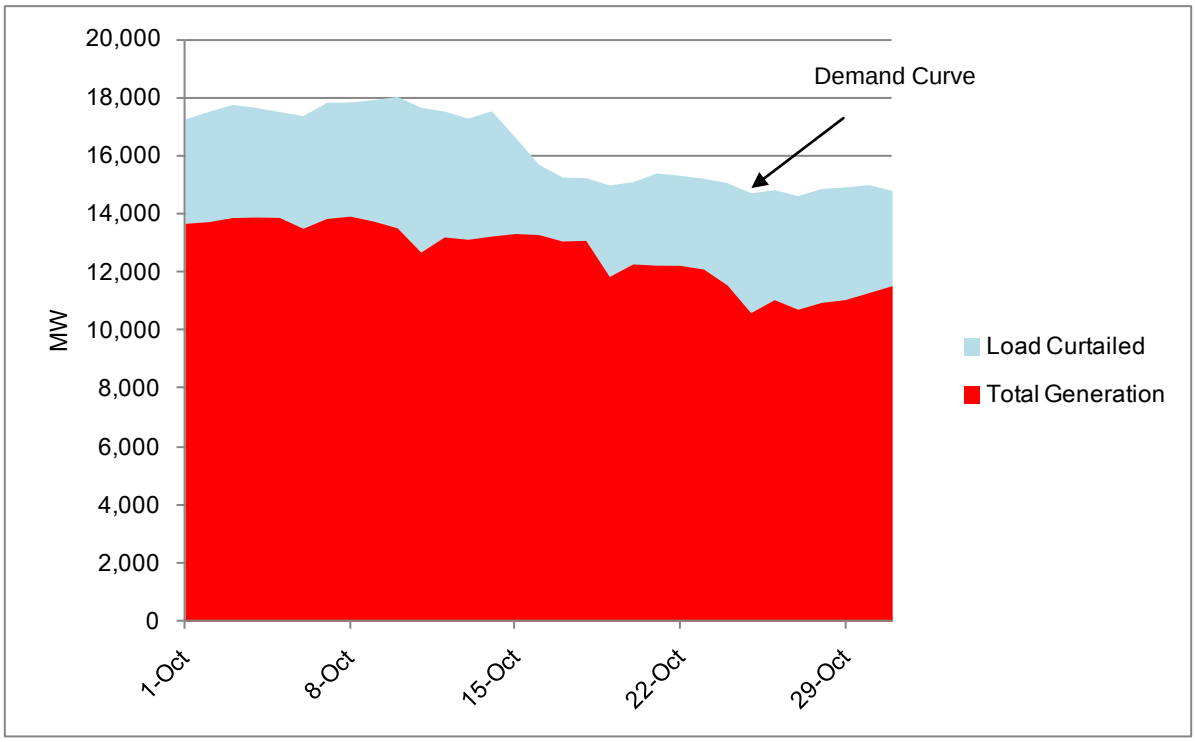
As shown in **Table 4.1-1** (Chapter 4), in the year 2011/12 consumption by the tube wells was 8,415 GWh. This is 12.8% of the national electricity requirement. If there had been no regular load shedding, the consumption by tube wells and loss value would have been much higher. A little investment through the introduction of more efficient pumps will result in big electricity savings, which can be instrumental in the reduction of load shedding hours.

2.4 Situation of Load Shedding

There is a huge imbalance between the supply and demand of electricity in the national grid. The difference is in the range of 6,000 MW. Around 30% of the electricity demand is not sufficient for regular supply of electricity to all the consumers. With the current expansion plans and progress on the implementation of ongoing projects, it is expected that the crisis in the power sector would continue well beyond 2020, unless major hydropower plants and base load power generation on coal are introduced along with the development of coal mines in the country. Load shedding has become a part of life and will remain for quite a long period.

2.4.1 Process of Load shedding

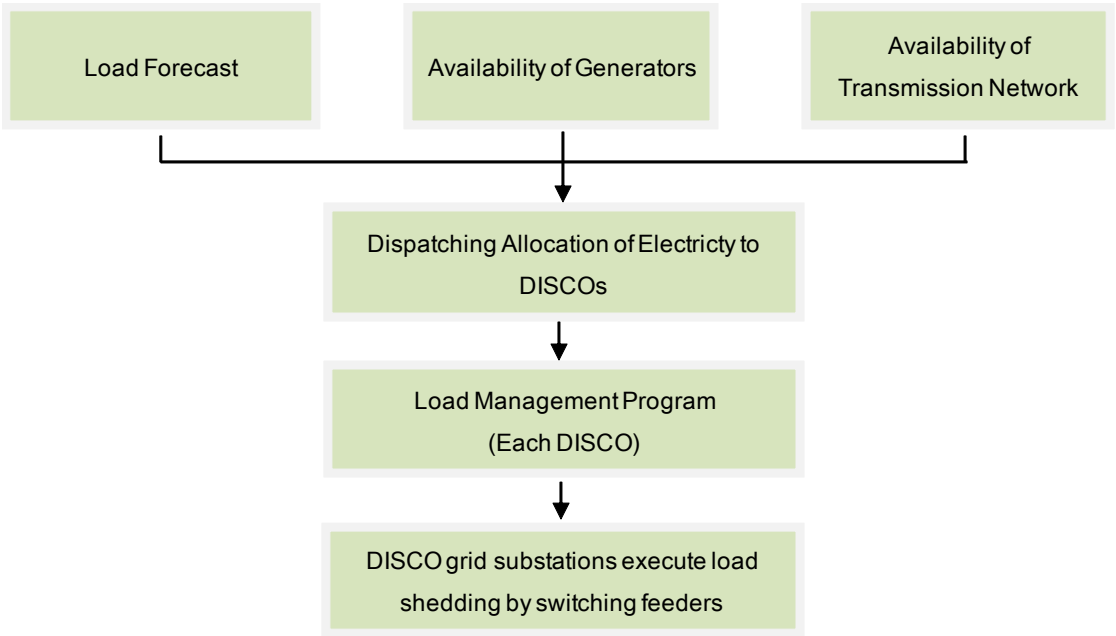
Figure 2.4.1-1 shows the peak demand and total generation in the national system excluding KESC system as of October 2013. In the figure, the blue portion is the demand curtailed by load shedding.



Source: Prepared by the JICA Survey Team based on the Data from NPCC

Figure 2.4.1-1 Actual Demand Supply Curve in October 2013

The process of load shedding is shown in **Figure 2.4.1-2**.



Source: Prepared by the JICA Survey Team based on Interview at Related Organizations

Figure 2.4.1-2 Process of Load Shedding

NPCC, the system operator, collects the electricity demand data from the DISCOs. Similarly, NPCC collects data on the availability of generators. NPCC sets the operating plan of the national grid, considering the availability of the transmission grid. NPCC allocates MW ceiling to each of the DISCOs from the net available generation on the basis of fixed sharing ratio shown in **Table 2.2.3-2** (Chapter 2). According to this allocation, the DISCOs are allowed to draw power from the

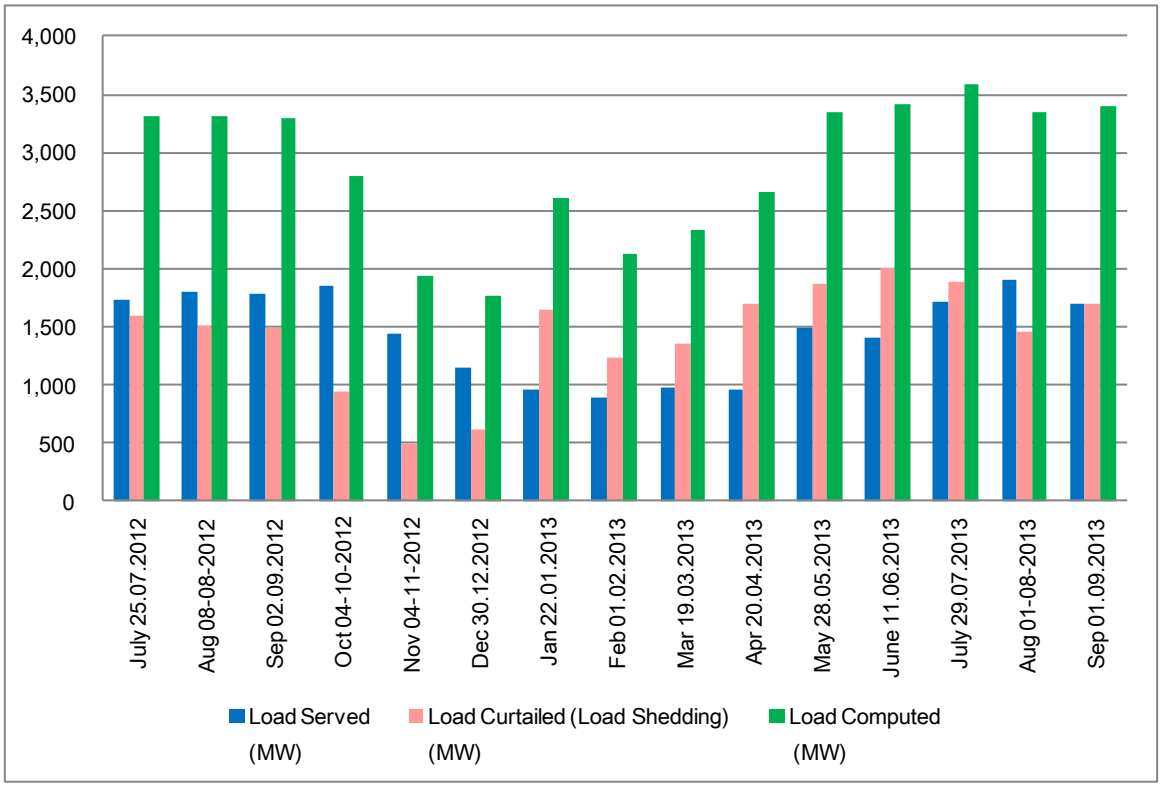
national grid. The DISCOs shall do their best to run their network within the given allocation. In order to satisfy this condition, DISCOs impose load shedding by switching the 11 kV feeders.

2.4.2 Execution Method and Criteria of Load Shedding

DISCOs are well aware of the demand pattern in each feeder. The electricity demand of consumers in each category (e.g. domestic, commercial and industrial) has their own patterns of using electricity and the demand will also differ accordingly from one consumer category to another. DISCOs keep a record of their consumers and they conduct market surveys regularly. This helps DISCOs to accurately forecast the demand of each feeder. With all this information, DISCOs will prepare a load management program to stay within the limit provided to them and publish load shedding notice. Examples of such load shedding notices are given in **Appendix B** as Load Management Program.

The load shedding hours may differ from one DISCO to another, but within one DISCO, the planned load shedding hours for each category remains the same. While preparing such programs, DISCOs try to maintain: i) equal load shedding hours (total at the end of day) for all consumer categories, and ii) in a way that industrial consumers suffer load shedding in only one stretch in 24 hours.

An example of the difference between the demand, supply, and curtailed load for MEPCO is given in **Figure 2.4.2-1** below.



Source: Prepared by the JICA Survey Team on the basis of the data provided by MEPCO

Figure 2.4.2-1 Monthly Peak Demand and Supply

The demand for the months of May to September is much higher than in the months of November and December. The difference between potential demand (load computed) and actual supply (load

served) is represented by pink columns. It changes from one month to another and this is more visible with the change of season. Using this chart, DISCOs announce their load shedding schedules to give advance notice to their respective consumers. From the figure above, prepared with actual data provided by MEPCO; it is clear that MEPCO was compelled to curtail the amount (in pink column) of load during peak load days of respective months by load shedding. The curtailed load in November and December 2012 was less than in other months of the year. This must have resulted to less hours of load shedding during November and December than in the months of July, August, and September.

Load management schedules comprehensively represent these activities and their anticipated effects. Big changes in the actual operation due to failure of any component of the system including generator may cause an additional undeclared load shedding.

2.4.3 Effect of Load Shedding to Industrial Sector

The Pakistan industrial sector is suffering from frequent power outages since 2008. As per the Economic Survey Report 2012/13 (conducted by the Ministry of Finance), the overall economy is affected due to insufficient supply of electricity. It states that there exists high correlation between GDP growth rate and increase in energy consumption. The survey witnessed large increase in energy consumption followed by high GDP growth rate; conversely, smaller increase in energy consumption caused lower GDP growth. The All Pakistan Textile Mills Association (APTMA) claims that 10 million workers are engaged in the textile industry, and there is fear of laying off half of the workers due to the daily power outages.

Recent research conducted by Dr. Hafiz A. Pasha and Dr. Aisha Ghaus-Pasha (Institute of Public Policy, Beaconhouse National University) on economic costs of power load shedding in Pakistan established that in 2011/12, the total cost of outages to the small-scale industrial sector of Pakistan is estimated at Rs 83 billion (equivalent to US$885 million). The same study established that the cost of unserved energy to the small-scale industry in the national level is Rs 50.5/kWh (US$0.50/kWh), whereas for large-scale industries it stands at US$2.13/kWh. The implied outage cost per kWh across the economy in 2010/11 is Rs 79.3 or US$0.93.

2.4.4 Review on Method and Criteria of Load shedding

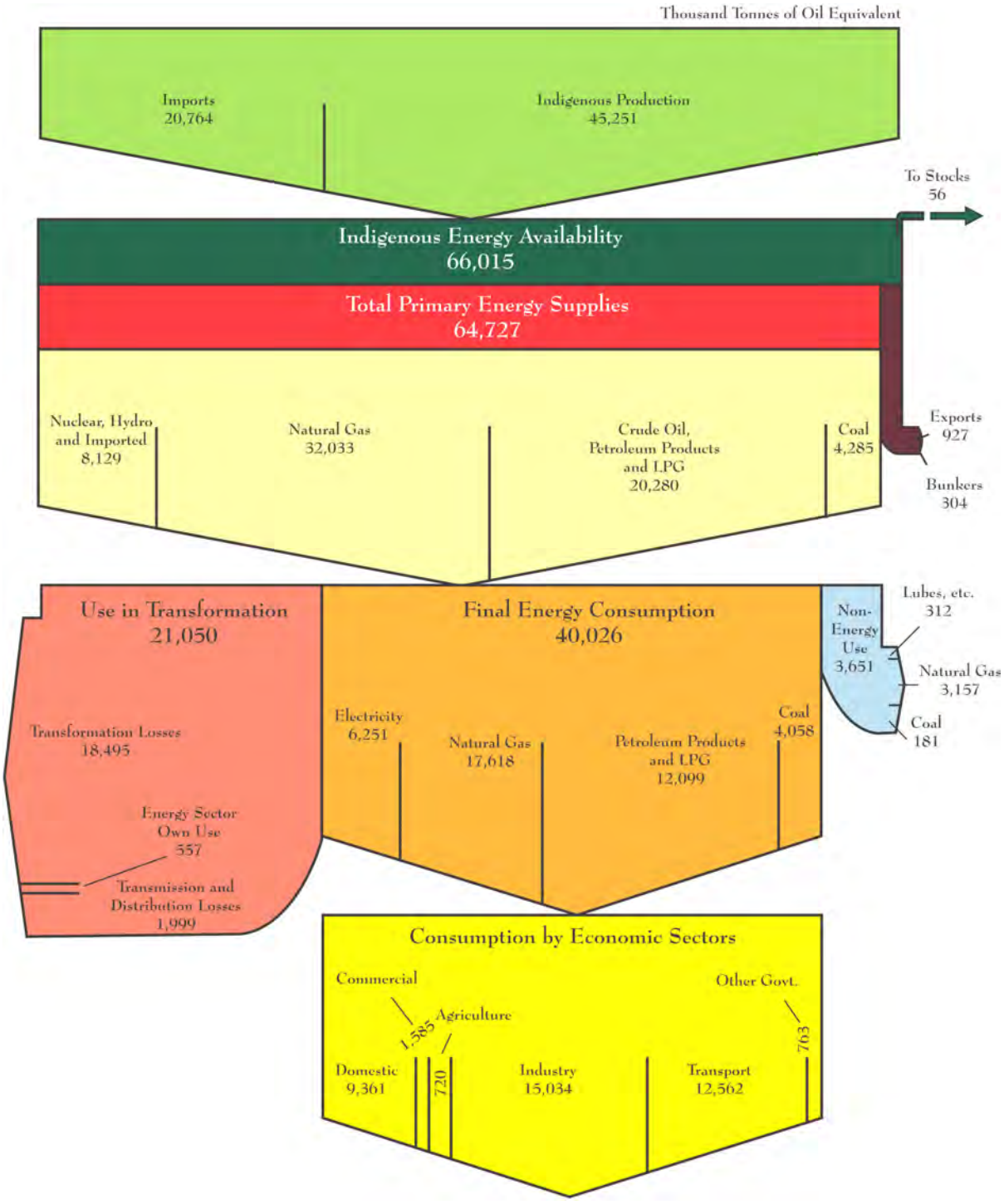
Officials clearly indicate that they understand that the effects of load shedding on different times of the day have different effects on the quantity of unserved energy. But the declared load shedding chart is prepared to keep the consumers of each category experience the same total hours of load shedding at the end of the day to comply with the court order. However, officials of MEPCO did not hesitate to disclose that the consumers in rural feeder lines faces more hours of load shedding than consumers in urban areas.

Load management programs of some DISCOs are provided in **Appendix B**.

Chapter 3 PRIMARY ENERGY FOR ELECTRIC POWER GENERATION

3.1 Overview

Figure 3.1-1 below shows the energy flowchart along with TOE quantities for the year 2011/12.



Source: "Pakistan Energy Yearbook 2012" (HDIP)

Figure 3.1-1 Energy Flow Chart 2011/12

Figure 3.1-1 shows that the total primary energy supply in Pakistan was 64,727,000 ton of oil equivalent (TOE[3]) in the year 2011/12. , which includes the use in transformation, the final energy consumption, and the non-energy use.

The use in transformation consists of transformation losses, energy sector own use, and transmission and distribution losses.

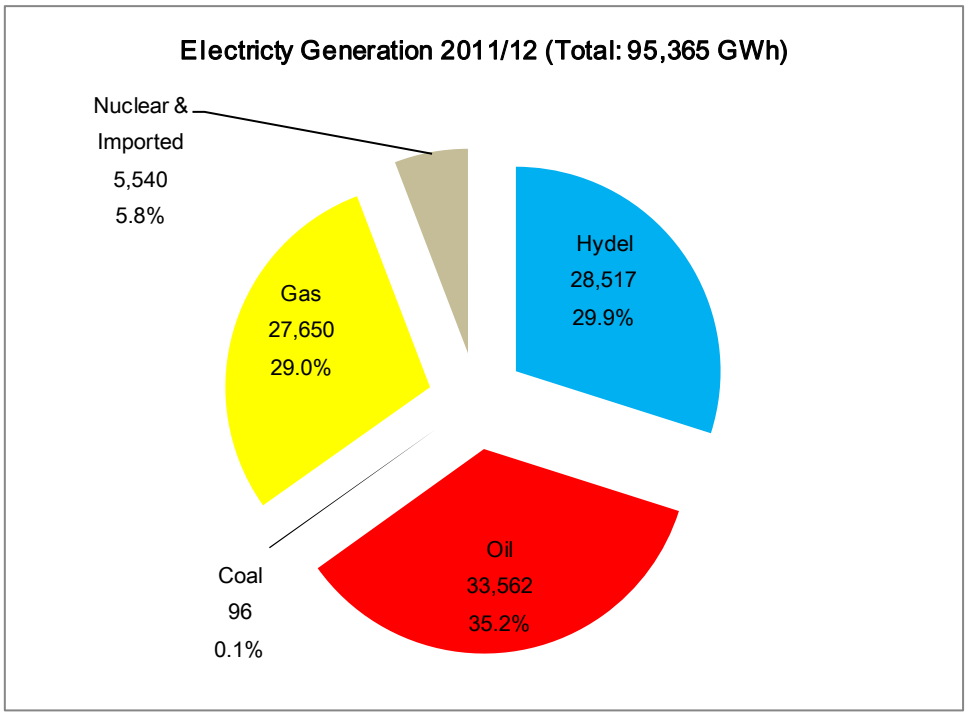
The transformation losses mean energy losses at the time of transforming primary energy to another form of energy such as crude oil to petroleum products, coal to electricity, and so on. The major losses were produced for transforming primary energy to electricity. According to Pakistan Energy Yearbook 2012, the transformation losses to generate electricity were 14,516,000 TOE, which stands at 78% of the total transformation losses of 18,495,000 TOE in the figure.

Regarding the energy sector own use of 557,000 TOE and the transmission and distribution losses of 1,999,000 TOE, out of those, the values for electricity sector were 194,000 TOE (35% of the total) and 1,351,000 TOE (68% of the total), respectively, according to Pakistan Energy Yearbook 2012.

Figure 3.1-1 shows that out of the final energy consumption of 40,026,000 TOE, the consumption of electricity was 6,251,000 TOE. In order to supply this electricity to the end consumers, the total input of energy, including the transformation losses, the own use, and the transmission and distribution losses, is calculated as 22,312,000 TOE from the above values: total of 6,251,000, 14,516,000, 194,000, and 1,351,000 TOE. This means that only 28% of the total input energy was received by the end consumers of electricity.

Figure 3.1-2 below shows the electricity generation by source in the year 2011/12.

[3] TOE is considered as an amount of energy released by burning one tonne of crude oil approximately equal to 42 GJ. [1 TOE = 41.84 GJ = 11, 622 kWh =39.683 million Btu].



Source: "Pakistan Energy Yearbook 2012" (HDIP) (Reproduced by the JICA Survey Team)

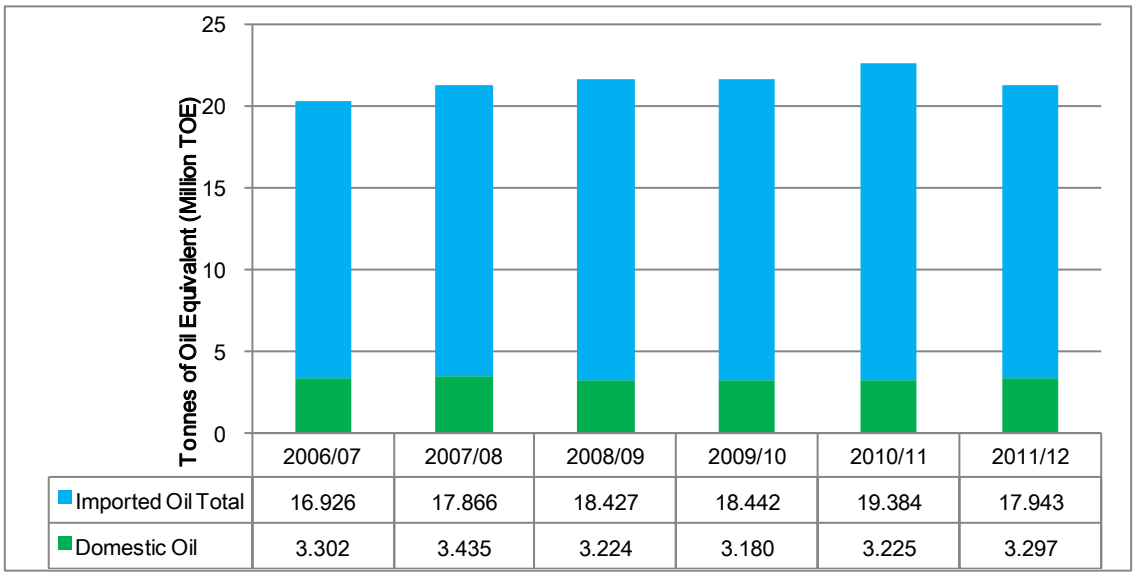
Figure 3.1-2 Electricity Generation by Source in 2011/12

The energy infrastructure map is shown in **Appendix C**.

3.2 Oil

3.2.1 Domestic Oil Production and Refinery

Figure 3.2.1-1 shows the oil supplied from domestic and imported resources and their total.



	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
Imported Oil Total	16.926	17.866	18.427	18.442	19.384	17.943
Domestic Oil	3.302	3.435	3.224	3.180	3.225	3.297

Source: Prepared by the JICA Survey Team based on "Pakistan Energy Year Book 2012", HDIP

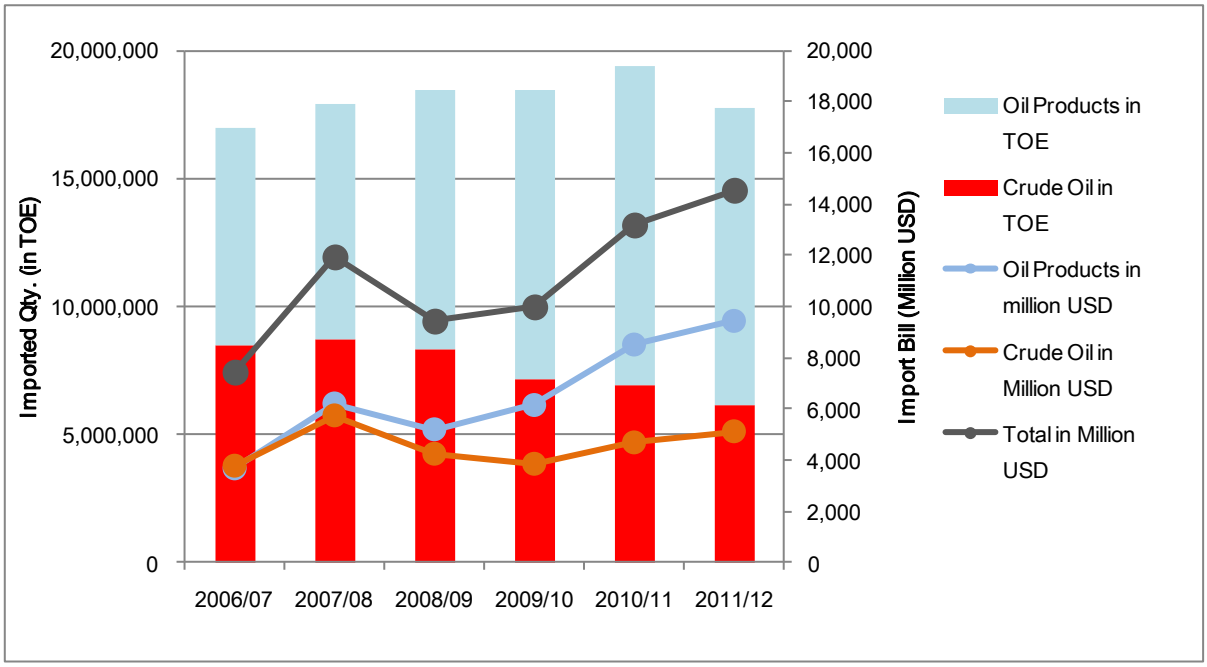
Figure 3.2.1-1 Oil Energy Supply - Share of Domestic and Imports

The total supply of oil in 2011/12 was 21.24 million TOE. The share of domestic oil production to the total supply in the same year remains at 16%.

Pakistan has seven oil refineries with a total capacity of 14 million tons per year. There are 13 companies involved in crude oil production in Pakistan. Among these 13 companies, the Oil and Gas Development Company Limited of Pakistan has the highest share of production, which accounted for almost 58% of the total domestic production in 2012.

3.2.2 Import of Oil

Figure 3.2.2-1 shows the yearly import bill for crude oil and petroleum products.



Source: Prepared by the JICA Survey Team based on "Pakistan Energy Year Book 2012", HDIP

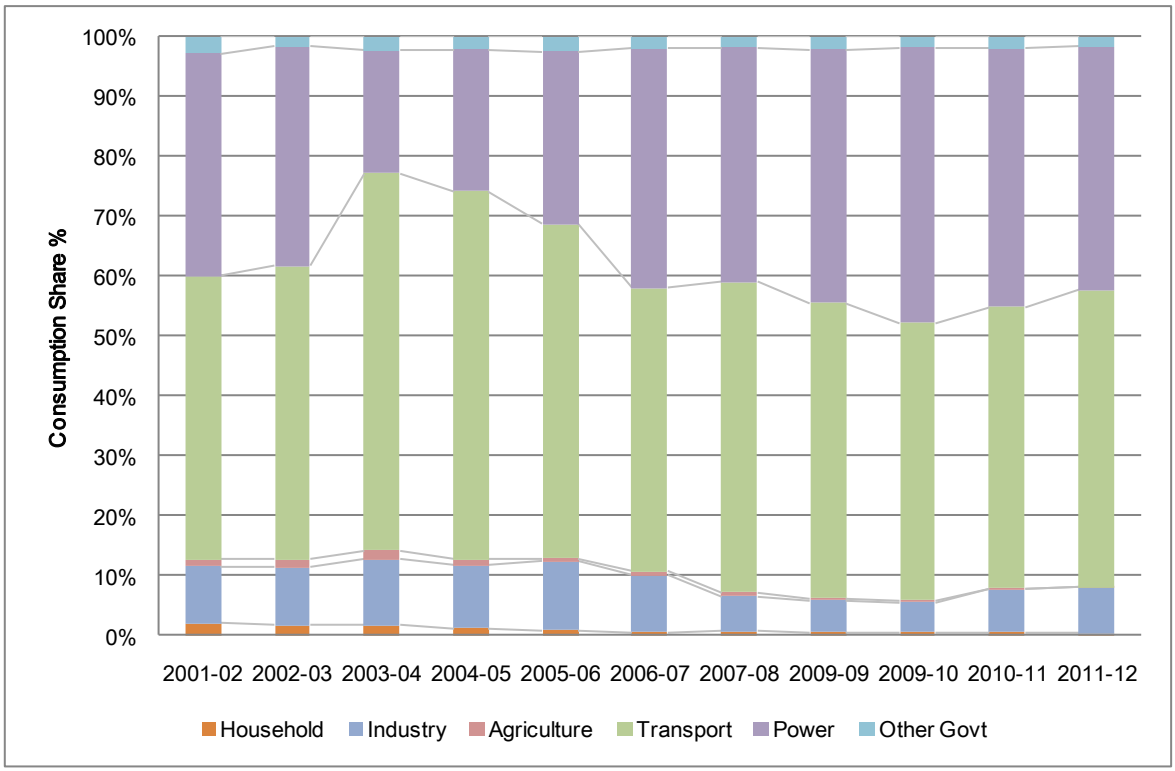
Figure 3.2-2-1 Value of Imported Oil and Petroleum Products

The figure indicates:

- ✓ There is no big change on the yearly quantity of imported crude oil and petroleum products, however the bill in million US$ increased rapidly. This is the result of price hike of the crude oil and petroleum products.
- ✓ The quantity of imported crude oil is constantly decreased from 2007/08. From this, it is considered that the capacity utilization ratios of the refineries in Pakistan were falling for these years, which lead to the further increase of production cost of oil products.

3.2.3 Consumption of Oil

Figure 3.2.3-1 shows the share of each sector in the total consumption of oil from years 2001/02 to 2011/12.



Source: Prepared by the JICA Survey Team based on "Economic Survey of Pakistan Report 2011/12", MoF and "Pakistan Energy Year Book 2012", HDIP

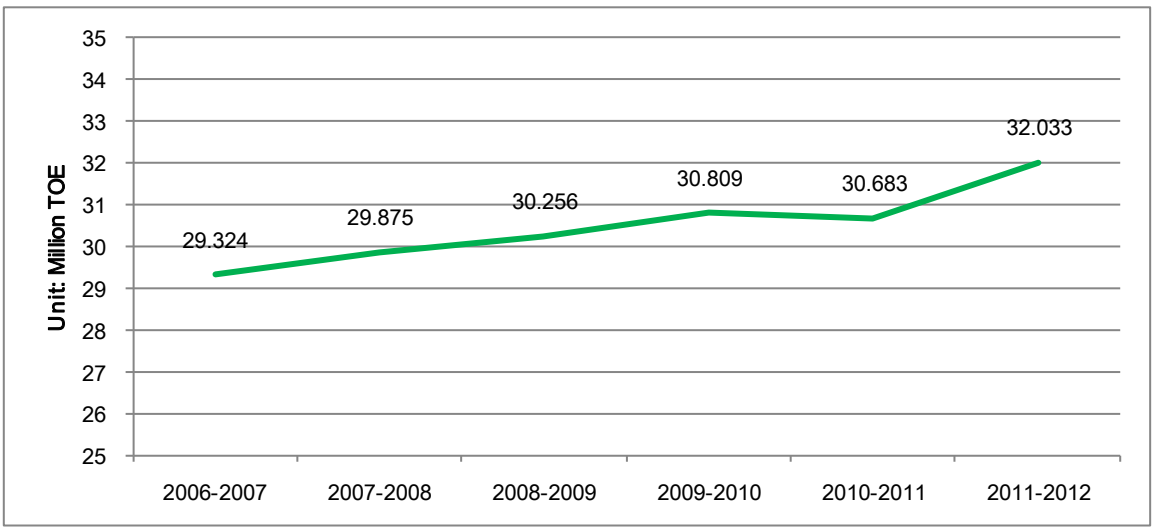
Figure 3.2.3-1 Consumption of Oil and Petroleum Products by Economic Group

Figure 3.2.3-1 indicates that the main users of petroleum products are transportation and power sectors which have jointly consumed 90% of total oil and petroleum products, and more than one-third of the same are consumed by the power sector in Pakistan.

3.3 Natural Gas

3.3.1 Domestic Natural Gas

The total energy supplied through natural gas is given in **Figure 3.3.1-1** in TOE.



Source: Prepared by the JICA Survey Team based on "Pakistan Energy Year Book 2012", HDIP

Figure 3.3.1-1 Supply of Energy through Natural Gas in TOE

During 2011/12, the total domestic gas production stood at 1,559 billion cubic feet (BCF) that is equivalent to 32 million TOE, which shows a growth of 6% when compared to its preceding year, while in TOE it shows a growth of 4.5%.

There are 146 nonassociated gas fields while 44 associated gas fields are operating under 15 companies. The companies having major shares in gas production are given in **Table 3.3.1-1**.

Table 3.3.1-1 Company-wise Share of Production and Number of Fields of Natural Gas

Name of Company	Share in Gas Production	Number of Location of Gas Fields				
		Punjab	Sindh	KPK	Baluchistan	Total
OGDC	24.79%	12	51	2	5	**70**
PPL	18.09%	1	4	0	1	**6**
Mari Petroleum	13.21%	0	5	0	1	**6**
ENI	11.31%	0	3	0	0	**3**
BHP Billiton Petroleum	10.39%	0	1	0	0	**1**

Source: Prepared by the JICA Survey Team based on Economic Survey of Pakistan Report 2011-12

Table 3.3.1-2 shows details the gas consumption by sector.

Table 3.3.1-2 Consumption of Gas and Growth

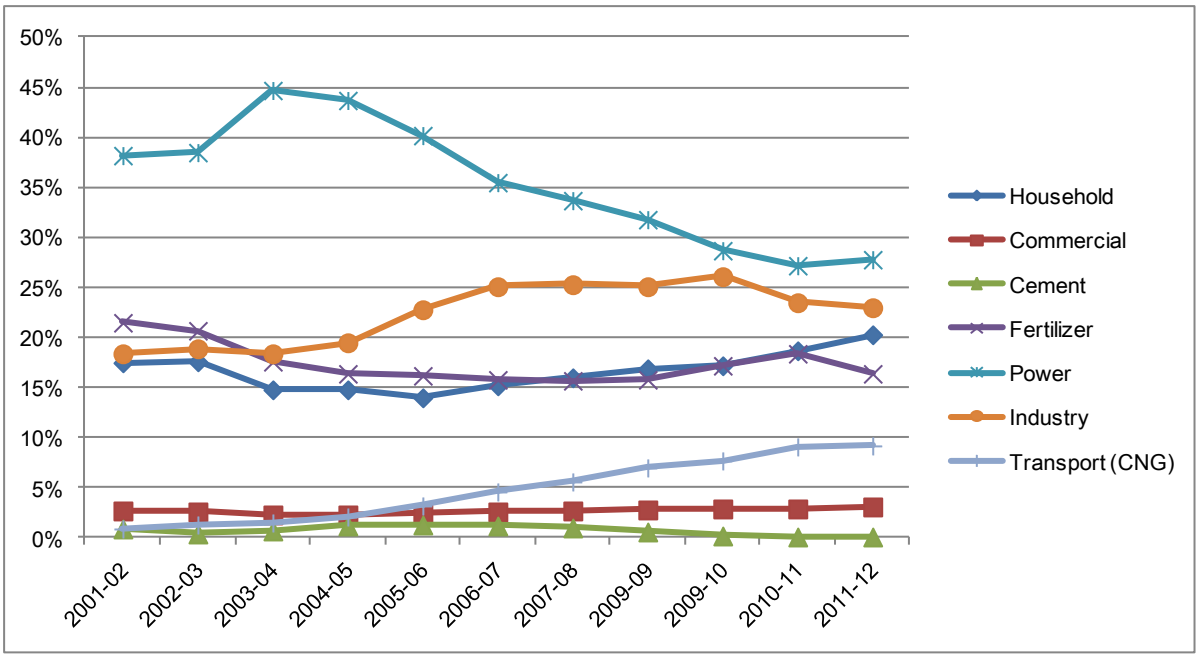
(Unit: BCF)

Year	Households		Commercial		Cement		Fertlizer		Power		Industry		Transport (CNG)	
	Vol.	Change %	Vol.	Change %	Vol.	Change %	Vol.	Change %	Vol.	Change %	Vol.	Change %	Vol.	Change %
2001/02	144	2.1%	22	4.8%	7	0.0%	178	1.7%	315	12.1%	151	8.6%	7	66.6%
2002/03	154	6.9%	23	4.5%	3	-57.1%	181	1.7%	336	6.7%	165	9.3%	11	57.1%
2003/04	155	0.6%	24	4.3%	8	166.7%	185	2.2%	470	39.9%	193	17.0%	16	45.5%
2004/05	172	11.0%	27	12.5%	13	62.5%	190	2.7%	507	7.9%	226	17.1%	24	50.0%
2005/06	171	-0.6%	29	7.4%	15	15.4%	198	4.2%	492	-3.0%	279	23.5%	39	62.5%
2006/07	186	8.8%	31	6.9%	15	0.0%	194	-2.0%	434	-11.8%	307	10.0%	56	43.6%
2007/08	204	9.7%	34	9.7%	13	-13.3%	200	3.1%	430	-0.9%	323	5.2%	72	28.6%
2008/09	214	4.9%	36	5.9%	7	-46.2%	201	0.5%	404	-6.0%	319	-1.2%	88	22.2%
2009/10	219	2.3%	37	2.8%	2	-71.4%	220	9.5%	367	-9.2%	334	4.7%	99	12.5%
2010/11	232	5.9%	36	-2.7%	1	-50.0%	228	3.6%	337	-8.2%	292	-12.6%	113	14.1%
2011/12	262	12.8%	39	8.7%	1	0.0%	211	-7.3%	358	6.2%	296	1.5%	119	5.3%
10-Year Mean	192	5.9%	31	5.9%	8	0.6%	199	1.8%	405	3.1%	262	7.5%	59	37.1%

Source: Prepared by the JICA Survey Team based on Economic Survey of Pakistan Report 2011-12

The above table shows that there is noticeable growth in consumption of natural gas by household, commercial and industrial sectors but there is huge growth in consumption by the transport sector that is through consumption as CNG. The CNG consumption was only 7 BCF during the year 2001/02 that has gone to 58.55 BCF during the year 2011/12. The maximum gas share in consumption of natural gas by the power sector was during year 2004/05 when it consumed 507 BCF of natural gas that was dropped to 358 BCF during year 2011/12.

Figure 3.3.1-2 below shows the sector-wise consumption of natural gas from 2001/02 to 2011/12.



Source: Prepared by the JICA Survey Team based on "Economic Survey of Pakistan Report 2011/12", MoF and "Pakistan Energy Year Book 2012", HDIP

Figure 3.3.1-2 Sector-wise Share of Natural Gas Consumption

According to Economic Survey of Pakistan Report for year 2011/12, the total estimated natural gas potential of the country is 282,000 BCF of which only 24,000 BCF is recoverable. The current production of natural gas is 4 BCF per day. During the year 2011/12 the total gas production was 1,559 BCF that showed a growth of 6% over preceding year. Even if the production remains at the level in 2011/12, the recoverable potential of domestic natural gas: 24,000 BCF will be dried up within 15 years. According to the forecast prepared by ISGS the total natural gas production is estimated to reduce to 2.35 BCF by the year 2019/2020.

The government has formulated a Gas Allocation and Management Policy, 2005, which highlights a merit order in a low gas supply scenario. However, this policy has been blatantly violated by the gas companies since 2005 as the merit order envisaged in the policy was not followed in terms of actual gas allocation.

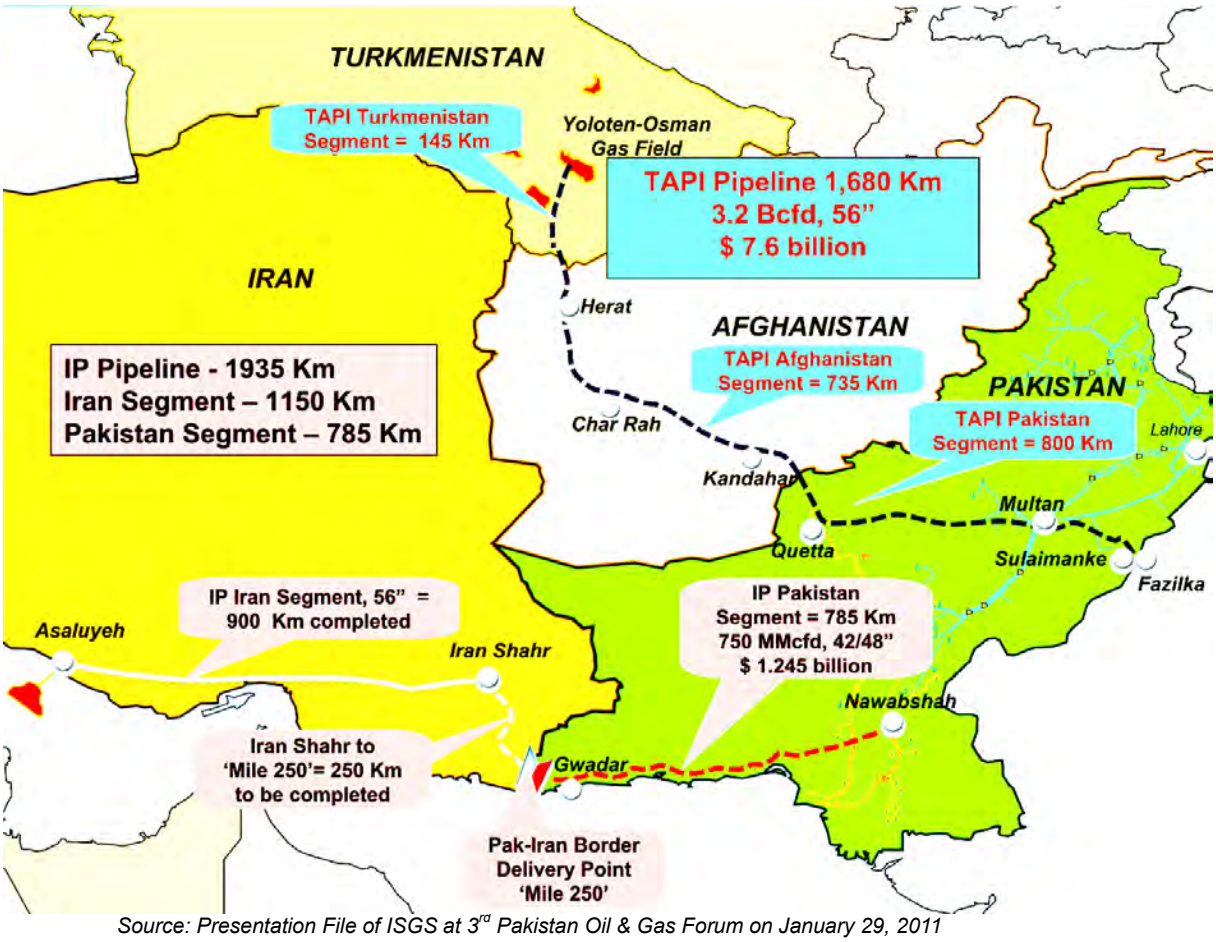
3.3.2 Import of Natural Gas

At present, natural gas is not imported from any countries in Pakistan.

However, the Government of Pakistan (GOP) has planned to import natural gas from Iran and Turkmenistan since long back in order to meet the growing energy consumption. To help achieve this objective, the Inter State Gas System (ISGS) was established in 1996 as a private limited company.

ISGS has been mandated by GOP to develop natural gas import projects, and to serve as an interface between GOP and other national and international agencies for the import and storage of natural gas in Pakistan.

The route map of gas pipelines is shown in **Figure 3.3.2-1**.



Source: Presentation File of ISGS at 3rd Pakistan Oil & Gas Forum on January 29, 2011

Figure 3.3.2-1 Route Map of Gas Pipeline (IP and TAPI)

(1) Iran-Pakistan Gas Pipeline (IP)

The pipeline will start from the onshore gas processing facility at Assaluyeh in Iran and traverse a distance of 1,150 km up to the Iran-Pakistan border. This part will be built and operated by Iran. Iran has already completed 900 km of the 56-inch diameter pipeline from Assaluyeh to Iran Shehr. The remaining 250 km up to the Pakistan border is being designed, and is expected to be completed in two years. The Pakistan section of the pipeline is to be laid close to the Makran Coastal Highway from the Iran-Pakistan border up to Pakistan take-off point at Nawabshah, covering a distance of over 781 km.

(2) Turkmenistan – Afghanistan – Pakistan – India Gas Pipeline (TAPI)

The Turkmenistan–Afghanistan–Pakistan–India (TAPI) gas pipeline project aims to bring natural gas from the Yoloten/Osman and adjacent gas fields in Turkmenistan to Afghanistan, Pakistan, and India. The ADB acts as the facilitator and coordinator for the project. ADB funded a feasibility study for the project in 2004. The capital cost of the project was originally estimated at US$3.3 billion, which has been revised to US$7.6 billion in 2008, using the latest cost of steel and construction at the time of revision.

The pipeline will carry a total of 3,150 million cubic feet per day (MMCFD) of natural gas from South Yolotan/Osman and adjacent gas fields through a 6-inch diameter pipeline going through Herat and Kandahar in Afghanistan to Chaman at Pakistan-Afghan border, that will further pass

through Zhob, DG Khan, and Multan in Pakistan to Fazilika at the Pakistan-India border with a total length of 1,680 km. Of the total gas that will be carried, Afghanistan has a share of 500 MMCFD, Pakistan with 1,325 MMCFD, and India with 1,325 MMCFD. The gas flow is expected and targeted to start in 2017.

(3) Import of Liquefied Natural Gas (LNG)

In order to encourage LNG import to bridge the widening gap between gas demand and supply, GOP has drafted the LNG Policy, 2011. In line with said objectives, the Economic Coordination Committee (ECC) approved the following LNG import projects on October 3, 2012:

- ✓ **LNG Floating Terminal**: The ISGS is facilitating both public and private sectors for this purpose. Two bids have already been called for setting up floating, storage, and regasification units (FSRUs) in the private sector. The selected party or parties will perform marine transportation activities and establishment of LNG terminal and injection of regasified liquefied natural gas (RLNG) into the network of Sui Southern Gas Company Limited (SSGCL). These terminals will be constructed for a period of 15 years in Port Qasim in Sindh Province.
- ✓ **Fast Track LNG Import Project**: SSGCL's subsidiary company, SSGCL LPG Company, will act as a special purpose vehicle (SPV) in securing LNG supply. To receive the LNG, the LNG terminal will be set up at the existing LPG terminal site(s) in Port Qasim in Sindh Province to reduce commissioning time.

3.3.3 Natural Gas Distribution System

There are two companies in Pakistan who are responsible for the distribution of natural gas to all sectors in Pakistan. These companies are SSGCL and the Sui Northern Gas Pipelines Limited (SNGPL). The service area of these companies is divided based on geographical location: SSGCL is serving the Sindh and Balochistan provinces while SNGPL is serving the Punjab and Khyber Pakhtunkhwa (KPK) provinces.

The distribution network maps are shown in **Appendix D**.

3.4 Price Mechanism for Oil and Natural Gas

The prices of oil and natural gas in Pakistan are being regulated in order to safeguard the interest of people and businesses in the country. This task was carried out by Ministry of Petroleum and Natural Resources (MPNR) but lately, the task has been assigned to the Oil and Gas Regulatory Authority (OGRA).

OGRA has been set up under the Oil and Gas Regulatory Authority Ordinance dated March 28, 2002 to foster competition, increase private investment and ownership in the midstream and downstream petroleum industry, and protect the public interest.

OGRA determines the gas prices based on the revenue requirements (prescribed prices) of the gas companies whereas the consumers' sale prices are fixed by GOP. Under OGRA Ordinance 2002, the revenue requirement consists of the following three components:

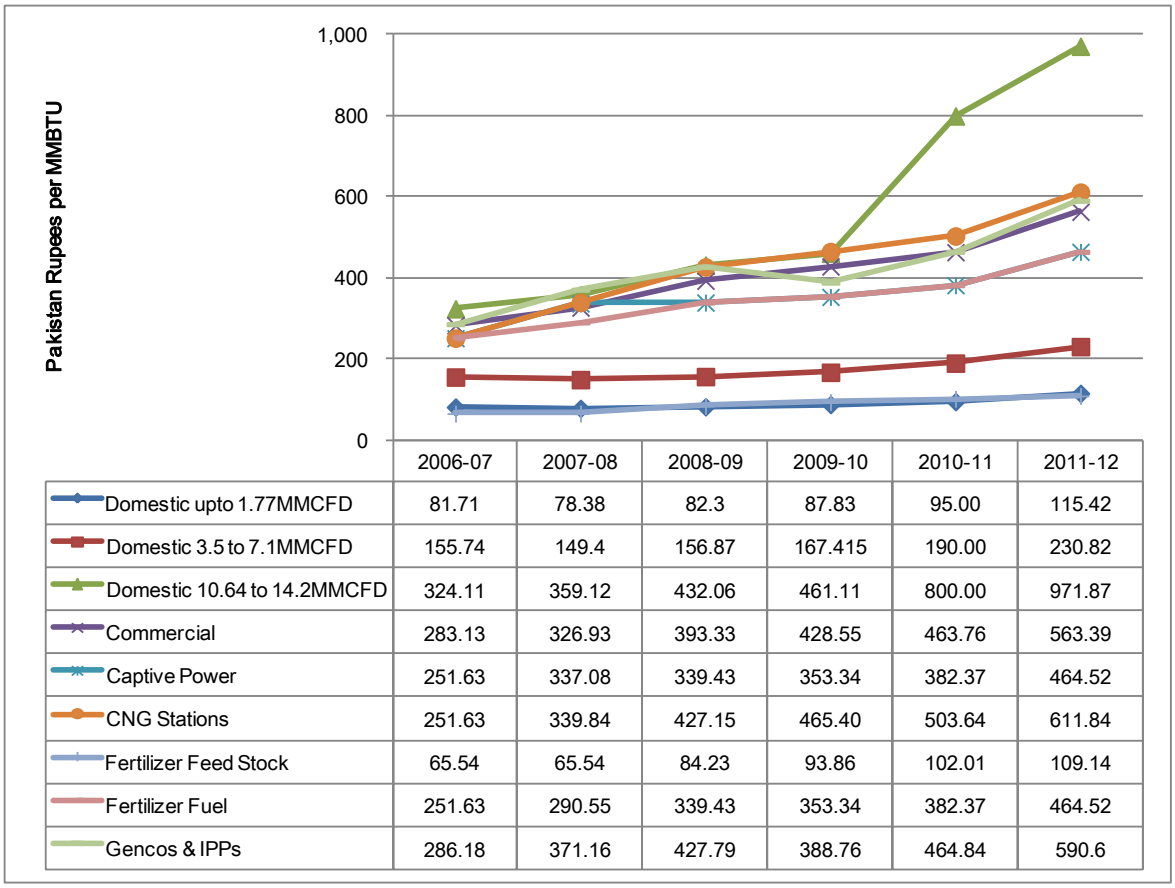
- ✓ Cost of gas,

- ✓ Operating cost, and
- ✓ Return on assets.

In accordance with GOP's policy guidelines, the IRR is currently 17.5% for SNGPL and 17.0% for SSGCL.

Based on the gas prices determined by OGRA, GOP advises the selling prices for each consumer category under Section 9 (3) of the Ordinance. The selling prices are then published by OGRA in the official gazette.

The natural gas tariff for various sectors in Pakistan over the years is given in **Figure 3.4-1** below.



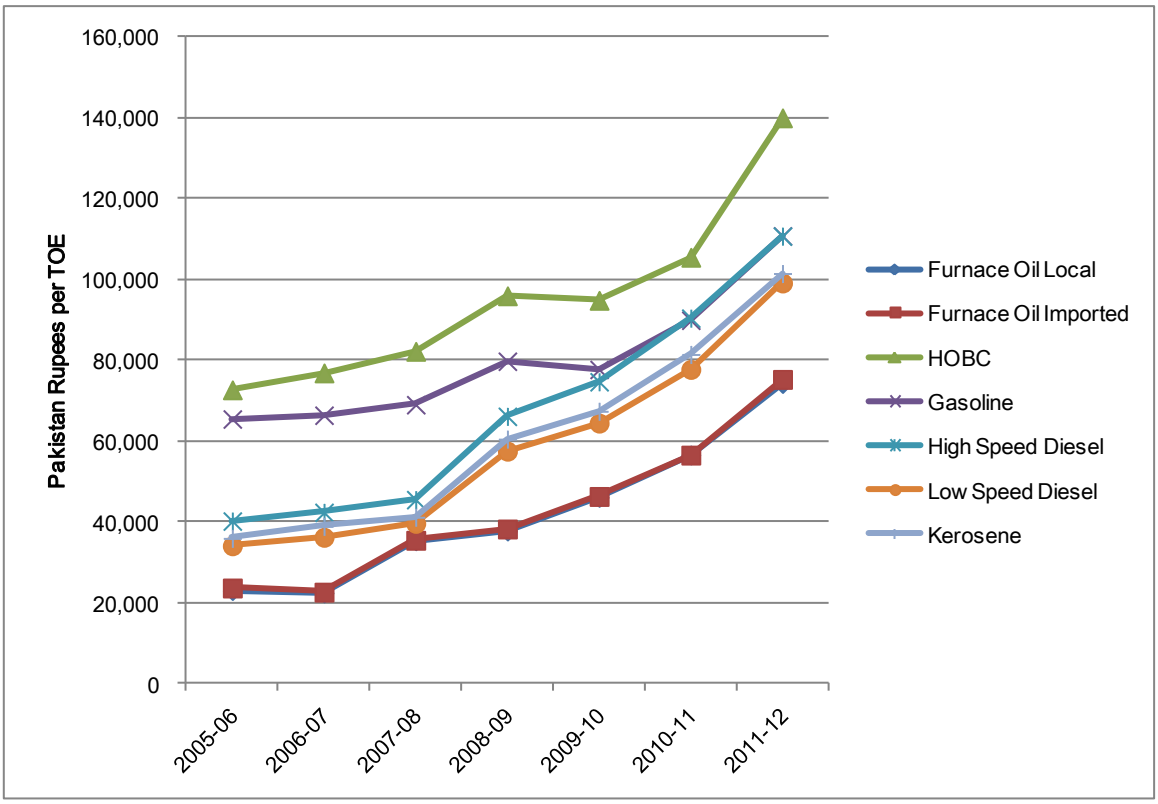
	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
Domestic upto 1.77MMCFD	81.71	78.38	82.3	87.83	95.00	115.42
Domestic 3.5 to 7.1MMCFD	155.74	149.4	156.87	167.415	190.00	230.82
Domestic 10.64 to 14.2MMCFD	324.11	359.12	432.06	461.11	800.00	971.87
Commercial	283.13	326.93	393.33	428.55	463.76	563.39
Captive Power	251.63	337.08	339.43	353.34	382.37	464.52
CNG Stations	251.63	339.84	427.15	465.40	503.64	611.84
Fertilizer Feed Stock	65.54	65.54	84.23	93.86	102.01	109.14
Fertilizer Fuel	251.63	290.55	339.43	353.34	382.37	464.52
Gencos & IPPs	286.18	371.16	427.79	388.76	464.84	590.6

Prepared by the JICA Survey Team based on "Economic Survey of Pakistan Report 2011/12"
**The values in the chart/table were computed by the taking average of prices during the year. In calculating prices for fertilizer feed stock and IPPs, the average price for all users was taken into consideration.*

Figure 3.4-1 Natural Gas Tariff for Various Sectors 2006/07 to 2011/12

From the graph, it is very evident that fertilizer feed stocks are by far the lowest tariff payers for natural gas in Pakistan.

Figure 3.4-2 graphs the yearly average selling prices of petroleum products.



Prepared by the JICA Survey Team based on "Economic Survey of Pakistan Report 2011/12"
** The values in the chart/table were computed by the taking average of prices during the year.*
**Calorific value of 20,500 btu/lb was taken for HOBC, 20,400 btu/lb for gasoline, 19,300 btu/lb for HSD, 19,000 btu/lb for LSD, 19,900 btu/lb for kerosene, and 18,300btu/lb for imported and domestic furnace oil as nominal international values as was advised by PSO.*
**TOE: Tonnes of oil equivalent is considered as 39. 683 MMBTU*

Figure 3.4-2 Petroleum Product Prices (Yearly Average)

OGRA used to announce prices of petroleum products. However, since June 2011, the prices of petroleum products have been deregulated and are now associated with import price of Pakistan State Oil (PSO). Now, only prices of kerosene and E10[4] are regulated and announced by OGRA while those for the other petroleum products are announced by oil marketing companies on the first day of every month. Yet, OGRA determines the petroleum products' levy every month whereas the petrol pump margin and margin of oil marketing companies is determined by MPNR.

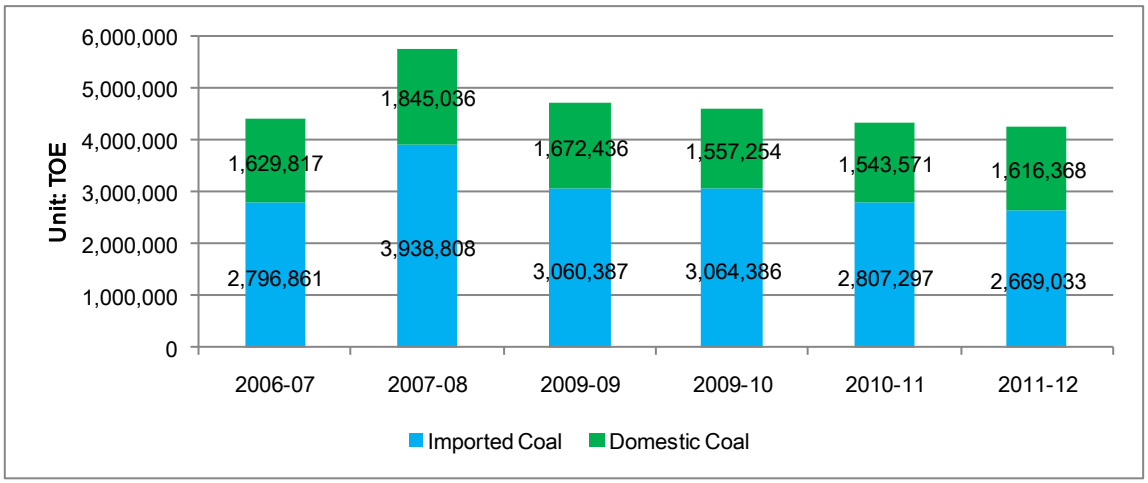
3.5 Coal

3.5.1 Domestic Coal

According to Economic Survey, Pakistan has coal resources estimated at over 186 billion tons, including 175 billion tons identified at Thar coalfields. Pakistan's coal generally ranges from lignite to subbituminous. To meet domestic demand, almost 4 million tons of coal is imported annually.

Figure 3.5.1-1 below shows the share of coal supply of local production and imports from 2006/07 to 2011/12.

[4] a blend of 10% ethanol and 90% gasoline (Source: http://www.fueleconomy.gov/feg/ethanol.shtml)



Source: Prepared by the JICA Survey Team based on "Pakistan Energy Year Book 2012", HDIP

Figure 3.5.1-1 Share of Imported and Domestic Coal Supply

From the figure, it can be seen that imported coal is more than locally produced.

Table 3.5.1-1 below shows the share of each sector in the consumption of coal and their growth rates from 2001/02 to 2011/12.

Table 3.5.1-1 Consumption of Coal (Share and Growth Rates)

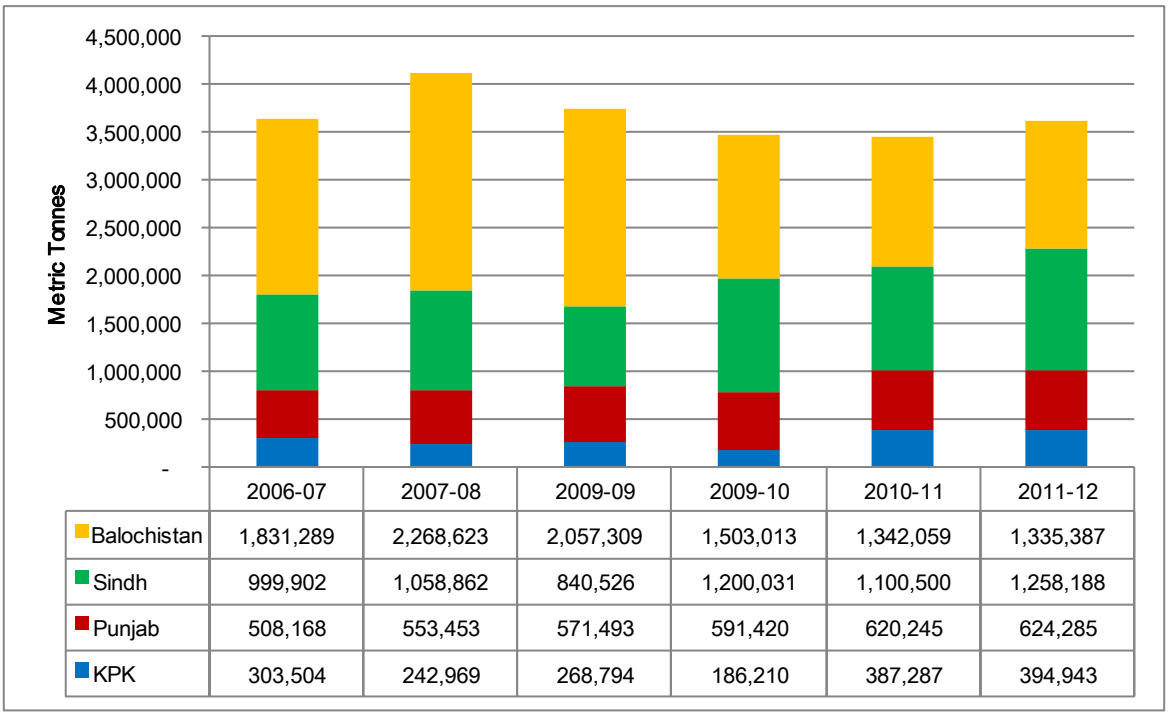
Year	Share in Total Consumption				Growth Rates				Overall Growth
	Household	Power	Brick Kilns	Cement	Household	Power	Brick Kilns	Cement	
2001-02	0.0%	5.7%	58.5%	35.9%	0.0%	21.2%	-9.2%	58.1%	9.0%
2002-03	0.0%	4.2%	53.3%	42.5%	0.0%	-18.4%	1.1%	31.5%	10.9%
2003-04	0.0%	3.0%	42.7%	54.2%	0.0%	-9.2%	-0.7%	58.3%	24.0%
2004-05	0.0%	2.3%	49.5%	48.2%	0.0%	-2.7%	50.9%	15.7%	30.2%
2005-06	0.0%	1.9%	54.7%	43.3%	0.0%	-17.1%	8.1%	-12.2%	-2.3%
2006-07	0.0%	2.1%	41.5%	56.4%	0.0%	10.1%	-22.4%	33.2%	2.3%
2007-08	0.0%	1.6%	37.2%	61.2%	0.0%	1.5%	14.7%	39.0%	28.1%
2009-09	0.0%	1.3%	39.0%	59.6%	0.0%	-20.0%	-12.9%	-19.2%	-17.0%
2009-10	0.0%	1.5%	36.9%	61.5%	0.0%	11.6%	-8.2%	0.1%	-3.0%
2010-11	0.0%	1.3%	38.9%	59.8%	0.0%	-23.1%	-0.1%	-7.8%	-5.2%
2011-12	0.0%	1.4%	40.5%	58.1%	0.0%	8.4%	-3.5%	-3.5%	-0.6%

Source: Prepared by the JICA Survey Team based on "Economic Survey of Pakistan Report 2011-12", MoF and "Pakistan Energy Year Book 2012", HDIP

The major users of coal are the cement and brick kiln sectors. About 58% of the total coal was consumed by cement sector while 41% was consumed by the brick kiln industry in 2011/12. The cement sector share of coal consumption has been increasing. The reason for this increase is due to the switch from furnace oil to coal.

The electric power sector share in consumption is small and decreased from 5.7% in 2001/02 to 1.4% in 2011/12.

The area-wise domestic coal productions are shown in **Figure 3.5.1-2** below.



	2006-07	2007-08	2009-09	2009-10	2010-11	2011-12
Balochistan	1,831,289	2,268,623	2,057,309	1,503,013	1,342,059	1,335,387
Sindh	999,902	1,058,862	840,526	1,200,031	1,100,500	1,258,188
Punjab	508,168	553,453	571,493	591,420	620,245	624,285
KPK	303,504	242,969	268,794	186,210	387,287	394,943

Source: Prepared by the JICA Survey Team based on "Pakistan Energy Year Book 2012", HDIP

Figure 3.5.1-2 Area Wise Total Domestic Coal Supply in Pakistan

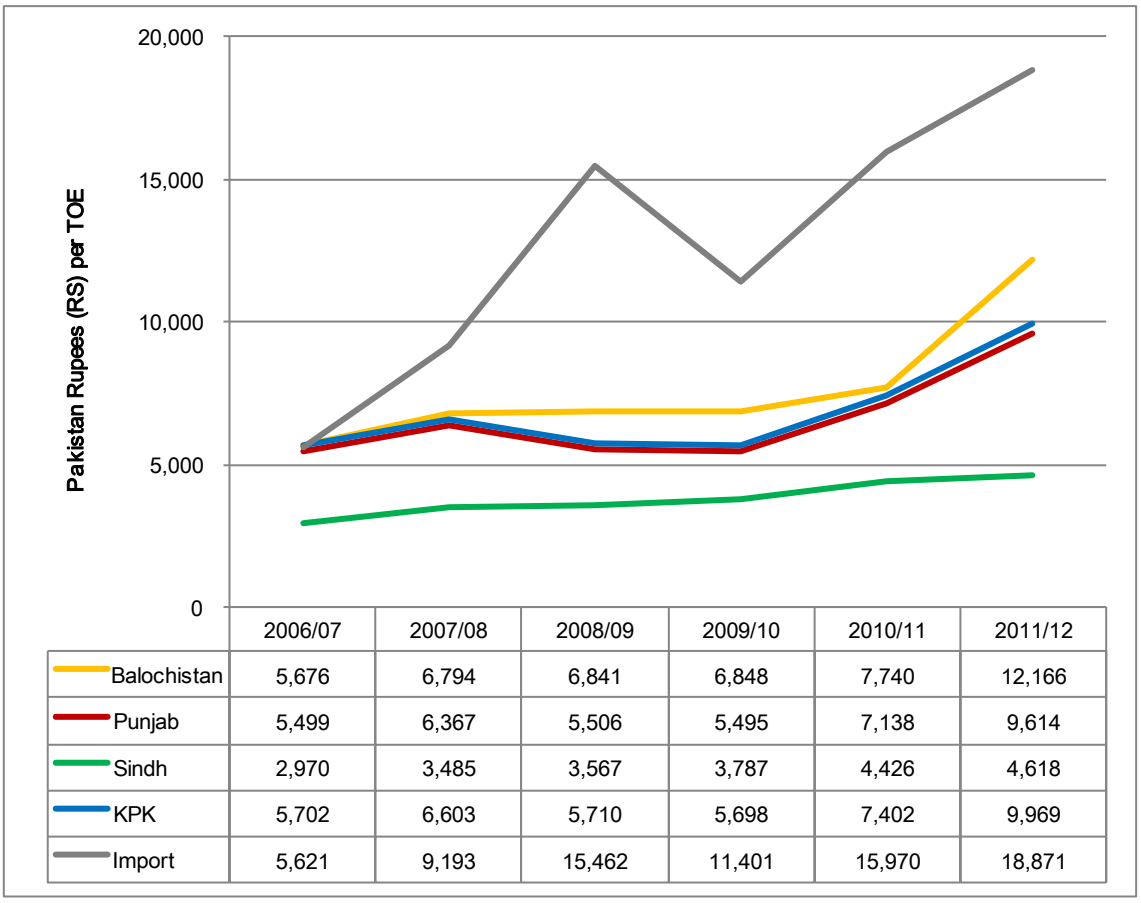
The largest producer of coal in Pakistan is Balochistan Province followed by Sindh and Punjab provinces.

The location of coal reserves in each province is given in **Appendix E**.

3.5.2 Import of Coal

In order to meet the domestic demand, coal is regularly imported with a volume greater than domestic coal as shown in **Figure 3.5.1-1**. Coal is imported mostly from Malaysia, South Africa, and Australia.

The prices of imported and domestic coal are shown in **Figure 3.5.2-1** below.



	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
Balochistan	5,676	6,794	6,841	6,848	7,740	12,166
Punjab	5,499	6,367	5,506	5,495	7,138	9,614
Sindh	2,970	3,485	3,567	3,787	4,426	4,618
KPK	5,702	6,603	5,710	5,698	7,402	9,969
Import	5,621	9,193	15,462	11,401	15,970	18,871

Source: Prepared by the JICA Survey Team based on "Pakistan Energy Year Book 2012", HDIP, Presentation by Mines and Minerals Department, Punjab government and interview with the Director General, Mines and Minerals Department, KPK Province
**TOE: Tonnes of oil equivalent is considered as 39. 683 MMBTU*
**Prices of coal are ex-mine.*

Figure 3.5.2-1 Prices of Imported Coal and Domestic Coal in Pakistan

The price of imported coal has increased much more than the price of domestic coal. It is rational to increase production of domestic coal rather than to increase the importation of coal.

3.6. Nuclear Energy

The Pakistan Atomic Energy Commission (PAEC) is responsible for planning, construction, and operation of nuclear power plants, i.e., Karachi Nuclear Power Plant (KANUPP) and Chashma Nuclear Power Plant Units 1 and 2 (C-1 and C-2). The construction of two more units, C-3 and C-4, is in progress.

According to the Economic Survey Report 2011/12, the commercial operations of C-3 and C-4, each producing 340 MW, are planned to start in December 2016 and October 2017, respectively. GOP has mandated PAEC to install nuclear power plants with capacities up to 8,800 MW by the year 2030.

3.7. Hydropower (other than Small Hydro)

Pakistan is divided into three major geographic areas, namely: the northern highlands, the Indus River plain with two major subdivisions corresponding roughly to the provinces of Punjab and Sindh, and the Balochistan Plateau. Pakistan is comprised of several mountains in the north and

steady plains in the central and southern part. It also has long seashore in the south. The mean annual precipitation ranges from less than 100 mm in parts of the Lower Indus Plain to over 750 mm near the foothills of the Upper Indus Plain. The Upper Indus Plain has a high hydropower potential.

Considering the large potential and the intrinsic characteristics of hydropower in promoting the country's energy security and flexibility in system operations, the government accelerated hydropower development. The hydropower potential of Pakistan is estimated at around 60,000 MW, in which around 57,000 MW is above 50 MW and around 2,300 MW falls below 50 MW. The installed hydropower generating capacity in Pakistan, from year 2007 to 2012, is given in **Table 3.7-1**.

Table 3.7-1 Installed Hydropower Generation Capacities by Type

(Unit: MW)

Year	2007	2008	2009	2010	2011	2012	Oct. 2013
WAPDA Hydel	6,444	6,444	6,444	6,444	6,444	6,444	6,750
IPPs Hydel	30	111	111	111	111	111	195
Total	**6,474**	**6,555**	**6,555**	**6,555**	**6,555**	**6,555**	**6,945**

Source: "Pakistan Energy Yearbook 2012", HDIP and Interview at NTDC

The latest information provided by NTDC reveals that 306 MW of new hydropower plants have been completed by WAPDA and 84 MW by the private sector in the first 10 months of 2013. So the total installed hydropower capacity is increased to 6,945 MW.

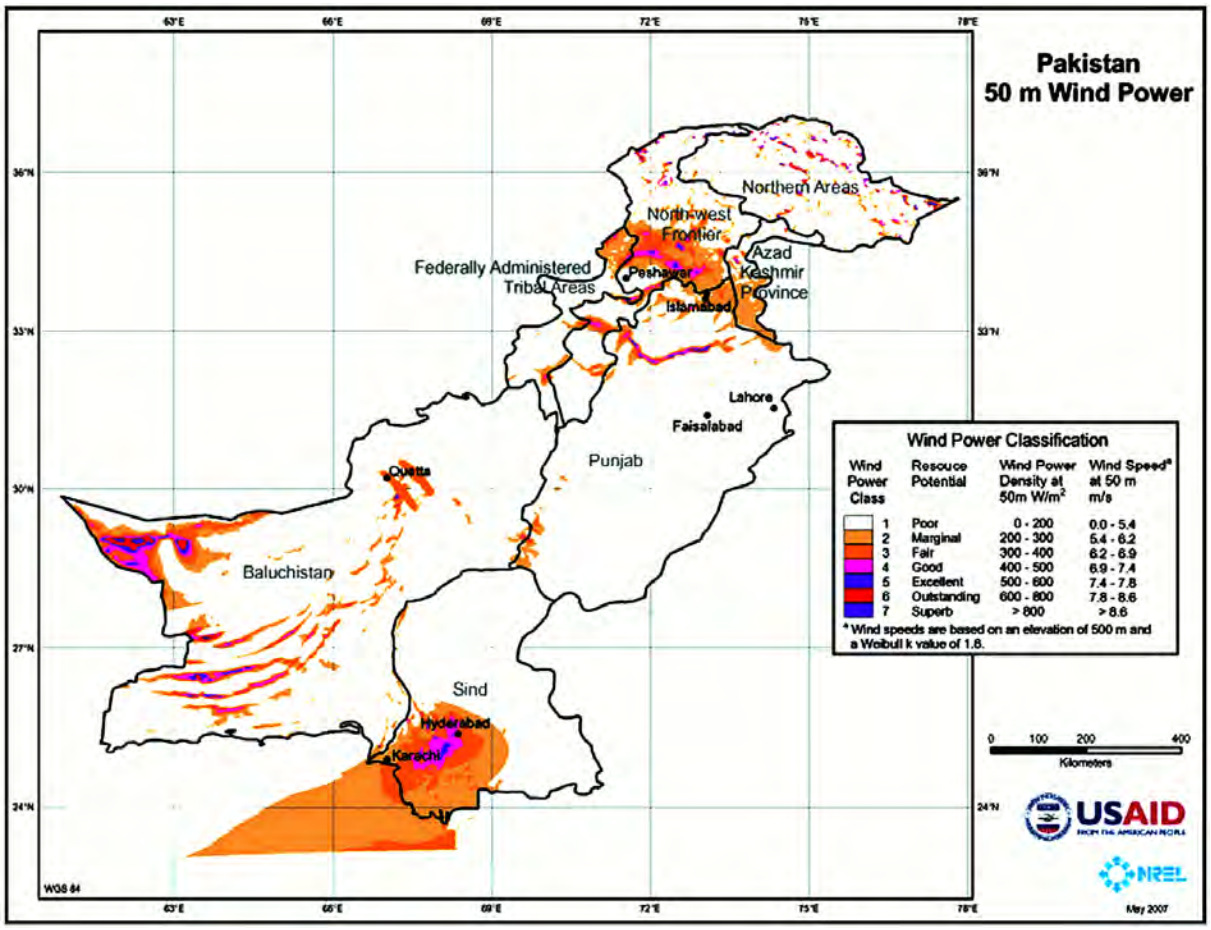
3.8 Renewable Energy

Pakistan has large and viable resources in wind, solar, biomass, waste, geothermal, and small hydropower. In order to develop these alternative and renewable resources, GOP offers lucrative fiscal and financial incentives to investors.

3.8.1 Wind

The wind power map of Pakistan, developed by National Renewable Energy Labs (NREL), USA, identifies the locations having good wind speeds in the country with a total estimated potential of approximately 340,000 MW.

Figure 3.8.1-1 shows the average wind power potential in Pakistan



Source: Website of AEDB (http://www.aedb.org/downloads.htm)

Figure 3.8.1-1 Average Wind Power Potential Map of Pakistan

The Gharo-Keti Bandar Wind Corridor, in Sindh Province, has an approximate potential of 50,000 MW and is the most attractive site to investors at the moment due to good resource potential as well as proximity to major load centers and to the national grid.

In Jhimpir, Sindh Province, two investors, namely, FFC Energy (Ltd) and Zorlu Enerji, have almost finished their construction of wind farms. They started commercial operations since late 2012 with a combined installed capacity of 105.90 MW.

By July 2012, the Alternative Energy Development Board (AEDB) has issued a Letter of Intent (LOI) to 37 wind farm project developers with generating capacities ranging from 2.4 to 500 MW each. Later, the Sindh Board of Investment (SBI) had cancelled LOI for companies that they found to have no intention in pursuing the project. According to the latest information provided by SBI as of November 7, 2013, there are 27 LOI holders with a cumulative installed capacity of 1,846.40 MW.

The Sindh government has leased land to 15 wind farm IPPs. Moreover, NEPRA, being the authority that will approve the tariff of the electricity generated by the wind farm, announced tariff approvals for five projects. Six companies have already signed EPC contract for installation of wind farms with a cumulative installed capacity of 349 MW.

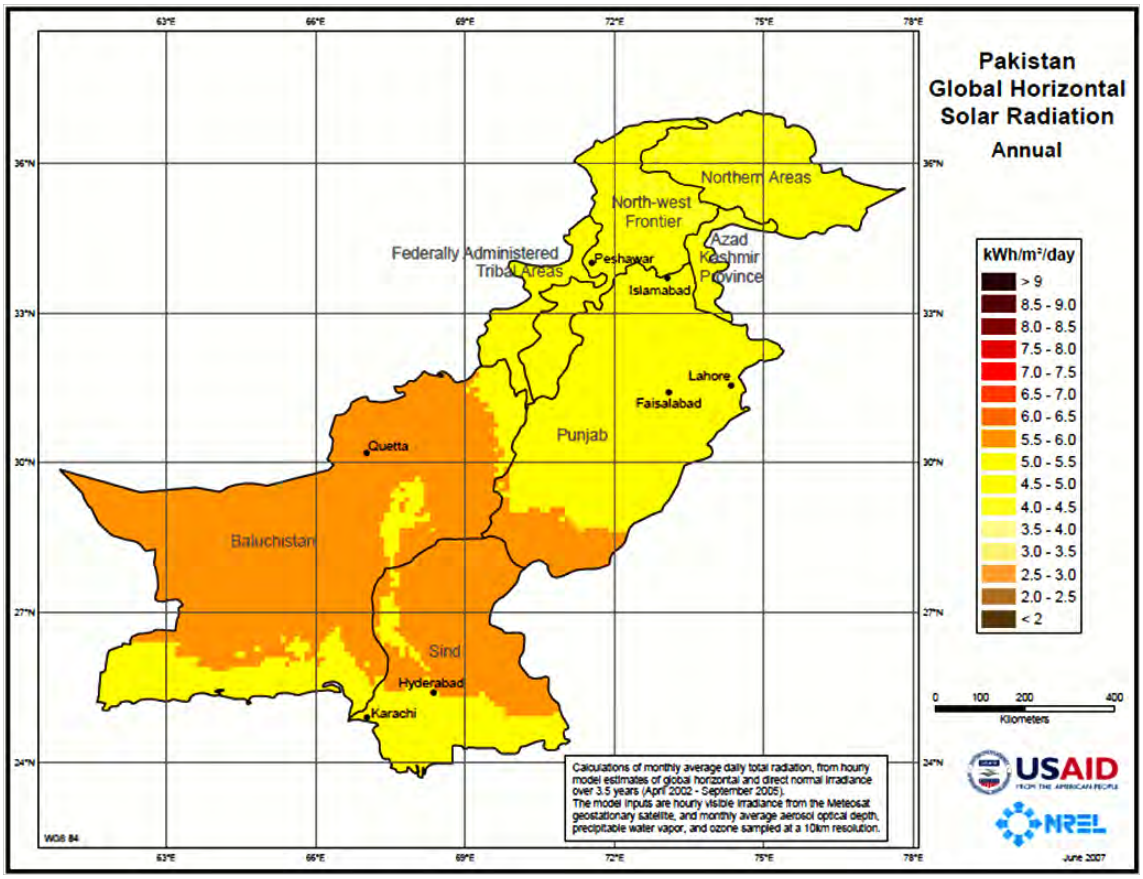
According to SBI and Energy Department of Sindh Province, nine companies with a cumulative capacity of 930 MW will achieve financial closure by September 2014, and can be commissioned by June 2015, but there is no transmission line in place to conduct the power from these power plants. NTDC will only be able to complete the transmission line by 2016.

GOP has a medium-term plan (2011-2020) for wind energy development. The target for the year 2020 was set at 3,150 MW.

3.8.2 Solar

The entire Pakistan has a high potential for solar energy. In particular, Baluchistan, Sindh, and Southern Punjab provinces receive solar radiation of over 2 MWh/m^2 per year. This means that the annual average horizontal solar radiation per day in these areas is more than 5.48 kWh・m^{-2}・day^{-1}. For comparison, the highest solar radiation measured in Japan was in Naha of Okinawa Prefecture, in which the annual average solar radiation is around 4.5 kWh・m^{-2}・day^{-1}.

Figure 3.8.2-1 below shows the global horizontal solar radiation levels in Pakistan.



Source: AEDB

Figure 3.8.2-1 Global Horizontal Annual Average Solar Radiation Level in Pakistan

The Punjab Provincial Government established Qaid-e-Azam Solar Park in Cholistan area near Bahawalpur and allocated 10,000 acres of land. They are developing infrastructure and they will develop blocks for 50 MW capacity solar photovoltaic (PV) power plants each with 250 acres of land. The land will be leased at a rate of US$1 per acre. In order to attract private investors, the

Punjab government planned to setup a 100 MW solar plant by themselves and the bidding process for that has already started.

3.8.3 Biomass

Pakistan has large amounts of agriculture wastes in the form of baggasse, cotton sticks, rice straw, rice husk, corn stalks, corn cobs, sugarcane leaves, wheat straw, etc. According to estimates by NEPRA, converting these wastes to energy can easily generate 3,000 MW of power. Pakistan offers lucrative opportunities in this sector and some IPP projects are already been under preparation.

3.8.4 Small Hydro

There are many canals in Pakistan. There are also rivers in the northern mountainous region of the country.

According to the Hydropower Resources of Pakistan published by Private Power and Infrastructure Board (PPIB) in 2011, about 330 potential sites with a total capacity of 7,291 MW were identified in Punjab Province at different canals and barrages having medium and small heads. Out of these, eight projects with a capacity of 1,699 MW are in operation. According to the information provided by the Punjab Power Development Board (PPDB), 29 small hydro projects are under implementation by the private sector, whereas for five sites, the Punjab government has prepared feasibility studies and IEEs and they are planning to auction these sites to the private sector.

As Sindh province lies in the plains, the potential for small hydro is very limited. According to the Hydropower Resources of Pakistan published by PPIB in 2001, there are 18 sites identified in Sindh Province with a total potential of 193 MW. According to officials of Sindh Energy Department, the Sindh government is planning to set up the first small hydro plant at Rohri Canal with 5 MW installed capacity under public–private partnership (PPP) scheme.

Chapter 4 ELECTRICITY SUPPLY DEVELOPMENT PLAN

4.1 Review of Demand Forecast

The National Transmission and Dispatch Company Limited (NTDC) is responsible for developing power demand forecasts of Pakistan.

The latest demand forecast was developed by NTDC in collaboration with DISCOs titled "Electricity Demand Forecast Reports based on Power Market Survey 22nd Issue, December 2012". This report covers the period from 2012 to 2022.

The model of demand forecast is called Power Market Survey (PMS) model which is based on a mix of end-use, trend projection, and known consumer expansion plans. It can be considered adequate for mid-term planning purpose.

The forecasted energy demand and annual growth rates for different consumer categories are given in **Table 4.1-1**.

Table 4.1-1 Category-wise Forecasted Energy Demand (excluding Unserved Energy by Load Shedding)

Year	Domestic		Commercial		Public Light		Small		M&L		Tube Well		Total	
	Energy (GWh)	G.R. (%)	Energy (GWh)	G.R. (%)	Energy (GWh)	G.R. (%)	Energy (GWh)	G.R. (%)	Energy (GWh)	G.R. (%)	Energy (GWh)	G.R. (%)	Energy (GWh)	G.R. (%)
2011/12	33,054		4,873		361		2,281		16,659		8,415		65,642	
2012/13	35,098	6.2	5,195	6.6	382	6	2,446	7.3	17,962	7.8	9,012	7.1	70,095	6.8
2013/14	37,148	5.8	5,535	6.5	405	5.9	2,613	6.8	19,210	6.9	9,623	6.8	74,533	6.3
2014/15	39,312	5.8	5,926	7.1	429	6	2,792	6.9	20,602	7.2	10,258	6.6	79,320	6.4
2015/16	41,606	5.8	6,344	7.1	455	6.1	2,983	6.8	22,071	7.1	10,917	6.4	84,377	6.4
2016/17	44,023	5.8	6,810	7.3	483	6.2	3,184	6.7	23,555	6.7	11,599	6.2	89,654	6.3
2017/18	46,584	5.8	7,289	7	513	6.3	3,398	6.7	25,264	7.3	12,307	6.1	95,355	6.4
2018/19	49,344	5.9	7,810	7.2	546	6.4	3,622	6.6	27,028	7	13,042	6	101,393	6.3
2019/20	52,321	6	8,337	6.7	582	6.5	3,859	6.5	28,858	6.8	13,807	5.9	107,763	6.3
2020/21	55,440	6	8,885	6.6	621	6.7	4,107	6.5	30,440	5.5	14,601	5.8	114,095	5.9
2021/22	58,598	5.7	9,427	6.1	662	6.7	4,358	6.1	32,132	5.6	15,364	5.2	120,540	5.6

Note: G.R.: Annual growth rate

Source: Demand Forecast Report December 2012

In the table above, 2011/12 serves as the base year of this forecast. Thus, the data in the year are actual recorded data and does not include estimation of unserved energy by load shedding.

The peak demand of each DISCO is calculated from the forecasted energy demand applying the load factors and accumulated to the national peak demand with coincidence factors, transmission losses, auxiliary consumption, and supply to KESC. The forecasted peak demand for the period from 2011/12 to 2021/22 is given in **Table 4.1-2** below.

Table 4.1-2 DISCO-wise Forecasted Peak Demand (including Unserved Electricity by Load Shedding)

(Unit: MW)

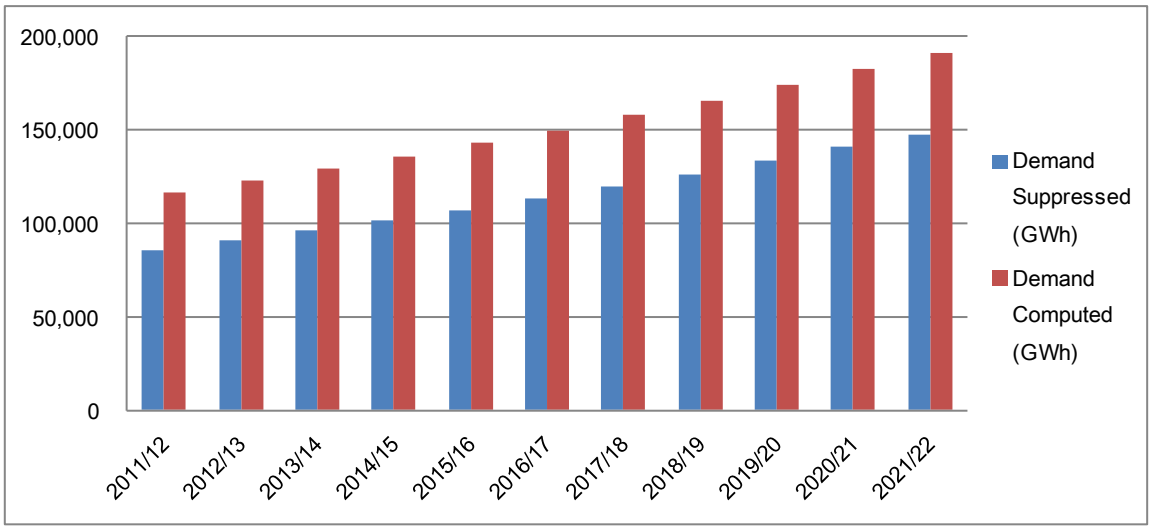
Name	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22
LESCO	4,062	4,326	4,478	4,649	4,855	5,063	5,271	5,495	5,736	5,976	6,210
GEPCO	1,994	2,093	2,198	2,324	2,439	2,560	2,686	2,818	2,957	3,102	3,254
FESCO	2,812	3,013	3,216	3,427	3,651	3,886	4,167	4,480	4,807	5,127	5,450
IESCO	2,285	2,389	2,481	2,621	2,754	2,894	3,047	3,201	3,354	3,509	3,669
MEPCO	3,106	3,299	3,499	3,734	3,949	4,170	4,399	4,636	4,894	5,161	5,438
PESCO	2,606	2,645	2,754	2,865	2,976	3,089	3,202	3,316	3,431	3,547	3,663
HESCO	1,350	1,421	1,496	1,574	1,656	1,742	1,831	1,926	2,024	2,128	2,236
QESCO	1,245	1,288	1,332	1,377	1,425	1,474	1,525	1,579	1,635	1,693	1,753
TESCO	622	641	662	682	704	726	750	774	799	825	852
SEPCO	1,019	1,070	1,122	1,176	1,232	1,290	1,350	1,412	1,476	1,542	1,611
DISCOs Demand (undiversified)	21,102	22,184	23,237	24,428	25,639	26,894	28,228	29,637	31,113	32,608	34,135
Coincidence Factor (%)	88.11%	88.11%	88.11%	88.11%	88.11%	88.11%	88.11%	88.10%	88.11%	88.11%	88.11%
DISCOs Demand (Diversified)	18,592	19,545	20,473	21,523	22,590	23,695	24,871	26,112	27,412	28,730	30,075
T & T Losses (500 &220kV)	593	626	655	689	723	759	796	836	878	920	963
%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	19,121	20,171	21,129	22,212	23,313	24,453	25,667	26,948	28,290	29,649	31,038
Auxiliary Consumption	327	345	361	380	398	418	439	460	483	507	530
%Auxiliary Consumption	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68
PEPCO Demand w/o Export to KESC	19,448	20,516	21,490	22,592	23,711	24,871	26,105	27,408	28,773	30,156	31,568
Export to KESC	610	610	610	610	610	610	610	610	610	610	610
PEPCO Demand with Export to KESC	20,058	21,126	22,100	23,202	24,321	25,481	26,715	28,018	29,383	30,766	32,178

Source: Demand Forecast Report December 2012

The peak demand of the above table includes the unserved electricity by load shedding. The peak demands of DISCOs for the base year 2011/12 of the above table were calculated from the energy demand of the same year including estimated value of unserved energy by load shedding.

Figure 4.1-1 shows the forecasted energy demand for PEPCO network[5]. The figure provides suppressed and computed forecasted energy demands. The suppressed demand excludes unserved energy by load shedding while the computed demand includes unserved energy by load shedding.

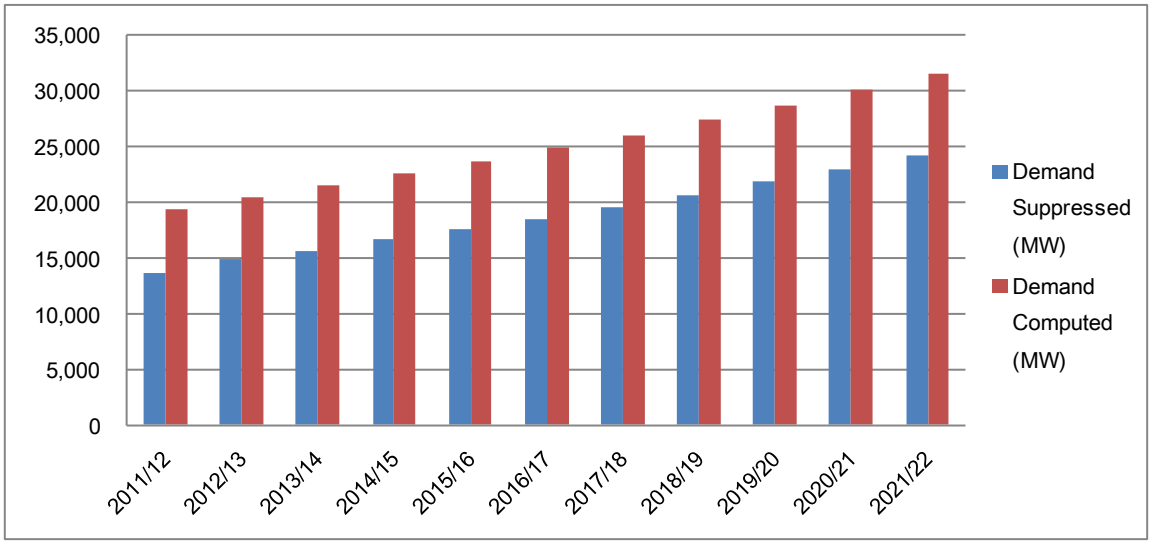
[5] PEPCO network means the whole network of Pakistan except for KESC.



Source: Demand Forecast Report December 2012

Figure 4.1-1 Energy Demand Forecast

Figure 4.1-2 below provides the forecasted peak demand for PEPCO network excluding export to KESC, both on computed basis and on suppressed demand basis.



Source: Demand Forecast Report December 2012

Figure 4.1-2 Peak Demand Forecast

The suppressed demand is about 70%-76% of the computed demand, whereas the energy not served will be about 22%-27% of the total requirement.

4.2 Ongoing Development Project

In this report for the public sector, the projects in which the bidding documents have been completed are considered as ongoing development project. Similarly, for the private sector, the projects in which contracts have been awarded are considered as ongoing development projects.

4.2.1 Transmission /Distribution Line Substation

In Pakistan, transmission lines and substations of voltage level 220 kV and above are maintained and operated by NTDC, while transmission networks up to 132 kV belong to the DISCOs.

The transmission network requires augmentation and expansion as the electricity demand increases. To meet such increase in demand, the following projects given in **Table 4.2.1-1** are being implemented.

Table 4.2.1-1 Ongoing Transmission Lines Projects

S. No.	Name	Description	Justification
	NTDC		
1	New DG Khan 500 kV Grid Station (G/S) and associated transmission line (T/L)	2 X 600 MVA, 500/220 kV; 2 X 250 MVA, 220/132 kV; 21.4 km 500 kV T/L and 18 km T/L of 132 and 220 kV	To meet the increasing demand with increased efficiency
2	New Okara 220 kV Grid Substation and associated T/L (220 kV T/L in and out from the Sarfaz Nagar–Yusufwala T/L)	4 X 160 MVA, 220/132 kV new grid substation 220 kV T/L, 10.5 km	To relieve 220 kV substations at Sarfaz Nagar and Yusufwala and increase efficiency
3	Dispersal of power from Jarwar IPP (132 kV T/L from Ghotki (Sindh) to Rahimyar Khan (Punjab))	64 km 132 kV T/L	To connect the generating station with the system
	GEPCO		
4	132 kV J.P. Jattan - Awan Sharif	132 kV T/L 20 km	Feed for Awan Sharif G/S
5	Narowal – Pasrur	132 kV T/L Double Circuit (D/C) 34 km	
6	In and out of New Daska from Gakhar-Sahowala T/L	132 kV T/L D/C 2.5 km	Feed for New Daska G/S
7	In and out of Old Power House from City-New Sialkot T/L	132 kV T/L D/C 2.6 km	Feed for Old Power House G/S
8	132 kV Sahowala-Gohad pur	132 kV T/L D/C 9.5 km	Feed for Godh pur G/S
9	132 kV Hafizabad-II-Kolo Tarar	132 kV T/L D/C 8.4 km	Feed for Kolo Tarar G/S
10	132 kV Kolo Tarar-J.P.Nau	132 kV T/L 15.8 km	Feed for Jalal Pur Nau G/S
11	In and out of the existing G.H.RD-T/Sansi Line at 132 kV switch yard of 500 kV G/S Nokhar	132 kV T/L D/C 25.6 km	
12	In and out of Nokhar-Therisansi Line at Garhi G/S	132 kV T/L D/C 15.4 km	Feed for Garhi G/S
13	In and out of Nokhar- Hafizabad Line cct No.1 at Hafizabad-II G /S	132 kV T/L D/C 16.5 km	Feed for Hafizabad-II G/S
14	132 kV Nokhar-Hafizabad – II	132 kV T/L D/C 27.7 km	Alternate feed for Hafizabad - II G/S
15	132 kV Sahowala-Pasrur	132 kV T/L D/C 43 km	
	MEPCO		
16	Miran Pur (Galaywal) a/w T/L	132 kV T/L and 2 X 26 MVA	New substation
17	Kamir a/w T/L	132 kV T/L and 2 X 26 MVA	New substation
18	Ali Pur a/w T/L	132 kV T/L and 2 X 13 MVA	
19	Fatehpur a/w T/L	132 kV T/L and 2 X 13 MVA	
20	Noor Sar a/w T/L	132 kV T/L and 2 X 13 MVA	
21	Mubarak Pur with T/L	132 kV T/L 2km and 2 X 26 MVA	New
22	Chunawala with T/L	132 kV T/L 26 km and 1 X 26 MVA	New
23	Chak 83/12-L	132 kV, 2 X 26 MVA	
24	Dharanwala	132 kV, 2 X 26 MVA	
25	Faqirwali	132 kV, 2 X 26 MVA	
26	Fort Abbas	132 kV, 2 X 26 MVA	
27	Shah Sadar	132 kV, 2 X 26 MVA	
28	Lodhran	132 kV, 40 MVA	Augmentation

29	Bahwalpur	132 kV, 40 MVA	Augmentation
30	Burewala Old	132 kV, 2 X 26 MVA	
31	Mianchannu - Chak 83/12-L	132 kV, 30 km	
32	Chishtian–Dharanwala	132 kV, 30 km	
33	Haroon Abad-Faqir wali	132 kV, 25 km	
34	Faqirwali-Fort Abbas	132 kV, 32 km	
35	Shadan Lund-Shah Sadar Din	132 kV,25 km	
36	132 kV Sahiwal-III (New)	2x26 MVA	
37	132 kV D.G. Khan-II (New)	2x26 MVA	
38	66 kV Khairpur Tamewali (Conv.)	1x26 MVA 1x13 MVA	Upgrade
39	66 kV Lal Suhanra(Conv.)	1x13 MVA	
40	Sahiwal Old-Sahiwal-III	132 kV, D/C 2.7 km	SDT (Single Circuit for Double Circuit Tower) Feed for (F/F) Sahiwal-III
41	In and out of Mian Channu-Chichwatni 132 kV D/C at 220 kV Kassowal	132 kV, D/C 0.88 km	
42	220 kV BWP-Lal Sohanra end	132 kV, D/C 1.34 km	In and out of Lal Sohanra G/S
43	In and out Chichwatni-Sahiwal 132 kV S/C at Kassowal	132 kV, D/C 22.5 km	
44	132 kV Vehari–Ludden	132 kV, 33.7 km	
45	132 kV G/S Hota	1 x 13 MVA 1x26 MVA	
46	132 kV G/S Mankot	1x10/13 MVA	Including T/L
47	132 kV G/S Bati Bangla	1x10/13 MVA	Including D/C T/L
48	132 kV G/S Gaggo	2x10/13 MVA	
49	In and out 132 kV Qasimpur-Vehari Road T/L at 500 kV Multan	16 km	Feed for Jail Road G/S.
50	132 kV Kabir wala	20/26 MVA	Extension
51	Jamal Din Wali	10/13 MVA	Extension
52	Khan bella	10/13 MVA	Extension
53	CHOWK MUNDA		Line bay extension
54	Yazman(66 kV)	10/13 MVA	66 kV extension
55	Dajal (66 kV)	6.3 MVA	66 kV extension
56	Rang Pur (Aug.)	10/13 MVA	66 kV extension
57	Dahranwala	10/13 MVA	66 kV extension
58	Mian Channu	20/26 MVA	Replacement
59	132 kV SDT Chishtian–Bahwalnagar	46.5 km	
60	132 kV D/C F/F DG Khan-II	2.3 km	
61	JAHANIAN-DUNIYA PUR	20 km	
62	132 kV D/C Bahawalpur-Lal Suhanra	58.5 km	
	IESCO		
63	132 kV Hattian to Bagh	132 kV, 25 km, D/C Lynx	
64	132 kV Mangla-L.B.Mangla–Rajjar	132 kV, 48 km	Remodeling from Wolf to Rail
65	N.P.Sethi (upgrading of 66 kV substation to 132 kV substation)	2x13	
66	E-8 Islamabad	132/11 kV, 40 MVA	Addition
67	Satellite Town	132/11 kV, 26 MVA	Addition
68	Mangla right bank	132/11 kV, 13 MVA	Addition
69	Minhasa	132/11 kV, 13 MVA	Addition
70	Hajeera	132/11 kV, 13 MVA	Addition
71	Pindi Gheb	132/11 kV, 2 X 13 MVA	Addition
72	H-11 Islamabad	132/11 kV, 2 X 13 MVA	Augmentation

73	Mangla left bank	2 X 13 MVA	
	FESCO		
74	Kot shakir	1 X 13 MVA	Addition of 132/11 kV trans.
75	Millat Road	1 X 26 MVA 1 X 13 MVA	Addition of 132/11 kV trans.
76	Garlo Fateh Shah	2 X 13 MVA	Addition of 132/11 kV trans.
77	Lundian wala	1 X 26 MVA 1 X 13 MVA	Addition of 132/11 kV trans.
78	Chowk Rajana	2 X 13 MVA	Addition of 132/11 kV trans.
79	Usman Gani	1 X 26 MVA 1 X 13 MVA	Addition of 132/11 kV trans.
80	Chenab Nagar	1 X 26 MVA 1 X 13 MVA	Addition of 132/11 kV trans.
81	Sargodha III	1 X 26 MVA 1 X 13 MVA	Addition of 132/11 kV trans.
82	SPS Faisalabad	1 X 26 MVA 1 X 13 MVA	Addition of 132/11 kV trans.
83	Aminpur	2 X 13 MVA	Addition of 132/11 kV trans.
84	Mamunkajan	2 X 13 MVA	Addition of 132/11 kV trans.
85	Chak Jhumra	1 X 26 MVA	Augmentation
86	Pir Mahal (T-4)	1 X 13 MVA	Addition of 66/11 kV trans.
87	Old Thermal Plant	1 X 13 MVA	Addition of 66/11 kV trans.
88	Garah Maharaja	10 MVA	Addition of 66/11 kV trans.
89	Noshera	6.3 MVA	Addition of 66/11 kV trans.
90	Adhi Kot	7.5 MVA	Addition of 66/11 kV trans.
91	Nia Labore	1 X 13 MVA	Addition of 132/11 kV trans.
92	Bhumb	1 X 13 MVA	Addition of 132/11 kV trans.
93	Jauharabad	1 X 13 MVA	Addition of 132/11 kV trans.
94	Chiniot Road	1 X 40 MVA	Addition of 132/11 kV trans.
95	Chuttiana	1 X 26 MVA	Addition of 132/11 kV trans.
96	132 kV Agr University (T·J)	1 X 40 MVA	Addition of 132/11 kV trans.
97	Bhowann	1 X 26 MVA	Addition of 132/11 kV trans.
98	Chiniot Ind.(T-2)	1 X 40 MVA	Addition of 132/11 kV trans.
99	Chiniot Rd.(T-2)	1 X 40 MVA	Addition of 132/11 kV trans.
100	T.T Singh	1 X 40 MVA	Addition of 132/11 kV trans.
101	Thikriwolo	1 X 26 MVA	Addition of 132/11 kV trans.
102	Bhalwal	1 X 40 MVA	Addition of 132/11 kV trans.
103	Bhakkar	1 X 40 MVA	Addition of 132/11 kV trans.
104	Chak 103/RB FSD (T-2)	1 X 26 MVA	Addition of 132/11 kV trans.

Source: Prepared by the JICA Survey Team from data collected during interviews with each DISCO

NTDC basically concentrate their activity on the construction of 500 kV and 220 kV substations to meet the increasing demand in different parts of the country. At the same time, they are involved in construction of transmission lines 132 kV and above from the power plants constructed by IPPs. DISCOs use their resources to upgrade the 66 overhead transmission lines to 132 kV and upgrade associated substations to increase efficiency.

From the above table, it is clear that DISCOs are spending funds more for addition of transformers or augmentation of transformer capacity in the exiting substations. Their requirements exceed their capacity even with large support from financial institutions such as ADB and WB. In the distribution side, DISCOs bifurcate the 11 kV feeders to meet the increasing

demand of their respective feeders. These activities are also carried out to reduce losses. Furthermore, DISCOs install capacitors in the 11 kV lines to improve power factor and increase voltage at the far end of the feeder.

4.2.2 Hydropower

The major hydropower plants are under the domain of WAPDA. **Table 4.2.2-1** provides a list of ongoing hydropower projects carried out by WAPDA. WAPDA has started working on Neelum-Jehlum Hydropower Project with a 969 MW capacity. The hydropower project is located in Gilgit-Baltistan and Azad Jammu and Kashmir (AJK). The plant is expected to be completed by the end of 2015 and will generate 5,150 GWh of energy per year.

Table 4.2.2-1 Ongoing Hydropower Projects by WAPDA

Sr. No.	Project	Location	Capacity (MW)	Type	Phase	Expected COD6
1	Neelum Jehlum Hydro Project	AJK	969	New	Under construction	2015
2	Tarbela 4th extension hydropower Project	KPK	1,410	New	Bids Called	
3	Tarbela Rehabilitation	KPK	128	Upgrading	Under construction	2015
4	Mangla Rehabilitation	AJK	100	Upgrading	Under construction	2015
5	Gomal-Zam Dam	KPK	17.4	New	Under construction	2015
6	Satpara Dam	Gilgit - Baltistan	17.7	New	Under construction	2015
7	Jinnah Hydropower	Punjab	96	New	Under construction	2014
8	Duber Khwar Hydropower Project	KPK	130	New	Under construction	
9	Jabban Hydropower Project	KPK	22	New	Under construction	

Source: Prepared by the JICA Survey Team based on information from donors, WAPDA and MOWP

WAPDA, with the help of USAID, has also started renovation and rehabilitation of Tarbela Dam that will result in an additional 128 MW of power from the existing facility. WAPDA is also in the process of rehabilitation of generators at Mangla Dam that will result in additional power of 100 MW from the existing structure. Besides, WAPDA is also undertaking the multipurpose Gomal Zam Dam in Khyber Pakhtunkhwa (KPK) and Satpara Dam in Gilgit-Baltistan province. These dams will result in the addition of 17.4 MW and 17.7 MW of power, respectively.

WAPDA has started the process of bidding for Tarbela 4th Extension Hydropower Project. The Tarbela 4th Extension Project proposes to provide additional generation to the existing 3,478 MW hydropower installed at Tarbela. The proposed project would have an installed capacity of 1,410 MW. This would be achieved by installing three new generating units onto the existing Irrigation Tunnel 4, which will be converted to power without affecting the existing irrigation release capabilities of Tarbela.

There is huge potential for hydropower generation in the country especially in KPK, Gilgit-Baltistan, and AJK territories. To overcome the financial constraints, GOP has awarded projects with capacities greater than 50 MW to the private sector, as well as other projects equal to or less than 50 MW. There are two projects being undertaken by the private sector as hydro power plants (HPPs) with a total installed capacity of 247 MW. Details are given in **Table 4.2.2-2**.

[6] Commercial Operation Date

Table 4.2.2-2 List of Hydropower Projects under Private Sector

Sr. No.	Project	Location	Capacity (MW)	Type	Phase	Expected COD
1	Patrind Hydropower Project	Kunhar River KPK/AJK	147	New	Under construction	2017
2	Gulpur Hydropower Project	Poonch River AJK	100	New	Under construction	2017

Source: Prepared by the JICA Survey Team based on information from PPIB

4.2.3 Thermal Power

There is a shift in fuel as oil prices are very high and natural gas is not readily available, so GOP is focusing more towards coal. GOP is also looking for ways to convert the existing refined furnace oil (RFO)-based power plants to coal-powered power plants.

Table 4.2.3-1 provides a list of thermal power projects that are under construction and are undertaken by GENCO Holding Company.

Table 4.2.3-1 Ongoing Thermal Power Projects by GENCO

Sr. No.	Project	Location	Capacity (MW)	Type	Phase	Expected COD[7]
1	Jamshoro Coal Power Plant (GENCO I)	Sindh	960	New	under construction	2017
2	Guddu Combined Cycle Plant (GENCO II)	Sindh	128	New	under construction	2015
3	Nandi Pur Coal Plant	Punjab	425	New	under construction	2014
4	Jamshoro (GENCO I)	Sindh	Unknown	Up-gradation	under construction	2014
5	Muzzafargarh (GENCO III)	Punjab	Unknown	Up-gradation	under construction	2014

Source: Prepared by the JICA Survey Team based on information collected during interview with GENCO in Lahore.

GENCO has prepared bidding documents and secured funding for the first coal-based power plant in Pakistan using super critical boiler near Jamshoro in Sindh Province.

Table 4.2.3-2 below provides a list of thermal power projects undertaken by the Sindh government.

Table 4.2.3-2 Ongoing Thermal Power Projects by Sindh Province

Sr. No.	Company Name	Capacity (MW)	LOI	Land Allotment	Feasibility Studies	IEE	Financial Close	Tariff	EPC Contracts	FSA/GSA
1	Sindh Nooriabad Power Co.	100	√	√	√	√		√	In Process	√

Note: (√) means already completed
Source: Prepared by the JICA Survey Team based on information collected during interview with Energy Secretary Sindh.

Sindh government has established Sindh Nooriabad Power Company to undertake and complete 100 MW gas-powered plant near Nooriabad Industrial Estate.

4.2.4 Renewable Energy

GOP and the provincial governments are promoting renewable energy in the country. A wind corridor has been identified in Sindh Province and two wind power projects with a total installed capacity of 106.4 MW have already started production.

In Sindh province, there are six wind power projects that have already signed EPC contracts with a cumulative contracted capacity of 349 MW. **Table 4.2.4-1** lists the wind power projects that have already signed the EPC contracts.

[7] Commercial operation date

Table 4.2.4-1 List of Ongoing Wind Power Project in Sindh Province

Sr. No	Company Name	Capacity (MW)	LOI	Land Allotment	Feasibility Studies	IEE	Financial Close	Tariff	EPC Contracts
6	China Three Gorges-I	49.5	√	√	√	√	√	√	√
7	China Three Gorges-II	100	√	√	√	√	In Process	√	√
8	Sachal Energy Development	49.5	√	√	√	√	In Process	√	√
9	Zephyr Power	50	√	√	√	√	In Process		√
11	Tenage Generasi Ltd	50	√	√	√	√			√
13	Deewan Energy	50	√	√	√	√	In Process		√

Note: (√) means already completed.
Source: Prepared by the JICA Survey Team based on information collected from Sindh-BOI during interview

In Punjab Province, the focus is more on small hydro and solar power projects. The Punjab government has already assigned 5,000 acres (2,023.43 ha) for installation of solar power in the country named Qaid-e-Azam Solar Park. The infrastructure development work has already started and the park is divided in blocks of 250 acres (101.17 hectares) each for the installation of 50 MW solar power projects. In order to attract the private sector, the Punjab Energy Department has called for bids for installation of 100 MW solar PV plant in the solar park.

The provinces are also undertaking some low-head, run-of-river small hydropower projects in both private sector and under PPP scheme. Although major sites lie in the areas of KPK, Gilgit-Baltistan, and AJK territories, there are still some sites identified in the Punjab and Sindh Provinces.

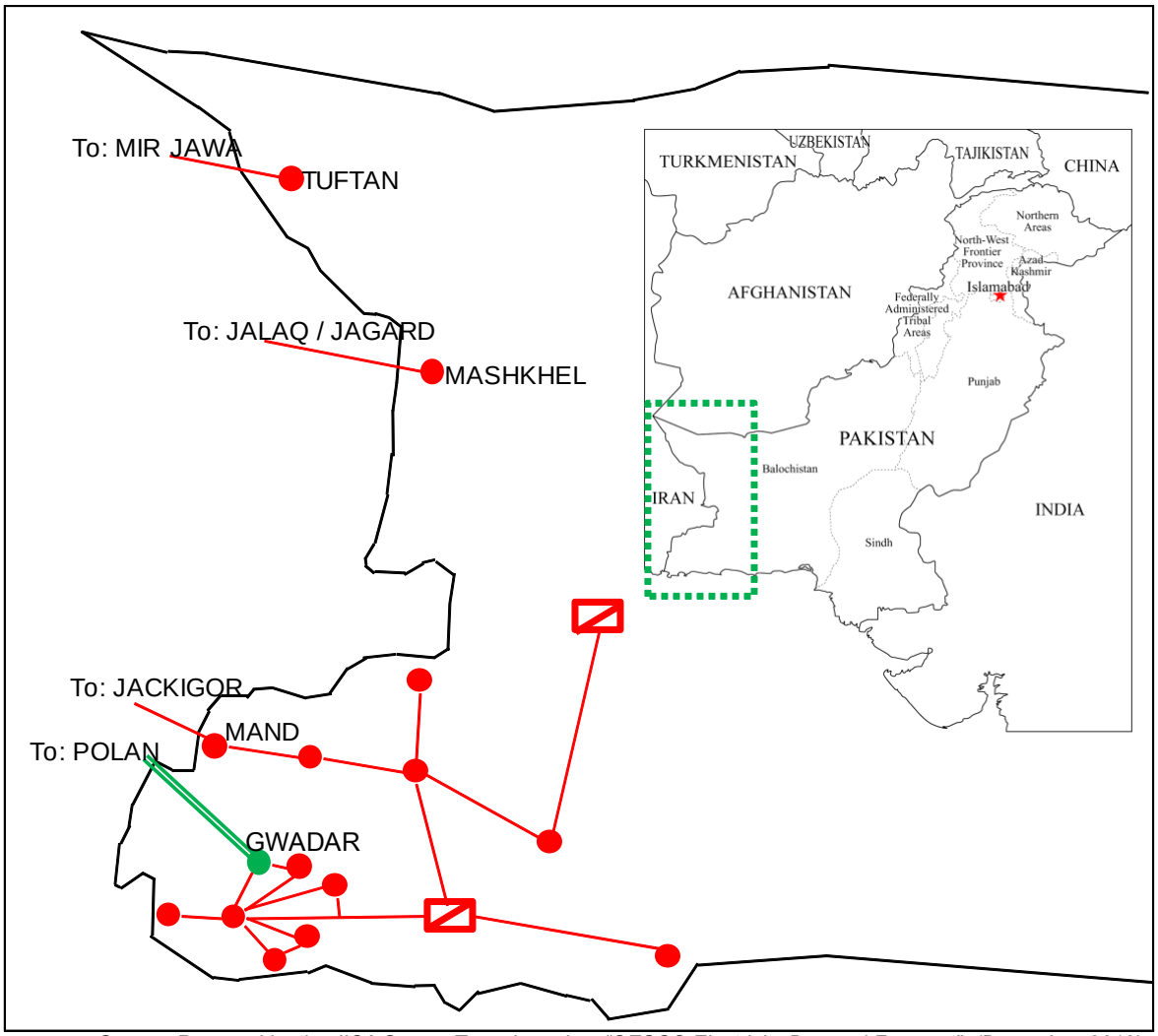
The Sindh government has not started any small hydro projects in the province. However, Punjab province, some projects have been initiated and are already at various stages of progress. Yet, there is not a single small hydro project that has achieved EPC contract signing nor is expected to be started in the future.

4.2.5 Import of Electricity

The present interconnection between Pakistan and Iran has a capacity of 74 MW.

Pakistan and Iran agreed to construct 220 kV line for import of another 100 MW. For this purpose, a double circuit twin bundle 220 kV line will be constructed from Polan in Iran to Gwadar in Pakistan. Length of transmission line in Pakistan would be 75 km and 51 km in Iran. Project cost is estimated at Rs 3,664 million. Iran will finance 70% of the cost of the project. The remaining 30% is to be borne by NTDC. NTDC has acquired land for this substation. The contractor for transmission line has been mobilized but the construction of 220 kV line and 220 kV substation in Gwadar remains at initial stage due to sanctions on Iran.

Figure 4.2.5-1 shows the location of the project to import the electricity from Iran which is under construction.



Source: Prepared by the JICA Survey Team based on "QESCO Electricity Demand Forecast", (December, 2012) and the map available on http://www.freemap.jp/

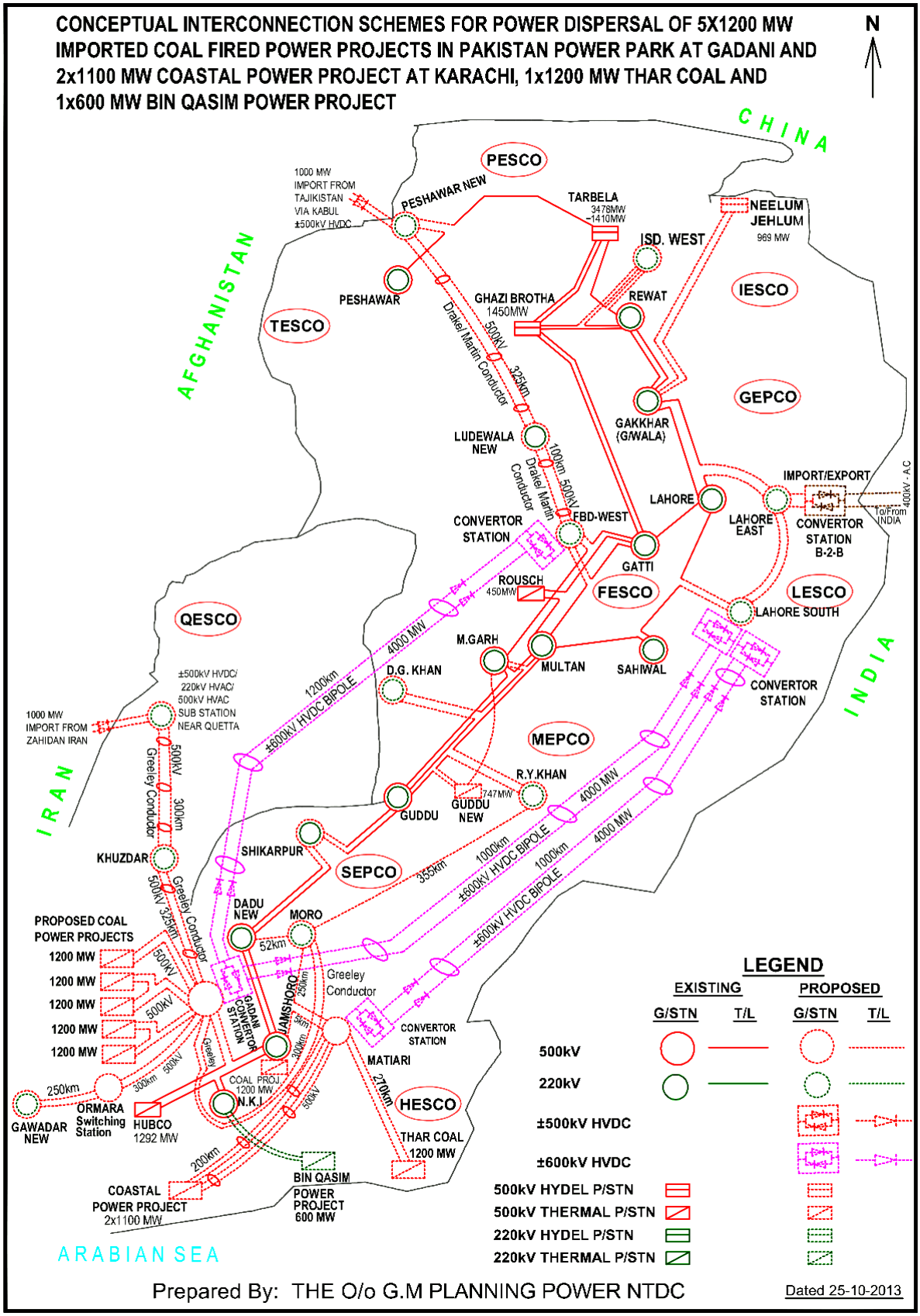
Figure 4.2.5-1 Location of 220 kV Cross-border Transmission Line from Iran

4.3 Government Development Plan

4.3.1 Transmission/Distribution Line and Substation

The transmission network requires expansion with the inclusion of new power generating plants because of the growth in electricity demand. NTDC has prepared several transmission plans to connect the planned generating stations to the national grid. These plans also take care of the proposed import of electricity from neighboring countries.

The recently revised transmission plans is given below in **Figure 4.3.1-1**.



Source: Planning Power Department of NTDC

Figure 4.3.1-1 National Grid Development Plan

The National Grid Development Plan prepared by NTDC is summarized in **Table 4.3.1-1**.

Table 4.3.1-1 Project List of National Grid Development Plan

S. No.	Name of Project	Scope of Work	Estimated Cost (million Rs)	Estimated Cost (million US$)	Expected Completion
1	500 kV Islamabad West	500 kV substation with 500/220 kV 2x750 MVA TXs and 220/132 kV 2x250 MVA TXs In and out of 500 kV Tarbela- Rewat S/C at Islamabad West (40+40 km) In and out of 500 kV G/Barotha-Rewat S/C at Islamabad West (50+50 km) In and out of 220 kV Tarbela-ISPR S/C at Islamabad West (15 km) In and out of 220 kV Mansehra/lslamabad University-ISPR D/C at Islamabad West (5+5 km)	13,608	126	2017-18
2	500 kV Faisalabad West	**Phase- II** 500 kV D/C T/L in and out of 500 kV Multan-Gatti SIC at 500 kV Faisalabad West (30 km) 220 kV D/C T/L from 500 kV Faisalabad West to 220 kV Lalian New (80 km)	4,338	43	2016-17
3	220 kV Chakwal	220 kV substation with 2x250 MVA 220/132 kV TXs and allied equipment. In and out of 220 kV Mangla-Rewat S/C at Chakwal (60 km)	4,320	40	2016-18
4	Dispersal of Power from Patrind Hydropower Project	132 kV D/C T/L from Patrind HPP to Mansehra G/S (45 km) 132 kV D/C T/L for I/O of 132 kV D/C Patrind HPP to Mansehra G/S at Balakot (5 km) 132 kV D/C T/L for I/O of 132 kV D/C Patrind HPP to Mansehra G/S at Muzaffarabad II (5 km)	1,977	10	2015-16
5	220 kV Transmission System Network Reinforcement in Islamabad and Burhan	A new 220 kV D/C T/L from Tarbela to Burhan (35.1 km) Reconductoring of 220 kV Tarbela-ISPR D/C T/L (62.5 km) In and out of one circuit of 220 kV Mansehra-ISPR D/C T/L at Islamabad University Substation (40 km)	2,705	25	2015-16
6	Transmission of electricity from 6,600 MW Pakistan Power Park at Gadani, 2,200 MW Nuclear Power Plants near Karachi	**HVAC Portion:** Three 500 kV D/C T/Ls from power plant to Gadani 500 kV collector station at Gadani 500 kV G/S at Lahore with 2x750 and 3x250MVA TXs 500 kV T/Ls for dispersal of power to Khuzdar, Quetta and NKI 500 kV D/C T/L from Thar to Matiari Two 500 kV D/C T/Ls from nuclear plants to Matiari **HVDC Portion:** ±600kV HVDC T/Ls from Gadani to Lahore and Faisalabad ±600kV converter stations at Lahore, Faisalabad and Gadani ±600kV HVDC T/L from Matiari to Lahore South ±600kV HVDC converter station at Matiari	648,912	6,078	2018-19
7	Transmission of electricity from Dasu HPP	**Phase-II:** Switching station at 500 kV Mansehra substation. 500 kV double circuit T/L from Mansehra to Faisalabad West with series compensation (375 km).	43,200	400	2018-19

Source: Planning Power Department of NTDC

The projects under the National Grid Development Plan require huge investment of around US$7 billion. The above table does not include transmission lines for Dasu HPP Phase I, Golen Gol HPP, and other major projects which are in the pipeline.

DISCOs also have their own transmission network development plan. Basically, they are guided to overcome the problem of overloading of the transformers in the substations.

The distribution lines serving rural areas are too long and the voltage at the consumers end is far below the nominal value. Investment for strengthening the 11 kV lines and low voltage lines is also large. Presently, such activities are being carried out using their own resources.

As an example of transmission development plan of DISCOs, under the plan of FESCO, is presented in **Table 4.3.1-2**.

Table 4.3.1-2 FESCO's Transmission Development Plan

S. No.	Name of Transmission Lines	Type	Voltage (kV)	Length (km)	Circuit	Conductor
1	Ludewala-Head Faqirian in and out (F/F Bhera Industrial)	New	132	15.3	D/C	Rail
2	Industrial Estate-Agricultural University (F/F Usman-e-Ghanni)	New	132	5	D/C	Rail
3	132 kV T/L from 220 kV Lalian to Ludewala Old cct-2 in and out (F/F Sargodha-III)	New	132	4	D/C	Rail
4	132 kV T/L from 220 kV Lalian to Chiniot-II in and out at Chenab Nagar (F/F Chenab Nagar)	New	132	5	D/C	Rail
5	103/RB - Bucheki in and out (F/F Lundianwala)	New	132	2	D/C	Lynx
6	Nishatabad-GTPS in and out (F/F SPS Colony)	New	132	1.5	D/C	Rail
7	Jhang Road-Bhowana in and out (F/F Aminpur)	New	132	6	D/C	Lynx
8	Nishatabad-Liberty power in and out (F/F Millat Road Faisalabad)	New	132	0.5	D/C	Lynx
9	Samundri Road-factory area in and out (F/F FSD City)	New	132	5.5	D/C	Rail
10	132 kV Ludewala-SP Noon in and out (F/F Jhawrian)	New	132	30	D/C	Rail
11	132 kV T/L from 220 kV Lalian to Chiniot-II (F/F Chiniot-II)	New	132	25	D/C	Rail
12	Muridwala-Rajana (F/F Rajana)	New	132	15	D/C	Rail
13	Muridwala-Manjhala Bagh in and out (F/F Mamukanjan)	New	132	3	D/C	Lynx
14	Piplan-Bhakkar in and out (F/F Darya Khan)	New	132	25	D/C	Lynx
15	220 kV Jaranwala Road-Sahiwal Old in and out (F/F Garh Fateh Shah)	New	132	4.036	D/C	Lynx
16	Bhamb-Kot Shakir (F/F Kot Shakir)	New	132	23.5	SDT	Lynx
17	132 kV Daud Khei-Mianwali in and out (F/F Shahbaz Khel)	New	132	8	D/C	Lynx
18	132 kV Shahpur-Wan Bhachran in and out (F/F Katha)	New	132	25	D/C	Lynx
19	Piplan-Kaloor Kot (F/F Kaloorkot)	New	132	25	SDT	Lynx
20	18-Hazari- GM Raja in and out(F/F Rodu Sultan/Pul Lashari).	New	132	5	SDT	Rail
21	220 kV SammundriRoad-Narwala Road in and out (F/F Nia lahore)	New	132	25	D/C	Rail
22	Sargodha-II - Pathan Kot (F/F Pathan Kot)	New	132	30	SDT	Lynx
23	132 kV T/L from Jinnah Hydropower to Kala Bagh in and out (F/F Kala Bagh)	New	132	5	D/C	Rail
24	Piplan-Bhakkar in and out (F/F Rakh Dagran)	New	132	3	D/C	Lynx
25	132 kV Kuthiala Sheikhan-Bhalwal in out (F/F Bhabra)	New	132	20	D/C	Rail
26	132 kV Kud Lathi-Bhamb in and out (F/F Jahania Shah)	New	132	5	D/C	Lynx
27	Kala Bagh-Trug (F/F Trug)	New	132	45	D/C	Lynx
28	Piplan-Bilakkar in and out(F/F Fazal)	New	132	3	D/C	Lynx
29	132 kV Shorkot-Kabirwala in and out (F.F GM Raja)	New	132	18	D/C	Lynx
30	H.B Shall-18-Hazari (F/F 18-Hazari)	New	132	30	D/C	Rail
31	G.M Raja-Ahmadpur Sial (F/F Ahrnadpur Sial)	New	132	30	SDT	Lynx
32	18-Hazari-Hyderabad Thai (F/F Hyderabad Thai)	New	132	35	SDT	Rail
33	Hyderabad Thai-Mankera (F/F Mankara)	New	132	30	SDT	Lynx
34	Chowk Azam-Bhakkar in and out (F/F Behal G/s)	New	132	16	D/C	Lynx
35	Quaidabad-Adhikot (F/F Adhikot)	New	132	34	SDT	Lynx
36	Kala Bagh-Trug cct-I in and out (F/F Makarwal)	New	132	6	D/C	Lynx
37	HEP Chashrna-Wan Bhachran in and out (F/F Chashma)	New	132	4	D/C	Lynx
38	Quaidabad-Nowshera (F/F Nowshera)	New	132	45	SDT	Lynx
39	Khewa-Bhowana	New	132	15	SDT	Lynx
40	132 kV T/L from 220 kV G/S TT Singh to H.B Shah	New	132	60	D/C	Rail
41	132 kV T/L from 220 kV Lalian to Ludewala Old-I cct-1 in and out at Sargodha-II	New	132	15	D/C	Rail
42	Chichawatni-Muridwala in and out at Kamalia G/S	New	132	0.5	D/C	Lynx
43	Tandlianwala-Sarnmundri City	2nd cct	132	23	S/C	Lynx
44	132 kV T/L from 220 kV Bandala to 132 kV Bandala	New	132	3.15	D/C	Rail
45	In and out at 220 kV Bandala of Shahkot-Bandala Old T/L	New	132	0.76	D/C	Lynx
46	In and out at 220 kV Bandala of Nishatabad New-Shahkot T/L	New	132	0.826	D/C	Lynx
47	220 kV T.T.Singh-Muridwala	New	132	25	D/C	Rail
48	Nishatabd 220 kV-Chiniot Road in and out (F/F Chak Jhumra)	2nd cct	132	16	D/C	Lynx
49	132 kV Piplan-Bhakkar	2nd cct	132	91	D/C	Lynx
50	132 kV T/L Ludewala-Quaidabad cct-1 (in and out at Jauharabad G/S)	New	132	6	D/C	Rail
51	132 kV T/L from 220 kV Ludewala Quaidabad	New	132	75	D/C	Rail
52	Ludewala-Wan Bhachran In and Out (fed for Shahpur)	2nd cct	132	5.1	D/C	Lynx

53	Jhang Road-Bhowana	2nd cct	132	46.2	SDT	Lynx
54	132 kV T/L from 220 kV Lalian to Ludewala Old	New	132	45	D/C	Rail
55	132 kV 18-Hazari-GM Raja	New	132	45	SDT	Rail
56	132 kV T/L Chiniot Industrial - Old Lalian I in and out at 220/132 kV Lalian	New	132	7	D/C	Lynx
57	132 kV T/L Liberty - Chak No.126/SB in and out at 220/132 kV Lalian	New	132	7	D/C	Lynx
58	Sammundri Road 220 kV-Narwala Road in and out at 500 kV G/S Fsd East	New	132	25	D/C	Rail
59	Jhang Road-Bhowana cct-2 in and out at 500 kV G/S Fsd East	New	132	30	D/C	Lynx
60	Chiniot lndustriai-Kriana in and out (F/F Lalian G/S)	2nd cct	132	2.02	S/C	Lynx
61	T-off Liberty-Millat Road	Rec	132	6	D/C	Rail
62	Reconductoring t-off Liberty in and out Kamalpur (F/F Kamlpur)	Rec	132	10	D/C	Rail
63	Remodeling / Reconductoring 220 kV Sammundri Road G/S T-off 132 kV Gojra	Rec	132	16	D/C	Rail
64	Jhang Road Narwala Road	Rec	132	8	D/C	Rail
65	Narwala Road-Chiniot Road	Rec	132	11	S/C	Rail
66	Narwala Road-Industrial Estate	Rec	132	9	S/C	Rail

Note: cct = circuit, Rec = reconductoring, S/C = Single Circuit, D/C = Double Circuit, SDT = Single Circuit on Double Circuit Tower, "Lynx" and "Rail" = Standard codes of conductor.
Source: FESCO

Other DISCOs also have similar plans. For the execution of such plans, ADB, WB, and other financial institutions are helping DISCOs. Augmentation and expansion of transmission and distribution network are considered as their regular works. They are basically guided by the increased demand requirement. DISCOs are given targets to keep themselves within the given limit of percentage losses. Most of the DISCOs do not meet the target as the available resources for the distribution system improvement are far below the requirement.

4.3.2 Hydropower

The GOP through WAPDA is developing two major hydropower projects on River Indus in KPK and Gilgit-Baltistan province. These include Diamer-Bhasha Project in Gilgit-Baltistan and Dassu Project in KPK that are expected to be completed in the next 12-15 years.

Table 4.3.2-1 provides details of these and other hydropower projects along with their planned capacities.

Table 4.3.2-1 List of Future Hydropower Projects under WAPDA

Sr. No.	Project	Location	Capacity (MW)	Type	Phase	Expected COD[8]
1	Diamer- Bhasha	Gilgit-Baltistan	4,500	New	Land acquisition under progress	2026
2	Dassu	KPK	4,320	New	Bids called	2020
3	Chor Nullah	KPK	1,176	New	F/S and EIA Ready	Unknown
4	Munda Dam	AJK	660	New	F/S and EIA Ready	Unknown
5	Spat Gah Lower	KPK	567	New	Unknown	Unknown
6	Spat Gah (Middle)	KPK	501	New	Unknown	Unknown
7	Spat Gah (Upper)	KPK	273	New	Unknown	Unknown
8	Kayal Khwar	KPK	125	New	Unknown	Unknown
9	Golen Gol	Gilgit-Baltistan	106	New	Unknown	Unknown
10	Kurram Tangi Dam	KPK	83	New	Unknown	Unknown

Source: Prepared by the JICA Survey Team based on information from the website of WAPDA

4.3.3 Thermal Power

From the Government Development Plan, it seems that GOP and its autonomous corporations are not planning to invest in thermal power projects. GOP has established Pakistan Power Park Company that will undertake two 660 MW coal-fired power plants in the coastal area of Gaddani in Balochistan Province. These two plants are expected to achieve COD by the middle of 2018.

[8] Commercial Operation Date

GOP has planned to establish the park with total installed capacity will be 6,600 MW of which 5,280 MW will be from IPPs.

4.3.4 Renewable Energy

GOP refrained from investing into renewable energy sector and is only spending money to provide infrastructure and facilities to the private sector. GOP has not undertaken any wind, solar, biomass or small hydro project, and according to the information obtained during the survey, it does not intend to undertake in the future as well. The federal and provincial governments are working to facilitate and attract private sector and develop the basic infrastructure required for the development of renewable energy in the area.

4.3.5 Import of Electricity

Preparatory works are ongoing for two cross-border transmission lines that aim to import a total of 2,300 MW of electricity.

i) Import of 1,000 MW from Iran

Pakistan and Iran agreed to construct the high-voltage, direct current (HVDC) interconnection on ±500 kV from Zahedan (Iran) to Quetta (Pakistan) for importing 1,000 MW. The total length of the transmission line will be around 678 km, out of which, 93 km will be constructed in Iran while 585 km will be constructed in Pakistan. Iran will construct a 1,300 MW power plant in Zahedan dedicated for this purpose. The total estimated cost of the transmission line project is US$700 million. Electricity price for the first five years after commissioning will be US$0.8-0.11/kWh, depending on the crude oil price.

ii) Import of 1,000 MW from Kyrgyz Republic and Tajikistan (CASA1000)

This project known as Central Asia and South Asia-1000 Electricity Transmission and Trade Project (CASA1000) involves Kyrgyz Republic and Tajikistan to Afghanistan and Pakistan. A 750 km HVDC transmission system between Tajikistan and Pakistan via Afghanistan, together with associated converter stations in Sangtuda (1,300 MW), Kabul (300 MW), and Peshawar (1,300 MW); and a 477 km 500 kV alternating current link between the Kyrgyz Republic (Datka) and Tajikistan (Khoujand) are proposed under this project. Feasibility study for this project has been completed by SNC Lavilin International Inc.

As per the feasibility study report, Kyrgyz Republic and Tajikistan have close to 6,000 GWh of surplus (2,150 GWh from Kyrgyz and 3,750 GWh from Tajikistan), almost entirely available in the summer months. The total project cost is US$953 million including interest during construction. The estimated completion time for the project is 58 months. The rate of energy from this line is expected to remain below US$0.10/kWh.

4.4 Private Sector Development Plan

The private sector is actively involved in the development of renewable energy in Pakistan. One of the reasons seems to be that these renewable energy power projects are of smaller scale and incentives offered by GOP through its RE Policy are lucrative. All provinces are trying to capitalize on the resources they have. In Sindh Province, more focus is given on wind as this

potential has been identified, whereas in Punjab province, the focus is on solar and small hydropower projects.

In Sindh Province, there are 21 wind power projects that have already obtained an LOI with a cumulative contracted capacity of 1,497.4 MW. Out of these 21 projects, nine have secured land. **Table 4.4-1** provides a list of planned wind power projects in Sindh Province.

Table 4.4-1 List of Wind Power Projects planned by Private Companies in Sindh Province

Sr. No.	Company Name	Capacity (MW)	LOI	Land Allotment	Feasibility Studies	IEE	Financial Close	Tariff
1	NBT Wind Power Pakistan	500	√	√	√	√	In process	In process
2	Titan Energy Pakistan	10	√	√	√	√	In process	
3	Tapal Wind	30	√	√	√	√	In process	
4	Fina Energy	50	√	√	√	√	In process	
5	United Energy Pakistan	100	√	√	√	√		
6	Sapphire Wind Power	50	√	√	√	√	√	√
7	Hydrochina Daoowd Power	50	√	√	√	√		√
8	Pakistan Wind Energy	5	√	√	√	√	–	–
9	Iran Pak Wind Power	50	√	√	√	√	–	–
10	Hydrochina XIBEI Engineering	50	√	–	–	–	–	–
11	Foundation-I (Beacon)	50	√	–	–	–	–	–
12	Foundation-II (Green)	50	√	–	–	–	–	–
13	Tricon Boston	150	√	–	–	–	–	–
14	Master Wind Energy Ltd	50	√	–	–	–	–	–
15	Luck Energy	50	√	–	–	–	–	–
16	Metro Power Co.	50	√	–	–	–	–	–
17	China Sunsec Energy	2.4	√	–	–	–	–	–
18	Hartford Alternative Energy	50	√	–	–	–	–	–
19	HAWA Energy	50	√	–	–	–	–	–
20	Al Abbas Stel Group	50	√	–	–	–	–	–
21	Gul Ahmed Energy	50	√	–	–	–	–	–

Note: (√) means already completed.
Source: Prepared by the JICA Survey Team based on information collected from Sindh-BOI during interview

Besides wind power, biomass energy development is becoming popular in the private sector.

The sugar mills are getting permission for power generation using bagasse as fuel. The sugar mills operate for six months every year and have biomass in the form of bagasse that can be used as fuel for power generation. Most of the sugar mills are opting to setup a moderate-sized power plant where they will use bagasse as well as other biomass fuel for power generation. Besides, some companies have acquired LOI to develop biomass power plants and intend to utilize biomass from other agriculture residues as fuel.

In Sindh Province, nine companies are in the process of setting up their power plants with a total installed capacity of 105.68 MW, whereas in Punjab Province, there are 15 companies with a total installed capacity of 204 MW. The list and details of these projects in Sindh Province are given in **Table 4.4-2** while those for Punjab Province are shown in **Table 4.4-3**.

Table 4.4-2 List of Bagasse/Biomass-based Power Projects planned by Private Companies in Sindh Province

Sr. No.	Company Name	Capacity (MW)	LOI	Feasibility Studies	IEE	Financial Close	Tariff	Generation License
1	Al-Noor Sugar Mills	21.8	√	√	√	unknown	√	√
2	Digri Sugar Mills	6	√	√	√	unknown	√	√
3	Tando All Yar Sugar Mills	12	√	√	√	unknown	√	√
4	Olympia Power Generation	5.88	√	√	√	unknown	√	√
5	Ghotki Sugar Mills	12	√	√	√	unknown	√	√
6	Al-Noor Sugar Mills	20	√	√	√	unknown	√	√
7	Al-Abbas Sugar Mills	8	√	√	√	unknown	√	√
8	SSJD Bionenergy Ltd	12	√	√	√	√	√	√
9	Pak Ethanol	8	√	√	√	unknown	√	√

Note: (√) means already completed
Source: Prepared by the JICA Survey Team based on data from AEDB

Table 4.4-3 List of Bagasse/Biomass-Based Power Projects planned by Private Companies in Punjab Province

Sr. No.	Company Name	Capacity (MW)	LOI	Feasibility Studies	IEE	Financial Close	Tariff	Generation License
1	Ashraf Sugar Mills	8	√	√	√	unknown	√	√
2	Ittefaq Sugar Mills	11	√	√	√	unknown	√	√
3	Thal Industries Corp	9.2	√	√	√	unknown	√	√
4	Brother Sugar Mills	13	√	√	√	unknown	√	√
5	Indus Sugar Mills	11	√	√	√	unknown	√	√
6	JDW Sugar Mills	22	√	√	√	unknown	√	√
7	RYK Sugar Mills	12	√	√	√	unknown	√	√
8	Sheikhoo Sugar Mills	12	√	√	√	unknown	√	√
9	Shakarganj Sugar Mills	23.6	√	√	√	unknown	√	√
10	Hamza Sugar Mills	9.2	√	√	√	unknown	√	√
11	Layyah Sugar Mills	22	√	√	√	unknown	√	√
12	Etihad Sugar Mills	15	√	√	√	unknown	√	√
13	Ashraf Sugar Mills	12	√	√	√	unknown	√	√
14	Lumen Energia	12	√	√	√	√	√	√
15	Masood Textile Mills	12	√	√	√	unknown	In process	In process

Note: (√) means already completed
Source: Prepared by the JICA Survey Team based on data from AEDB

The provinces are also undertaking some run-of-river type small hydropower projects both by private and under PPP mode. Although major sites lie in the areas of KPK, Gilgit-Baltistan, and AJK territories, there are still some sites identified in the Punjab and Sindh provinces.

The Sindh government has initiated to develop its first small hydropower project of 5 MW on RD[9] 15 of Rohri Canal in the province in PPP mode.

In Punjab province, 29 projects have been initiated by private companies which have already obtained LOIs from PPDB and are at various stages of progress. The total installed capacity of these 29 projects will be 233.25 MW. The Punjab government has also prepared feasibility studies and IEE for four sites with the assistance of ADB. The Punjab government intends to

[9] Full form of "RD" is Reduced Distance. It indicates the distance from the head of the canal, and RD 1 equivalents to 1,000 feet from the head of the canal.)

auction these sites to the private sector as well. The details of these small hydropower projects in Punjab Province are provided in **Table 4.4-4**.

Table 4.4-4 List of Small Hydro Power Projects planned by Private Companies in Punjab Province

Sr. No.	Company Name	Site Name	Capacity (MW)	LOI	Feasibility Studies	IEE	Financial Close	Tariff
1	Habib Rafiq (Pvt.) Ltd.	Rasul HPP (Jhelum)	20	√	√	√		√
2	Habib Rafiq (Pvt.) Ltd.	Punjnad HPP (Chenab)	15	√	√	√		√
3	Olympia Hydropower (Pvt.) Ltd.	B.S. Link Canal (RD 106+250)	11	√	√	√		√
4	Olympus Energy (Pvt.) Ltd.	Marala (Lucky HPP) (Chenab)	20	√	√	√		
5	New Park Energy (Pvt.) Ltd.	T.P. Link Canal (RD 183+000)	9	√	√	√		
6	New Park Energy (Pvt.) Ltd.	B.S.Link 1 (Tail) (RD 266+000)	9	√	√	√		
7	Alka Power (Pvt.) Ltd.	Jhang Branch Canal (RD 0+000 to 69+000)	1.8	√	√	√		
8	Alka Power (Pvt.) Ltd.	L.B.D.C. (RD 489 + 000)	3.3	√	√			
9	Muntaha Power (Pvt.) Ltd.	Muzzaffargarh Canal (RD 64+357 to 147+500)	2.64	√	√			
10	M/s Zaitoon Power (Pvt) Ltd.	Marala Ravi Link Canal (RD 262 + 180)	16.5	√	√	√		
11	The Punjab Power Co.	Lower Jhelum Feeder Canal (RD 8 + 626)	5.2	√	√			
12	Sarkar Energy (Pvt.) Ltd.	Lower Chenab Canal (RD 40 + 200)	1.77	√	√			
13	Waleed Power (Pvt.) Ltd.	Northern Branch of L.J.C. (RD 24+320)	1	√	√			
14	M/s Muntaha Power (Pvt) Ltd.	Lower Gugera Branch Canal (RD 27 + 000)	1.17	√	√			
15	C.J. Hydro (Haseeb Khan & Co.)	C.J. Link Tail Canal Fall (RD 316+622)	44.3	√	√			
16	Tarakai Energy (Pvt.) Ltd.	B.R.B.D Link Canal (RD 0+000) (Bombanwala)	2	√	Dropped			
17	Al-Rehman Energy (Pvt.) Ltd.	LBDC Canal (RD 589+000 to 640+200)	1.8	√				
18	AB Power (Pvt.) Ltd.	Pakpattan Canal (RD 315 + 000)	1.8	√				
19	M/s Aqua Power (Pvt.) Ltd.	B.S. Link II Canal (RD 33 + 430)	11	√	Dropped			
20	MR Power Company	Marala Ravi Link Canal (RD 313 + 500) Out Falls	13	√				
21	Trans Tech Pakistan	Jhang Branch Canal Upper RD 37+025	1.4	√				
22	Trans Tech Pakistan	LBDC RD 258+654	3	√				
23	Trans Tech Pakistan	LBDC RD 285+454	2.5	√				
24	Data Oil Mills	Bhowana Branch RD 7+400 to RD 9+000	0.3	√	√			
25	Gugera Power Company	Upper Gugera Branch Canal RD 214 + 000 to 220 + 750	2.57	√	√			
26	Noor Power (Pvt.) Limited	B.S. Link II Canal (RD 193 + 339)	5	√				
27	Noor Power (Pvt.) Limited	Trimmu Barrage	19.2	√				
28	Chenab Energy (Pvt.) Ltd.	L.B.D.C. RD 329+058 to 340+850 (Sahiwal HPP) (Solicited)	4.8	√	√	√		
29	Blue Star Energy (Pvt.) Ltd.	Gujrat Branch Canal RD 0+000 to 2+500 (Khokhra HPP)	3.2	√	√	√		
30	Under Process	Lower Chenab Canal RD 0 + 000 (Solicited)	7.55		√	√		
31	Under Process	Khanki Barrage (Solicited)	14.09		√	√		
32	Under Process	Qadirabad Barrage (Solicited)	23.00		√	√		
33	Under Process	Upper Chenab Canal (RD 133 + 296) (Solicited)	3.58		√	√		

Note: (√) means already completed
Source: Prepared by the JICA Survey Team based on information collected during interview with PPDB

Some of the private companies intend to develop multi-fuel power plants in Pakistan. These plants are of bigger capacity and are intended to utilize a mix of fuel comprising biomass and coal. As biomass is not available all the time, they will use coal as fuel during periods when biomass is not available. There are six companies which applied for generation license through PPIB with installed capacities ranging from 60 MW to 120 MW. The details are provided in **Table 4.4-5**.

Table 4.4-5 List of Biomass Multi-fuel Power Projects planned by Private Companies

Sr. No.	Project	Sponsor/Company Name	Location	Net Capacity (MW)
1	JDW Multi-fuel Project	JDWP/JSML	Near Rahim Yar Khan, Punjab	80
2	Ramzan Multi-fuel Project	Ramazan Energy/Sharif Group, Ramaz Sugar Mills	Bhawana, Jhang Road Chiniot, Punjab	100
3	Janpur Multi-fuel Project	Janpur Energy/RYK Mills	Janpur, District Rahim Yar Khan, Punjab	60
4	Chishtia Multi-fuel Project	CPL/CSML	Sillanwali - Sahiwal road District Sargodha, Punjab	65
5	Dewan Multi-fuel Project	Dewan Energy Ltd	Dewan City 20 km from Sujawal on Sujwal-Badin Road, Sindh	120
6	Etihad Multi-fuel Project	Etihad Power Generation Ltd	Karamabad District Rahim Yar Khan Punjab	60

Source: Prepared by the JICA Survey Team based on information collected from PPIB and the website of PPIB

4.5 Other Donors' Activities

There are many donor agencies working in Pakistan but there are only four major donors who are actively involved in the energy sector. These are the Asian Development Bank (ADB), Japan International Cooperation Agency (JICA), United States Assistance for International Development (USAID), and World Bank (WB). Normally, the funding from ADB and WB comes as loan, from JICA both as grant aid and soft loan, and from USAID as grant aid. The ADB funds both public and private sector projects in Pakistan, whereas the rest only provides funding for public sector projects where arrangements are directly between governments.

Brief details about projects carried out with donors are shown in **Appendix F**.

Chapter 5 RECOMMENDED PROJECTS FOR JAPANESE OFFICIAL ASSISTANCE

5.1 Candidate Project

The JICA Survey Team had meeting with around 30 organizations concerned in the energy sector of Pakistan. Through the meetings, the team collected data and information and also received the proposals for the yen loan project from several organizations. The team reviewed the proposals from the view points of possibility to apply Japanese technology, effectiveness to improve the current situation of energy sector in Pakistan, and the existence of strong initiative by Pakistan side to realize the project, and selected nine candidates.

As the result of the review, the JICA Survey Team recommends the projects listed in **Table 5.1-1** as the candidates for Japanese yen loan project.

Table 5.1-1 Candidate Projects for Japan's Official Assistance

No.	Project Title	Responsible/Implementing Organization
1	Project for Improvement of Water Pump Efficiency in Lahore	Water and Sanitation Agency (WASA), Lahore.
2	Punjab Solar Park Project	Government of Punjab
3	Project of Solar Power Generation Effective for Loss Reduction in Multan Area	Government of Punjab
4	Project of New LNG Terminal at Port Qasim in Karachi	Inter State Gas Systems (Pvt) Ltd. (ISGS), GOP
5	Oil Pipeline Extension Project	Pakistan State Oil (PSO), GOP
6	Coal Mining Development Project in Punjab Province	Government of Punjab
7	Project of New Coal Thermal Power Plant Construction at Jamshoro	GENCO Holdings Company, GOP
8	Taunsa 120 MW Hydropower Project	Government of Punjab
9	Loss Reduction Project in Distribution Network	DISCOs, GOP

Source: Prepared by the JICA Survey Team

The above candidate projects were selected from the view points of possibility to apply Japanese technology, effectiveness to improve the current situation of energy sector in Pakistan, and the existence of strong initiative by Pakistan side to realize the project.

In addition to the above projects, the JICA Survey Team reviewed the other potential projects and the possible ideas to formulate the candidate projects. Especially for the space to introduce Japanese technology, the following were considered.

- ✓ Gas thermal power generation and gas engine generation
- ✓ Electric energy meter, gas meter, and prepaid meter

Regarding development of gas power generation and gas engine generation, an assurance of stable gas supply to the projects for the project life is essential. At present, the gas supply in Pakistan is not satisfying the demand in the country and this supply only depends on domestic gas; there is no importing gas. Besides, according to the survey result, it was found that the potential of domestic gas of Pakistan is not large and it would take time to realize gas import. From the situation, the JICA Survey Team evaluated that these gas generation projects are not viable as the project of yen loan.

Regarding electric energy meter, gas meter, and prepaid meter, the JICA Survey Team could not confirm the space to introduce Japanese technologies of them in Pakistan. There are digital energy and gas meters of Pakistani make, which are dominated in the country. If there are needs of prepaid meters, it is easy to envisage that Pakistani manufacturers can produce such meters with much cheaper cost compared with that of Japanese make. From this reason, the JICA Survey Team did not pick up the project to introduce these meters in Pakistan as the candidate project for yen loan.

The details of the above projects are described in **Table 5.1-2**.

Table 5.1-2 Project Sheet of Candidate Projects

No.	Description
1	(1) Project Title
	Project for Improvement of Water Pump Efficiency in Lahore
	(2) Responsible/Implementing Organization
	Water and Sanitation Agency (WASA), Lahore
	(3) Salient Feature
	There are 527 tube well pumps and 122 disposal pumps under WASA, Lahore. Almost all pumps are centrifugal and are operating with poor efficiency. The sanctioned load for these pumps is 72.866 MW and average yearly consumption is 212.782 GWh. Replacement with more energy efficient pumps could improve efficiency and reduce annual energy consumption by 40%-50%.
	(4) Stage of Progress: Project Promotion, Pre-F/S, F/S, PC-1
	Project promotion
	(5) Necessity of Environmental Clearance
	Not required
	(6) Scheduled Completion Time
	12 months after selection of contractor.
	(7) Consultant Comments and Estimation on Completion Time
	Further study will be required before actual start of project. It is considered to be completed within 12 months after selection of contractor.
	(8) Estimated Project Cost with Consultants Comments
	Can be assessed during detailed study.
	(9) Necessity of Co-financing and Collaboration with Other Donors
	Not required
	(10) Advantage of Japanese Technology
	Efficient submersible pumps from Japan may have benefit over pumps from other countries.
2	(1) Project Title
	Punjab Solar Park Project
	(2) Responsible/Implementing Organization
	Government of Punjab Province
	(3) Salient Feature
	The Punjab Provincial Government is planning to develop 1,000 MW solar generation capacity in Cholistan (desert area in southern Punjab) and develop it as a solar park. Cholistan experiences solar radiation of greater than 6 kWh/m^2/day. The provincial government has allocated 2,000 hectares of land in 20 blocks each of 100 hectares suitable for 50 MW. They have undertaken upgrading of the existing 66 kV transmission line in this area to one capable of handling a voltage of 132 kV to transmit power from this park while they are also planning to construct a 220 kV line in the future. The provincial government is currently implementing the first 100 MW solar plant by themselves in order to attract the private sector, and has invited bids for installation of 100 MW solar photovoltaic (PV) plant in the park. For this first 100 MW solar PV plant, the provincial government is looking for funding and expecting Japanese yen loan for that.
	(4) Stage of Progress: Project Promotion, Pre-F/S, F/S, PC-1

	F/S completed, pre-qualification of bidders started, bidding documents ready
	(5) Necessity of Environmental Clearance
	Required EIA required already completed and submitted for approval by Punjab-EPA
	(6) Scheduled Completion Time
	Nine months from contract award for first 100 MW.
	(7) Consultant Comments and Estimation on Completion Time
	Twelve months from the contract award seems to be a realistic period for implementation. By the completion time, upgrading transmission line from 66 kV to 132 kV should be completed.
	(8) Estimated Project Cost with Consultants Comments
	The project cost was estimated by the provincial government to cost US$150 million. The estimate is in the lower side. It is lower by 40% compared to the price in the international market for reliable and high quality PV modules
	(9) Necessity of Cofinancing and Collaboration with Other Donors
	The Punjab Provincial Government wants to involve private parties and other financing agencies in developing the solar park.
	(10) Advantage of Japanese Technology
	Quality and reliability of Japanese PV modules is competitive in the international market. However, the provincial government places their priority on the cost competitiveness, thus, there seems to be not much of an advantage for Japanese products for this project.
3	(1) Project Title
	Project of Solar Power Generation Effective for Loss Reduction in Multan Area
	(2) Responsible/Implementing Organization
	The Government of Punjab Province
	(3) Salient Feature
	Distribution companies (DISCO) in Pakistan are suffering from high system losses and poor electrical parameters at the consumer end. In the Multan area, Multan Eletric Power Company (MEPCO) is having around 9% loss in 11 kV distribution lines, i.e., around 1,000 GWh/year. PV modules will be installed over canals and connected to the 11 kV feeders running close to or across the canals, which will reduce annual loss in the 11 kV lines by 30%-40% as well as inject electricity to the distribution network. Capacity and unit size will vary from 500 kW to 1000 kW, and will be worked out to minimize losses in the respective 11 kV distribution line to maximum possible level. This scheme will also increase voltage at the far end of the line and help increase overall productivity. This project will add right amount of renewable energy in the distribution system and will help improve generation mix to a favorable level without additional investment in transmission network and will reduce dependency on imported fuel.
	(4) Stage of Progress: Project Promotion, Pre-F/S, F/S, PC-1
	Pre-F/S level of study was conducted by the JICA Survey Team.
	(5) Necessity of Environmental Clearance
	IEE to be submitted to the Punjab Provincial Government for clearance.
	(6) Scheduled Completion Time
	Seventeen months after selection of contractor
	(7) Consultant Comments and Estimation on Completion Time
	A time frame of 17 months for the construction is very tight. Well-organized technical supervision and good coordination with the irrigation department by competent consultant is essential. Contractor must apply advanced technologies to shorten the construction period as much as possible.
	(8) Estimated Project Cost with Consultants Comments
	US$300 million Total capacity of solar PV modules can be adjusted according to the available funds.
	(9) Necessity of Co-financing and Collaboration with Other Donors
	Not necessary.
	(10) Advantage of Japanese Technology
	There is necessity and a great deal of Japanese technological advantage for high quality PV modules, materials, and method for crossing over canals, qualified site management capacity, and reliable workmanship.
4	(1) Project Title

	Project of New LNG Terminal at Port Qasim in Karachi
	(2) Responsible/Implementing Organization
	Inter State Gas Systems (Pvt) Ltd. (ISGS), GOP
	(3) Salient Feature
	Pakistan is facing acute shortages of natural gas and GOP is planning to add imported LNG into the distribution network in Pakistan to help meet the demand. GOP has decided to import LNG from Qatar, and for this purpose, GOP is planning to construct the first land LNG terminal in Pakistan, which will handle 1.1 Billion Cubic Feet per Day (BCFD) of LNG. Bidding has been requested from the private sector for a second floating terminal but for the land terminal, GOP intends to construct this on its own. The demand for natural gas is forecasted to increase to over 4.5 BCFD by 2020, whereas the supplies, under the current scenario, will remain at around 1 BCFD. The planned project is expected to help bridge the gap between this demand and supply.
	(4) Stage of Progress: Project Promotion, Pre-F/S, F/S, PC-1
	Pre-feasibility done, PC-1 Submitted
	(5) Necessity of Environmental Clearance
	EIA required
	(6) Scheduled Completion Time
	Three years after selection of contractor.
	(7) Consultant Comments and Estimation on Completion Time
	It is considered to be completed within the stipulated period.
	(8) Estimated Project Cost with Consultants Comments
	US$300-350 million. The cost needs to be carefully estimated in F/S.
	(9) Necessity of Co-financing and Collaboration with Other Donors
	Not required
	(10) Advantage of Japanese Technology
	There is an advantage with Japanese technology as Japan is in the LNG business for a long time.
5	(1) Project Title
	Oil Pipeline Extension Project
	(2) Responsible/Implementing Organization
	Pakistan State Oil (PSO), GOP
	(3) Salient Feature
	Currently, there is a dual carriage pipeline that carries diesel and kerosene from Karachi to Machike, near Sheikhupura, a town some 40 km from Lahore. From Machike, these fuels are then transported through truck-mounted tankers to northern parts of Pakistan. There is a plan to extend this existing oil pipeline from Machike to Siala, near Rawalpindi/Islamabad, and then to Tara Jabbah, near Peshawar. Completion of this pipeline network will eliminate truck transportation to these areas. On average, 200 tankers leave the facilities every day for transportation of diesel and kerosene. The planned project will reduce the overall cost on transportation of fuel within Pakistan.
	(4) Stage of Progress: Project Promotion, Pre-F/S, F/S, PC-1
	Pre-F/S was completed by private sector.
	(5) Necessity of Environmental Clearance
	EIA required
	(6) Scheduled Completion Time
	Three years after selection of the contractor
	(7) Consultant Comments and Estimation on Completion Time
	It is considered to be completed within the stipulated period.
	(8) Estimated Project Cost with Consultants Comments
	No estimated cost. The cost must be carefully estimated in F/S.
	(9) Necessity of Co-financing and Collaboration with Other Donors
	It needs to be co-financed by private or public sector organizations.
	(10) Advantage of Japanese Technology
	There is not much advantage in using Japanese technology in the field of oil pipeline and no cost competitiveness.
6	(1) Project Title

	Coal Mining Development Project in Punjab Province
	(2) Responsible/Implementing Organization
	Government of Punjab Province/Punjab Mines and Minerals Department
	(3) Salient Feature
	Construction of five units of a set of two inclined coal mines. After completion, the Punjab Provincial Government intends to auction these units and use the funds generated to complete another five units in order to increase the number of mines. The Punjab Provincial Government has recently completed the coal potential study by Snowden, a company from Australia. In order to attract private sector investment, the government plans to establish at least five mines and later auction it to the private sector. This way, the risk will be totally eliminated and is expected to attract the private sector. After auctioning off these mines, the funds will be used to setup another five mines and this way, the whole area can be explored. One mine will result in yearly production of 12,000 tonnes that will help reduce the import of coal. Moreover, the Snowden study proves that Punjab coal is also good for power generation.
	(4) Stage of Progress: Project Promotion, Pre-F/S, F/S, PC-1
	PC-1 is ready based on one unit and submitted to government for approval, pre-feasibility conducted, coal potential study completed by Snowden, Australia.
	(5) Necessity of Environmental Clearance
	EIA required
	(6) Scheduled Completion Time
	By the end of 2017
	(7) Consultant Comments and Estimation on Completion Time
	Can be completed within the stipulated time
	(8) Estimated Project Cost with Consultants Comments
	US$2.55 million/unit
	(9) Necessity of Co-financing and Collaboration with Other Donors
	Not required
	(10) Advantage of Japanese Technology
	There is not much advantage in using Japanese technology and no cost competitiveness.
7	(1) Project Title
	Project of New Coal Thermal Power Plant Construction at Jamshoro
	(2) Responsible/Implementing Organization
	GENCO Holdings Company, GOP
	(3) Salient Feature
	Construction of coal thermal power plant 1,320 MW (660 MW x 2) with super critical boilers, which is the first in Pakistan. Imported fuel coal is used.
	(4) Stage of Progress: Project Promotion, Pre-F/S, F/S, PC-1
	PC-1 Completed, feasibility study completed, and bidding documents are prepared. Besides, the railway transportation arrangements have been made with Pakistan Railway and the agreement with Port Qasim Authority was signed for handling of imported coal.
	(5) Necessity of Environmental Clearance
	Already completed and submitted to concerned EPA
	(6) Scheduled Completion Time
	End of 2017
	(7) Consultant Comments and Estimation on Completion Time
	It is considered to be completed within stipulated time
	(8) Estimated Project Cost with Consultants Comments
	US$2.5 billion, which is a realistic cost.
	(9) Necessity of Co-financing and Collaboration with Other Donors
	It is needed. US$900 million committed by ADB and US$450 million by IDB
	(10) Advantage of Japanese Technology
	Japanese technology has advantage.
8	(1) Project Title
	Taunsa 120 MW Hydropower Project

	(2) Responsible/Implementing Organization
	Government of Punjab Province
	(3) Salient Feature
	This power plant is designed to have five units of 24 MW turbines: a total installed capacity of 120 MW, with annual energy generation of 675.30 GWh. Normal water head will be from 4 m to 8 m. Design discharge is at 2310 m^3/sec. The averaged tariff for the electricity generated by this power plant has been fixed at US$0.08954/kWh. The project will help generate renewable energy and will help improve in generation mix substantially.
	(4) Stage of Progress: Project Promotion, Pre-F/S, F/S, PC-1
	F/S completed, PC-1 submitted to GOP for approval, and bidding documents are ready.
	(5) Necessity of Environmental Clearance
	EIA completed and submitted with Punjab-EPA for approval.
	(6) Scheduled Completion Time
	End of 2017 (target).
	(7) Consultant Comments and Estimation on Completion Time
	It is difficult to complete the project by the end of 2017 because 48 months will be required for completion after arrangements of finances.
	(8) Estimated Project Cost with Consultants Comments
	US$400 million
	(9) Necessity of Co-financing and Collaboration with Other Donors
	Matching funds or part co-financing may be available from the Punjab Provincial Government if the project cannot be funded through single finance.
	(10) Advantage of Japanese Technology
	There is no advantage of Japanese technology for low head hydropower generation and from the viewpoint of cost competitiveness.
9	(1) Project Title
	Loss Reduction Project in Distribution Network
	(2) Responsible/Implementing Organization
	Concerned DISCOs (such as GEPCO, FESCO, IESCO, and MEPCO)
	(3) Salient Feature
	Due to the annual increase in electrical power with limited rehabilitation works conducted in the distribution network, each DISCO has accumulated the required reinforcement work for the distribution network. To improve supply quality, reduce losses, and maintain uninterrupted electric supply to the consumers, massive distribution network rehabilitation work is required. The scope includes: - Upgrading of 66 kV lines and associated substations into 132 kV, - Bifurcation of 11 kV feeders, and - Replacement of conductors in distribution network. This work will reduce overload problem, reduce losses, and improve supply quality.
	(4) Stage of Progress: Project Promotion, Pre-F/S, F/S, PC-1
	F/S
	(5) Necessity of Environmental Clearance
	Upgrading of 66 kV lines into 132 kV requires IEE.
	(6) Scheduled Completion Time
	Two years for selected scope of work after selection of contractor.
	(7) Consultant Comments and Estimation on Completion Time
	Upgrading of 66 kV network to 132 kV is a practical solution for transmission network improvement. The works can be completed within 30 months.
	(8) Estimated Project Cost with Consultants Comments
	US$300 million. The scope of work can be adjusted based on the limited available financial source.
	(9) Necessity of Co-financing and Collaboration with Other Donors
	USAID, ADB, and WB are also financing similar works being conducted by DISCOs.
	(10) Advantage of Japanese Technology

Japanese equipments are more reliable but have no cost competitiveness.

Source: Prepared by the JICA Survey Team

5.2 Criteria for Selection of Recommended Projects

In order to select the best recommended project for Japanese official assistance from the nine candidate projects explained in Chapter 5.1, the JICA Survey Team evaluated and compared the candidate projects based on the following evaluation items:

(1) Advantage of Japanese technology,
(2) Expected start time of operation,
(3) Utilization of domestic energy resources,
(4) Possibility of exclusive Japanese assistance,
(5) Necessity of environmental clearance, and
(6) Risk of failure to complete the project

In comparing the projects, the JICA Survey Team applied the point system to the three ranks for each evaluation item with criteria as shown in **Table 5.2-1**.

Table 5.2-1 Points with Criteria on Evaluation Items

No.	Evaluation Item with Criteria	Point	Rank
1	Advantage of Japanese Technology		
	High	6	A
	Middle	4	B
	Low	1	C
2	Expected Start Time of Operation		
	By the end of year 2017	6	A
	By the end of year 2020	4	B
	After year 2021	1	C
3	Utilization of Domestic Energy Resources		
	Domestic energy resources only	3	A
	Mix of domestic and foreign energy resources	2	B
	Foreign energy resources only	1	C
4	Possibility of Japan's Exclusive Assistance		
	Japan's exclusive assistance assured	3	A
	Possibility of both sole assistance and coassistance	2	B
	Coassistance with other donors assured	1	C
5	Necessity of Environmental Clearance		
	Both EIA and IEE not required	3	A
	IEE required	2	B
	EIA required	1	C
6	Risk of Failure to Complete the Project		
	Low	3	A
	Middle	2	B
	High	1	C

Source: Prepared by the JICA Survey Team

5.3 Analysis and Evaluation of Candidate Projects

The candidate projects for Japanese official assistance are evaluated by applying the points and criteria to each evaluation item stated in Chapter 5.2.

The evaluation results are summarized in a scoring table as shown in **Table 5.3-1**.

Table 5.3-1 Scoring Table for Evaluation of Candidate Project

No.	Project Title	Score on Evaluation Item*						
		(1)	(2)	(3)	(4)	(5)	(6)	Total
1	Project for Improvement of Water Pump Efficiency in Lahore	4	4	2	3	3	1	**17**
2	Punjab Solar Park Project	1	6	3	3	1	2	**16**
3	Project of Solar Power Generation Effective for Loss Reduction in Multan Area	6	6	3	3	2	3	**23**
4	Project of New LNG Terminal at Port Qasim in Karachi	6	4	1	1	1	2	**15**
5	Oil Pipeline Extension Project	1	4	2	1	1	1	**10**
6	Coal Mining Development Project in Punjab Province	1	4	3	1	1	2	**12**
7	Project of New Coal Thermal Power Plant Construction at Jamshoro	6	6	3	1	1	3	**20**
8	Taunsa 120 MW Hydropower Project	1	4	3	1	1	2	**12**
9	Loss Reduction Project in Distribution Network	1	4	2	1	2	3	**13**

Note

* : Number in the blankets corresponds to the item number in the table below.

Item No.	Evaluation Item	Point in Rank		
		A	B	C
(1)	Advantage of Japanese Technology	6	4	1
(2)	Expected Start Time of Operation	6	4	1
(3)	Utilization of Domestic Energy Resources	3	2	1
(4)	Possibility of Japan's Alone Assistance	3	2	1
(5)	Necessity of Environmental Clearance	3	2	1
(6)	Risk of Failure to Project Completion	3	2	1

Source: Prepared by the JICA Survey Team

As a result of the evaluation of the candidate projects, the Project of Solar Power Generation Effective for Loss Reduction in Multan Area is selected as the most appropriate to be recommended for Japanese official assistance, of which the total score is 23.

Second ranked project is Project for New Coal Thermal Power Plant Construction at Jamshoro, of which the total score is 20. Since this project is planned to introduce supercritical coal-fired technology, the advantage of Japanese technology is high. Because this is on-going project, it does not take long time to reach its commercial operation. There is space to finance this project by yen loan. However, ADB and Islamic Development Bank (IDB) already committed to finance the project. One of the important criteria of the recommended project for yen loan is to be single-financed project by yen loan. On this sole finance point and on the environmental point, this project loses the score compared with the first ranked project. Now, another JICA Survey Team is working on promoting supercritical coal-fired project in Pakistan: Thar Coal Project. At this moment, it is considered that Thar Coal Project is the most appropriate project to apply Japanese technology in the field of coal thermal power generation.

Third ranked project is Project for Improvement of Water Pump Efficiency in Lahore, of which the total score is 17. There is also advantage of Japanese technology because this is energy saving project, in which field Japanese technology has advantage. The lowest evaluated point on this

project is the risk of failure to project completion. There is no any technical data of the existing water pumps' efficiency. The stage of the project is just promotion or idea level.

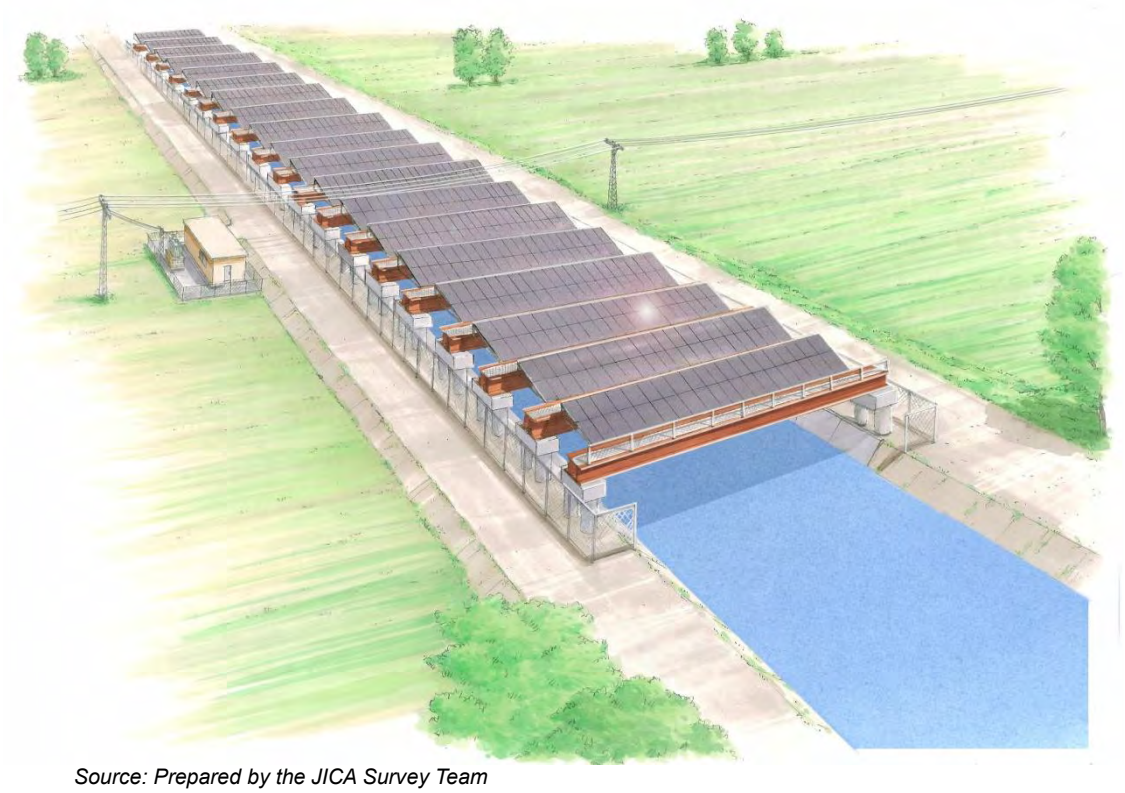
Fourth ranked project is Punjab Solar Park Project, of which the total score is 16. The progress stage of this project is most advanced among the candidate nine projects. This is also solar generation project in the same way as the first ranked project. It is evaluated that there is no advantage of Japanese technology on Punjab Solar Park Project while strong advantage of the same is evaluated on the first ranked project. The reason why the evaluation result is totally opposite on this project and the first ranked project is attributed to that this project is simply large scale solar generation project. The Government of Punjab places the highest priority on cost competitiveness to select the contractor of Punjab Solar Park Project. In this case, Japanese products for solar generation lose advantage.

The total score of fifth ranked project is 15 where there is 8 points difference from the first ranked project. For the evaluation results on this project and lower ranked projects than this, Table 5.3-1 is referred to.

5.4 Recommended Project for Japanese Official Assistance

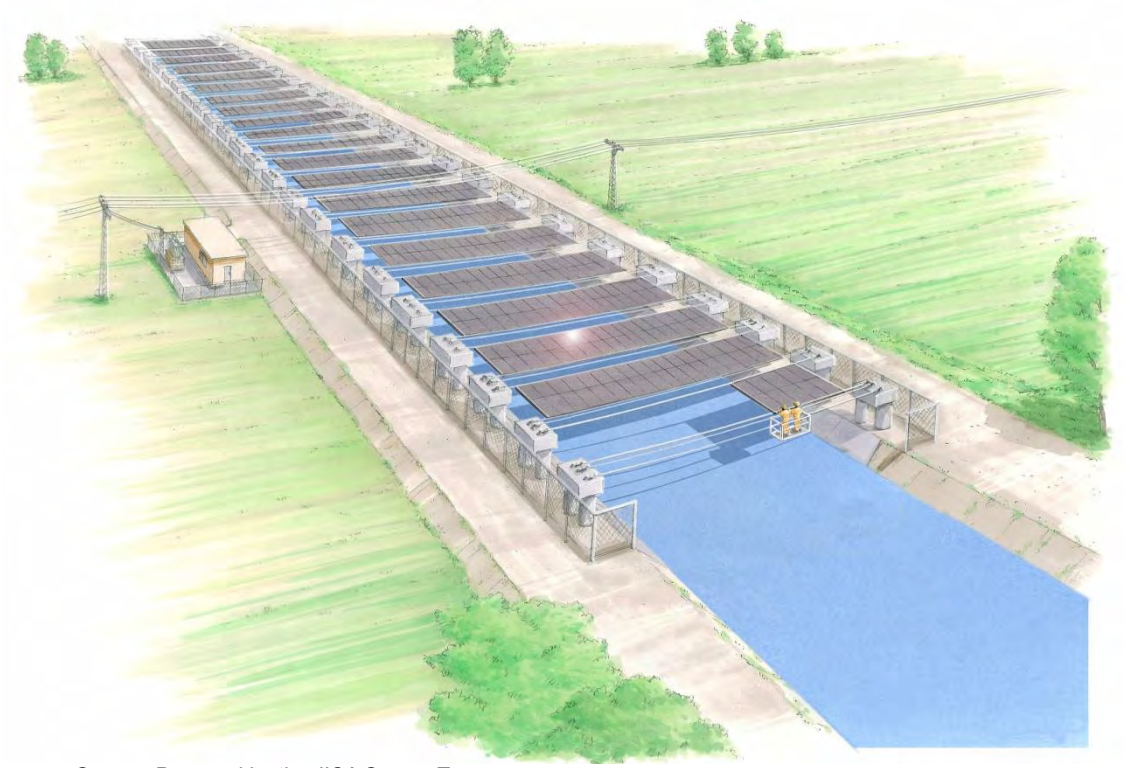
Project of Solar Power Generation Effective for Loss Reduction in Multan Area is the recommended project for Japanese official assistance. This project is scattered solar generation project of which the maximum capacity of one solar generation unit is around 1 MW. The total number of scattered solar generation unit is planned to be around 100. Solar panels (hereinafter referred to as PV modules) are designed to be installed over the irrigation canals and each solar generation unit will be connected to 11 kV feeders of MEPCO's distribution network.

The installation images of the recommended project are shown in **Figure 5.4-1** and **Figure 5.4-2**. Two types of installation setup of PV modules are presented: one is by girder structure and the other one is by suspension structure.



Source: Prepared by the JICA Survey Team

Figure 5.4-1 Image of Recommended Project (PV Module Installation by Girder Structure)



Source: Prepared by the JICA Survey Team

Figure 5.4-2 Image of Recommended Project (PV Module Installation by Suspension Structure)

(1) Expected Outcome and Advantage

The expected outcomes of this project are shown below.

- ✓ Reducing losses in 11 kV feeders and total distribution network
- ✓ Increasing voltage profile
- ✓ Mitigating electricity supply shortage
- ✓ Postponing investment timing on overloaded facilities

The recommended project is generation project. Besides that, the project reduces the losses in the distribution network totally. Electric losses are generated by the resistance of conductor and the current in the conductor. The conductor resistance is proportional to the length of conductor; the resistance of long distribution line is large. Reducing carrying distance of current and current itself makes the losses to be small. The image of the ideal situation is that generation and consumption of electricity are at the same place. The scattered solar generation unit is located near the demand and inject the electricity (current) to 11 kV feeder, which reduce the current flow from power source (G/S) of 11 kV feeder. This reduced current realizes the loss reduction in the 11 kV feeder. This results in reducing electricity flow in the source G/S and further in the transmission line to feed the electricity to G/S, which leads to the loss reduction in the G/S and the transmission line.

The voltages at the end of long distribution lines are very low. The scattered solar generation units lift up these voltages. As the result, the voltage profile will be much improved.

Needless to say, the recommended project will increase electricity supply to the distribution system.

As mentioned above, the recommended project will reduce the current flow in 11 kV feeders, GSs, and power source transmission lines. Many of the elements of distribution facilities of MEPCO are facing overloading and these elements need augmentation or replacement. The investment cost for that is very large. MEPCO can postpone this investment timing by reducing the current flow through the project.

Together with above expected outcomes, there are the advantages of this project which are shown below.

- ✓ Increasing electricity supply and reducing losses at same time by single way
- ✓ Releasing from land acquisition problem
- ✓ Increasing carbon-free electric energy

(2) Why Multan Area?

The Multan area[10] is selected for this project. The reasons why the Multan area was selected for this project are shown below.

- ✓ There is high potential to reduce distribution losses
- ✓ There are many irrigation canals
- ✓ MEPCO has strong intention to reduce distribution losses

This area is distribution territory of MEPCO and this territory is largest among ten DISCOs' distribution territories. In order to supply electricity to the consumers scattered in the territory,

[10] The Multan area in this report and for this project is defined as the electricity supply area of MEPCO

MEPCO has been extending long 11 kV distribution lines which create large distribution losses. Installation of many scattered power sources is effective to reduce the losses in the long distribution lines. The fist reason to select the Multan area is that there is high potential to mitigate distribution losses by this recommended project.

As already explained above, PV modules of the solar generation unit will be installed over the irrigation canals and the each unit will be connected to 11 kV feeder. Thus, the project sites are the points where 11 kV feeder crosses over canal or is laid close to canal. Since there are many irrigation canals in the Multan area, the sufficient numbers of appropriate project site are expected to be found. This is the second reason to select the Multan area.

Third, it is MEPCO's intention. MEPCO has strong intention to reduce distribution losses. They well understood that the recommended project helps to reduce distribution losses of MEPCO and then expressed a welcome to the implementation of the project. MEPCO will be the buyer of the electricity generated by the recommended project. MEPCO's understanding and cooperative mind to the project work will effectively for the successful project implementation.

(3) Assurance of Project Sites

Detailed site survey needs carrying out to assure the existence of necessary numbers of appropriate project sites. More than around 100 project sites are required to be confirmed.

The JICA Survey Team conducted the sample survey on six 11 kV feeders in the survey period. As a result of this sample survey, it was found that any of six feeders has at least one crossing point over canal. There are more than 990 11 kV feeders in the Multan area. Based on these data available, the JICA Survey Team assures that there exist appropriate project sites in the required number for the project implementation.

(4) Relationship with Other Donors

MEPCO is working with USAID for installation of Automatic Meter Reading (AMR) to the load of tube wells in their distribution network. There are 60,000 tube well connections. Out of 60,000 tube wells, USAID is providing fund for installation of AMR at 20,000 tube wells. In this project framework, MEPCO has the plan to introduce remote control system for tube wells.

There is synergy effect between the recommended project for yen loan and the above USAID project. Solar power system generate electricity only in daytime. If the tube well load of 11 kV feeder, on which the solar power system is connected, is guided or shifted to the daytime with AMR or the remote control system, the recommended project can reduce more losses of the 11 kV feeder. The purpose of the USAID project is also loss reduction of distribution network of MEPCO. Implementation of both projects is beneficial each other.

(5) Privatization of MEPCO

MEPCO is the government owned company same as the other nine DISCOs. GOP proceeds with the privatization of DISCOs. According to the information from MOWP, MEPCO will be ready to privatize in 2 years; GOP is preparing for privatization of IESCO and FESCO in the first phase and in the second phase goes for PESCO and MEPCO. The policy of privatization is decided but

the actual way forward has not been decided yet. In any case of the privatization, it will not affect any investment plan of GOP to the distribution sector.

Even after the privatization of MEPCO, there is no any change in the fairness for distributing electricity to the consumers because the electricity sector is monitored and regulated by NEPRA without any distinction to the players which are either public entities or private entities.

MEPCO will be the buyer of electricity generated by the recommended project and clearly mentioned that MEPCO has no intention to become the project owner. The Government of Punjab will be the project owner and they are actively promoting this recommended project. Under the circumstance, it is observed that there is no chance for the project formation to change.

Chapter 6 RECOMMENDATIONS

As a result of the survey, Project of Solar Power Generation Effective for Loss Reduction in Multan Area (hereinafter referred to as the Multan solar project) was selected as the recommended project for Japanese yen loan for infrastructure improvement of energy sector in Pakistan. In order to successfully implement the Multan solar project, the JICA Survey Team recommends the following:

1. Continuous Promotion

After the Multan solar project was selected as the recommended project, the JICA Survey Team actively worked in promoting this project. The Government of Punjab Province, which will be the project owner, and MEPCO, which will be buyer of electricity generated by the Multan solar project, understood the project concept well and agreed to proceed with the project. Besides, the officials of the Government of Punjab Province and MOWP became aware of the necessity of applying Japanese technology and products for the Multan solar project.

In order to maintain this situation, it is recommended to continuously conduct promotional activities. Once this situation in Pakistan is lost, it needs to have more resources again in order to lift up the situation to the current level.

2. Preparation of Digital Map

Solar modules will be installed over canals by the Multan solar project. Electricity generated by the solar modules will be injected to 11 kV feeders.

By this project feature, it is essential to identify the exact locations where 11 kV feeders cross over canals or installed as close to canals in the project design. The JICA Survey Team could not find any topographic map that indicates the exact location of both the canals and 11 kV feeders in the Multan area. The JICA Survey Team realized that such topographic maps most probably do not exist.

In the preparatory survey of the Multan solar project, it is recommended to create a digital topographic map to identify the exact location of canals and 11 kV feeders from satellite images with the land survey for 11 kV lines by Global Positioning System (GPS).

3. Coordination with Grant Aid Program

In order to ensure the Multan solar project to be successfully realized, it is recommended to coordinate with Japanese grant aid program.

The installation of PV modules over canals is still not popular around the world and the Multan solar project will be the first case in Pakistan to apply this new installation method. Besides, the concept to reduce distribution losses using solar generation is also a new idea in Pakistan. Therefore, the design and bid documents should be prepared carefully. For this reason, it is recommended to carry out the detailed design under Japanese grant aid program.

In case the implementation of the project by yen loan is suspended, it is recommended to implement the project by utilizing grant aid program. It is the second best way. In this case, total capacity of PV modules will be 3-4 MW, and the number of sites will be 3 to 4, around 1 MW at each site.

Appendix A

Overview on MEPCO Electricity Distribution Network

A Overview on MEPCO Electricity Distribution Network

Multan Electric Supply Company (MEPCO) is supplying power to districts of Multan, Sahiwal, Bahawalpur, Bahawal Nagar, Muzzaffargarh, Dera Ghazi Khan, Rahim Yar Khan and Vehari. The service territory of MEPCO is 105,505 km^2. They have following administrative arrangement for daily operation of the organization.

Table A-1 MEPCO Organizational Setup

	Operation	PD (Const)	PD ,GSC	GSO	Tech. Service (M&T)
Circles	08	01	01	02	02
Divisions	35	08	03	06	08
Sub Divisions	159	19	05	25	-

Note: PD (Const) stands for "Project Director, Construction, GSC stands for "Grid System Construction", GSO stands for "Grid System Operation" and M&T stands for "Metering & Testing".
Source: Interview at MEPCO

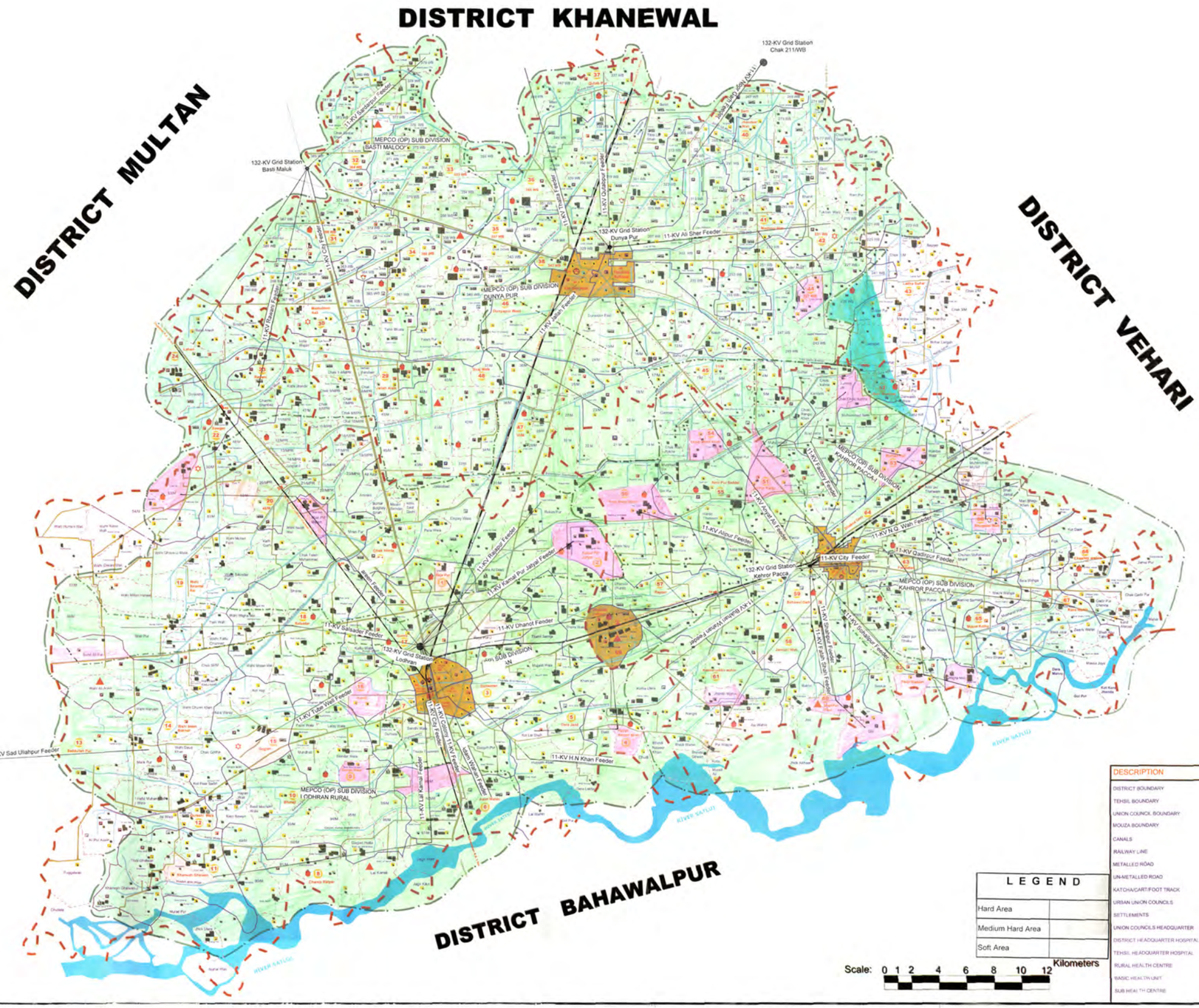
The total number of consumers is 4.71 million as of July 2013. Around 90 % of them are of domestic category. In the year 2011/12, MEPCO's total sale was 10,218 GWh. Out of the total sale consumers in domestic category consumed 5,040 GWh (49.3%). The electricity consumption by large, medium and small scale industries had a share of 24.5%, whereas the consumption by tube wells had a share of 18.4%. There are 112 substations and 5,651 power transformers of 132/11 kV and 66/11 kV are in operation in those substations. These substations are interlinked with 2,987 km of 132 kV transmission line and 1,176 km of 66 kV transmission line. 993 nos. of 11 kV distribution feeders with a total length of 69,521 km are originated from these substations. There are 142,719 distribution transformers in the MEPCO network. The average length of the 11 kV distribution feeder is 70 km. To supply electricity to 68 consumers they have one kilometre of 11 kV line. Most of the rural feeders are having a total length more than 100 km.

To give an overview of the electrical distribution system in MEPCO network following information are annexed.

(a) Map of MEPCO Lodhran Division
(b) Node to node detail of (some of the) 11 kV feeders with transformers connected to them
(c) Daily Load Curve of the feeders from Lodhran substation
(d) Information on performance of some selected feeders in Multan area

DISTRICT LODHRAN

BASE MAP



DATE : 31-12-2005

MEPCO OPERATION DIVISION LODHRAN

11 kV Distribution Line in Lodhran Division, MEPCO Area

Division: Lodhran **Feeder: Dhanot** **Substation: Lodhran**

Node		Section Length (km)	Conductor	Section (kVA)
From	To			
0	1	0.05	Cable	
1	2	1.85	Osprey	
2	3	0.15	Osprey	25
3	4	0.2	Osprey	
4	5	0.5	Osprey	
5	6	0.8	Osprey	
6	7	0.5	Osprey	
7	8	0.45	Osprey	
8	9	0.35	Osprey	
9	10	0.5	Osprey	
10	11	0.8	Osprey	25
11	12	0.1	Osprey	
12	13	0.3	Osprey	
13	14	0.25	Osprey	
14	15	0.2	Osprey	25
15	16	0.5	Osprey	25
16	17	1	Osprey	
17	18	0.25	Osprey	
18	19	0.75	Osprey	25
19	20	0.5	Osprey	25
20	21	1	Osprey	
21	22	0.15	Osprey	25
22	23	0.15	Osprey	450 kVAr
23	24	0.15	Osprey	25
24	25	0.25	Osprey	15

Node		Section Length (km)	Conductor	Section (kVA)
From	To			
25	26	0.25	Dog	
26	27	0.25	Dog	
27	28	0.2	Dog	
28	29	0.3	Dog	25
29	30	0.35	Dog	
30	31	0.25	Dog	
31	32	0.15	Dog	
32	33	0.05	Dog	
33	34	0.15	Dog	
34	35	1	Dog	
35	36	1	Dog	
36	37	0.1	Dog	100
37	38	0.2	Dog	25
38	39	0.05	Dog	
39	40	0.1	Dog	
40	41	0.2	Dog	
41	42	0.2	Dog	
42	43	0.8	Dog	
43	44	0.3	Dog	
44	45	0.25	Dog	25
45	46	0.2	Dog	
46	47	0.2	Dog	200
47	48	0.1	Dog	
48	49	0.25	Dog	
49	50	0.35	Dog	
50	51	0.45	Dog	
51	52	0.4	Dog	
52	53	0.45	Dog	25
53	54	0.5	Dog	
54	55	0.3	Dog	100
55	56	0.6	Dog	25
56	57	0.05	Dog	100
57	58	0.5	Dog	50
58	59	0.4	Dog	50
59	60	0.3	Dog	
60	61	0.1	Dog	
61	62	0.8	Dog	25
62	63	0.7	Dog	
63	64	0.5	Dog	
64	65	0.3	Dog	25
65	66	0.2	Dog	25
66	67	0.1	Dog	25
67	68	0.2	Dog	25
68	69	0.3	Dog	450 kVAr
69	70	0.2	Dog	
70	71	0.4	Dog	
71	72	0.5	Dog	
72	73	0.6	Dog	
73	74	0.72	Dog	

Appendix A(b)-1

Node		Section Length (km)	Conductor	Section (kVA)
From	To			
2	75	0.3	Rabbit	25
3	76	0.15	Rabbit	50
4	77	0.5	Rabbit	50
5	78	0.25	Rabbit	50
6	79	0.4	Rabbit	50
7	80	0.2	Rabbit	25
8	81	0.05	Rabbit	25+50
8	82	0.15	Rabbit	50
9	83	0.1	Rabbit	25
10	84	0.6	Rabbit	
84	85	0.75	Rabbit	
85	86	0.25	Rabbit	200
85	87	0.25	Rabbit	15
84	88	0.4	Rabbit	25
12	89	0.4	Rabbit	50+25
13	90	0.35	Rabbit	25
90	91	0.6	Rabbit	25
14	92	0.4	Rabbit	25
17	93	0.3	Rabbit	50
18	94	0.35	Rabbit	100
19	95	0.5	Rabbit	100
21	96	0.15	Rabbit	50
26	97	0.1	Rabbit	25
26	98	1.1	Rabbit	25
98	99	0.5	Rabbit	
99	100	0.45	Rabbit	25
99	101	0.4	Rabbit	50
101	102	0.25	Rabbit	25
102	103	0.25	Rabbit	
103	104	0.25	Rabbit	25
104	105	0.1	Rabbit	25
103	106	0.25	Rabbit	25
106	107	0.25	Rabbit	50
27	108	0.35	Rabbit	50
28	109	0.3	Rabbit	50
109	110	0.1	Rabbit	
110	111	0.5	Rabbit	50
110	112	0.1	Rabbit	
112	113	0.2	Rabbit	25
112	114	0.25	Rabbit	50
114	115	0.3	Rabbit	25
115	116	0.25	Rabbit	25
30	117	0.35	Rabbit	25
30	118	0.45	Rabbit	25
118	119	0.5	Rabbit	25
31	120	0.1	Rabbit	25
32	121	0.4	Rabbit	25
121	122	1.4	Rabbit	25
122	123	0.4	Rabbit	25
33	124	0.25	Rabbit	25
124	125	0.3	Rabbit	25
34	126	0.35	Rabbit	25
35	127	0.15	Rabbit	25
127	128	0.5	Rabbit	25
127	129	0.45	Rabbit	25

Node		Section Length (km)	Conductor	Section (kVA)
From	To			
36	130	0.5	Dog	
130	131	0.3	Rabbit	100
130	132	0.15	Dog	50
132	133	0.2	Dog	25
133	134	0.1	Dog	
134	135	0.15	Rabbit	50
134	136	0.4	Dog	
136	137	0.5	Rabbit	25
137	138	0.1	Rabbit	50
138	139	0.15	Rabbit	50
136	140	0.65	Dog	
140	141	0.1	Gopher	
141	142	0.25	Rabbit	50
141	143	0.25	Rabbit	25
141	144	0.6	Gopher	25
144	145	0.3	Gopher	
145	146	0.3	Gopher	25
145	147	0.2	Gopher	
147	148	0.2	Gopher	50
147	149	0.8	Gopher	
149	150	0.3	Gopher	
150	151	0.5	Gopher	
151	152	0.7	Rabbit	50
151	153	0.25	Rabbit	50
150	154	0.5	Gopher	50
154	155	0.45	Gopher	25
155	156	0.4	Gopher	25
149	157	0.1	Gopher	50
157	158	0.5	Rabbit	50
140	159	0.1	Dog	
159	160	0.5	Gopher	100
159	161	0.4	Dog	25
161	162	0.3	Dog	
162	163	0.4	Rabbit	25
163	164	0.3	Rabbit	
164	165	1.75	Rabbit	25
165	166	0.3	Rabbit	
166	167	0.55	Rabbit	50
166	168	0.7	Rabbit	50
164	169	0.4	Rabbit	25
169	170	0.2	Rabbit	50
170	171	0.45	Rabbit	25
162	172	0.2	Rabbit	25
172	173	0.1	Rabbit	
173	174	0.2	Rabbit	50
173	175	0.35	Rabbit	
175	176	0.5	Rabbit	25
175	177	0.4	Rabbit	
177	178	0.2	Rabbit	25
177	179	0.1	Rabbit	25
179	180	0.2	Rabbit	
180	181	0.35	Rabbit	25
181	182	0.5	Rabbit	50
182	183	0.4	Rabbit	25
182	184	0.6	Rabbit	
184	185	0.2	Rabbit	50
185	186	0.25	Rabbit	50
184	187	0.4	Rabbit	10

Appendix A(b)-1

Node		Section Length (km)	Conductor	Section (kVA)
From	To			
180	188	0.1	Rabbit	25
188	189	0.7	Rabbit	
189	190	0.3	Rabbit	50
189	191	0.35	Rabbit	
191	192	0.45	Rabbit	50
192	193	0.35	Rabbit	50
191	194	0.3	Rabbit	50
194	195	0.5	Rabbit	
195	196	0.5	Gopher	50
196	197	0.4	Gopher	10
195	198	0.1	Rabbit	100
39	199	0.15	Rabbit	25
199	200	0.15	Rabbit	10
199	201	0.45	Rabbit	25
39	202	0.4	Rabbit	
202	203	0.1	Rabbit	25
202	204	0.4	Rabbit	50
40	205	0.1	Rabbit	50
205	206	0.2	Rabbit	50
41	207	0.1	Rabbit	25
42	208	0.3	Rabbit	400
43	209	0.3	Rabbit	100
209	210	0.15	Rabbit	50
210	211	0.85	Rabbit	50
44	212	0.15	Rabbit	50
212	213	0.25	Rabbit	
213	214	0.45	Gopher	50
213	215	0.5	Gopher	100
215	216	0.7	Gopher	25
215	217	0.7	Gopher	50
44	218	0.15	Gopher	25
218	219	0.8	Gopher	25
219	220	1	Gopher	100
46	221	0.12	Gopher	50
221	222	0.49	Gopher	200
48	223	0.24	Gopher	25
49	224	0.24	Gopher	100
50	225	0.12	Gopher	
225	226	0.12	Gopher	25
226	227	0.12	Gopher	25
225	228	0.12	Gopher	
228	229	0.24	Rabbit	10
228	230	0.12	Rabbit	25
51	231	0.24	Rabbit	50
231	232	0.49	Rabbit	
232	233	0.12	Rabbit	100
232	234	0.98	Rabbit	
234	235	0.49	Rabbit	25
235	236	0.12	Rabbit	25
236	237	0.06	Rabbit	50
237	238	0.12	Rabbit	50
238	239	0.06	Rabbit	50
234	240	0.18	Rabbit	100
240	241	0.3	Rabbit	50
240	242	0.8	Rabbit	25
240	243	0.4	Rabbit	
243	244	1.5	Rabbit	25

Node		Section Length (km)	Conductor	Section (kVA)
From	To			
243	245	0.5	Rabbit	
245	246	0.3	Rabbit	50
245	247	0.3	Rabbit	
247	248	0.35	Rabbit	50
247	249	0.5	Rabbit	50
249	250	0.3	Rabbit	
250	251	0.15	Rabbit	50
250	252	0.2	Rabbit	50
252	253	0.5	Rabbit	
253	254	0.8	Rabbit	50
253	255	0.5	Rabbit	50
52	256	0.55	Gopher	100
256	257	0.5	Gopher	25
257	258	0.8	Gopher	400
258	259	0.1	Gopher	
259	260	0.3	Rabbit	50
259	261	0.25	Gopher	
261	262	0.2	Rabbit	25
261	263	0.5	Gopher	50
263	264	1	Gopher	25
264	265	0.25	Gopher	
265	266	0.25	Rabbit	50+25
265	267	0.5	Gopher	25
267	268	1	Gopher	50
267	269	0.15	Gopher	25
269	270	0.15	Gopher	
270	271	0.15	Rabbit	25
270	272	0.25	Gopher	50
272	273	0.25	Gopher	
273	274	0.25	Rabbit	50
273	275	0.2	Rabbit	
275	276	0.3	Rabbit	400
275	277	0.35	Gopher	
277	278	0.25	Gopher	50
278	279	0.15	Rabbit	50
279	280	0.05	Gopher	
280	281	0.15	Rabbit	50
280	282	1	Rabbit	25
282	283	1	Rabbit	25
283	284	0.1	Rabbit	
284	285	0.2	Rabbit	25
285	286	0.05	Rabbit	25
284	287	0.1	Rabbit	25
287	288	0.2	Rabbit	
288	289	0.2	Rabbit	50
288	290	0.8	Rabbit	25
290	291	0.3	Rabbit	50
291	292	0.25	Rabbit	25
292	293	0.2	Rabbit	15
280	294	0.2	Rabbit	400+25
54	295	0.1	Rabbit	50
58	296	0.25	Rabbit	50
59	297	0.35	Rabbit	50
60	298	0.45	Rabbit	50
61	299	0.4	Rabbit	50
299	300	0.45	Rabbit	
300	301	0.5	Rabbit	50
300	302	0.3	Gopher	50

Node		Section Length (km)	Conductor	Section (kVA)
From	To			
61	303	0.6	Gopher	25
303	304	0.15	Gopher	50
304	305	0.5	Gopher	50
305	306	0.25	Gopher	50
305	307	0.4	Gopher	
307	308	0.2	Gopher	
308	309	0.05	Gopher	25
308	310	0.15	Gopher	50
307	311	0.1	Gopher	
311	312	0.6	Gopher	50
311	313	0.25	Gopher	25
313	314	0.25	Gopher	50
314	315	0.25	Gopher	
315	316	0.5	Gopher	25
315	316.1	0.25	Gopher	
316.1	317	0.6	Rabbit	
317	318	0.35	Rabbit	50
317	319	0.6	Rabbit	50
319	320	0.4	Rabbit	50
320	321	0.3	Rabbit	50
316.1	322	0.35	Rabbit	25
322	323	0.5	Rabbit	50+25
323	324	0.15	Rabbit	
324	325	0.1	Rabbit	50
324	326	1	Rabbit	
326	327	0.5	Rabbit	50
326	328	0.45	Rabbit	
328	329	0.4	Rabbit	25
329	330	0.25	Rabbit	50
330	331	0.25	Rabbit	25
331	332	0.25	Rabbit	50
328	333	0.1	Rabbit	25
63	334	0.25	Rabbit	25
64	335	0.25	Rabbit	50
69	336	0.35	Rabbit	50
336	337	0.3	Rabbit	25
70	338	0.1	Rabbit	
338	339	0.5	Rabbit	25
338	340	0.1	Rabbit	
340	341	0.2	Rabbit	10
341	342	0.25	Rabbit	50
340	343	0.3	Rabbit	25
343	344	0.25	Rabbit	50
343	345	0.35	Rabbit	
345	346	0.45	Rabbit	50
345	347	0.5	Rabbit	50
71	348	0.1	Rabbit	25
72	349	0.4	Rabbit	100
72	350	1.4	Rabbit	200
350	351	0.4	Rabbit	50
351	352	0.25	Rabbit	
352	353	0.3	Rabbit	25
352	354	0.35	Rabbit	
354	355	0.15	Rabbit	
355	356	0.25	Rabbit	50
355	357	0.45	Rabbit	25

Node		Section Length (km)	Conductor	Section (kVA)
From	To			
354	358	0.5	Rabbit	25
358	359	0.3	Rabbit	
359	360	0.15	Rabbit	50
359	361	0.2	Rabbit	
361	362	0.1	Rabbit	25
362	363	0.15	Rabbit	25
361	364	0.4	Rabbit	50
364	365	0.5	Rabbit	50
365	366	0.1	Rabbit	100
365	367	0.15	Rabbit	
367	368	0.65	Rabbit	
368	369	0.1	Rabbit	50
368	370	0.25	Rabbit	25
367	371	0.25	Rabbit	
371	372	0.6	Rabbit	25
371	373	0.3	Rabbit	50
373	374	0.3	Rabbit	25
365	375	0.2	Rabbit	
375	376	0.2	Rabbit	25
375	377	0.6	Rabbit	
377	378	0.3	Rabbit	
378	379	0.5	Rabbit	50
378	380	0.7	Rabbit	50
380	381	0.25	Rabbit	25
377	382	0.5	Rabbit	
382	383	0.45	Rabbit	
383	384	0.4	Rabbit	10
384	385	0.1	Rabbit	10
385	386	0.5	Rabbit	50
384	387	0.1	Rabbit	50
387	388	0.5	Rabbit	25
383	389	0.4	Rabbit	25
389	390	0.3	Rabbit	25
382	391	0.4	Rabbit	50
73	392	0.3	Rabbit	
392	393	1.25	Rabbit	25
392	394	0.3	Rabbit	400

Total Line Length 142.26 km

Line Length with:

Osprey Conductor	11.65 km
Dog Conductor	16.82 km

11 kV Distribution Line in Lodhran Division, MEPCO Area

Division: Lodhran **Feeder: Tube Well** **Substation: Lodhran**

Node		Section Length (km)	Conductor	Section (kVA)
From	To			
0	1	0.061	Cable	
1	2	4.6	Dog	
2	3	0.25	Dog	
3	4	0.8	Dog	
4	5	0.2	Dog	50
5	6	0.6	Dog	
6	7	0.5	Dog	25
7	8	0.4	Dog	25
8	9	0.25	Dog	25
9	10	0.5	Dog	25
10	11	1.2	Dog	25
11	12	0.4	Dog	25
12	13	0.5	Dog	
13	14	0.2	Dog	
14	15	0.7	Dog	
15	16	0.122	Dog	
16	17	0.976	Dog	25
17	18	0.244	Dog	
18	19	0.488	Dog	25
19	20	0.244	Dog	25
20	21	0.244	Dog	
21	22	0.732	Dog	25
22	23	0.488	Dog	25
23	24	0.244	Dog	
24	25	0.488	Dog	
25	26	0.488	Dog	
26	27	0.488	Dog	
27	28	0.732	Dog	
28	29	0.244	Dog	
29	30	0.366	Dog	50
30	31	0.488	Dog	
31	32	0.366	Dog	
32	33	0.732	Dog	
33	34	0.244	Dog	
34	35	0.122	Dog	
35	36	0.122	Dog	
36	37	0.366	Dog	
37	38	0.488	Dog	
38	39	0.244	Dog	
39	40	0.366	Dog	100
40	41	0.244	Dog	
41	42	0.244	Dog	50
42	43	0.122	Dog	100+200
43	44	0.122	Dog	
44	45	0.122	Dog	
45	46	0.244	Dog	
46	47	0.244	Dog	
47	48	0.244	Dog	25
48	49	0.61	Dog	
49	50	0.61	Dog	25
50	51	0.122	Dog	25
51	52	0.244	Dog	
52	53	0.244	Dog	
53	54	0.244	Dog	
54	55	0.244	Dog	
2	56	0.244	Dog	
56	57	0.732	Dog	25
56	58	0.244	Dog	25

Node		Section Length (km)	Conductor	Section (kVA)
From	To			
3	59	0.488	Dog	
59	60	0.244	Dog	50
59	61	0.122	Dog	25
4	62	0.244	Dog	25
62	63	0.366	Dog	25
63	64	0.244	Dog	50
6	65	0.854	Dog	50
65	66	0.122	Dog	
66	67	0.488	Dog	200
66	68	0.244	Dog	50
10	69	0.366	Dog	50
69	70	0.488	Rabbit	50
70	71	0.732	Gopher	25
71	72	0.732	Gopher	
72	73	0.122	Rabbit	25
72	74	0.122	Rabbit	25
74	75	0.244	Rabbit	25
72	76	0.122	Gopher	25
76	77	1.098	Gopher	
77	78	0.122	Rabbit	25
78	79	0.488	Rabbit	50
77	80	0.244	Rabbit	
80	81	0.244	Rabbit	25
80	82	0.244	Rabbit	25
82	83	0.366	Rabbit	25
83	84	0.366	Rabbit	
84	85	0.244	Rabbit	25
84	86	0.122	Rabbit	25
86	87	0.122	Rabbit	25
87	88	0.732	Rabbit	25
13	89	0.122	Rabbit	
89	90	0.122	Rabbit	25
89	91	0.244	Rabbit	
91	92	0.122	Rabbit	25
91	93	0.244	Rabbit	25
93	94	0.244	Rabbit	25
94	95	0.244	Rabbit	25
14	96	0.61	Rabbit	25
15	97	0.122	Rabbit	25
16	98	0.366	Rabbit	25
98	99	0.244	Rabbit	25
99	100	0.122	Rabbit	25
17	101	0.244	Rabbit	25
101	102	0.122	Rabbit	25
18	103	0.732	Rabbit	
103	104	0.122	Rabbit	50
103	105	0.976	Rabbit	50
21	106	0.488	Rabbit	25
106	107	0.244	Rabbit	25
107	108	0.122	Rabbit	25
108	109	0.366	Rabbit	
109	110	0.244	Rabbit	15
109	111	0.122	Rabbit	50
109	112	0.366	Rabbit	25
112	113	0.366	Rabbit	50
113	114	0.366	Rabbit	25
22	115	0.122	Rabbit	25

Node		Section Length (km)	Conductor	Section (kVA)
From	To			
24	116	0.244	Rabbit	25
116	117	0.488	Rabbit	25
117	118	0.488	Rabbit	25
118	119	0.688	Rabbit	
119	120	0.61	Rabbit	25
119	121	0.122	Rabbit	25
121	122	0.122	Rabbit	25
24	123	0.488	Rabbit	
123	124	0.244	Rabbit	25
123	125	0.122	Rabbit	25
125	126	0.244	Rabbit	
126	127	0.244	Rabbit	25
126	128	0.244	Rabbit	25
128	129	0.244	Rabbit	
129	130	0.488	Rabbit	
130	131	0.244	Rabbit	25
130	132	0.488	Rabbit	25
132	132.1	0.488	Rabbit	
132.1	133	0.122	Rabbit	400
133	134	0.244	Rabbit	
134	135	0.122	Rabbit	15
134	136	0.244	Rabbit	25
132.1	137	0.122	Rabbit	25
137	138	0.366	Rabbit	
138	139	0.122	Rabbit	25
138	140	0.244	Rabbit	25
140	141	0.122	Rabbit	25
132.1	141.1	0.122	Rabbit	25
129	142	0.244	Rabbit	25
142	143	0.488	Rabbit	25
143	144	0.366	Rabbit	
144	145	0.122	Rabbit	25
144	146	0.244	Rabbit	25
146	147	0.488	Rabbit	
147	148	0.976	Rabbit	25
147	149	0.244	Rabbit	25
149	150	0.488	Rabbit	
150	151	0.732	Rabbit	50
150	152	0.244	Rabbit	25
152	153	0.122	Rabbit	25
153	154	1.098	Rabbit	25
154	155	0.732	Rabbit	25
155	156	0.122	Rabbit	
156	157	0.366	Rabbit	25
156	158	0.366	Rabbit	25
147	159	0.488	Rabbit	25
159	160	0.854	Rabbit	50
160	161	0.732	Rabbit	
161	162	0.488	Rabbit	25
161	163	0.488	Rabbit	25
161	164	0.244	Rabbit	
164	165	0.122	Rabbit	630
164	166	0.122	Rabbit	25
166	167	0.488	Rabbit	25
25	168	0.488	Rabbit	50
168	169	0.122	Rabbit	25
26	170	0.732	Rabbit	25
27	171	0.122	Rabbit	
171	172	0.122	Rabbit	50
171	173	0.122	Rabbit	25

Node		Section Length (km)	Conductor	Section (kVA)
From	To			
27	174	0.488	Rabbit	
174	175	0.122	Rabbit	100
174	176	0.122	Rabbit	25
176	177	0.366	Rabbit	25
177	178	0.122	Rabbit	
178	179	0.61	Rabbit	25
179	180	0.244	Rabbit	25
180	181	0.488	Rabbit	25
181	182	0.122	Rabbit	25
178	183	0.244	Rabbit	50
183	184	0.366	Rabbit	50
184	185	0.488	Rabbit	
185	186	0.244	Rabbit	
186	187	0.122	Rabbit	25
186	188	0.366	Rabbit	50
185	89	0.366	Rabbit	
189	190	0.122	Rabbit	25
189	191	0.122	Rabbit	25
191	192	0.732	Rabbit	25
192	193	0.244	Rabbit	25
192	194	0.244	Rabbit	
194	195	0.122	Rabbit	25
194	196	0.122	Rabbit	25
28	197	0.122	Rabbit	25
197	198	0.122	Rabbit	
198	199	0.244	Rabbit	25
198	200	0.122	Rabbit	
200	200.1	0.061	Rabbit	450
200.1	201	0.061	Rabbit	50
201	202	0.122	Rabbit	25
200	203	0.244	Rabbit	
203	204	0.122	Rabbit	25
203	205	0.122	Rabbit	
205	206	0.244	Rabbit	630
205	207	0.122	Rabbit	
207	208	0.122	Rabbit	
208	209	0.122	Rabbit	50
208	210	0.122	Rabbit	25
207	211	0.122	Rabbit	25
211	212	0.732	Rabbit	15
212	213	0.244	Rabbit	25
213	214	0.244	Rabbit	25
212	215	0.976	Rabbit	
215	216	0.366	Rabbit	25
215	217	0.244	Rabbit	
217	218	0.122	Rabbit	15
217	219	0.366	Rabbit	25
219	220	0.122	Rabbit	
220	221	0.976	Rabbit	15
221	222	0.122	Rabbit	25
222	223	0.122	Rabbit	
223	224	0.488	Rabbit	25
223	225	0.488	Rabbit	
225	226	0.854	Rabbit	25
225	227	0.122	Rabbit	25
227	228	1.098	Rabbit	
228	229	0.244	Rabbit	25
228	230	0.244	Rabbit	25
230	231	0.366	Rabbit	
231	232	0.122	Rabbit	
232	233	0.366	Rabbit	25
232	234	0.122	Rabbit	25

Node		Section Length (km)	Conductor	Section (kVA)
From	To			
231	235	0.122	Rabbit	25
235	236	0.366	Rabbit	
236	237	0.366	Rabbit	25
236	238	0.122	Rabbit	15
238	239	0.122	Rabbit	
239	240	0.366	Rabbit	25
240	241	0.122	Rabbit	25
239	242	0.366	Rabbit	25
242	243	0.122	Rabbit	25
243	244	0.244	Rabbit	25
29	245	0.244	Rabbit	25
245	246	0.366	Rabbit	50
31	247	0.244	Rabbit	
247	248	0.244	Rabbit	25
247	249	0.122	Rabbit	25
249	250	0.122	Rabbit	50
250	250.1	0.061	Rabbit	450
250.1	251	0.061	Rabbit	
251	252	0.366	Rabbit	25
251	253	0.244	Rabbit	15
253	254	0.122	Rabbit	25
254	255	0.61	Rabbit	
255	256	0.122	Rabbit	10
256	257	0.122	Rabbit	50
255	258	0.244	Rabbit	
258	259	0.366	Rabbit	25
258	260	0.122	Rabbit	25
255	261	0.732	Rabbit	
261	262	0.122	Rabbit	25
261	263	0.244	Rabbit	
263	264	0.244	Rabbit	25
263	265	0.244	Rabbit	
265	266	0.488	Rabbit	25
265	267	0.244	Rabbit	15
267	268	0.122	Rabbit	
268	269	0.854	Rabbit	25
268	270	0.244	Rabbit	
270	271	0.61	Rabbit	25
270	272	0.122	Rabbit	
272	273	0.122	Rabbit	50
272	274	0.122	Rabbit	25
274	275	0.244	Rabbit	25
32	276	0.244	Rabbit	25
276	277	0.366	Rabbit	25
277	278	0.366	Rabbit	25
278	279	0.122	Rabbit	
279	280	0.244	Rabbit	25
279	281	0.366	Rabbit	25
281	282	0.366	Rabbit	25
32	283	0.244	Rabbit	25
283	284	0.122	Rabbit	25
284	285	0.488	Rabbit	25
33	286	0.122	Rabbit	25
286	287	0.122	Rabbit	25
287	288	0.122	Rabbit	
288	289	0.488	Rabbit	
289	290	0.244	Rabbit	25
289	291	0.244	Rabbit	25
291	292	0.244	Rabbit	
292	293	0.122	Rabbit	
293	294	0.366	Rabbit	25
293	295	0.244	Rabbit	25

Node		Section Length (km)	Conductor	Section (kVA)
From	To			
292	296	0.122	Rabbit	25
296	297	0.366	Rabbit	25
297	298	0.61	Rabbit	25
297	299	0.488	Rabbit	25
299	300	0.366	Rabbit	25
300	301	0.61	Rabbit	15
299	302	0.122	Rabbit	25
302	303	1.244	Rabbit	
303	304	1	Rabbit	
304	305	0.122	Rabbit	10
305	306	0.61	Rabbit	25
304	307	0.854	Rabbit	25
307	308	0.122	Rabbit	25
308	309	0.732	Rabbit	
309	310	0.366	Rabbit	25
309	311	0.488	Rabbit	
311	312	0.122	Rabbit	25
311	313	0.122	Rabbit	
313	314	0.488	Rabbit	25
313	315	0.488	Rabbit	25
315	316	0.366	Rabbit	
316	317	0.122	Rabbit	
317	318	0.488	Rabbit	25
317	319	0.366	Rabbit	25
317	320	0.366	Rabbit	25
320	321	0.244	Rabbit	25
316	322	0.854	Rabbit	25
322	323	0.122	Rabbit	25
323	324	0.61	Rabbit	25
324	325	0.976	Rabbit	25
316	326	0.244	Rabbit	25
326	327	0.244	Rabbit	25
307	328	0.366	Rabbit	25
328	329	0.244	Rabbit	50
329	330	0.61	Rabbit	
330	331	0.122	Rabbit	25
330	332	0.488	Rabbit	10
323	333	0.488	Rabbit	10
333	334	0.732	Rabbit	25
334	335	0.244	Rabbit	25
330	336	0.122	Rabbit	
336	337	0.488	Rabbit	25
336	338	0.122	Rabbit	10
338	339	0.122	Rabbit	25
339	340	0.122	Rabbit	
340	341	0.122	Rabbit	25
340	342	0.488	Rabbit	25
342	343	0.488	Rabbit	25
343	344	0.366	Rabbit	25
342	345	0.122	Rabbit	25
345	346	0.122	Rabbit	25
346	347	0.488	Rabbit	25
347	348	0.61	Rabbit	25+25
348	349	0.122	Rabbit	25
349	350	0.366	Rabbit	
350	351	0.122	Rabbit	25
350	352	0.244	Rabbit	25
347	353	0.122	Rabbit	25
353	354	0.366	Rabbit	25

Node		Section Length (km)	Conductor	Section (kVA)
From	To			
303	355	0.488	Rabbit	50
355	356	0.366	Rabbit	25
356	357	0.122	Rabbit	
357	358	0.122	Rabbit	50
358	359	0.244	Rabbit	25
359	360	0.366	Rabbit	25
360	361	0.454	Rabbit	50
361	362	0.244	Rabbit	25
362	363	0.244	Rabbit	25
363	364	0.61	Rabbit	
364	365	0.732	Rabbit	15
364	366	0.122	Rabbit	25
363	367	0.122	Rabbit	25
367	368	0.244	Rabbit	25
360	369	0.488	Rabbit	50
369	370	0.366	Rabbit	25
370	371	0.122	Rabbit	15
369	372	0.122	Rabbit	25
357	373	0.488	Rabbit	25
373	374	0.61	Rabbit	15
374	375	0.488	Rabbit	25
375	376	0.122	Rabbit	15
376	377	0.61	Rabbit	15
377	378	0.244	Rabbit	
378	379	0.366	Rabbit	15
378	380	0.122	Rabbit	15
356	381	0.488	Rabbit	
381	382	0.122	Rabbit	25
382	383	0.244	Rabbit	25
381	384	0.366	Rabbit	25
384	385	0.488	Rabbit	25
381	386	0.366	Rabbit	25
386	387	0.61	Rabbit	25
288	388	0.366	Rabbit	
388	389	0.244	Rabbit	25
388	390	0.488	Rabbit	50
390	391	0.244	Rabbit	25
391	392	0.244	Rabbit	
392	393	0.366	Rabbit	50
393	394	0.244	Rabbit	25
393	395	0.244	Rabbit	
395	396	0.122	Rabbit	25
395	397	0.122	Rabbit	50
397	398	0.244	Rabbit	50
392	399	0.244	Rabbit	
399	400	0.122	Rabbit	25
400	401	0.244	Rabbit	15
400	402	0.244	Rabbit	25
402	403	0.244	Rabbit	25
399	404	0.244	Rabbit	
404	405	0.244	Rabbit	25
405	406	0.61	Rabbit	25
404	407	0.732	Rabbit	
407	408	0.122	Rabbit	25
408	409	0.244	Rabbit	50
409	410	0.244	Rabbit	
410	411	0.244	Rabbit	25
410	412	0.61	Rabbit	25
412	413	0.244	Rabbit	50
412	414	0.244	Rabbit	
414	415	0.732	Rabbit	50
415	416	0.244	Rabbit	50

Node		Section Length (km)	Conductor	Section (kVA)
From	To			
414	417	0.122	Rabbit	25
417	418	0.366	Rabbit	25
407	419	0.488	Rabbit	25
419	420	0.488	Rabbit	25
420	421	0.488	Rabbit	25
421	422	0.122	Rabbit	
422	423	0.61	Rabbit	25
423	424	0.366	Rabbit	25+25
423	425	0.366	Rabbit	50
422	426	0.122	Rabbit	
426	427	0.488	Rabbit	50
426	428	0.244	Rabbit	25
428	429	1.122	Rabbit	25
429	430	0.122	Rabbit	25
430	431	0.122	Rabbit	50
34	432	0.122	Rabbit	25
35	433	0.122	Rabbit	25
36	434	0.488	Rabbit	25
434	435	0.122	Rabbit	25
435	436	0.488	Rabbit	
436	437	0.122	Rabbit	10
437	438	0.122	Rabbit	
438	439	0.122	Rabbit	25
438	440	0.366	Rabbit	50
440	441	0.366	Rabbit	50
440	442	1	Rabbit	25
436	443	0.488	Rabbit	50
443	444	0.244	Rabbit	25
443	445	0.122	Rabbit	25
445	446	0.122	Rabbit	25
37	447	0.244	Rabbit	
447	448	0.366	Rabbit	25
448	449	0.122	Rabbit	25
447	450	0.244	Rabbit	
450	451	0.244	Rabbit	25
451	452	0.122	Rabbit	25
450	453	0.244	Rabbit	
453	454	0.122	Rabbit	50
453	455	0.488	Rabbit	
455	456	0.122	Rabbit	50
455	457	0.732	Rabbit	25
457	458	0.244	Rabbit	50
458	459	0.122	Rabbit	50
459	490	0.122	Rabbit	50
460	461	0.488	Rabbit	15
461	462	0.244	Rabbit	
462	463	0.488	Rabbit	25
463	464	0.366	Rabbit	25
462	465	0.61	Rabbit	
465	466	0.488	Rabbit	25
466	467	0.244	Rabbit	25
465	468	0.244	Rabbit	
468	469	0.122	Rabbit	50
468	470	0.122	Rabbit	50
470	471	0.122	Rabbit	25
471	472	0.732	Rabbit	
472	473	0.122	Rabbit	
473	474	0.366	Rabbit	25
473	475	0.244	Rabbit	25

Node		Section	Conductor	Section
From	To	Length (km)		(kVA)
472	476	0.244	Rabbit	25
476	477	0.122	Rabbit	
477	478	0.244	Rabbit	25
477	479	0.61	Rabbit	25
479	480	0.488	Rabbit	25
480	481	0.244	Rabbit	
481	482	0.366	Rabbit	25
481	483	0.122	Rabbit	25
483	484	0.488	Rabbit	25
38	485	0.244	Rabbit	100
485	486	0.244	Rabbit	25
486	487	0.244	Rabbit	25
485	488	0.488	Rabbit	200
39	489	0.244	Rabbit	100
43	490	0.122	Rabbit	25
44	491	0.61	Rabbit	50
491	492	0.244	Rabbit	25
491	493	0.244	Rabbit	25
493	494	0.732	Rabbit	
494	495	0.366	Rabbit	50
495	496	0.244	Rabbit	50
494	497	0.122	Rabbit	50
497	498	0.61	Rabbit	25
45	499	0.122	Rabbit	25
499	500	0.366	Rabbit	25
500	501	0.122	Rabbit	25
46	502	0.122	Rabbit	25
47	503	0.366	Rabbit	25
49	504	0.488	Rabbit	25
52	505	0.122	Rabbit	
505	506	0.244	Rabbit	25
505	507	0.244	Rabbit	
507	508	0.122	Rabbit	25
508	509	0.122	Rabbit	25
507	510	0.366	Rabbit	50
510	511	0.122	Rabbit	15
53	512	0.244	Rabbit	25
54	513	0.488	Rabbit	
513	514	0.122	Rabbit	
514	515	0.122	Rabbit	50
514	516	0.224	Rabbit	50
513	517	0.224	Rabbit	
517	518	0.244	Rabbit	25
518	519	0.366	Rabbit	25
517	520	0.244	Rabbit	
520	521	0.122	Rabbit	25
520	522	0.244	Rabbit	
522	523	0.366	Rabbit	25
522	523.1	0.122	Rabbit	450
522.1	524	0.122	Rabbit	
524	525	0.61	Rabbit	100
524	526	0.244	Rabbit	25
526	527	0.488	Rabbit	25
527	528	0.244	Rabbit	25

Node		Section	Conductor	Section
From	To	Length (km)		(kVA)
524	529	0.488	Rabbit	
529	530	0.122	Rabbit	25
529	531	0.122	Rabbit	
531	532	0.488	Rabbit	25
532	533	0.488	Rabbit	25
533	534	0.732	Rabbit	25
534	535	0.244	Rabbit	
535	536	0.244	Rabbit	25
535	537	0.244	Rabbit	25
537	538	0.488	Rabbit	
538	539	0.122	Rabbit	25
539	540	0.122	Rabbit	25
538	541	0.366	Rabbit	25
541	542	0.122	Rabbit	25
542	543	0.366	Rabbit	
543	544	0.488	Rabbit	25
543	545	0.122	Rabbit	25
545	546	0.488	Rabbit	25
534	547	0.732	Rabbit	25
547	548	0.122	Rabbit	25
531	549	0.732	Rabbit	
549	550	0.122	Rabbit	10
550	551	0.61	Rabbit	50
551	552	0.244	Rabbit	25
552	553	0.244	Rabbit	25
553	554	0.244	Rabbit	25
554	555	0.244	Rabbit	25
549	556	0.488	Rabbit	25
556	557	0.122	Rabbit	25
557	558	0.122	Rabbit	
558	559	0.366	Rabbit	50
559	560	0.122	Rabbit	25
560	561	0.122	Rabbit	50
560	562	0.244	Rabbit	25
562	563	0.244	Rabbit	50
558	564	0.366	Rabbit	25
564	565	0.122	Rabbit	25
565	566	0.244	Rabbit	
566	567	0.244	Rabbit	25+15
566	568	0.488	Rabbit	25
568	569	0.122	Rabbit	
569	570	0.244	Rabbit	25
569	571	0.488	Rabbit	25
55	572	1	Rabbit	
572	573	0.366	Rabbit	50
572	574	0.122	Rabbit	25
574	575	0.122	Rabbit	50
575	576	0.488	Rabbit	25
575	577	0.366	Rabbit	25

Total Line Length 193.004 km

Line Length with:

Dog Conductor 30.132 km

11 kV Distribution Line in Lodhran Division, MEPCO Area

Division: Lodhran **Feeder: Adam Wahin** **Substation: Lodhran**

Node		Section Length (km)	Conductor	Section (kVA)
From	To			
0	1	0.061	Cable	
1	2	0.44	Osprey	
2	3	0.04	Osprey	
3	4	0.25	Osprey	25
4	5	0.61	Osprey	
5	6	0.975	Osprey	
6	7	0.732	Osprey	
7	8	0.95	Osprey	
8	9	0.25	Osprey	
9	10	0.13	Osprey	200
10	11	0.73	Osprey	50
11	12	0.12	Osprey	
12	13	0.12	Osprey	
13	14	0.75	Osprey	50
14	15	0.1	Dog	
15	16	0.25	Dog	
16	17	0.15	Dog	
17	18	0.25	Dog	25
18	19	0.25	Dog	
19	20	0.2	Dog	
20	21	0.25	Dog	
21	22	0.15	Dog	25
22	23	0.2	Dog	100
23	24	0.25	Dog	
24	25	0.3	Dog	100
25	26	0.25	Dog	25
26	27	0.12	Dog	
27	28	0.12	Dog	
28	29	0.25	Dog	
29	30	0.25	Dog	
30	31	0.25	Dog	
31	32	0.25	Dog	
32	33	0.25	Dog	
33	34	0.12	Dog	50
34	35	0.15	Dog	
35	36	0.25	Dog	25
36	37	0.15	Dog	
37	38	0.15	Dog	25
38	39	0.25	Dog	50
39	40	0.12	Dog	25
40	41	0.15	Dog	50
41	42	0.15	Dog	
42	43	0.15	Dog	50
43	44	0.15	Dog	100
44	45	0.15	Dog	
45	46	0.25	Dog	50
46	47	0.25	Dog	
47	48	0.15	Dog	
48	49	0.25	Dog	
49	50	0.25	Dog	
50	51	0.25	Dog	
51	52	0.15	Dog	
52	53	0.15	Dog	
53	54	0.13	Dog	
54	55	0.4	Dog	

Node		Section Length (km)	Conductor	Section (kVA)
From	To			
55	56	0.6	Dog	25
56	57	0.5	Dog	25
57	58	0.25	Dog	
58	59	0.5	Dog	
59	60	0.6	Dog	
60	61	0.5	Dog	
61	62	0.15	Dog	
62	63	0.25	Dog	
63	64	0.4	Dog	
64	65	0.18	Dog	
65	66	0.1	Dog	
66	67	0.185	Gopher	
67	68	0.107	Gopher	
68	69	0.367	Gopher	
69	70	0.488	Gopher	
70	71	0.61	Gopher	
71	72	0.122	Gopher	
72	73	0.122	Gopher	
73	74	0.255	Gopher	25
74	75	0.244	Gopher	25
75	76	0.367	Gopher	
76	77	0.488	Gopher	25
77	78	0.122	Gopher	
78	79	0.488	Gopher	25
79	80	0.244	Gopher	25
80	81	0.122	Gopher	
81	82	0.122	Gopher	
82	83	0.367	Gopher	
83	84	0.122	Gopher	
84	85	0.367	Gopher	
85	86	0.244	Gopher	
86	87	0.244	Gopher	
87	88	0.122	Gopher	
88	89	0.12	Gopher	
89	90	0.122	Gopher	25
90	91	0.122	Gopher	25
91	92	0.122	Gopher	
92	93	0.122	Gopher	25
93	94	0.122	Gopher	25
94	95	0.122	Gopher	
95	96	0.2	Gopher	
96	97	0.122	Gopher	25
97	98	0.152	Gopher	25
98	99	0.488	Gopher	
99	100	0.244	Gopher	25
100	101	0.67	Gopher	50
101	102	0.12	Gopher	
102	103	0.37	Gopher	
103	104	0.47	Gopher	25
104	105	0.305	Gopher	25
105	106	0.3	Gopher	25
106	107	0.25	Gopher	25
107	108	0.35	Gopher	
108	108.1	0.45	Gopher	25

Node		Section Length (km)	Conductor	Section (kVA)
From	To			
2	109	0.25	Rabbit	50
3	110	0.25	Rabbit	50
110	111	0.5	Rabbit	25
5	112	0.25	Rabbit	50
6	113	0.25	Rabbit	
113	114	0.5	Rabbit	25
113	115	0.25	Rabbit	25
115	116	0.35	Rabbit	25
7	117	0.25	Rabbit	15
8	118	0.61	Rabbit	50
9	119	0.25	Rabbit	50
12	120	0.976	Rabbit	
120	121	0.25	Rabbit	
121	122	0.15	Rabbit	100
121	123	0.4	Rabbit	50
123	124	0.36	Rabbit	100
120	125	0.5	Rabbit	50
125	126	0.15	Rabbit	50
126	127	0.5	Rabbit	
127	128	0.37	Rabbit	50
127	129	0.5	Rabbit	
129	130	0.13	Rabbit	25
129	131	0.25	Rabbit	25
13	132	0.13	Rabbit	75
15	133	0.25	Rabbit	25
16	134	0.25	Rabbit	50
17	135	0.15	Rabbit	25
18	136	0.15	Rabbit	25
19	137	0.4	Rabbit	25
137	138	0.5	Rabbit	50
138	139	0.13	Rabbit	
139	140	0.4	Rabbit	10
140	141	0.45	Rabbit	10
139	142	0.25	Rabbit	
142	143	0.13	Rabbit	25
142	144	0.13	Rabbit	
144	145	0.13	Rabbit	25
144	146	0.37	Rabbit	
146	147	0.13	Rabbit	15
147	148	0.37	Rabbit	25
146	149	0.13	Rabbit	50
21	150	0.37	Rabbit	
150	151	0.25	Rabbit	50
150	152	0.5	Rabbit	25
152	153	0.37	Rabbit	25
153	154	0.35	Rabbit	25
154	155	0.37	Rabbit	25
155	156	0.75	Rabbit	50
155	157	0.15	Rabbit	
157	158	0.25	Rabbit	15
158	159	0.13	Rabbit	25
157	160	0.37	Rabbit	
160	161	0.15	Rabbit	15
160	162	0.15	Rabbit	25
20	163	0.25	Rabbit	
24	164	0.25	Rabbit	25
164	165	0.37	Rabbit	25

Node		Section Length (km)	Conductor	Section (kVA)
From	To			
27	166	0.25	Rabbit	50
27	167	0.13	Rabbit	25
167	168	0.4	Rabbit	25
168	169	0.13	Rabbit	25
28	170	0.13	Rabbit	25
170	171	0.25	Rabbit	25
171	172	0.13	Rabbit	25
29	173	0.5	Rabbit	50
30	174	0.25	Rabbit	25
31	175	0.35	Rabbit	25
32	176	0.13	Rabbit	200
33	177	0.13	Rabbit	25
177	178	0.5	Rabbit	25
35	179	0.25	Rabbit	
179	180	0.25	Rabbit	100
179	181	0.13	Rabbit	50
37	182	1.09	Rabbit	100
39	183	0.25	Rabbit	50
40	184	0.15	Rabbit	25
184	185	0.37	Rabbit	50
42	186	0.13	Rabbit	25
186	187	0.25	Rabbit	
186	188	0.975	Rabbit	25
188	189	0.25	Rabbit	25
45	190	0.25	Rabbit	200
190	191	0.25	Rabbit	200
45	192	0.13	Rabbit	
192	193	0.25	Rabbit	
192	194	0.5	Rabbit	25
194	195	0.25	Rabbit	25
195	196	0.13	Rabbit	25
196	197	0.25	Rabbit	
197	198	0.25	Rabbit	100
197	199	0.13	Rabbit	50
47	200	0.61	Rabbit	15
48	201	0.13	Rabbit	25
201	202	0.13	Rabbit	
202	203	0.5	Rabbit	25
203	204	0.25	Rabbit	25
204	205	0.25	Rabbit	25
202	206	0.13	Rabbit	25
206	207	1.9	Rabbit	25
207	208	0.25	Rabbit	
208	209	0.25	Rabbit	15
208	210	0.36	Rabbit	
210	211	0.13	Rabbit	25
210	212	0.25	Rabbit	25
210	213	0.97	Rabbit	
213	214	0.25	Rabbit	50
214	215	0.25	Rabbit	50
213	216	0.25	Rabbit	25
216	217	0.13	Rabbit	25
217	218	0.13	Rabbit	
218	219	0.25	Rabbit	50
218	220	0.37	Rabbit	50
48	221	0.25	Rabbit	
221	222	0.13	Rabbit	
222	223	0.25	Rabbit	25

Node		Section Length (km)	Conductor	Section (kVA)
From	To			
222	224	0.5	Rabbit	
224	225	0.13	Rabbit	25
224	226	0.13	Rabbit	
226	227	0.13	Rabbit	15
226	228	0.75	Rabbit	
228	229	0.13	Rabbit	
228	230	0.37	Rabbit	25
230	231	0.25	Rabbit	
221	232	0.25	Rabbit	
232.1	233	0.976	Rabbit	
233	234	0.12	Rabbit	25
233	235	0.25	Rabbit	25
232.1	236	0.13	Rabbit	25
236	237	0.25	Rabbit	25
237.1	238	0.25	Rabbit	50
238	239	0.25	Rabbit	25
239	240	0.15	Rabbit	25
239	241	0.15	Rabbit	25
49	242	0.15	Rabbit	100
50	243	0.15	Rabbit	50
51	244	0.4	Rabbit	200
244	245	0.45	Rabbit	
245	246	0.25	Rabbit	100
246	247	0.4	Rabbit	25
247	248	0.9	Rabbit	50
246	249	0.13	Rabbit	25
245	250	0.75	Rabbit	50
250	251	0.25	Rabbit	100
251	252	1.95	Rabbit	
252	253	0.61	Rabbit	25
252	254	0.13	Rabbit	
254	255	0.25	Rabbit	25
254	256	0.25	Rabbit	50
256	257	0.5	Rabbit	50
52	258	0.25	Rabbit	25
258	259	0.4	Rabbit	25
259	260	0.4	Rabbit	50
260	261	0.4	Rabbit	25
53	262	0.25	Rabbit	200
54	263	0.13	Rabbit	25
263	264	0.13	Rabbit	200
55	265	0.45	Rabbit	
265	266	0.13	Rabbit	200
266	267	0.37	Rabbit	25
265	268	0.13	Rabbit	
268	269	0.13	Rabbit	25
268	270	0.15	Rabbit	
270	271	0.15	Rabbit	200
270	272	0.25	Rabbit	25
272	273	0.25	Rabbit	
273	274	0.15	Rabbit	25
273	275	0.15	Rabbit	50
275	276	0.15	Rabbit	25
275	277	0.37	Rabbit	
277	278	0.25	Rabbit	200
277	279	0.25	Rabbit	200
58	280	0.25	Rabbit	50
58	281	0.13	Rabbit	25

Node		Section Length (km)	Conductor	Section (kVA)
From	To			
59	282	0.13	Rabbit	25
60	283	0.13	Rabbit	25
61	284	0.15	Rabbit	25
284	285	0.35	Rabbit	25
285	286	0.13	Rabbit	25
62	287	0.25	Rabbit	50
63	288	0.5	Rabbit	50+50
64	288.1	0.25	Dog	
288.1	289	0.15	Dog	
289	290	0.13	Rabbit	25
289	191	0.75	Dog	
291	192	0.37	Rabbit	25
291	293	0.15	Dog	50
293	294	0.25	Rabbit	25
293	295	1.75	Dog	
295	296	0.25	Rabbit	25
295	297	0.15	Dog	25
297	298	0.25	Dog	
298	299	0.5	Rabbit	25
299	300	0.15	Rabbit	100
300	301	0.5	Rabbit	25
301	302	0.25	Rabbit	50
299	303	0.25	Rabbit	25
303	304	0.61	Rabbit	
304	305	0.25	Rabbit	50
304	306	0.25	Rabbit	50
298	307	1.09	Rabbit	
307	308	0.36	Rabbit	25
308	309	0.15	Rabbit	
309	310	0.15	Rabbit	25
309	311	0.35	Rabbit	25
311	312	0.25	Rabbit	25
312	313	0.9	Rabbit	25
307	314	0.15	Dog	50
314	315	0.15	Dog	25
315	316	1.976	Dog	
67	317	0.25	Rabbit	25
68	318	0.61	Rabbit	25
69	319	0.25	Rabbit	50
70	320	0.25	Rabbit	
320	321	0.5	Rabbit	25
320	322	0.85	Rabbit	25
71	323	0.85	Rabbit	25
72	324	0.25	Rabbit	
327	325	0.25	Rabbit	25
324	326	0.13	Rabbit	25
326	327	0.75	Rabbit	
327	328	0.15	Rabbit	25
328	329	0.15	Rabbit	25
329	330	0.976	Rabbit	25
327	331	0.37	Rabbit	25
331	332	0.15	Rabbit	25
332	333	0.15	Rabbit	50
333	334	0.34	Rabbit	25
74	335	0.4	Rabbit	25
76	336	0.5	Rabbit	25
336	337	0.55	Rabbit	25
337	338	0.45	Rabbit	25

Node		Section Length (km)	Conductor	Section (kVA)
From	To			
77	339	0.15	Rabbit	25
339	340	0.25	Rabbit	
340	341	0.4	Rabbit	25
341	342	0.5	Rabbit	25
342	343	0.45	Rabbit	
343	344	0.45	Rabbit	25
343	345	0.15	Rabbit	25
340	346	0.25	Rabbit	
346	347	0.15	Rabbit	50
346	348	0.45	Rabbit	25
78	349	0.55	Rabbit	25
81	350	0.25	Rabbit	10
82	351	0.25	Rabbit	
351	352	0.5	Rabbit	25
351	353	0.35	Rabbit	25
353	354	0.24	Rabbit	25
83	355	0.4	Rabbit	25
84	356	0.35	Rabbit	25
85	357	0.3	Rabbit	25
86	358	0.25	Rabbit	25
385	359	0.45	Rabbit	25
87	360	0.3	Rabbit	25
88	361	0.45	Rabbit	25
361	362	0.55	Rabbit	25
89	363	0.15	Rabbit	25
92	364	0.25	Rabbit	25
364	365	0.4	Rabbit	25
365	366	0.15	Rabbit	25
95	367	0.4	Rabbit	25
96	368	0.9	Rabbit	25
99	369	0.37	Rabbit	25
102	370	0.4	Rabbit	25
370	371	0.45	Rabbit	
371	372	0.5	Rabbit	
372	373	0.55	Rabbit	25
372	374	0.55	Rabbit	25
372	375	0.5	Rabbit	25
375	376	0.45	Rabbit	25
371	377	0.75	Rabbit	25
103	378	0.45	Rabbit	25
378	379	0.4	Rabbit	
379	380	0.25	Rabbit	25
379	381	0.5	Rabbit	
381	382	0.15	Rabbit	25
381	383	0.61	Rabbit	
383	384	0.48	Rabbit	25
383	385	0.24	Rabbit	25
106	386	0.48	Rabbit	
386	387	0.55	Rabbit	50
386	388	0.15	Rabbit	50
388	389	0.5	Rabbit	
389	390	0.25	Rabbit	25
390	391	0.5	Rabbit	25
389	392	0.15	Rabbit	25
392	393	0.15	Rabbit	25
107	394	0.25	Rabbit	25
108	395	0.35	Rabbit	25

Node		Section Length (km)	Conductor	Section (kVA)
From	To			
66	396	0.37	Rabbit	
396	397	0.55	Rabbit	
367	398	0.5	Rabbit	25
397	399	0.45	Rabbit	
399	400	0.4	Rabbit	25
399	401	0.37	Rabbit	50
401	402	0.25	Rabbit	100
402	403	0.15	Rabbit	
403	404	0.37	Rabbit	25
403	405	0.25	Rabbit	25
405	406	0.15	Rabbit	25
405	407	0.25	Rabbit	
407	408	0.25	Rabbit	25
407	409	0.2	Rabbit	25
409	410	0.4	Rabbit	25
409	411	0.3	Rabbit	25
403	412	0.35	Rabbit	
412	413	0.45	Rabbit	50
412	414	0.15	Rabbit	25
403	415	1.15	Rabbit	25
415	416	0.15	Rabbit	25
416	417	0.15	Rabbit	25
417	418	0.25	Rabbit	
418	419	0.35	Rabbit	25
418	420	0.15	Rabbit	25

Total Line Length 137.298 km

Line Length with:

Osprey Conductor	6.097 km
Dog Conductor	12.29 km

11 kV Distribution Line in Lodhran Division, MEPCO Area

Division: Lodhran **Feeder: Galay Wala** **Substation: Lodhran**

Node		Section Length (km)	Conductor	Section (kVA)
From	To			
0	1	0.1	Cable	
1	2	0.65	Osprey	
2	3	0.55	Osprey	
3	4	0.45	Osprey	
4	5	0.1	Osprey	
5	6	0.25	Osprey	25
6	7	0.1	Osprey	
7	8	0.15	Osprey	
8	9	0.05	Osprey	
9	10	0.05	Osprey	
10	11	0.05	Osprey	25
11	12	0.1	Osprey	
12	13	0.1	Osprey	
13	14	0.25	Osprey	25
14	15	0.25	Osprey	
15	16	0.15	Osprey	
16	17	0.15	Dog	
17	18	0.4	Dog	
18	19	0.3	Dog	25
19	20	0.2	Dog	
20	21	0.2	Dog	
21	22	0.2	Dog	
22	23	0.25	Dog	25
23	24	0.25	Dog	
24	25	0.25	Dog	
25	26	0.2	Dog	25
26	27	0.1	Dog	
27	28	0.3	Dog	
28	29	0.05	Dog	
29	30	0.25	Gopher	
30	31	0.25	Gopher	
31	32	0.5	Gopher	
32	33	0.1	Gopher	
33	33.1	0.05	Gopher	
33.1	34	0.26	Rabbit	
34	35	0.15	Rabbit	
35	36	0.1	Rabbit	
36	37	0.1	Rabbit	
37	38	0.25	Rabbit	
38	39	0.45	Rabbit	
39	40	0.5	Rabbit	25
40	41	0.1	Rabbit	25
41	42	0.25	Rabbit	
42	43	0.3	Rabbit	25
43	44	0.5	Rabbit	

Node		Section Length (km)	Conductor	Section (kVA)
From	To			
44	45	0.15	Dog	
45	46	0.25	Dog	25
46	47	0.75	Dog	
47	48	0.25	Dog	
48	49	0.4	Dog	
49	50	0.1	Dog	50
50	51	0.4	Dog	
51	52	0.75	Dog	
52	53	0.15	Dog	25+50
53	54	0.25	Dog	
54	55	1.6	Dog	
55	56	0.35	Dog	25
56	57	0.3	Dog	
57	57.1	0.1	Dog	
57.1	58	0.3	Dog	
58	59	0.45	Rabbit	
59	60	0.15	Rabbit	
60	61	0.25	Rabbit	25
61	62	1.1	Rabbit	
62	63	0.4	Rabbit	15
63	64	0.1	Rabbit	25+50
64	65	0.15	Rabbit	25
65	66	0.2	Rabbit	
66	67	1.6	Rabbit	
67	68	0.5	Rabbit	10
68	69	0.7	Rabbit	
69	70	0.25	Gopher	
70	71	0.25	Gopher	
71	72	0.2	Gopher	25
72	73	0.4	Gopher	
73	74	0.1	Gopher	25
74	75	0.25	Gopher	
75	76	0.6	Gopher	50
76	77	0.1	Gopher	
77	78	0.3	Gopher	50
78	79	0.4	Gopher	
79	80	0.1	Gopher	25
80	81	0.15	Rabbit	50
81	82	0.05	Rabbit	50

Node		Section Length (km)	Conductor	Section (kVA)
From	To			
16	83	0.1	Dog	
83	84	0.09	Dog	
84	85	0.74	Gopher	50
85	86	0.15	Rabbit	
86	87	0.2	Rabbit	
87	88	0.5	Rabbit	
88	89	0.25	Rabbit	
89	90	0.25	Rabbit	25
90	91	0.1	Rabbit	
91	92	0.5	Rabbit	
92	93	0.15	Rabbit	
93	94	0.3	Rabbit	
94	95	1.8	Rabbit	
95	96	0.1	Rabbit	
96	97	0.5	Rabbit	25
97	98	0.1	Rabbit	
98	99	0.55	Rabbit	25
99	100	0.1	Rabbit	
100	101	0.2	Rabbit	
101	102	0.2	Rabbit	
102	103	0.1	Rabbit	
103	104	0.3	Rabbit	
104	105	0.25	Rabbit	
105	106	0.4	Rabbit	
106	107	0.1	Rabbit	
107	108	0.25	Rabbit	25
108	109	0.25	Rabbit	
109	110	0.25	Rabbit	
110	111	0.4	Rabbit	
111	112	0.5	Rabbit	
112	113	0.7	Rabbit	
113	114	0.4	Rabbit	
114	115	0.25	Rabbit	
115	116	0.1	Rabbit	
116	117	0.25	Rabbit	
117	118	0.25	Gopher	25
118	119	0.37	Gopher	
119	120	0.61	Gopher	

Node		Section Length (km)	Conductor	Section (kVA)
From	To			
120	121	0.45	Rabbit	
121	122	0.15	Rabbit	25
122	123	0.7	Rabbit	
123	124	0.1	Rabbit	25
124	125	0.15	Rabbit	25
125	126	0.1	Rabbit	
126	127	0.15	Rabbit	25
127	128	0.7	Rabbit	
128	129	0.2	Rabbit	50
129	130	0.4	Rabbit	
130	131	0.4	Rabbit	
131	132	1	Rabbit	
132	133	0.25	Rabbit	
133	134	0.4	Rabbit	25
134	135	0.1	Rabbit	25
135	136	0.15	Rabbit	25
136	137	0.5	Rabbit	
137	138	0.25	Rabbit	
138	139	0.15	Rabbit	
139	140	0.3	Rabbit	
140	141	0.3	Rabbit	
141	142	0.45	Rabbit	25
142	143	0.5	Rabbit	
143	144	0.2	Rabbit	
144	145	0.3	Rabbit	50
145	146	0.15	Rabbit	25
146	147	0.1	Rabbit	25
147	148	0.5	Rabbit	
148	149	0.7	Rabbit	25
149	150	0.4	Rabbit	
150	151	0.6	Rabbit	
151	152	0.35	Rabbit	50
152	153	0.25	Rabbit	50
153	154	0.5	Rabbit	50
154	155	0.4	Rabbit	25

Node		Section Length (km)	Conductor	Section (kVA)
From	To			
2	156	0.5	Rabbit	25
3	157	0.25	Rabbit	
4	158	0.15	Rabbit	25
5	159	0.1	Rabbit	50
7	160	0.1	Rabbit	25
160	161	0.2	Rabbit	25
8	162	0.05	Rabbit	25
162	163	0.1	Rabbit	25
163	164	0.85	Rabbit	25
162	165	0.25	Rabbit	
165	166	0.25	Rabbit	25
166	167	0.1	Rabbit	25
167	168	0.15	Rabbit	50
168	169	0.2	Rabbit	
165	170	0.05	Rabbit	25
170	171	0.1	Rabbit	
9	172	0.4	Rabbit	25
10	173	0.15	Rabbit	400
12	174	0.5	Rabbit	50
13	175	0.1	Rabbit	50
15	176	0.25	Rabbit	
176	177	0.4	Rabbit	
177	178	0.25	Rabbit	25
178	179	0.25	Rabbit	25
177	180	0.7	Rabbit	25
180	181	0.1	Rabbit	10
176	182	0.1	Rabbit	25
182	183	0.25	Rabbit	100+400+40

Node		Section Length (km)	Conductor	Section (kVA)
From	To			
17	184	0.4	Rabbit	25
18	185	0.4	Rabbit	
185	186	0.25	Rabbit	25
185	187	0.2	Rabbit	25
187	188	0.15	Rabbit	25
188	189	0.2	Rabbit	
189	190	0.15	Rabbit	25
189	191	0.25	Rabbit	25
191	192	0.25	Rabbit	25
188	193	0.3	Rabbit	25
193	194	0.15	Rabbit	
194	195	0.25	Rabbit	50
194	196	0.15	Rabbit	25
50	197	0.15	Rabbit	
197	198	0.05	Rabbit	50
197	199	0.2	Rabbit	
199	200	0.1	Rabbit	25
199	201	0.4	Rabbit	25
201	202	0.25	Rabbit	25
202	203	0.4	Rabbit	25
21	204	0.15	Rabbit	25
22	205	0.15	Rabbit	25
205	206	0.45	Rabbit	50
206	207	0.25	Rabbit	25
24	208	0.1	Rabbit	100
208	209	0.15	Rabbit	25
24	210	0.5	Rabbit	25
25	211	0.2	Rabbit	25
211	212	0.25	Rabbit	25
26	213	0.2	Rabbit	
213	214	0.2	Rabbit	25
213	215	0.05	Rabbit	25
215	216	0.35	Rabbit	500
215	217	0.5	Rabbit	25
213	218	0.2	Rabbit	25
218	219	0.5	Rabbit	25
219	220	0.15	Rabbit	25
220	221	0.25	Rabbit	25
220	222	1.15	Rabbit	25
27	223	0.1	Rabbit	25
223	224	0.1	Rabbit	25
28	225	0.35	Rabbit	50
225	226	0.65	Rabbit	25
226	227	0.35	Rabbit	25
227	228	0.15	Rabbit	
228	229	0.25	Rabbit	
229	230	0.2	Rabbit	50
229	231	0.3	Rabbit	25
231	232	0.25	Rabbit	25
232	233	0.3	Rabbit	25
229	234	0.4	Rabbit	100
228	235	0.4	Rabbit	25

Node		Section Length (km)	Conductor	Section (kVA)
From	To			
29	236	1.5	Rabbit	25
236	237	0.05	Rabbit	25
30	238	0.2	Rabbit	50
30	238.1	0.05	Rabbit	25
31	239	0.1	Gopher	25
239	240	0.1	Gopher	25
240	241	0.25	Gopher	25
241	242	0.25	Gopher	25
242	243	0.6	Gopher	25
243	244	0.1	Gopher	25
244	245	0.35	Gopher	
245	246	0.2	Gopher	25
245	247	0.25	Gopher	25
247	248	0.25	Gopher	25
248	249	0.35	Gopher	25
249	250	0.35	Gopher	25
250	251	0.2	Gopher	25
32	252.1	0.05	Rabbit	25
32	252	0.2	Rabbit	25
33	253	0.05	Rabbit	400
33.1	253.1	0.05	Rabbit	25
34	254	0.15	Rabbit	50
254	255	0.25	Rabbit	25
34	256	1	Rabbit	
256	257	0.25	Rabbit	25
256	258	0.65	Rabbit	25
258	259	0.15	Rabbit	200
259	260	0.1	Rabbit	200
258	261	0.15	Rabbit	25
261	262	0.2	Rabbit	25
262	263	0.2	Rabbit	25
263	264	0.15	Rabbit	25
264	265	0.35	Rabbit	25
265	266	0.15	Rabbit	25+25
266	267	0.25	Rabbit	25
35	268	0.15	Rabbit	25
268	269	0.4	Rabbit	25
269	270	0.1	Rabbit	25
36	271	0.35	Rabbit	25
37	272	0.15	Rabbit	25
38	273	0.5	Rabbit	200
39	274	0.2	Rabbit	50
274	275	0.4	Rabbit	50
275	276	0.5	Rabbit	50
276	277	0.2	Rabbit	25
277	278	0.15	Rabbit	50
42	279	0.45	Rabbit	630
279	280	0.5	Rabbit	25+400
280	281	0.4	Rabbit	
281	282	0.1	Rabbit	25
282	283	0.15	Rabbit	50
281	284	0.25	Rabbit	
287	288.1	0.4	Rabbit	
288.1	288.2	0.2	Rabbit	50
288.2	288.3	0.1	Rabbit	25
288.3	288.4	0.5	Rabbit	25
288.1	288.5	0.5	Rabbit	
288.5	288.6	0.2	Rabbit	50

Node		Section Length (km)	Conductor	Section (kVA)
From	To			
284	285	0.2	Rabbit	25
284	286	0.25	Rabbit	50
286	287	0.5	Rabbit	
287	288	0.1	Rabbit	25
287	289	0.4	Rabbit	
289	290	0.2	Rabbit	25
290	291	0.1	Rabbit	25
289	292	0.2	Rabbit	50
292	293	0.2	Rabbit	50
293	294	0.5	Rabbit	25
294	295	0.5	Rabbit	
295	296	0.35	Rabbit	25
295	297	0.15	Rabbit	
297	298	0.3	Rabbit	15
298	299	0.1	Rabbit	50
299	300	0.5	Rabbit	25
297	300.1	0.5	Rabbit	
300.1	301	0.3	Rabbit	25
300.1	302	0.25	Rabbit	
302	303	0.2	Rabbit	25
303	304	0.45	Rabbit	25
304	305	0.2	Rabbit	
305	306	0.45	Rabbit	25+50
306	307	0.15	Rabbit	25
305	308	0.15	Rabbit	100
308	309	0.4	Rabbit	50
309	310	0.15	Rabbit	25
310	311	0.15	Rabbit	
311	312	0.15	Rabbit	25
311	313	0.5	Rabbit	25
313	314	0.2	Rabbit	25
302	315	0.1	Rabbit	
315	316	0.5	Rabbit	50
315	317	0.25	Rabbit	50
317	318	0.3	Rabbit	
318	319	0.8	Rabbit	50
319	320	0.25	Rabbit	
318	321	0.25	Rabbit	50
321	322	0.1	Rabbit	
44	323	0.25	Rabbit	25
323	324	0.2	Rabbit	25
324	325	0.05	Rabbit	25
45	326	0.75	Rabbit	50
326	327	0.5	Rabbit	25
327	328	0.15	Rabbit	
328	329	0.4	Rabbit	50
328	330	0.25	Rabbit	50
47	331	0.25	Rabbit	25
48	3332	0.3	Rabbit	50
332	333	0.5	Rabbit	25
333	334	0.3	Rabbit	25
49	335	0.3	Rabbit	25
335	336	0.2	Rabbit	25
51	337	0.15	Rabbit	25
52	338	0.3	Rabbit	25
338	339	0.25	Rabbit	50
339	340	0.5	Rabbit	25
340	341	0.75	Rabbit	50

Node		Section Length (km)	Conductor	Section (kVA)
From	To			
54	342	0.15	Rabbit	25
55	343	1.25	Rabbit	25
243	344	0.35	Rabbit	25
57	345	0.1	Rabbit	25
58	346	0.15	Rabbit	25
59	347	0.25	Rabbit	100
60	348	0.2	Rabbit	25
62	349	0.7	Rabbit	25
349	350	0.65	Rabbit	
350	351	0.75	Rabbit	25
350	352	1	Rabbit	25
352	353	0.5	Rabbit	25
353	354	0.4	Rabbit	50
354	355	0.45	Rabbit	25
63	356	0.25	Rabbit	50
356	357	0.25	Rabbit	25
357	358	0.1	Rabbit	25
358	359	0.1	Rabbit	
359	360	0.25	Rabbit	25
359	361	0.2	Rabbit	100
66	362	0.15	Rabbit	50
362	363	0.3	Rabbit	25
363	364	0.35	Rabbit	50
364	365	0.7	Rabbit	
365	366	0.75	Rabbit	25
365	367	0.35	Rabbit	25
67	368	0.25	Rabbit	25
368	369	1.5	Rabbit	25
69	370	0.5	Rabbit	
370	371	0.2	Rabbit	25
370	372	0.25	Rabbit	25
372	373	0.2	Rabbit	50
373	374	0.1	Rabbit	50
70	375	0.35	Rabbit	25
375	376	0.3	Rabbit	25
376	377	0.3	Rabbit	25
377	378	0.2	Rabbit	25
378	379	0.25	Rabbit	25
379	380	0.35	Rabbit	25
71	381	0.4	Rabbit	25
73	382	0.45	Rabbit	50
75	383	0.5	Rabbit	25
383	384	0.35	Rabbit	100
384	385	0.4	Rabbit	25
77	386	0.1	Rabbit	25
386	387	0.15	Rabbit	25
387	388	0.15	Rabbit	25
388	389	0.3	Rabbit	25
79	390	0.35	Rabbit	25
79	391	0.55	Rabbit	5
83	392	0.15	Rabbit	25
86	393	0.45	Rabbit	
393	394	1.25	Rabbit	50
394	395	0.2	Rabbit	25
395	396	0.3	Rabbit	50
393	397	0.03	Rabbit	
397	398	0.9	Rabbit	200
397	399	0.1	Rabbit	25

Node		Section Length (km)	Conductor	Section (kVA)
From	To			
87	400	0.25	Rabbit	50
88	401	0.1	Rabbit	25
89	402	0.15	Rabbit	
402	403	0.25	Rabbit	25
402	404	0.25	Rabbit	25
92	405	0.4	Rabbit	25
93	406	0.2	Rabbit	
406	407	0.1	Rabbit	25
407	408	0.25	Rabbit	50
406	409	0.15	Rabbit	50
409	410	0.3	Rabbit	50
94	411	0.1	Rabbit	25
411	412	0.2	Rabbit	25
412	413	0.2	Rabbit	50
413	414	0.35	Rabbit	
414	415	0.2	Rabbit	25
414	416	0.2	Rabbit	25
416	417	0.9	Rabbit	
417	418	0.3	Rabbit	25
417	419	0.15	Rabbit	25
713	420	0.15	Rabbit	
420	421	0.1	Rabbit	25
421	422	0.2	Rabbit	25
420	423	0.8	Rabbit	
423	424	0.2	Rabbit	25
423	425	1.8	Rabbit	25
95	426	0.1	Rabbit	
426	427	0.25	Rabbit	25
426	428	0.25	Rabbit	50
428	429	0.8	Rabbit	25
429	430	0.5	Rabbit	25
96	431	0.3	Rabbit	50
98	432	0.3	Rabbit	
432	433	0.2	Rabbit	25
432	434	0.1	Rabbit	50
434	435	0.1	Rabbit	
435	436	0.55	Rabbit	50
436	437	0.1	Rabbit	25
435	438	0.1	Rabbit	25
435	439	0.1	Rabbit	
439	440	0.3	Rabbit	25
439	441	0.1	Rabbit	
441	442	0.5	Rabbit	25
442	443	0.55	Rabbit	50
441	444	0.25	Rabbit	25
100	445	1.05	Rabbit	25
101	446	0.6	Rabbit	25
446	447	0.1	Rabbit	
447	448	1	Rabbit	50
448	449	1.15	Rabbit	50
447	450	0.25	Rabbit	25
450	451	0.2	Rabbit	50
451	452	1.2	Rabbit	50
102	453	0.05	Rabbit	25
103	454	0.25	Rabbit	25
104	455	1.1	Rabbit	50
455	456	0.75	Rabbit	50

Node		Section Length (km)	Conductor	Section (kVA)
From	To			
105	457	0.75	Rabbit	25
106	458	0.25	Rabbit	25
107	459	0.2	Rabbit	50
459	460	0.25	Rabbit	
460	461	0.2	Rabbit	400
460	462	0.1	Rabbit	25
108	463	1.6	Rabbit	25
109	464	0.3	Rabbit	25
464	465	0.1	Gopher	50
465	466	0.2	Gopher	25
466	467	0.4	Gopher	
467	468	0.25	Gopher	50
468	469	0.4	Gopher	50
469	470	0.8	Gopher	25
467	471	0.5	Gopher	25
471	472	0.3	Gopher	
472	473	0.3	Gopher	
473	474	0.2	Gopher	630
473	475	0.5	Gopher	
475	476	0.1	Gopher	25
476	477	0.1	Gopher	10
477	478	0.1	Gopher	25
475	479	0.1	Gopher	
479	480	0.2	Gopher	25
479	481	0.1	Gopher	
481	482	0.3	Gopher	25
481	483	0.15	Gopher	50
483	484	0.55	Gopher	25
484	485	0.25	Gopher	25
472	486	0.2	Gopher	25
486	487	1.05	Gopher	100
486	488	0.25	Gopher	25
488	489	0.3	Gopher	
489	490	0.6	Gopher	25
490	491	0.25	Gopher	25
491	492	0.25	Gopher	50
492	493	0.25	Gopher	25
493	494	1	Gopher	25
490	495	0.25	Gopher	25
495	496	1.15	Gopher	
496	497	0.25	Gopher	25
496	498	0.25	Gopher	
498	499	0.2	Gopher	50
498	500	0.4	Gopher	
500	501	0.05	Gopher	50
500	502	0.25	Gopher	25
502	503	1.1	Gopher	25
489	504	0.75	Gopher	25
504	505	0.75	Gopher	100
505	506	0.2	Gopher	
506	507	0.1	Gopher	50
506	508	0.6	Gopher	
508	509	0.4	Gopher	25
508	510	0.5	Gopher	
510	511	0.1	Gopher	25

Node		Section Length (km)	Conductor	Section (kVA)
From	To			
510	512	0.4	Gopher	
512	513	0.15	Gopher	25
512	514	0.25	Gopher	
514	515	0.3	Gopher	
515	516	0.4	Gopher	25
515	517	0.6	Gopher	25
514	518	0.5	Gopher	25
518	519	0.35	Gopher	
519	520	0.7	Gopher	25
520	521	0.2	Gopher	25
519	522	0.4	Gopher	25
522	523	0.45	Gopher	
523	524	0.4	Gopher	50
523	525	0.35	Gopher	25
110	526	0.4	Rabbit	50
111	527	0.25	Rabbit	50
112	528	0.3	Rabbit	25
528	529	0.15	Rabbit	50
113	530	0.15	Rabbit	
530	531	0.25	Rabbit	25
530	532	0.2	Rabbit	25
532	533	0.6	Rabbit	50
533	534	0.25	Rabbit	25
114	535	0.2	Rabbit	
535	536	0.25	Rabbit	100
536	537	0.2	Rabbit	25
537	538	0.25	Rabbit	25
535	539	0.6	Rabbit	50
539	540	0.2	Rabbit	25
540	541	0.25	Rabbit	25
541	542	0.25	Rabbit	25
542	543	0.15	Rabbit	
543	544	0.7	Gopher	25
543	545	0.1	Gopher	25
545	546	0.5	Gopher	
546	547	0.25	Gopher	25
547	548	0.2	Gopher	25
546	549	0.3	Gopher	25
549	550	0.25	Gopher	
550	551	0.35	Gopher	25
550	552	0.2	Gopher	
552	553	0.45	Gopher	50
552	554	0.35	Gopher	50
115	555	0.4	Rabbit	25
555	556	0.5	Rabbit	25
116	557	0.55	Rabbit	25
118	558	0.3	Rabbit	25
119	559	0.45	Rabbit	50
119	560	0.25	Rabbit	
560	561	0.2	Rabbit	50
560	562	0.2	Rabbit	
562	563	0.5	Rabbit	25
562	564	0.45	Rabbit	
564	565	0.5	Rabbit	25
564	566	0.3	Rabbit	50
566	567	0.5	Rabbit	
567	568	0.25	Rabbit	25
567	569	0.45	Rabbit	50

Node		Section	Conductor	Section
From	To	Length (km)		(kVA)
120	570	0.1	Rabbit	25
121	571	0.2	Rabbit	25
571	572	0.35	Rabbit	25
123	573	0.3	Rabbit	25
126	574	0.15	Rabbit	50
128	575	0.7	Rabbit	
575	576	0.4	Rabbit	25
575	577	0.9	Rabbit	
577	578	0.15	Rabbit	25
578	579	0.5	Rabbit	25
577	580	0.3	Rabbit	50
130	581	0.4	Rabbit	
581	582	0.1	Rabbit	50
581	583	0.65	Rabbit	
583	584	0.2	Rabbit	25
583	585	0.25	Rabbit	50
585	586	0.1	Rabbit	50
586	587	0.5	Rabbit	25
587	588	0.25	Rabbit	25
588	589	0.25	Rabbit	25
589	590	0.15	Rabbit	25
590	591	0.25	Rabbit	
591	592	0.25	Rabbit	25
591	593	0.45	Rabbit	50
593	594	0.35	Rabbit	50
589	595	0.15	Rabbit	
595	596	0.15	Rabbit	25
596	597	0.2	Rabbit	25
597	598	0.25	Rabbit	25
598	599	0.5	Rabbit	25
599	600	0.3	Rabbit	50
595	601	0.35	Rabbit	50
601	602	0.1	Rabbit	
602	603	0.05	Rabbit	25
602	604	0.15	Rabbit	
604	605	0.15	Rabbit	25
605	606	0.1	Rabbit	25
604	607	0.05	Rabbit	25
607	608	0.5	Rabbit	10
608	609	0.2	Rabbit	10
609	610	0.4	Rabbit	
610	611	0.4	Rabbit	25
610	612	0.25	Rabbit	25
612	613	0.5	Rabbit	
613	614	0.1	Rabbit	25
613	615	0.2	Rabbit	25
615	616	0.25	Rabbit	10
616	617	0.15	Rabbit	15
617	618	0.7	Rabbit	25
618	619	0.3	Rabbit	25
131	620	0.1	Rabbit	
620	621	0.1	Rabbit	25
620	622	0.15	Rabbit	
622	623	0.1	Rabbit	25
623	624	0.1	Rabbit	25
622	625	0.4	Rabbit	
625	626	0.15	Rabbit	25

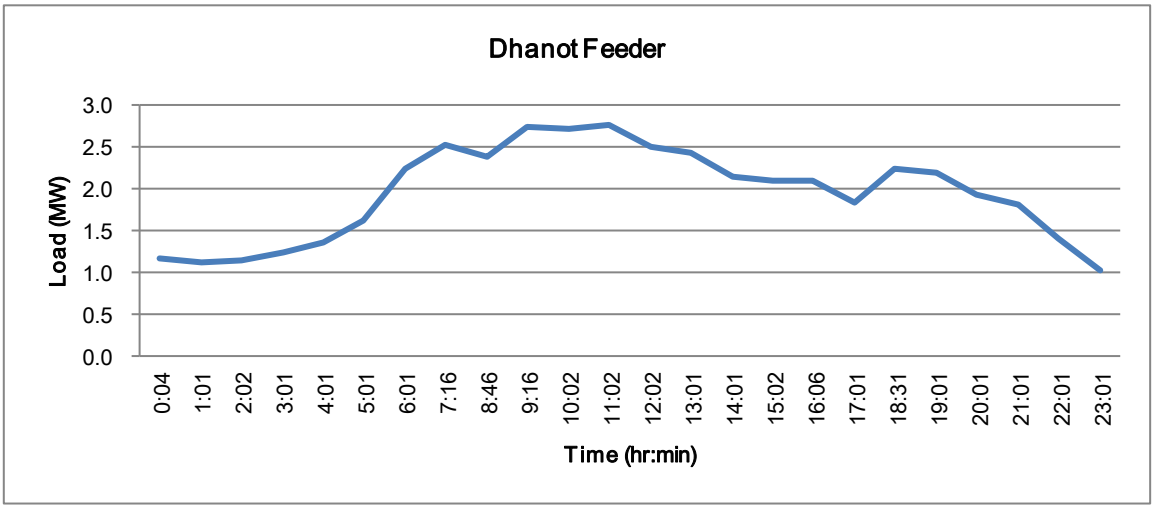
Node		Section	Conductor	Section
From	To	Length (km)		(kVA)
625	627	0.1	Rabbit	
627	628	0.3	Rabbit	25
627	629	0.3	Rabbit	50
629	630	0.1	Rabbit	25
630	631	0.25	Rabbit	25
631	632	0.25	Rabbit	50
630	633	0.1	Rabbit	50
633	634	0.2	Rabbit	25
132	635	0.35	Rabbit	25
133	636	0.3	Rabbit	25
137	637	0.35	Rabbit	50
637	638	0.3	Rabbit	50
637	639	0.35	Rabbit	25
639	640	0.5	Rabbit	
640	641	0.2	Rabbit	15
640	642	0.25	Rabbit	50
138	643	0.25	Rabbit	50
139	644	0.1	Rabbit	25
644	645	0.1	Rabbit	25
644	646	0.3	Rabbit	25
140	647	0.25	Rabbit	50
141	648	0.35	Rabbit	50
648	649	0.5	Rabbit	25
649	650	0.15	Rabbit	25
650	651	0.25	Rabbit	
651	652	0.2	Rabbit	50
652	653	0.2	Rabbit	
653	654	0.6	Rabbit	25
653	655	0.4	Rabbit	50
651	656	0.1	Rabbit	25
651	657	0.1	Rabbit	
657	658	0.1	Rabbit	25
657	659	0.5	Rabbit	25
659	660	0.5	Rabbit	50
143	661	0.1	Rabbit	25
144	662	0.4	Rabbit	50
148	663	0.65	Rabbit	25
663	664	0.5	Rabbit	25
150	665	0.35	Rabbit	50
665	666	0.15	Rabbit	25
666	667	0.15	Rabbit	
667	668	0.3	Rabbit	25
667	669	0.35	Rabbit	50
669	670	0.25	Rabbit	50
151	671	0.15	Rabbit	
671	672	0.25	Rabbit	50
671	673	0.1	Rabbit	25
673	674	0.3	Rabbit	10
674	675	0.5	Rabbit	
675	676	0.4	Rabbit	25
675	677	0.1	Rabbit	50
152	678	0.35	Rabbit	25
678	679	0.4	Rabbit	25

Total Line Length 220.35 km

Line Length with:

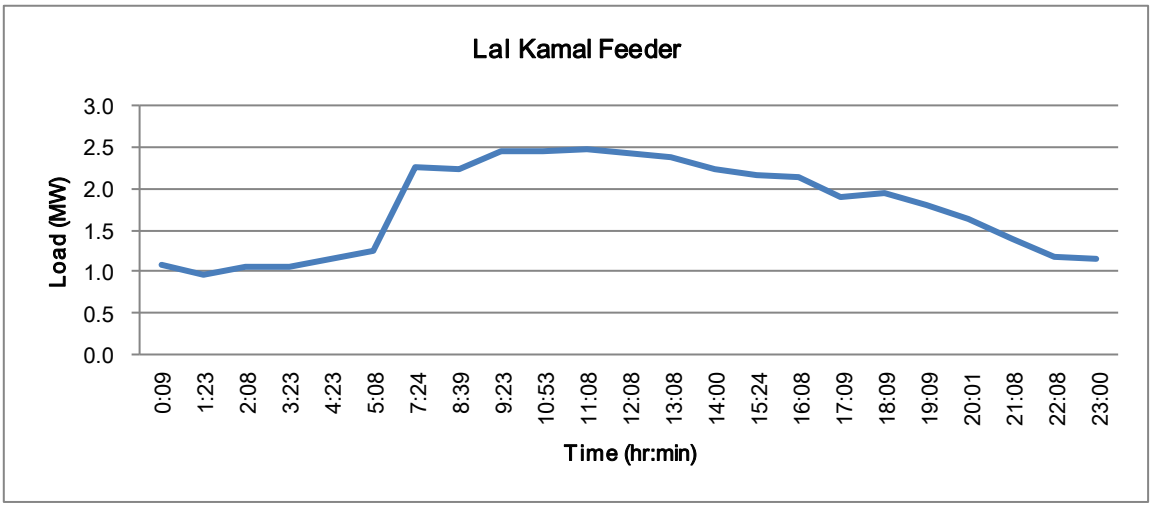
Osprey Conductor	3.25 km
Dog Conductor	8.95 km

(c) Daily Load Curve of the feeders from Lodhran substation for 26 Nov, 2013



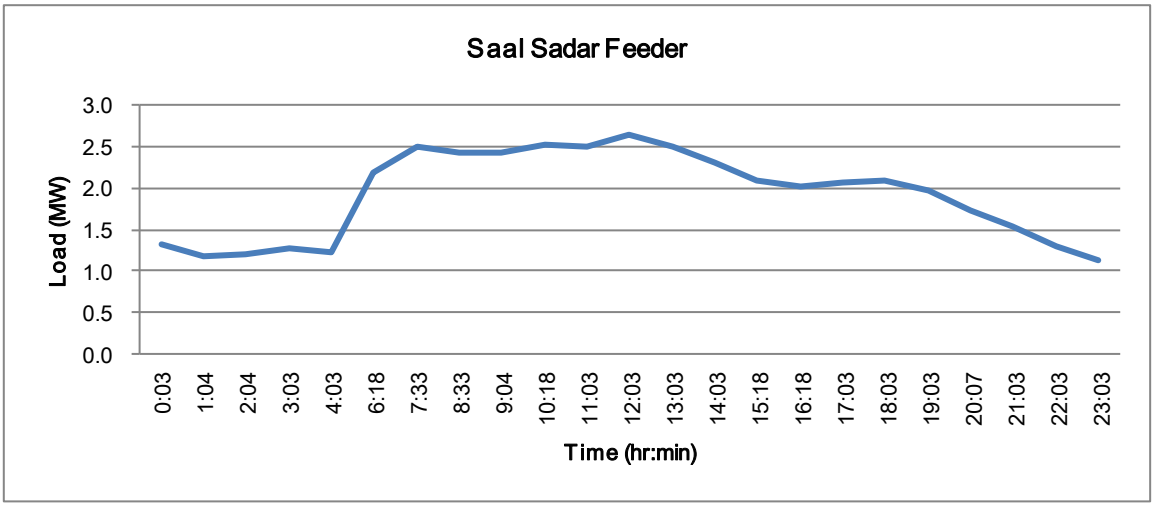
Source: MEPCO Control Centre, Multan

Figure C-1 Load Curve (Dhanot Feeder)



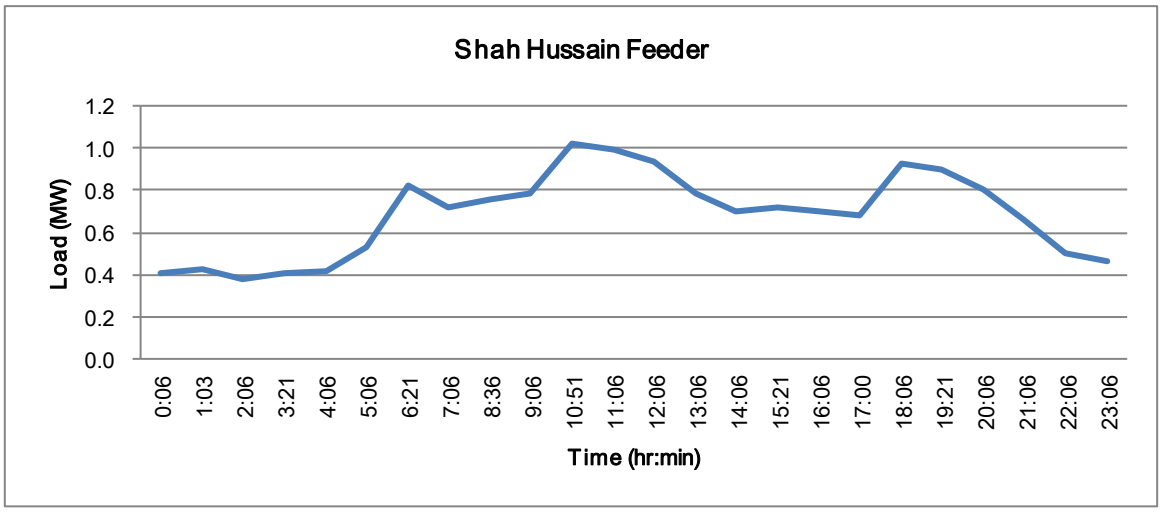
Source: MEPCO Control Centre, Multan

Figure C-2 Load Curve (Lal Kamal Feeder)



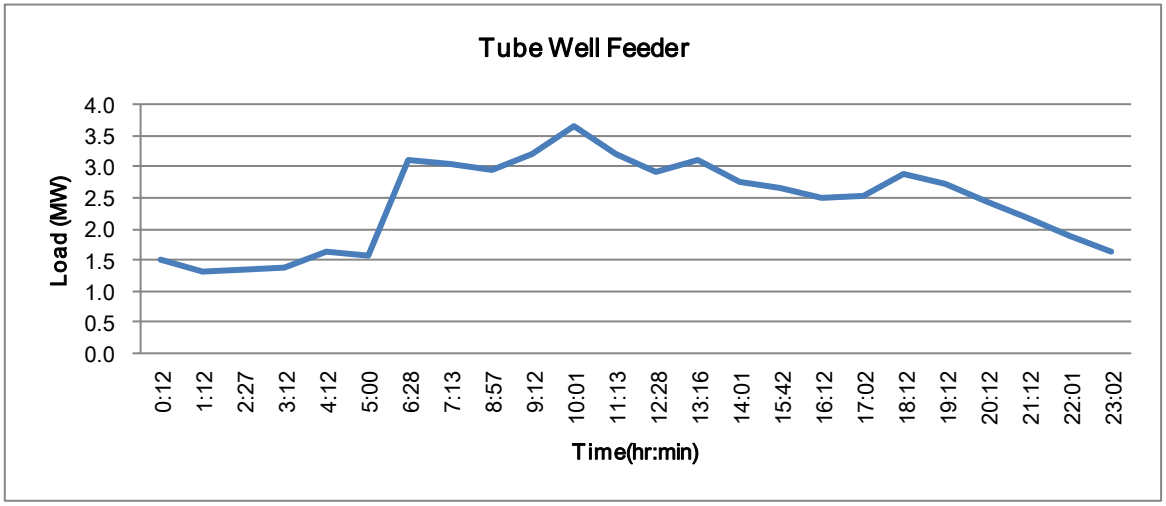
Source: MEPCO Control Centre, Multan

Figure C-3 Load Curve (Saal Sadar Feeder)



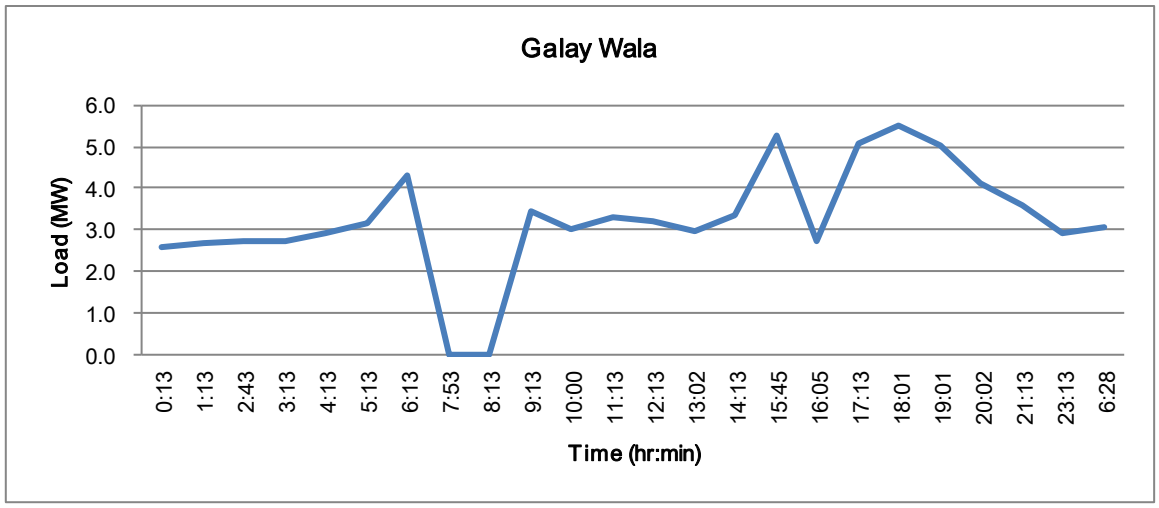
Source: MEPCO Control Centre, Multan

Figure C-4 Load Curve (Shah Hussain Feeder)



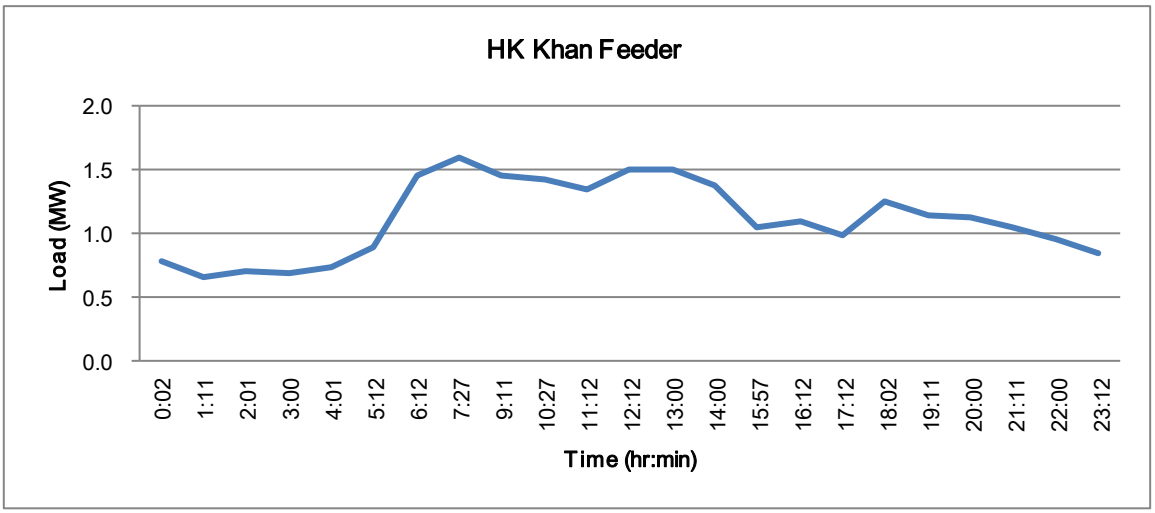
Source: MEPCO Control Centre, Multan

Figure C-5 Load Curve (Tube well Feeder)



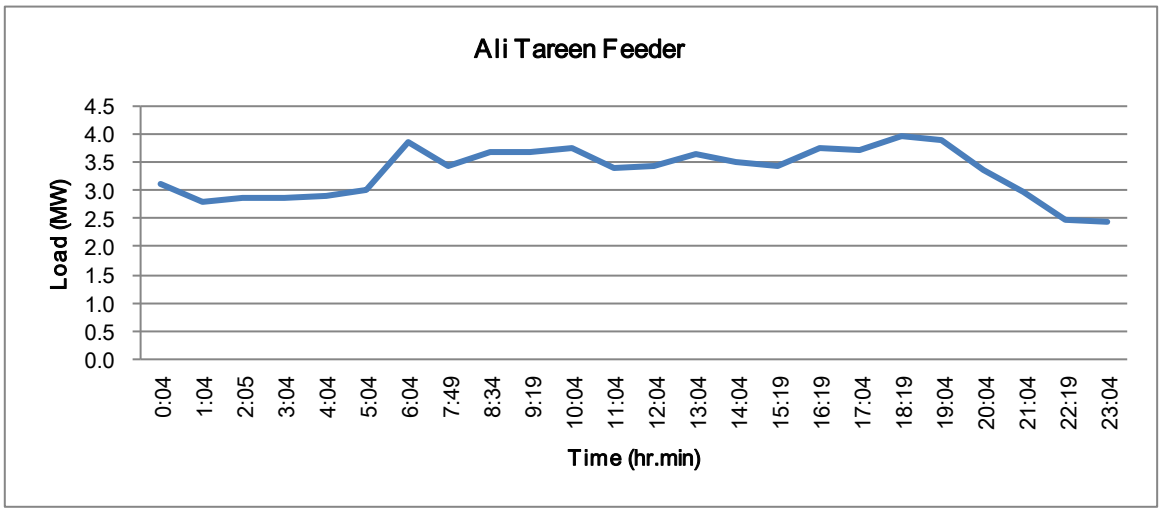
Source: MEPCO Control Centre, Multan

Figure C-6 Load Curve (Galay Wala Feeder)



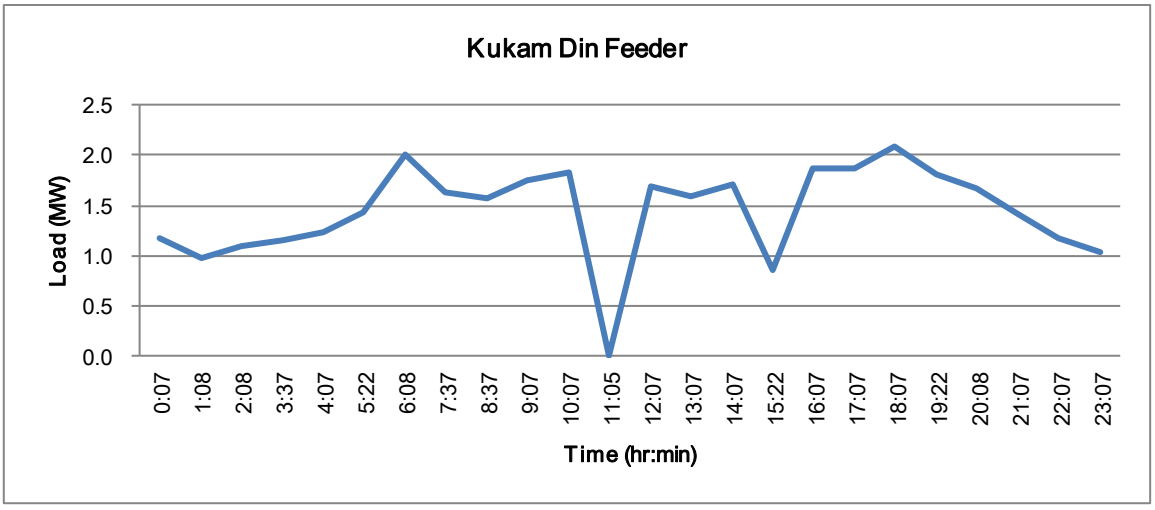
Source: MEPCO Control Centre, Multan

Figure C-7 Load Curve (HK Khan Feeder)



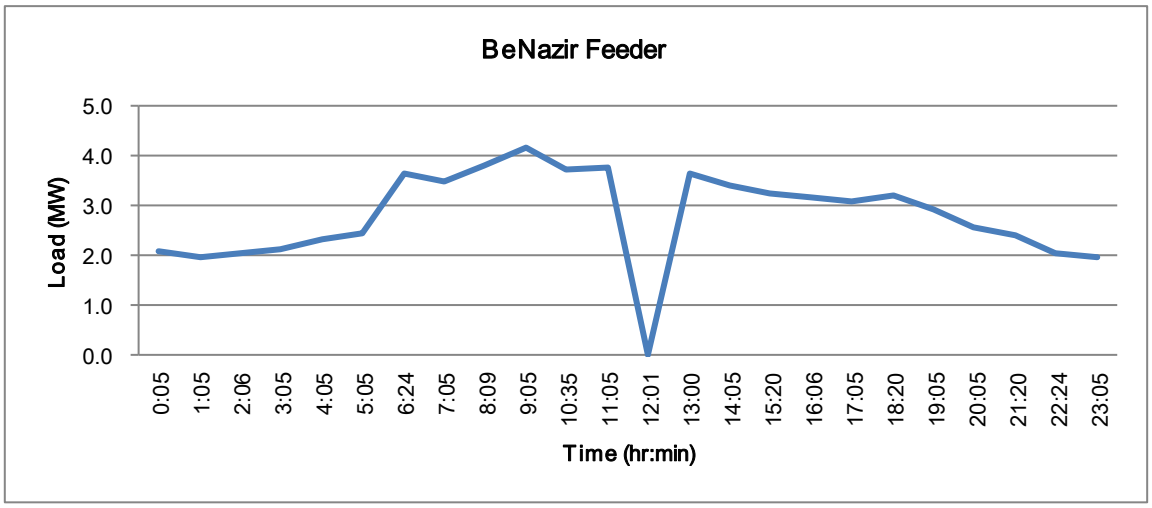
Source: MEPCO Control Centre, Multan

Figure C-8 Load Curve (Ali Tareen Feeder)



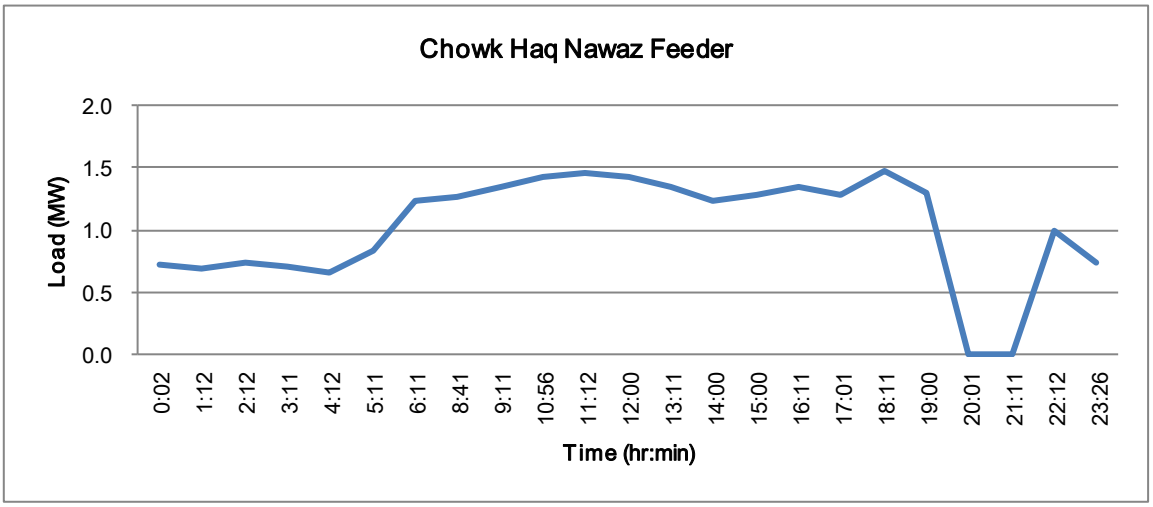
Source: MEPCO Control Centre, Multan

Figure C-9 Load Curve (Kukam Din Feeder)



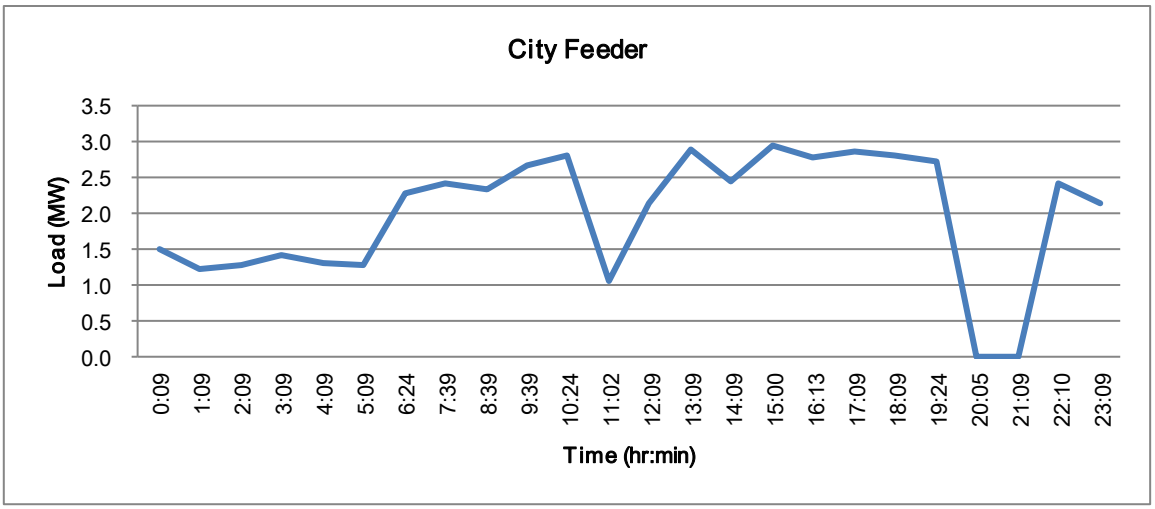
Source: MEPCO Control Centre, Multan

Figure C-10 Load Curve (BeNazir Feeder)



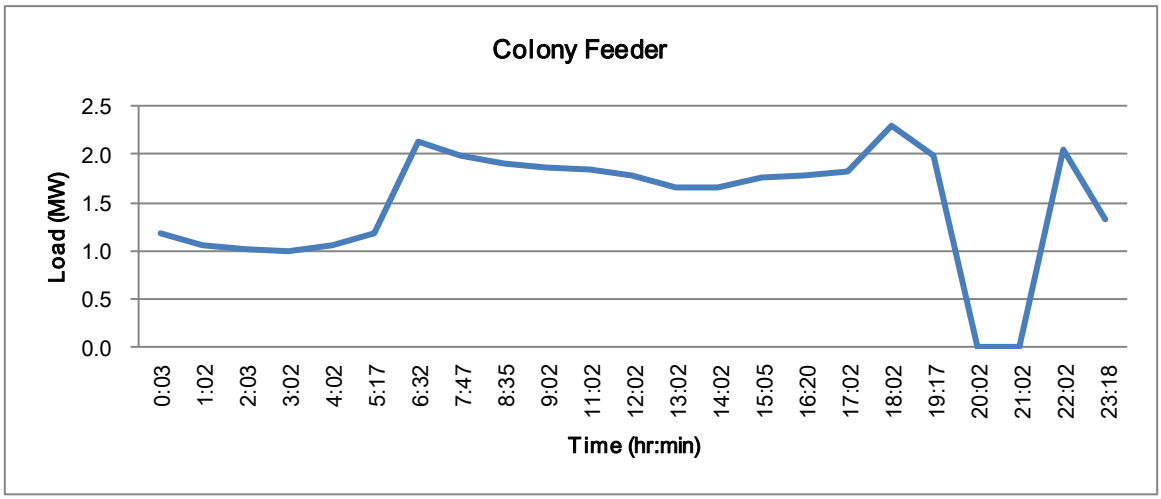
Source: MEPCO Control Centre, Multan

Figure C-11 Load Curve (Chowk Haq Nawaz Feeder)



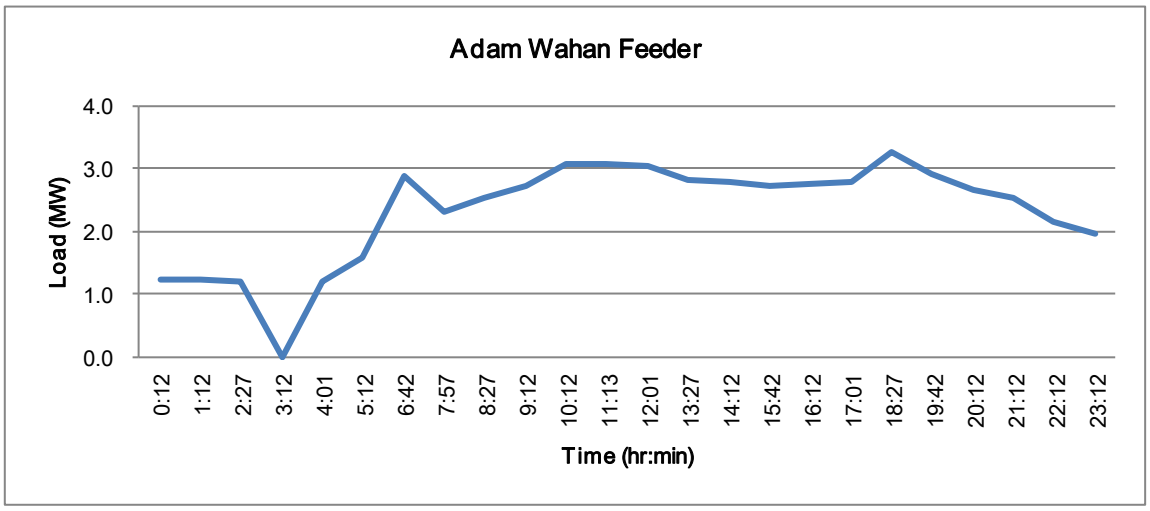
Source: MEPCO Control Centre, Multan

Figure C-12 Load Curve (City Feeder)



Source: MEPCO Control Centre, Multan

Figure C-13 Load Curve (Colony Feeder)



Source: MEPCO Control Centre, Multan

Figure C-14 Load Curve (Adam Wahan Feeder)

(d) Information on Performance of Some of Selected Feeders in Multan Area

Table D-1 Performance of Feeders from Lodhran Substation

Grid Substation		Lodhran					
SS/Feeder	Dhanot	HN Khan	Lal Kamal	Nasir Solvent plant	Saal Sadar	BeNazir	Tube Well
Annual Consumption/Sale (kWh) FY 2012-13	12,627,068	6,829,142	10,673,490	1,226,350	7,709,209	11,536,904	15,693,331
Losses (total), kWh FY 2012-13	3,074,852	1,820,835	3,475,930	(263,947)	3,208,681	1,899,646	799,979
Losses in 11 kV feeder, (%)	19.6	21.1	24.6	(27.4)	29.4	14.1	4.9
Number of Consumers total	6794	1796	4066	1	3408	3486	7396
Domestic	5853	1544	3412	0	3007	2973	6258
Industrial	398	70	102	0	64	48	280
Commercial	55	9	25	0	32	6	23
Tube well	140	66	159	0	110	195	228
Annual Peak (A)	320	120	200		160	300	320
Annual Sale (kWh) FY 2010-11			5,928,279		2,681,471	1,864,524	9,370,251
Losses in 11 kV feeder, (%)			25		11	12	27
Energy sale for Oct 2013 (kWh)	1,362,200	841,740	1,356,110	25,445	999,250	1,331,270	1,475,830
Energy sale for Nov 2013 (kWh)	1,232,950	715,5540	1,188,890	56,005	960,230	1,460,700	1,506,100

Source: MEPCO Head Office

Table D-2 Performance of Feeders from Chichawatni Substation

Grid Substation	Chichawatni				
SS/Feeder	Old Chichawatni	Sher Wala	Ghazi	Ghazi Abad	
Annual Consumption/Sale (kWh) FY 2012/13	10,249,676	11,261,795	7,755,152	15,894,805	
Losses (total), kWh FY 2012/13	2,127,494	1,818,955	198,859	2,211,935	
Losses in 11 kV feeder (%)	17.2	13.9	2.5	12.2	
Total 11 kV Line length	96	72.3		50.2	
Number of Consumers total	7,691	5,685	5,172	5,300	
Domestic	7,187	5,147	2,656	4,762	
Industrial	279	236	342	235	
Commercial	69	58	40	83	
Tube well	62	186	64	139	
Annual Peak (A)	370	370	-	-	Data from SS
Annual Sale (kWh) FY 2010/11	1,295,097	2,272,940	798,717	1,314,736	
Losses in 11 kV feeder (%)	7	14	6	5	

Source: MEPCO Head Office

Appendix B

Load Management Program

(Source: Each DISCO)

Appendix B.1

LOAD MANAGEMENT SCHEDULE GEPCO JAN 2014

SR/ NO	GRID STATION	Name of 11 KV FEEDER	AVERAGE LOAD (A)	0:00 TO 1:00	1:00 TO 2:00	2:00 TO 3:00	3:00 TO 4:00	4:00 TO 5:00	5:00 TO 6:00	6:00 TO 7:00	7:00 TO 8:00	8:00 TO 9:00	9:00 TO 10:00	10:00 TO 11:00	11:00 TO 12:00	12:00 TO 13:00	13:00 TO 14:00	14:00 TO 15:00	15:00 TO 16:00	16:00 TO 17:00	17:00 TO 18:00	18:00 TO 19:00	19:00 TO 20:00	20:00 TO 21:00	21:00 TO 22:00	22:00 TO 23:00	23:00 TO 0:00
1	132KV Therisansi Gujranwala	City (CD)	125		125			125	125			125	125						125					125	125		
2		Faisal Colony (ID)	209		209	209			209					209	209					209	209					209	
3		Bukhari Colony (ID)	145	145	145		145			145					145					145		145		145			
4		Baker Mandi (ID)	130	130	130		130		130	130					130					130						130	
5		Bajwa Road (ID)	115		115	115		115		115	115					115					115		115				
6		Sanat Road (ID)	215		215	215				215	215					215					215		215	215			
7		Bajwa Road -2 (ID)	75		75	75				75	75					75					75			75			75
8		Industrial (U)	29	29			29	29				29	29		29			29								29	
9		G.T.Raod-1 (ID)	154		154			154	154		154	154				154	154				154						
10		G.T.Road-2 (ID)	141			141		141	141			141	141			141	141			141							
11		G.T.Road-3 (ID)	108		108				108	108		108	108					108	108				108				
12		Sheikupura Road (PD)	186			186			186		186	186					186					186		186			186
13		Sheranwala (ID)	121		121	121		29							121						121			121		121	121
14		Khurshid Alam (ID)	136		136	136		136		136	136					136					136			136			
15		Kashmir Road.(CD)	136		136			136			136		136	136					136					136	136		
16		Furnace (F)	80	80	80	80	80	80																	80	80	80
17	132 KV Pasrur Road Gujranwala	Madni Road (U)	175	175	175			175				175	175				175	175		175							
18		Professar Town (ID)	33		33	33			33				33	33				33					33				33
19		Talwandi Musa Khan (R)	130			130	130			130			130	130				130					130			130	
20		Tour (UR)	211			211	211			211			211				211			211			211				211
21		Chak Nizam (ID)	76			76	76			76			76				76			76			76				76
22		Saleem Colony (ID)	154				154	154				154				154	154			154				154		154	
23		Colony (ID)	253	253			253	253		253	253						253					253			253		
24		Ferozwala Road (CD)	280		280		280			280	280			280					280					280	280		
25		Chamman Shah (PD)	174			174	174			174	174		174							174		174				174	
26		Wahdat Colony (PD)	130		130		130	130			130		130	130				130				130					
27		Chamra Mandi (PD)	93		93			93	93		93	93					93				93				93		
28		Pondanwala (PD)	76		76	76		76		76						76				76			76				76
29		New Freed Town (PD)	171		171	171		171				171	171				171	171						171			
30		Old Freed Town (PD)	146		146	146		146			146		146	146			146	146									
31		Race Cours Road (PD)	150	150		150	150			150					150	150				150				150			
32		Jandiala Bagh Wala (PD)	155			155			155	155			155	155			155				155					155	
33		Canal (U)	141	141			141			141		141			141	141				141			141				
34		Sialkot Road (ID)	188				188			188	188					188	188				188			188			188
35		New Sialkot Road (ID)	185			185	185				185	185			185					185						185	185
36		Popular Nursery (ID)	166			166		166	166			166	166			166							166			166	
37		New Settelite Town (CD)	120		120			120		120		120	120						120					120	120		
38		Wania (R)	38	38	38			38				38	38		38			38								38	
39		Dena Nager Road (CD)	86		86			86	86		86			86					86					86	86		
40		Khokherki (ID)	168				168	168			168	168				168				168			168				168

Appendix B.1

SR/ NO	GRID STATION	Name of 11 KV FEEDER	AVERAGE LOAD (A)	0:00 TO 1:00	1:00 TO 2:00	2:00 TO 3:00	3:00 TO 4:00	4:00 TO 5:00	5:00 TO 6:00	6:00 TO 7:00	7:00 TO 8:00	8:00 TO 9:00	9:00 TO 10:00	10:00 TO 11:00	11:00 TO 12:00	12:00 TO 13:00	13:00 TO 14:00	14:00 TO 15:00	15:00 TO 16:00	16:00 TO 17:00	17:00 TO 18:00	18:00 TO 19:00	19:00 TO 20:00	20:00 TO 21:00	21:00 TO 22:00	22:00 TO 23:00	23:00 TO 0:00
41	132KV SHAHEENABAD Gujranwala	Kashmir Road (ID)	124				124	124		124						124						124	124			124	124
42		Shama Colony (ID)	106		106			106			106	106				106					106	106				106	
43		Dhullay (ID)	125		125	125		125			125	125				125						125				125	
44		Model Town (CD)	108			108			108		108					108	108			108					108	108	
45		Ahmad Pura (ID)	89				89	89		89			89			89	89				89					89	
46		Gujranwala-1 (CD)	130		130			130	130			130	130						130					130	130		
47		Gujranwala-2 (CD)	126		126			126	126			126	126						126					126	126		
48		Dall Bazar (CD)	60		60			60	60			60	60						60					60	60		
49		Shaheen Abad (ID)	169		169		169		169				169				169	169				169					169
50		Gulashin iqbal (ID)	155	155		155	155			155			155	155				155							155		
51		Climaxabad (ID)	224		224		224					224	224				224	224				224				224	
52		New Lohianwala (ID)	221		221	221		221	221		221						221						221			221	
53		Gondlan Wala Road (ID)	176		176	176			176			176				176	176					176	176				
54		Madina Colony (ID)	109			109				109			109			109				109	109			109	109		
55		Sui Gas Road (ID)	173		173	173			173			173				173	173				173						173
56		Hospital Road (ID)	126	126		126				126			126		126				126			126			126		
57		Civil Line (U)	138		138		138	138			138						138	138		138			138				
58		D.C.Road (U)	126	126		126				126			126			126				126			126			126	
59		Session Court Road (U)	138	138		138	138			138	138						138			138							138
60		GEPCO (ID)	86	86			86			86	86					86							86			86	86
61		S.I.E-1 (ID)	93	93	93							93	93				93	93				93	93				
62		S.I.E-2 (ID)	180						180	180						180	180				180	180			180	180	
63		S.I.E-3 Pepsi (B-3)	90			90	90	90	90	90	90																
64		Boss (B-3)	50			50	50	50	50	50	50																
65		Furance-1 (F)	170										170	170	170	170	170	170	170	170							
66		Bismillah Furnace (F)	60	60	60	60	60	60																	60	60	60
67		Supra Steel (F)	100										100	100	100	100	100	100	100	100							
68		Furnace-4 (F)	320										320	320	320	320	320	320	320	320							
69		Industrial (F)	150										150	150	150	150	150	150	150	150							
70		LD Steel (F)	100										100	100	100	100	100	100	100	100							
71		Furnace-3 (F)	300										300	300	300	300	300	300	300	300							
72	132kv College Road Gujranwala	Kot Kazi (PD)	205		205	205		205	205					205	205				205								205
73		Alam Chowk (PD)	149		149	149		149	149		149	149				149										149	
74		Gujranwala-3 (ID)	155	155	155			155			155				155	155				155						155	
75		Shalimar Town (U)	20						20		20		20	20				20	20							20	20
76		Bilal Road (ID)	200	200			200	200			200	200				200	200								200		
77		Gulshan Abad (ID)	153	153		153	153		153			153				153	153								153		
78		Hafizabad Road (PD)	169	169			169			169		169				169	169						169			169	
79		NewJinnah Road (ID)	186		186	186			186			186				186	186					186	186				
80		Lahore Road (ID)	83		83			83			83						83	83					83			83	83
81		Farooq Gunj (ID)	105		105			105	105			105					105					105				105	105
82		Qazafi Road (ID)	116	116	116			116			116					116	116								116	116	
83		Rehman Pura (ID)	175		175	175		175			175						175	175				175					175
84		ByPass (ID)	164		164	164		164	164			164					164	164									164
85		Baghban Pura (ID)	100	100		100	100				100					100	100				100						100
86		Prince Road (PD)	183		183	183		183	183		183						183						183				183
87		Jamia Ashrafia (PD)	99		99				99	99					99	99					99			99			99
88		Clock Tower (PD)	161		161			161	161			161	161						161					161	161		
89		Muslim Town (PD)	201			201					201	201					201			201			201	201			201
90		Gondlanwala (R)	240	240		240			240					240					240			240	240			240	
91		GMC (F)	130										130	130	130	130	130	130	130	130							
92		S.S. Mills (F)	100										100	100	100	100	100	100	100	100							
93		Ishaq Steel (F)	170										170	170	170	170	170	170	170	170							
94		M.S Steel (F)	250										250	250	250	250	250	250	250	250							
95		AL -Rauf Steel (F)	170										170	170	170	170	170	170	170	170							
96		Ghazi (F)	140										140	140	140	140	140	140	140	140							

Appendix B.1

SR/ NO	GRID STATION	Name of 11 KV FEEDER	AVERAGE LOAD (A)	0:00 TO 1:00	1:00 TO 2:00	2:00 TO 3:00	3:00 TO 4:00	4:00 TO 5:00	5:00 TO 6:00	6:00 TO 7:00	7:00 TO 8:00	8:00 TO 9:00	9:00 TO 10:00	10:00 TO 11:00	11:00 TO 12:00	12:00 TO 13:00	13:00 TO 14:00	14:00 TO 15:00	15:00 TO 16:00	16:00 TO 17:00	17:00 TO 18:00	18:00 TO 19:00	19:00 TO 20:00	20:00 TO 21:00	21:00 TO 22:00	22:00 TO 23:00	23:00 TO 0:00
97	132KV Cantt: Gujranwala	Forest Colony (ID)	181	181		181			181	181			181				181					181			181		
98		A/Iqbal town (U)	30	30	30		30					30				30	30			30						30	
99		Rahwali (U)	140			140	140				140				140				140	140				140			140
100		DC Colony (U)	23			23	23			23				23	23			23					23			23	
101		D.C Colony-1 (U)	10			10	10			10				10	10			10	10							10	
102		D.C Colony-2 (U)	10			10	10			10				10	10			10	10								10
103		D.C Colony-3 (U)	10			10				10				10	10			10	10							10	10
104		Sharif Form (U)	115		115	115			115				115		115		115					115					115
105		New Defence (U)	73	73				73			73			73	73		73					73	73				
106		Gardon town (U)	31		31	31			31				31				31			31	31			31			
107		MLRS (E)	20																								
108		IncomeTax Colony (ID)	96		96		96	96		96						96	96							96		96	
109		Mandiala Warriach (ID)	124	124		124	124			124				124			124			124						124	
110		Medical College (U)	100	100		100			100	100			100							100		100					100
111		Dogranwala (TD)	240	240		240			240	240			240							240		240					240
112		Sonica (CPI)	50			50	50	50	50	50	50																
113		Furnace-2 (F)	40	40	40	40	40	40																	40	40	40
114		Irfan Steel (F)	40										40	40	40	40	40	40	40	40							
115		Furnace-8 (F)	320										320	320	320	320	320	320	320	320							
116		Ashraf Steel (F)	170										170	170	170	170	170	170	170	170							
117		Khalid Ashraf Steel (F)	100										100	100	100	100	100	100	100	100							
118		Shahzad Steel (F)	80	80	80	80	80	80																	80	80	80
119		Ali Steel (F)	140										140	140	140	140	140	140	140	140							
120	132KV Lahore Road Gujranwala	Jalil Town (ID)	84			84	84			84			84							84		84	84				84
121		Mukhtar Colony (ID)	111			111	111			111						111				111	111					111	111
122		Kashmir Colony (ID)	85		85	85		85		85					85				85							85	85
123		Canal View-I (U)	19		19				19			19				19	19			19	19				19		
124		East Wapda Town (U)	78			78				78			78	78			78				78		78				78
125		West Wapda Town (U)	78				78			78			78	78				78		78			78				78
126		Canal View-II (U)	19				19			19	19				19				19			19				19	19
127		Kholowala (ID)	173	173			173	173		173			173					173			173						173
128		Maraliwala (R)	130	130			130	130		130	130				130								130			130	
129		E.P.Z-1	10			10	10	10	10	10	10																
130		E.P.Z-2	10			10	10	10	10	10	10																
131		Ceramic-2 (ID)	50	50	50				50	50	50					50						50	50				
132		Khiali-2 (ID)	124							124	124					124						124	124	124	124	124	
133		Industrial-2 (ID)	135							135	135					135						135	135	135	135	135	
134		Industrial-3 (ID+F)	155										155		155		155	155		155							
135		Regal China(ID)	105		105	105						105	105	105								105	105	105			
136		PEPSI (B-3)	90			90	90	90	90	90	90																
137		Super Asia (B-3)	60			60	60	60	60	60	60																
138		City Housing (U)	5		5			5	5				5				5			5	5			5			
139		S.I.E-2 (F)	280										280	280	280	280	280	280	280	280							
140		Khalid Illyas Steel(F)	390										390	390	390	390	390	390	390	390							
141		Islamabad Steel (F)	300										300	300	300	300	300	300	300	300							
142		AL-Karam Steel (F)	280										280	280	280	280	280	280	280	280							

Appendix B.1

SR/ NO	GRID STATION	Name of 11 KV FEEDER	AVERAGE LOAD (A)	0:00 TO 1:00	1:00 TO 2:00	2:00 TO 3:00	3:00 TO 4:00	4:00 TO 5:00	5:00 TO 6:00	6:00 TO 7:00	7:00 TO 8:00	8:00 TO 9:00	9:00 TO 10:00	10:00 TO 11:00	11:00 TO 12:00	12:00 TO 13:00	13:00 TO 14:00	14:00 TO 15:00	15:00 TO 16:00	16:00 TO 17:00	17:00 TO 18:00	18:00 TO 19:00	19:00 TO 20:00	20:00 TO 21:00	21:00 TO 22:00	22:00 TO 23:00	23:00 TO 0:00
143		Cantt-1 (U)	186	186	186			186	186			186				86				186				186			
144		Cantt -2 (U)	220			220	220			220	220		220	220				220							220		
145		Sughar Mill (ID)	104		104	104		104		104	104			104	104							104					
146		New Fateh Garh (R)	90		90			90			90	90							90	90			90			90	
147		Kot Noora (TD)	78	78		78	78		78				78						78			78					78
148		Ahmad Nagar (R)	100	100				100			100	100					100	100				100	100				
149		Talwandi Khajore Wali (TD)	94	94				94	94			94			94					94						94	94
150		Gillwala (TD)	53				53		53	53		53						53			53			53		53	
151	220KV Ghakhar	Badoke (ID)	110	110		110	110		110			110						110		110							110
152		Nat Kalan (UR)	71	71		71		71	71			71		71	71								71				
153		S.S.Board (U)	90	90		90					90		90				90			90						90	90
154		New Ghakhar (ID)	151	151	151			151	151		151		151			151				151							
155		Old Ghakhar (ID)	126	126	126			126	126		126		126				126			126							
156		Jalal (TD)	104						104			104	104		104	104				104	104				104		
157		Askari (U)	30		30	30			30	30			30	30			30			30							
158		NLC (B-3)	30			30	30	30	30	30	30																
159		Maiz (CPI)	20			20	20	20	20	20	20																
160		Sardar Town (ID)	165		165				165	165		165	165				165							165			165
161		Aroop (TD)	184	184			184	184			184					184			184	184						184	
162		Power House (E)	5																								
163		Prime City (U)	10		10	10			10	10			10					10						10	10		
164		Joher Town (U)	5		5	5				5	5						5			5						5	5
165		NMC (E)	10																								
166		NDP-5 (R)	149	149		149	149					149	149			149				149						149	
167	132KV Aroop	Furnace-7 (F)	300										330	330	330	330	330	330	330	330							
168		Furnace-6 (F)	360										360	360	360	360	360	360	360	360							
169		Furnace-5 (F)	300										300	300	300	300	300	300	300	300							
170		Waqas Steel (F)	180										180	180	180	180	180	180	180	180							
171		Nadeem Steel (F)	180										180	180	180	180	180	180	180	180							
172		Farooq Steel (F)	280										280	280	280	280	280	280	280	280							
173		Taj Steel (F)	300										300	300	300	300	300	300	300	300							
174		Asif Steel (F)	240										240	240	240	240	240	240	240	240							
175		Warraich (ID)	144	144	144		144			144	144				144										144	144	
176	Hafizabad	Darbar Qaderia (ID)	144		144	144		144	144							144	144							144			144
177		Mubarak Shah Road (ID)	80	80			80		80	80							80		80						80		80
178		Noshehra Road. (ID)	134		134	134				134	134					134							134	134		134	
179		Jinnah Road (ID)	111		111		111	111				111					111							111		111	111
180		Fruit Mandi (CD)	143			143	143		143		143					143	143							143	143		
181		Data Gunj Bux (ID)	100				100		100	100					100	100					100					100	100
182		Madni (ID)	98		98	98		98	98							98	98							98			98
183		Awan Chowk (ID)	233		233	233				233	233					233							233	233		233	
184		New Baghban Pura (ID)	116	116		116	116				116					116	116				116						116
185	132KV Hafizabad	Muhammad Nager (ID)	121		121	121				121	121					121							121	121		121	
186	Road Gujranwala	Kot Shera (R)	118		118	118			118			118	118			118			118				118				
187		Qilla Mian Singh (TD)	98		98				98	98			98	98				98					98				98
188		Coca Cola (B-3)	100			100	100	100	100	100	100																
189		Madina Steel (F)	150										150	150	150	150	150	150	150	150							
190		Makkah Steel (F)	150										150	150	150	150	150	150	150	150							
191		Adil Steel (F)	150										150	150	150	150	150	150	150	150							
192		Haq Bahoo Steel (F)	240										240	240	240	240	240	240	240	240							
193		Hameed Steel (F)	240										240	240	240	240	240	240	240	240							

Appendix B.1

SR/ NO	GRID STATION	Name of 11 KV FEEDER	AVERAGE LOAD (A)	0:00 TO 1:00	1:00 TO 2:00	2:00 TO 3:00	3:00 TO 4:00	4:00 TO 5:00	5:00 TO 6:00	6:00 TO 7:00	7:00 TO 8:00	8:00 TO 9:00	9:00 TO 10:00	10:00 TO 11:00	11:00 TO 12:00	12:00 TO 13:00	13:00 TO 14:00	14:00 TO 15:00	15:00 TO 16:00	16:00 TO 17:00	17:00 TO 18:00	18:00 TO 19:00	19:00 TO 20:00	20:00 TO 21:00	21:00 TO 22:00	22:00 TO 23:00	23:00 TO 0:00
194		Kolar (R)	148		148		148	148		148	148				148	148							148				
195		PNP (ID)	89	89		89			89		89					89	89					89						89
196		Phaloke (ID)	140			140		140			140	140				140	140						140		140			
197		Wazirabad City (CD)	161		161	161				161				161	161			161						161	161			
198		Haji pura (ID)	189		189	189				189						189	189				189			189				189
199		Nizam abad (ID)	165			165				165	165					165	165							165	165			165
200	132KV Wazirabad	Dhonkal (R)	81	81				81			81	81				81	81				81				81			
201		Head Khanki (R)	91		91	91		91			91					91	91						91					91
202		Fateh Garh (TD)	75			75			75				75		75	75		75		75								75
203		Murdekey (TD)	174	174			174	174						174			174	174					174			174		
204		M.Zafar Ali Khan (TD)	190	190				190					190				190			190			190	190				190
205		Pipliwala (TD)	26	26			26		26			26				26			26				26		26			
206		Sandanwala (TD)	74						74	74		74	74		74					74			74		74			
207		Illah Abad (ID)	159			159	159		159						159					159	159					159	159	
208		Sago Bago (TD)	74				74		74				74	74			74						74			74	74	
209		Kot Shera (TD)	110					110		110				110		110							110	110		110	110	
210		Mangoki (R)	50			50	50		50					50						50			50			50	50	
211		Matta Virkan (TD)	58						58	58			58		58				58			58				58	58	
212	66KV Gharri	Mari (R)	70						70	70		70			70			70	70			70	70					
213		Boprra (R)	75					75	75		75			75					75	75		75	75					
214		Tatley Aali (TD)	155			155	155			155	155			155	155								155					155
215		Karyal Kalan (TD)	145						145		145	145		145	145				145			145			145			
216		Babbar (TD)	129			129			129	129		129							129			129			129	129		
217		Noshehra Virkan (CD)	190		190			190				190	190			190			190					190	190			
218		Chian Wali (ID)	89		89		89	89			89					89							89	89				89
219		Salar (ID)	196		196		196	196			196						196						196	196				196
220		Sadhoke (R)	185						185	185		185					185				185	185		185				185
221		Salamat Pura (PD)	201					201	201	201						201					201	201				201	201	
222		Kamoki City-1 (PD)	244					244	244	244						244					244	244				244	244	
223		Kamoki City-2 (PD)	166					166	166	166						166					166	166				166	166	
224		Kamoki City-3 (PD)	145					145	145	145						145					145	145				145	145	
225		Kamoki City-4 (PD)	145					145	145	145						145					145	145				145	145	
226		Kamoki City-5 (PD)	100					100	100	100						100					100	100				100	100	
227	132KV kamonki	Darga Pur (R)	123				123	123		123				123				123			123		123					123
228		Peelo-1 (TD)	115			115					115	115			115			115	115		115							115
229		Peelo-2 (ID)	116		116				116			116					116	116				116				116	116	
230		Sher Garh (TD)	79							79	79		79	79		79		79				79						79
231		A.P.L (B-3)	10			10	10	10	10	10	10																	
232		K.P.M (B-3)	30			30	30	30	30	30	30																	
233		J.P.Mills (ID)	145			145	145	145									145							145	145	145	145	
234		Master Tiles (CPI)	110			110	110	110	110	110	110																	
235		Sonix Tiles (CPI)	170			170	170	170	170	170	170																	
236		Tariq Spinning (TEX)	60																60	60	60	60	60	60				
237		Khalid Nazir (TEX)	120																120	120	120	120	120	120				
238		Wadala (TD)	114			114			114			114	114			114		114		114	144							
239		Talhara (TD)	115			115			115			115	115			115		115		115	115							
240		Bassi Wala (TD)	39			39			39			39	39		39			39			39							39
241	66KV Siranwali	Mohan Pur (TD)	83	83		83				83			83	83							83					83	83	
242		Machikay (.R)	200	200					200			200	200			200		200			200	200						
243		Baigay Wali (TD)	21					21				21	21			21			21	21						21	21	
244		Satrah (ID)	189			189					189	189		189	189					189						189	189	

Appendix B.1

SR/ NO	GRID STATION	Name of 11 KV FEEDER	AVERAGE LOAD (A)	0:00 TO 1:00	1:00 TO 2:00	2:00 TO 3:00	3:00 TO 4:00	4:00 TO 5:00	5:00 TO 6:00	6:00 TO 7:00	7:00 TO 8:00	8:00 TO 9:00	9:00 TO 10:00	10:00 TO 11:00	11:00 TO 12:00	12:00 TO 13:00	13:00 TO 14:00	14:00 TO 15:00	15:00 TO 16:00	16:00 TO 17:00	17:00 TO 18:00	18:00 TO 19:00	19:00 TO 20:00	20:00 TO 21:00	21:00 TO 22:00	22:00 TO 23:00	23:00 TO 0:00
245	132kv Eminabad Gujranwala	G.T.Raod (ID)	249	249		249			249			249					249	249				249					249
246		Mandiala Tega (ID)	223	223				223					223			223				223				223	223		223
247		Rajay Wala (TD)	201			201	201					201					201			201	201					201	201
248		Attawa (TD)	80					80		80			80				80		80				80			80	80
249		Khan Piara (TD)	81			81	81			81	81				81						81		81				81
250		Sansra (TD)	98	98			98			98	98					98	98					98				98	
251		Hameed Pur (TD)	85			85	85			85			85	85				85	85							85	
252		Eminabad (UR)	114		114			114				114		114			114		114	114							114
253		Ceramics (ID)	204			204	204	204									204							204	204	204	204
254		KH. Spinning Mills (TEX) (P)	150																150	150	150	150	150	150			
255		Five Star (B-3)	30			30	30	30	30	30	30																
256		Rizwan Steel (F)	250										250	250	250	250	250	250	250	250							
257		Rajpoot Steel (F)	170										170	170	170	170	170	170	170	170							
258		Khawaja Steel (F)	200										200	200	200	200	200	200	200	200							
259		Madina Steel (F)	150										150	150	150	150	150	150	150	150							
260		Mighty Steel (F)	160										160	160	160	160	160	160	160	160							
261		Ibrahim Steel (F)	180										180	180	180	180	180	180	180	180							
262		Ijaz Steel (F)	170										170	170	170	170	170	170	170	170							
263		New Hafiz Steel (F)	150										150	150	150	150	150	150	150	150							
264		MR Steel (F)	150										150	150	150	150	150	150	150	150							
265		Prim Steel (F)	150										150	150	150	150	150	150	150	150							
266		AL-Hamad Steel (F)	150										150	150	150	150	150	150	150	150							
267	132KV Qila Dedar Singh	New Kot Qazi (R)	76	76							76	76		76	76		76	76			76						
268		Philoki (R)	45					45			45			45	45		45	45					45			45	
269		Qilla Dedar Singh (ID)	156	156						156		156	156		156	156						156				156	
270		Islam Pura (U)	88			88	88			88			88	88						88			88				88
271		Chehel kalan (TD)	151	151							151	151			151			151				151		151			151
272		Kamo Mali (TD)	108			108			108	108			108				108			108	108						108
273		Ladhey Wala (TD)	81		81	81		81					81			81			81							81	81
274		Noor Pur (TD)	109						109		109	109		109	109			109					109			109	
275		Papnakha-2 (TD)	96		96						96	96		96	96					96					96	96	
276		Papnakha-1 (TD)	146								146	146		146	146			146					146		146	146	
277		Main Bazar (CD)	136			136				136	136			136	136				136					136	136		
278		Yasin Steel (F)	160										160	160	160	160	160	160	160	160							
279		Gujrat Steel (F)	160										160	160	160	160	160	160	160	160							
280	132KV Fateh Pur	Chanawan (TD)	141		141				141				141	141				141				141				141	141
281		Ladhay Wala (TD)	97						97	97		97	97		97								97			97	97
282		Verpal (TD)	155		155	155		155				155					155				155					155	155
283		Saharan (TD)	149		149						149		149				149	149					149		149	149	
284		Manchar (TD)	121							121	121		121			121			121	121					121	121	
285		Rasool Nagar (R)	244		244	244							244				244		244					244		244	244
286		City (U)	125			125			125				125	125				125				125	125			125	
287		Ali Pur (ID)	135			135			135				135	135				135				135	135			135	
288		Kailianwala (R)	139	139		139	139			139	139		139						139								139
289		Madan Chak (TD)	123				123		123	123			123			123								123		123	123
290		Chenab Board (CPI)	95																95	95	95	95	95	95			
291	66KV Daska	Daska -1 (ID)	104		104			104			104	104				104					104				104	104	
292		Collage Road (ID)	95		95	95			95			95					95				95	95					95
293		Daska -2 (ID)	71	71			71	71			71				71					71			71		71		
294		Haji pura (ID)	56		56		56				56					56					56			56		56	56
295		Koreke (R)	95						95				95	95			95	95					95	95		95	
296		Moutra (ID)	48				48			48	48			48	48				48						48		48
297		AdamKe (TD)	76	76			76			76		76				76	76					76			76		
298		M.R link (TD)	46	46		46				46		46	46						46					46			46
299		Wazirabad Road (TD)	46		46			46			46			46				46	46			46			46		
300		Gojra (TD)	49					49	49		49				49			49		49					49	49	
301		Refine Surgical Steel (F)	70	70	70	70	70	70																	70	70	70
302		Jameel Steel (F)	60	60	60	60	60	60																	60	60	60
303		Younas Sergical (F)	60	60	60	60	60	60																	60	60	60

Appendix B.1

SR/ NO	GRID STATION	Name of 11 KV FEEDER	AVERAGE LOAD (A)	0:00 TO 1:00	1:00 TO 2:00	2:00 TO 3:00	3:00 TO 4:00	4:00 TO 5:00	5:00 TO 6:00	6:00 TO 7:00	7:00 TO 8:00	8:00 TO 9:00	9:00 TO 10:00	10:00 TO 11:00	11:00 TO 12:00	12:00 TO 13:00	13:00 TO 14:00	14:00 TO 15:00	15:00 TO 16:00	16:00 TO 17:00	17:00 TO 18:00	18:00 TO 19:00	19:00 TO 20:00	20:00 TO 21:00	21:00 TO 22:00	22:00 TO 23:00	23:00 TO 0:00
304		OK (ID)	173		173	173				173	173									173	173				173	173
305		Apalo (ID)	120	120			120	120		120	120					120				120				120		
306		Daska-3 (ID)	190		190	190			190			190				190				190				190	190	
307		Pasrur Road (ID)	80	80			80				80	80					80			80	80				80	
308		Sian (R)	130					130			130		130	130				130	130					130	130	
309		Glotian (TD)	119					119	119		119		119			119				119				119	119	
310		Mitran Wali (TD)	160		160			160	160			160	160					160			160	160				
311		S.I.E (ID)	40	40	40				40		40					40	40						40	40		
312		Islam Steel (F)	180										180	180	180	180	180	180	180	180						
313		Sardar Steel (F)	150										150	150	150	150	150	150	150	150						
314	132KV Daska Industrial	Royal Steel (F)	170										170	170	170	170	170	170	170	170						
315		Usman Steel (F)	150										150	150	150	150	150	150	150	150						
316		Sindhu Steel (F)	100										100	100	100	100	100	100	100	100						
317		M.M Steel (F)	140										140	140	140	140	140	140	140	140						
318		M.N Steel (F)	140	140	140	140	140	140																	140	140	140
319		N.A Steel (F)	150										150	150	150	150	150	150	150	150						
320		Allah Din Steel (F)	180										180	180	180	180	180	180	180	180						
321		Daska Steel (F)	140										140	140	140	140	140	140	140	140						
322		Shahbaz Steel (F)	170										170	170	170	170	170	170	170	170						
323		Hameed Foundary (F)	30	30	30	30	30	30																	30	30	30
324		Majid Steel (F)	140										140	140	140	140	140	140	140	140						
325		AL-Madina Steel (F)	50	50	50	50	50	50																	50	50	50
326		Baig Pur (TD)	70		70				70	70				70							70	70	70		70		
327	132 KV SKP.Ind	Mallah Virkan (TD)	70		70				70	70				70							70	70	70		70		
328		Deepay Pur (TD)	70		70				70	70				70							70	70	70		70		
329		Hussain Pura (CD)	196		196			196			196	196				196			196					196	196		
330		Kot Mubarik (PD)	133	133		133		133	133			133	133				133			133							
331		Ghari Awan (PD)	153		153		153	153		153			153					153	153						153		
332		Ali Pur Road (PD)	186	186		186			186	186				186	186									186			186
333		Kalianwala (CD)	189		189		189		189	189			189						189					189	189		
334		Farooq-e-Azam Road (CD)	70	70			70	70				70			70				70					70	70		
335		District Complexe (U)	100		100			100		100					100					100		100			100	100	
336		Sagar (TD)	170				170	170						170	170			170				170			170	170	
337		Bhoon (TD)	50					50		50			50	50						50	50				50	50	
338		Dharanwali (TD)	144					144	144				144			144	144				144			144			144
339	132KV Hafizabad	Chabba Sindhu (TD)	96				96			96			96	96		96	96							96			96
340		Boeki (TD)	100				100		100	100			100		100					100			100				100
341		Kot Hassan Khan (TD)	136				136	136			136	136						136		136			136		136		
342		Chak Ghazi (TD)	108				108	108			108				108		108			108			108				108
343		Ahmad Pur (TD)	68				68	68			68					68				68			68		68	68	
344		Shah Jamal (TD)	118			118	118				118						118	118		118	118				118		
345		Peer Kot (TD)	106			106	106			106	106			106				106						106	106		
346		Jaidkay (TD)	80			80	80			80			80	80				80					80		80		
347		Lawary (TD)	83			83	83			83			83	83				83					83		83		
348		Raja Chowk (PD)	130			130	130		130			130		130					130	130						130	
349		Air Force (E)	5																								
350		Rakh Branch.(UR)	89			89	89				89				89	89				89		89			89		
351		Nanowana (TD)	103					103			103	103			103			103			103				103	103	
352		H-106 (TD)	53						53	53						53	53			53	53				53	53	
353		Uddoke (TD)	96	96					96	96								96			96	96				96	96
354	132KV Sukheke	G. Area (TD)	67	67					67		67	67							67			67				67	67
355		L-106 (TD)	115					115	115			115			115	115				115			115				115
356		K-106 (TD)	45		45			45	45		45				45				45				45				45
357		Jhang Branch. (UR)	124	124	124				124	124				124		124	124									124	
358		Nishat Dairy (B-3)	40			40	40	40	40	40	40																
359		Cresent Baho Maan (TEX)	170																170	170	170	170	170	170			

Appendix B.1

SR/ NO	GRID STATION	Name of 11 KV FEEDER	AVERAGE LOAD (A)	0:00 TO 1:00	1:00 TO 2:00	2:00 TO 3:00	3:00 TO 4:00	4:00 TO 5:00	5:00 TO 6:00	6:00 TO 7:00	7:00 TO 8:00	8:00 TO 9:00	9:00 TO 10:00	10:00 TO 11:00	11:00 TO 12:00	12:00 TO 13:00	13:00 TO 14:00	14:00 TO 15:00	15:00 TO 16:00	16:00 TO 17:00	17:00 TO 18:00	18:00 TO 19:00	19:00 TO 20:00	20:00 TO 21:00	21:00 TO 22:00	22:00 TO 23:00	23:00 TO 0:00
360	132KV Pindi Bhattian	Kot Nizam (TD)	100						100	100			100	100				100		100				100	100	
361		Mustafa abad (R)	126			126	126		126				126	126				126	126				126				
362		Old Jalal Pur (TD)	76						76			76	76			76	76		76	76							76
363		Kot Nakka (TD)	54					54			54	54			54				54	54					54	54	
364		Shory Manika (TD)	107		107				107				107	107								107	107		107	107	107
365		Lahore Road (U)	141			141	141		141			141						141	141				141				141
366		Pindi Bhattian (U)	90			90	90			90		90						90	90				90				90
367	66KV Jalal Pur Nau	Jalal Pur (ID)	110			110	110			110	110			110				110			110				110		
368		Chak Bhatti (TD)	133	133					133	133			133	133						133	133				133		
369		Khan Pur (TD)	94				94	94				94	94			94				94	94				94		
370		Kot Muhabbat (TD)	89	89						89			89	89			89				89				89	89	
371		Khuram Cherrah (TD)	124	124			124		124					124			124	124				124				124	
372		Rasool Pur (R)	88		88					88	88			88					88			88			88	88	
373		Pindi Bhattian Road (ID)	75								75		75	75	75			75			75				75	75	
374		Industrial (ID)	45							45	45			45	45		45				45				45	45	
375	66KV Kolo Tarrar	Kolo Tarrar (TD)	124						124				124	124			124	124			124	124					124
376		Ragho Sayedan (TD)	96							96	96		96				96		96		96	96				96	
377		Vanike Tarrar (TD)	191					191		191	191		191	191		191					191				191		
378		Balu Nau (TD)	59							59	59		59	59			59			59			59				59
379		Kot Chian (TD)	94	94			94			94	94		94					94	94								94
380	132KV Gujrat-1	Shah Doula (ID)	190		190			190		190	190		190					190				190			190		
381		Sheikh Pur (ID)	144		144		144	144			144	144								144					144	144	
382		Kathala (ID)	111	111					111	111			111						111	111			111		111		
383		G.T.Road (ID)	81		81					81	81						81				81		81	81			81
384		Ghauri (ID)	5			5		5			5	5					5				5		5			5	
385		Dhool (ID)	141			141			141	141			141	141							141		141			141	
386		Chenab (ID)	94		94				94	94		94	94							94			94				94
387		Shadiwal (TD)	216		216			216			216	216			216				216							216	216
388		Nangrian Wala (TD)	108			108	108				108		108		108			108		108							108
389		Sargodha Road (ID)	204	204	204		204		204				204					204			204					204	
390		Railway Road (ID)	194	194				194		194			194								194	194			194	194	
391		Sabowal (ID)	155	155		155	155				155		155	155							155				155		
392		GEPCO Complex (ID)	148			148		148			148	148				148					148			148			148
393		S.I.E (ID)	133		133			133	133			133				133						133	133				133
394		Old Service (B-3)	65			65	65	65	65	65	65																
395	132KV Gujrat-2	Muslim Bazar (CD)	146	146			146			146	146		146						146					146	146		
396		Jinnah Road (CD)	110		110				110	110		110				110			110					110	110		
397		Marghzar (CD)	124	124				124			124	124			124				124					124	124		
398		Jhangir (ID)	101						101		101		101	101									101	101		101	101
399		Shadmaan (U)	135	135			135				135	135							135			135	135				135
400		Moin ud Din Pur (TD)	5				5	5			5							5			5	5				5	5
401		Kalra (ID)	0	0		0			0				0				0	0				0				0	
402		Daulat Nagar (R)	194			194						194				194	194			194	194					194	194
403		Buken Sharif (R)	140		140					140			140						140	140				140		140	140
404		Jinnah Public (TD)	161				161				161	161			161				161	161						161	161
405		Beo Wali (TD)	170		170	170						170			170					170	170					170	170
406		Court Road (CD)	174	174	174		174			174			174						174					174	174		
407		Circular Road (ID)	145			145		145	145				145							145	145					145	145
408		University (U)	15		15	15		15			15								15			15				15	
409		Jail Road (U)	159			159			159	159		159				159				159				159			159
410		Madina (U)	108			108			108	108				108				108	108		108						108
411		Gagian (UR)	123	123			123	123			123			123				123	123						123		
412		New service (CPI)	98																98	98	98	98	98	98			
413		State Life (B-3)	14			14	14	14	14	14	14																

Appendix B.1

SR/ NO	GRID STATION	Name of 11 KV FEEDER	AVERAGE LOAD (A)	0:00 TO 1:00	1:00 TO 2:00	2:00 TO 3:00	3:00 TO 4:00	4:00 TO 5:00	5:00 TO 6:00	6:00 TO 7:00	7:00 TO 8:00	8:00 TO 9:00	9:00 TO 10:00	10:00 TO 11:00	11:00 TO 12:00	12:00 TO 13:00	13:00 TO 14:00	14:00 TO 15:00	15:00 TO 16:00	16:00 TO 17:00	17:00 TO 18:00	18:00 TO 19:00	19:00 TO 20:00	20:00 TO 21:00	21:00 TO 22:00	22:00 TO 23:00	23:00 TO 0:00
414	132 KV Lalamusa	Guliana (R)	176			176	176			176			176						176	176					176	176
415		Basco (R)	148		148		148				148		148	148							148				148	148	
416		Machiwal (R)	175				175	175				175	175		175					175			175				175
417		Kaka Sahib (U)	166				166		166			166			166	166					166				166	166	
418		Pak Pur (ID)	130							130	130			130					130	130		130			130	130	
419		Dhama Road (U)	121					121			121			121			121					121	121		121		121
420		Ali Chak (R)	165			165	165							165				165	165			165	165				165
421		Dina Chak (TD)	140	140					140				140	140			140	140			140					140	
422		Umar Chack (R)	110		110				110				110			110					110		110	110			110
423		Paswal (TD)	148	148		148						148				148	148						148			148	148
424		Rehmani (R)	129			129	129		129	129				129						129				129	129		
425		Lalamusa (CD)	74	74					74	74			74		74				74					74	74		
426		Main Bazar (CD)	150	150					150	150					150	150			150					150	150		
427	132-KV Jalal Pur Jattan	Sook Kalan (TD)	163		163				163		163			163	163			163	163								163
428		Main Bazar (PD)	184			184	184					184	184					184	184					184	184		
429		Islam Garh (PD)	203		203	203				203	203					203	203					203	203				
430		S.S.S (PD)	113		113	113				113	113					113	113					113	113				
431		Fateh Pur (R)	190						190	190			190			190	190			190	190				190		
432		Karrian Wala (R)	230			230				230	230		230				230	230				230					230
433		Kuri (R)	118				118		118	118			118				118	118		118							118
434		Awan Sharif (R)	238				238	238				238			238	238			238					238			238
435		Tanda (R)	184			184			184				184	184			184			184			184				184
436		Barila Sharif (R)	135			135						135		135				135	135			135	135			135	
437		Bhagowal (R)	165						165					165				165	165			165	165			165	165
438		Barnala AJK (R)	281				281						281			281	281				281		281	281			281
439		Sagar (R)	204	204		204							204	204				204	204				204				204
440	132-KV Dinga	Thana Road (U)	154				154					154		154	154			154				154	154			154	
441		Dinga (U)	128				128					128		128	128			128				128	128			128	
442		Joura (R)	243	243							243		243	243		243		243	243			243					
443		Noor Jamal (R)	79	79						79		79		79	79			79	79			79					
444		Aamra (R)	84			84						84	84		84			84	84	84				84			
445	132-KV Mangowal	Mangowal (R)	149				149			149	149			149	149			149						149	149		
446		Jokalian (R)	161	161			161	161			161	161				161			161						161		
447		Langay (R)	149					149	149		149	149				149				149			149				149
448		Ranfeekay (R)	103		103					103		103					103			103	103				103	103	
449		Jheuranwala (R)	69		69	69					69	69						69	69				69			69	
450		Machiana (R)	59		59		59				59				59			59	59			59			59		
451		Pak Wigha (R)	138			138	138			138	138				138			138					138				138
452		Kunjah (U)	135			135	135	135			135					135							135	135			135
453		Farooqi Pulpe Mills (B-3)	20			20	20	20	20	20	20																
454		KTM (TEX)	140																140	140	140	140	140	140			
455	132KV Bhimber	Industrial-1 (U)	221		221				221	221				221				221	221					221	221		
456		Ifthikarabad AJK (R)	228				228	228			228					228			228	228				228			228
457		Industrial-2 AJK (R)	69			69			69		69			69	69				69	69				69			
458		R-2 (R)	10			10				10		10					10	10			10				10	10	
459		R-3 (U)	5				5		5		5		5					5	5					5			5
460		Kotla-1 (UR)	265		265						265	265			265	265			265						265		265
461		Sadwal (R)	244			244	244			244		244				244	244			244						244	
462		Samani-2 AJK (UR)	220			220	220			220	220		220				220		220		220						
463		Kotla-2 (UR)	236	236			236	236			236	236			236						236				236		
464		Barnala AJK (UR)	189			189	189					189	189							189			189			189	189
465		Butter (R)	114		114	114						114	114							114			114		114	114	
466		Samani Express AJK (R)	204			204			204	204			204	204			204	204			204						
467		Bhimber-1 AJK (CD)	211				211			211	211				211			211			211	211			211		
468		Bhimber-2 AJK (CD)	153			153	153					153						153	153		153	153			153		
469		Sabour (R)	250		250	250						250	250							250			250		250	250	

Appendix B.1

SR/ NO	GRID STATION	Name of 11 KV FEEDER	AVERAGE LOAD (A)	0:00 TO 1:00	1:00 TO 2:00	2:00 TO 3:00	3:00 TO 4:00	4:00 TO 5:00	5:00 TO 6:00	6:00 TO 7:00	7:00 TO 8:00	8:00 TO 9:00	9:00 TO 10:00	10:00 TO 11:00	11:00 TO 12:00	12:00 TO 13:00	13:00 TO 14:00	14:00 TO 15:00	15:00 TO 16:00	16:00 TO 17:00	17:00 TO 18:00	18:00 TO 19:00	19:00 TO 20:00	20:00 TO 21:00	21:00 TO 22:00	22:00 TO 23:00	23:00 TO 0:00
470		Phalia Road. (CD)	219	219			219			219		219				219			219					219	219		
471		Wasu (U)	209	209				209	209						209	209			209	209						209	
472		Mong (R)	151	151			151				151	151			151			151	151						151		
473		Gulshan Iqbal (R)	100	100			100			100	100						100			100				100			100
474		Kheewa (R)	76	76			76			76				76					76			76		76	76		
475	132-KV Mandi Bahaudin	Shah Taj (UR)	79	79					79		79	79			79						79					79	79
476		Kot Baloch (R)	111				111				111	111			111				111			111				111	111
477		Jolana (UR)	165			165	165			165	165		165				165						165			165	
478		Canal (U)	198			198	198				198			198			198				198				198	198	
479		Mandi Bahaudin (CD)	163	163					163				163			163		163	163					163	163		
480		Katchery Road (CD)	124	124			124	124							124			124	124					124	124		
481		Sufi City (U)	10			10			10			10				10			10	10		10				10	
482		Gurrah (U)	200			200			200			200				200			200	200		200				200	
483		New Cantt: (U)	196			196	196			196		196			196			196				196				196	
484		Old Cantt: (U)	0	0		0	0		0					0		0			0				0				
485		Janda Wala (R)	200				200			200	200					200	200					200				200	200
486		New Dhoria (R)	199	199			199				199				199						199	199			199	199	
487		Old Dhoria (UR)	206	206				206				206		206	206						206			206	206		
488	132-KV Kharian	Malka (R)	136			136							136	136				136			136	136			136	136	
489		Randheer (R)	100				100		100				100				100			100	100				100	100	
490		Nona Wali (R)	100				100		100				100				100			100	100				100	100	
491		Karyala (R)	94				94			94			94					94		94	94			94	94		
492		Kharian City (CD)	134			134			134				134	134					134					134	134		134
493		Main Bazar (CD)	136			136			136				136	136					136					136	136		136
494		I.J.Colony (CD)	29			29			29				29	29					29					29	29		29
495		Dinga (R)	190				190		190		190							190	190			190	190			190	
496		Mano Chak (R)	211		211			211	211		211			211				211				211			211		
497		Hellan (R)	225			225	225				225	225					225			225				225			225
498	132KV Hellan	Marala (R)	161	161				161		161				161				161	161					161	161		
499		Pahrianwali (R)	110							110		110				110	110		110	110						110	110
500		Chimmon (R)	138		138						138	138						138	138			138			138	138	
501		Challianwala (R)	129			129			129		129		129							129			129			129	129
502		Aala (R)	204	204				204		204			204							204	204			204	204		
503	66KV Malakwal	Chot (TD)	111	111		111							111					111					111	111		111	111
504		Malakwal (CD)	153	153	153				153	153								153	153					153	153		
505		Miani (U)	72	72				72	72				72						72	72				72			72
506		Sahna (R)	130	130		130	130			130			130	130										130	130		
507		Mangat (R)	140		140	140			140	140				140				140					140				140
508		Saida (TD)	108	108			108					180	180		180		180				180					180	
509		Gohar (R)	103	103			103	103			103		103	103					103			103					
510		Gojra (R)	103	103			103	103			103		103	103				103				103					
511		New Gojra (R)	120		120	120		120				120			120	120				120				120			
512	132KV Khutiala Sheikhan	Qadirabad (TD)	183	183			183				183	183			183				183	183					183		
513		New Qadirabad (TD)	175		175	175							175		175				175	175		175				175	
514		Mianwal (TD)	110	110	110			110	110				110		110		110								110		
515		Phalia-1 (U)	168	168			168	168				168		168	168									168			168
516		Phalia-2 (CD)	95		95				95			95			95			95	95					95	95		
517		Khutiala Sheikhan (UR)	108		108	108			108				108					108	108					108	108		
518		College Road (CD)	169	169	169			169						169				169	169					169	169		
519		MTM (TEX) P	200																200	200	200	200	200	200			
520		Kalra (ID)	126	126		126			126				126				126	126				126				126	
521	132KV Ratti Gujrat	Ahmadabad (ID)	25						25		25		25	25									25	25		25	25
522		Ghauri (ID)	200			200		200			200	200					200				200		200			200	
523		Sada Chack (TD)	80				80	80			80							80			80	80				80	80
524	132KV Phalia	Phalia City (U)	30		30				30			30			30			30	30					30	30		
525		Mandi Road (R)	40		40	40			40	40				40				40					40				40
526		Duffer (R)	100	100		100				100				100			100					100			100	100	
527	132KV Head Faqirian	Barmusa (R)	90	90			90	90			90		90							90				90	90		
528		Mona (R)	80	80	80			80	80			80	80											80			80
529		Sanda (R)	80	80			80		80	80			80								80				80		80

Appendix B.1

SR/ NO	GRID STATION	Name of 11 KV FEEDER	AVERAGE LOAD (A)	0:00 TO 1:00	1:00 TO 2:00	2:00 TO 3:00	3:00 TO 4:00	4:00 TO 5:00	5:00 TO 6:00	6:00 TO 7:00	7:00 TO 8:00	8:00 TO 9:00	9:00 TO 10:00	10:00 TO 11:00	11:00 TO 12:00	12:00 TO 13:00	13:00 TO 14:00	14:00 TO 15:00	15:00 TO 16:00	16:00 TO 17:00	17:00 TO 18:00	18:00 TO 19:00	19:00 TO 20:00	20:00 TO 21:00	21:00 TO 22:00	22:00 TO 23:00	23:00 TO 0:00
530	66KV	Jassowal (TD)	90		90				90	90		90	90								90					90	90
531	Bhabr a	Bherowal (TD)	70		70				70			70	70			70						70				70	70
532	Na	NDP-4 (Colony) (R)	5		5	5			5				5				5			5				5	5		
533	Rasul	Dara Pur (R)	70		70	70			70				70				70			70				70	70		
534	P/H	Subsidry (Colony) (R)	10	10		10			10			10					10			10				10	10		
535	Sh	F-1 (Colony) (R)	5		5	5			5				5					5			5				5	5	
536		Qazi Chak (R)	139		139	139				139	139					139					139					139	139
537	220KV Sahowa	H.M.Z (ID)	93			93	93		93		93	93			93						93						93
538		Sahowala (TD)	89				89	89			89	89			89		89			89							89
539		Bhopal Wala (UR)	133			133	133		133	133		133								133			133			133	
540	la	Jourian (ID)	127		127	127		127		127	127					127						127	127				
541	S/wala	Uggoke (ID)	174		174	174		174	174				174					174					174		174		
542		Air Port (E)	10																								
543		Abbot Road (CD)	134			134	134			134		134	134						134					134	134		
544		Iqbal Town (ID)	88	88			88			88	88						88	88							88	88	
545		Muzafarpur (ID)	158	158	158		158			158	158		158	158										158			
546		Adalat Garha (ID)	134	134			134	134			134	134					134	134							134		
547		Muradpur (ID)	159	159			159	159			159	159									159	159			159		
548		Model Town (U)	75		75			75			75	75				75						75			75	75	
549	132KV New Sialkot	Kashmir Rd. (ID)	158		158	158		158			158	158					158						158			158	
550		Mianapura (ID)	64				64	64			64					64				64				64		64	64
551		Butter (ID)	109					109		109	109			109			109				109			109		109	
552		Malkay Kalan (ID)	112	112		112			112		112	112		112			112								112		
553		Muslim Town (ID)	145	145					145		145	145					145	145						145			145
554		Kapoor Wali (ID)	133	133					133	133					133			133		133				133	133		
555		Gohadpur (ID)	158		158					158	158					158		158		158					158	158	
556		Khokhar Town (ID)	145				145	145			145						145	145					145	145			145
557		Bhadal (ID)	160	160					160	160		160					160					160		160		160	
558		Ghunna (TD)	55				55	55			55		155	155				55				155				155	
559		Ghopaal Pur (TD)	104				104		104				104	104					104			104	104			104	
560		Vario (R)	133	133				133	133				133		133					133	133					133	
561		Islamabad (U)	138			138			138		138						138					138	138			138	138
562		Rasool pur (R)	156	156					156				156	156							156		156		156	156	
563		Rangpura (CD)	175	175			175			175	175		175						175					175	175		
564	132KV Pasrur Road	Langray Wali (ID)	151	151			151			151					151						151	151			151		151
565	Sialkot	Hundal (ID)	123	123					123			123				123						123	123			123	123
566		Pura Hira (U)	148			148	148			148		148					148					148				148	148
567		Habibpura (ID)	159	159						159	159			159			159				159				159		159
568		Imam Sahib (ID)	144				144	144			144	144								144	144				144		144
569		Circular Road. (CD)	117			117		117	117		117	117							117					117	117		
570		Paki Kotli (ID)	118	118						118		118			118	118				118			118			118	
571		Neika Pura (ID)	122				122		122			122	122		122				122						122		122
572		Badiana Express (ID)	129	129	129			129			129					129			129					129		129	
573		Green Wood Street (CD)	133	133			133	133					133	133					133					133	133		
574	City SKT	Hajjipura (ID)	164				164			164	164			164						164			164	164		164	
575		Fateh Garh (ID)	156	156	156		156			156							156				156	156			156		
576		Chand Chowk (ID)	105	105			105				105				105			105	105				105		105		
577		Fort (CD)	91	91			91	91			91	91							91					91	91		
578		Main Bazar (CD)	109		109	109		109		109	109								109						109	109	
579		Mubarik Pura (ID)	158			158	158		158		158	158					158								158	158	
580	132KV City Sialkot	Shahab Road. (CD)	106	106	106			106			106				106				106					106	106		
581		Ghouspura (ID)	175	175		175	175		175			175					175							175			175
582		Industrial-1 (ID)	68	68		68		68	68			68						68						68	68		
583		S.I.E-1 (ID)	68	68		68			68		68	68					68								68	68	
584		S.I.E-2 (ID)	86	86		86			86		86	86					86								86	86	
585		Kotli Loharan East (UR)	106		106	106			106	106		106					106	106					106				
586	132KV Kotli Loharan	Kotli Loharan West (UR)	96		96	96			96	96		96					96	96					96				
587		Kharota-1 (R)	71		71			71	71		71	71		71					71							71	
588		Kullowal (R)	96		96			96	96		96			96					96				96				96

Appendix B.1

SR/ NO	GRID STATION	Name of 11 KV FEEDER	AVERAGE LOAD (A)	0:00 TO 1:00	1:00 TO 2:00	2:00 TO 3:00	3:00 TO 4:00	4:00 TO 5:00	5:00 TO 6:00	6:00 TO 7:00	7:00 TO 8:00	8:00 TO 9:00	9:00 TO 10:00	10:00 TO 11:00	11:00 TO 12:00	12:00 TO 13:00	13:00 TO 14:00	14:00 TO 15:00	15:00 TO 16:00	16:00 TO 17:00	17:00 TO 18:00	18:00 TO 19:00	19:00 TO 20:00	20:00 TO 21:00	21:00 TO 22:00	22:00 TO 23:00	23:00 TO 0:00
589		Christian Town (ID)	125	125		125				125	125			125					125			125	125				
590		Chitti Sheikhan (ID)	196	196			196				196	196						196	196			196					196
591		Dalo Wali (UR)	164	164			164	164		164	164								164					164		164	
592		Gul Bahar (U)	164	164			164	164		164	164								164			164	164				
593		Kharota-2 (U)	150	150		150	150			150	150							150	150				150				
594		Kamman Wala (UR)	146			146	146			146	146							146	146					146	146		
595		Berth (ID)	136	136	136			136				136				136	136				136		136				
596		Sadar Bazar (U)	90			90	90				90			90			90			90			90				90
597		Ghazi Pur (CD)	146	146			146	146		146				146					146					146	146		
598	132KV Cantt Sialkot	Muhammad Pura (CD)	299	299	299				299	299			299						299					299	299		
599		Saidpur (R)	133			133	133		133			133							133			133	133				133
600		Shadiwal (TD)	121					121		121				121				121	121				121	121		121	
601		Kundanpur (R)	145	145			145		145			145						145	145			145	145				
602		Railway Road (CD)	123		123		123		123				123	123					123					123	123		
603		Paris Road (U)	110	110				110	110				110				110	110				110				110	
604		Clock Tower (CD)	99	99			99	99		99					99				99					99	99		
605		M.E.S. (U)	139				139	139				139			139				139			139			139	139	
606		M.E.S -1 (U)	102			102	102				102	102			102				102	102						102	
607		Askary Colony (U)	16		16	16			16					16					16	16			16			16	
608		Court Road (U)	128	128		128	128							128			128	128		128				128			
609		Peero Chak (UR)	171				171	171				171	171		171					171				171		171	
610		Ladhar (R)	140	140	140			140					140		140					140				140		140	
611		Imam Bukhari (R)	109		109		109	109				109			109				109			109				109	
612		Triggerry (R)	179	179	179				179			179		179	179					179				179			
613	132KV Ghuinke	Faiz ul Hassan (R)	175			175	175				175		175	175					175	175						175	
614		Ghuinke (ID)	119	119	119		119	119			119								119				119			119	
615		Ballo Wali (R)	179	179	179				179		179	179							179	179			179				
616		Addah (U)	111	111		111	111				111	111		111						111			111				
617		Kot Mana (R)	88	88	88			88		88		88	88							88			88				
618		Industrial-3 (ID)	96	96			96	96		96	96						96						96			96	
619		Pasrur-1 (CD)	134				134			134		134			134			134	134					134	134		
620		Pasrur-2 (CD)	174				174			174		174			174			174	174					174	174		
621		Musapur (R)	123			123			123			123				123	123			123				123	123		
622		Kalaswala (R)	114	114				114				114	114			114	114			114				114			
623		Godha (TD)	121	121					121			121		121	121			121	121							121	
624	132KV Pasrur	Ahmadabad (UR)	143	143			143			143		143	143						143	143			143				
625		Rachara (R)	113		113				113			113			113				113	113				113	113		
626		Badiana (TD)	150	150	150				150		150	150			150			150						150			
627		Qila Soba Sing (UR)	160			160	160		160		160	160							160					160			160
628		Chawinda (R)	143			143	143		143		143	143			143				143								143
629		Bun Bajwa (R)	148	148				148	148		148		148			148					148					148	
630		Chobara (R)	146		146		146	146				146	146							146				146	146		
631		Pindi Bhago (R)	118				118	118				118	118			118				118	118				118		
632		Marajke (R)	178			178	178			178	178				178						178		178				178
633		Khana Wali (TD)	116	116	116				116	116			116	116				116	116								
634	132KV Lalapur	New Khana Wali (TD)	100	100							100	100			100				100			100	100				100
635		Chawinda City-1 (U)	98	98			98	98			98	98						98					98				98
636		Chawinda City-2 (U)	98	98			98	98			98	98							98				98				98
637		Bhagowal (TD)	105	105			105	105			105		105							105						105	105
638		Bajra Garhi (R)	99	99			99	99				99	99		99					99			99				

Appendix B.1

SR/ NO	GRID STATION	Name of 11 KV FEEDER	AVERAGE LOAD (A)	0:00 TO 1:00	1:00 TO 2:00	2:00 TO 3:00	3:00 TO 4:00	4:00 TO 5:00	5:00 TO 6:00	6:00 TO 7:00	7:00 TO 8:00	8:00 TO 9:00	9:00 TO 10:00	10:00 TO 11:00	11:00 TO 12:00	12:00 TO 13:00	13:00 TO 14:00	14:00 TO 15:00	15:00 TO 16:00	16:00 TO 17:00	17:00 TO 18:00	18:00 TO 19:00	19:00 TO 20:00	20:00 TO 21:00	21:00 TO 22:00	22:00 TO 23:00	23:00 TO 0:00
639		Sankhatra (R)	129		129				129	129			129	129						129	129					129	
640		Kingra (R)	138	138	138				138			138	138					138		138				138			
641		Throumandi (R)	124				124		124			124	124					124	124				124			124	
642		Nonar (UR)	173	173	173				173	173		173	173							173						173	
643		Feroz Pur (UR)	100	100	100				100	100		100	100							100						100	
644	132KV Zafarwal	Singial (R)	81	81			81	81			81		81						81					81	81		
645		Darman (R)	179		179				179	179		179					179						179		179	179
646		Zafarwal (CD)	116		116				116		116			116				116	116					116	116		
647		Jabal (R)	175	175			175	175		175			175	175					175			175					
648		Dhamthal (R)	104	104	104			104			104			104				104			104	104					
649		Sadwal (R)	104	104	104			104			104	104		104				104			104						
650		Manga (R)	209						209		209	209		209	209			209			209						209
651		Talwandi pindran (R)	140						140		140	140			140		140	140		140							140
652	132KV Kot Agha	Sokanwand (R)	111			111	111			111	111			111					111	111							111
653		Changa (R)	39	39			39			39	39		39	39					39			39					
654		Jio Wali (R)	78	78				78	78		78	78			78				78	78							
655		Pajo Wali (R)	95			95	95		95	95			95		95			95					95				
656		Ghaziwal (R)	154	154				154	154			154	154		154			154									154
657		Narowal (CD)	103		103	103				103	103				103				103					103	103		
658		Ghousia (CD)	141	141				141			141	141				141			141					141	141		
659		Sadiqabad (TD)	100				100	100			100	100			100				100		100				100		
660		Civil Line (CD)	158	158				158			158				158			158	158					158	158		
661	132KV Narowal	Jassar (R)	139	139		139			139			139				139				139					139		139
662		Chander Key (R)	100	100			100	100			100			100	100					100				100			
663		Mangian (TD)	79	79			79				79	79			79			79			79						79
664		Khan Khasaa (TD)	123	123				123	123			123	123						123				123			123	
665		Domala (R)	128			128	128			128	128			128					128					128		128	
666		Industrial (ID)	40		40			40	40		40									40			40			40	40
667		Ahmad Steel (F)	260										260	260	260	260	260	260	260	260							
668		Nawaz Steel (F)	140										140	140	140	140	140	140	140	140							
669		Shakar Garh-1 (CD)	173			173				173	173			173				173	173					173	173		
670		Shakar Garh-2 (CD)	130			130				130	130			130				130	130					130	130		
671		Shakar Garh-3 (U)	60			60				60	60			60				60	60					60	60		
672		Ikhlaspur (R)	144			144	144			144	144				144		144				144					144	
673		Qasim pur (R)	160		160	160			160		160				160				160					160		160	
674		Gumtala (R)	144	144			144			144		144			144					144				144			144
675	132KV Shakar Garh	Bara Managa (R)	135		135	135			135		135		135						135	135				135			
676		Faiz Ahmad Faiz (R)	130	130				130	130			130	130							130				130			130
677		Nangal (R)	100	100	100			100	100			100				100	100			100							
678		Bostan (R)	165			165		165			165	165			165				165					165	165		
679		Chak Amro (R)	151			151	151		151	151		151	151							151						151	
680		Noor Kot (R)	143		143	143			143			143			143					143				143			143
681		Mir Pur (R)	105	105			105	105				105				105				105				105			105
682		Halowal (R)	158		158			158				158	158			158			158	158					158		
683		Burj (R)	39	39			39	39							39	39			39	39				39			
684	132KV Baddomali	Rayya (R)	103			103	103					103			103	103			103	103				103			
685		Badomali city (UR)	79		79			79				79				79	79		79	79				79			
686		Belo Wali (R)	34	34					34	34			34		34				34	34		34					
687		Jamkey (R)	106	106				106	106			106	106					106							106		106
688		Baddokey (R)	96	96				96	96			96							96					96	96		96
689		Baigo Wala (R)	145					145			145	145		145	145					145				145			145
690		Kot Dina (R)	143							143	143		143	143				143				143				143	143
691		Majrah (R)	179	179						179			179		179	179				179				179	179		
692	132KV Sambrial	Dhana Wali (R)	100	100						100			100		100	100				100				100	100		
693		Sambrial 1 (CD)	145		145					145	145		145					145	145					145	145		
694		Sambrial 2 (CD)	76		76					76	76		76					76	76					76	76		
695		Sambrial 3 (U)	119		119					119	119		119					119	119					119	119		
696		Air Port (E)	10																								
697		E.P.Z-1,2	5			5	5	5	5	5	5																
698		E.P.Z-3	5			5	5	5	5	5	5																

Appendix B.1

SR/ NO	GRID STATION	Name of 11 KV FEEDER	AVERAGE LOAD (A)	0:00 TO 1:00	1:00 TO 2:00	2:00 TO 3:00	3:00 TO 4:00	4:00 TO 5:00	5:00 TO 6:00	6:00 TO 7:00	7:00 TO 8:00	8:00 TO 9:00	9:00 TO 10:00	10:00 TO 11:00	11:00 TO 12:00	12:00 TO 13:00	13:00 TO 14:00	14:00 TO 15:00	15:00 TO 16:00	16:00 TO 17:00	17:00 TO 18:00	18:00 TO 19:00	19:00 TO 20:00	20:00 TO 21:00	21:00 TO 22:00	22:00 TO 23:00	23:00 TO 0:00
699	66KV Headmarla	Up Stream (R)	106	106					106	106			106				106	106		106							106
700		Chaprar(R)	145				145			145			145	145				145	145					145			145
701		Bajwat (R)	58	58				58			58		58			58				58				58			58
702		Bajwat-2 (R)	74		74	74			74		74		74				74							74	74		
703		Down Stream (R)	112	112				112	112		112				112				112	112							112
704		Colony (R)	6	6			6	6			6				6			6	6							6	
705		Barrage (R)	5								5					5	5				5						

Appendix B.2

LOAD SHEDDING PROGRAM
BASED ON EQUITABLE DISTRIBUTION OF AVAILABLE POWER IN FESCO

W.E.F.0000 DATE:- 12-09-2013

Time Slabs	Interruptions	01:00 to 02:00	02:00 to 03:00	03:00 to 04:00	04:00 to 05:00	05:00 to 06:00	06:00 to 07:00	07:00 to 08:00	08:00 to 09:00	09:00 to 10:00	10:00 to 11:00	11:00 to 12:00	12:00 to 13:00	13:00 to 14:00	14:00 to 15:00	15:00 to 16:00	16:00 to 17:00	17:00 to 18:00	18:00 to 19:00	19:00 to 20:00	20:00 to 21:00	21:00 to 22:00	22:00 to 23:00	23:00 to 24:00	24:00 to 01:00	Total MW	Avg MW
Urban (1ST Circle)	6	122		118										148		146		148						135		816	34.0
Urban (2ND Circle)	6	143		139		133					155			172		176										919	38.3
Urban (Jhang Circle)	6	87		83							87		103			104							99			563	23.5
Urban (Sargodha Circle)	6		144								161	161					177						171		159	972	40.5
Rural (1ST Circle)	6		50								56	57			61		60		61							346	14.4
Rural (2ND Circle)	6	46			51							60	62		63		65									347	14.4
Rural (Jhang Circle)	6		174							184		170			207		208								190	1,132	47.2
Rural (Sargodha Circle)	6				110								121	123		124		117						127		722	30.1
Commercial Dominated (FESCO)	6				17					19		29					42				35	32				173	7.2
Tubewell Dominated(1ST Circle)	6									85			89	88	85						94	90				530	22.1
Tubewell Dominated(2ND Circle)	6									43			45	46	45						43	42				264	11.0
Tubewell Dominated(Jhang Circle)	6							73	73			78	80		78	77										459	19.1
Tubewell Dominated(Sargodha Circle)	6								60	65			71	72	72						75					416	17.3
Industrial Dominated (1ST Circle)	6				163	164	164											217	214	213						1,135	47.3
Industrial Dominated (2ND Circle)	6						149	146	161											197	196	194				1,042	43.4
Industrial Dominated (Jhang Circle)	6						27	25	32												32	33	35			184	7.7
Industrial Dominated (Sargodha Circle)	6						10	9	10												12	12	12			65	2.7
Independent (OTHERS)	6			12							13		18		16		14		16							88	3.7
Independent Textile (1ST Circle)	6																		95	93	93	93	93	93		561	23.4
Independent Textile (2ND Circle)	6																		5	5	5	4	4	4		25	1.0
Independent Textile (Jhang Circle)	6																		14	13	13	13	13	13		78	3.2
Independent Textile (Sargodha Circle)	6																		9	6	6	6	6	6		38	1.6
Independent Non Textile (FESCO)	6																		10	9	10	10	10	10		60	2.5
Continuous Process (50% Load reduction) As per order of GM(O)		10	10	10	10	10	9	13	13	13	14	14	13	13	13	14	14	10	10	10	10	10	10	9	11	274	11.4
Cements Factories (25% Load reduction) As per order of GM(O)		16	15	15	15	16	16	16	17	10	11	12	11	10	12	12	13	13	13	13	13	13	12	12	13	316	13.2
A=TOTAL LOAD SHED (MW)		423	392	376	365	323	375	283	367	420	498	579	613	673	651	653	592	505	447	559	637	550	464	408	372	11,522	480.1
B=FESCO COMPUTED DEMAND (MW)		1,757	1,723	1,703	1,678	1,698	1,725	1,747	1,821	1,909	1,994	2,027	2,091	2,122	2,127	2,109	2,162	2,073	2,017	2,051	2,068	2,013	1,948	1,888	1,826	46,276	1,928.2
C=FESCO SHARE (MW)		1,311	1,311	1,311	1,311	1,365	1,365	1,465	1,465	1,465	1,465	1,465	1,465	1,465	1,465	1,465	1,565	1,565	1,565	1,496	1,496	1,496	1,496	1,496	1,461	34,795	1,449.8
DIFFERENCE (MW)		446	412	392	367	333	360	282	356	444	529	562	626	657	662	644	597	508	452	555	572	517	452	392	365	11,481	478.4
TARGET		446	412	392	367	333	360	282	356	444	529	562	626	657	662	644	597	508	452	555	572	517	452	392	365	11,481	478.4
DIFFERENCE- (MW)		-23	-20	-16	-2	-10	15	2	11	-25	-31	17	-13	16	-11	10	-5	-3	-5	4	65	34	12	16	6	41	1.7

Appendix B.3

LESCO LOAD MANAGEMENT PROGRAM DUE TO CANAL CLOSURE W.E.F 24-01-2014

S. #	Category of Consumers		No. of 11KV Fdrs	Running Load (MW)	Closure (HRS)	Load after Load Sheding (MW)																							
						0000-0100	0100-0200	0200-0300	0300-0400	0400-0500	0500-0600	0600-0700	0700-0800	0800-0900	0900-1000	1000-1100	1100-1200	1200-1300	1300-1400	1400-1500	1500-1600	1600-1700	1700-1800	1800-1900	1900-2000	2000-2100	2100-2200	2200-2300	2300-2400
1	Domestic Urban	Gp-1	484	890	8		63	63		63	63	105	105	105		126		126		126		170		140		140	140	112	85
		Gp-2				85	85		85	85		139	139	139	170		170		170		170	170		190		190	150	85	
		Gp-3					73	73	73	73		130	130	130		147		147		147	147	147		163		163	163		122	73
		Gp-4				73		73		73		130	130	130	147		147		147		147		163		163	163	122	122	73
		Gp-5				80		80		80	80	133	133	130		160	160		160	160		160	178		178		142		80
		Gp-6					80		80		80	133	133	133	135		160		160	160		160		178	178	178	142		80
		Gp-7					68		68		68		135	135		135		135		135	135	135	150	150		150	120	120	68
	DHQ		43	75	8	65		65		65	65		65		65		65	65	65		65	65		65	65	65		65	65
2	Commercial Dominated		57	90	8		51	43	43		42	42			85			88		99	99	99	72	72		72	66	66	64
	Commercial Independent		33	50		5	5	5	5		7	7			15	15		20			20	20	20			23	20	10	8
3	Power Looms		7	15			9	8		9	9		14	15		14	14		14	13		13	13		16	15		15	15
4	Industrial Domi. GP-1		113	320	8	100	100	100	100	100	100				150	150	155	155				158	158	140	140			120	120
	Industrial Domi. GP-2					100	100	100	100	100	100				150	150	155	155				158	158	140	140			120	120
5	Twell Dominated/Cold Storage		67	65	8	35	35	38	38		53		66		66		66		65		65		65	65		65		50	35
6	Rural Domestic	Gp-1	191	333	8	115	115		115	115	150	150			175			175	175		175		230	205		175	128	115
		Gp-2				115		115	115	115	150			175		175			175	175		195	230		205		150	128	125
7	Ind. Textile Industry (Prime User)		66	110	8 (1600-2400)	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110								
8	Ind. Textile Industry (Self Generation)		93	285		256	270	266	267	275	269	287	284	276	297	285	285	275	248	283	195								
9	Independent Feeders (Other than Textile & Furnace)		72	55	8 (0200-1000)	25	25									53	56	52	51	51	51	45	45	39	41	43	40	39	38
10	Cont. Process Feeders		39	80		74	71									56	78	78	79	76	83	67	74	73	72	61	63	64	63
11	Steel Re-Rolling Mills		20	15		7	8									15	15	15	15	15	15	15	15	9	9	9	9	9	9
12	Steel Furnace		89	252	8 (0900-1700)	163	168	157	163	176	200	191	177	103									47	49	41	46	152	160	157
13	Consumer Ownd Grid Stations (B-4) 28 Nos.	Group-I	19	61	8 (1600-2400)	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61								
		Group-II	6	44	8 (1600-2400)	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41								
		Ittehad Chemical (C.Process)	1	20	Load Reduction	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
		Domestic	2	10	8	17		17		17		17		17		17	17		17	17	17	17	17	17		17	17		17
14	Misc.(Exempted)		29	15		15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Total Running Load(MW)			1,402	2,785		1,560	1,571	1,448	1,497	1,591	1,681	1,709	1,656	1,633	1,700	1,743	1,688	1,731	1,706	1,702	1,629	1,680	1,601	1,590	1,649	1,433	1,541	1,568	1,443
		Allocated Generataion				1,436	1,436	1,436	1,436	1,436	1,537	1,537	1,537	1,537	1,587	1,587	1,587	1,587	1,587	1,587	1,537	1,537	1,618	1,618	1,618	1,597	1,436	1,436	1,436
		Varriation				124	135	12	61	155	144	172	119	96	113	156	101	144	119	115	92	143	-17	-28	31	-164	105	132	7

Note: This Schedule has been prepared according to generation quota 1,450 MW.
Any change in generation quota will result in the change of announced shedding schedule without any prior intimation to our valuable consumers to avoid the system collapse.

MEPCO LOAD MANAGEMENT SCHEDULE (28.01.2014)

I: For Domestic & Commercial Consumers

Sr	Category of Custon1ers	No. of Feeders	Running Load (MW)	Shedding Hours	Total Running Hrs
1	Domestic+ Commercial (Urban)	293	398	05-06 Hrs	18-19 Hrs
2	(Domestic + Commercial Mix) Power Loom	19	108	04 Hrs	20 Hrs
3	Rural (Domestic + Tube Well)	385	358	07-08 Hrs	16 17 Hrs
4	Tube Well Dominated	145	269	07-08 Hrs	16-17 Hrs
5	Exempted Feeders (Hospitals, Sensitive Installation)	15	14	No Closure	24 Hrs
Total		857	1,147		

II: For Industrial Consumers

6	Cement Industries	1	14	05 Hours (1700 to 2200)	19:00 Hrs
7	Continuous Process Indus.	2	5	40% Load Reduction during 17 to 22 Hrs	No Closure
8	Textile (Prime Users)	33	62	02 Hours (1800 to 2000 Hrs)	22:00 Hrs
9	Textile (Having self Generation)	37	145	05:30 Hours (1615 to 2145)	18:30 Hrs
10	Flour/ Ghee & Oil Mills	8	25	04 Hours (1700 to 2100)	20:00 Hrs
11	Other Industrial	18	46	-do-	-do-
12	Industrial Dominated	32	63	-do-	-do-
13	Steel Furnaces	3	8	08 Hours (1700 to 0100)	16:00 Hrs
Total		134	368		
Grand Total		991	1,515		

Average Demand =1,515 MW
Average Quota = 1,218 MW

Note:- Complete closure of commercial dominated feeders from 20:00 To 22:00 (02 Hours) daily.

Appendix B.5

SCHEDULE OF LOAD MANAGEMENT IN RESPECT OF HESCO W.E.F 01.10.2013

Sr. No.	Name of Grid Station	Name of 11KV Feeders	00:00 TO 01:00	01:00 TO 02:00	02:00 TO 03:00	03:00 TO 04:00	04:00 TO 05:00	05:00 TO 06:00	06:00 TO 07:00	07:00 TO 08:00	08:00 TO 09:00	09:00 TO 10:00	10:00 TO 11:00	11:00 TO 12:00	12:00 TO 13:00	13:00 TO 14:00	14:00 TO 15:00	15:00 TO 16:00	16:00 TO 17:00	17:00 TO 18:00	18:00 TO 19:00	19:00 TO 20:00	20:00 TO 21:00	21:00 TO 22:00	22:00 TO 23:00	23:00 TO 24:00	No. Of Hours
1	132KV Qasimabad	Cantt.								L/M	L/M			L/M	L/M				L/M	L/M			L/M	L/M			8
2		Defence								L/M	L/M			L/M	L/M				L/M	L/M			L/M	L/M			8
3		Sachal					L/M	L/M				L/M	L/M				L/M	L/M			L/M	L/M					8
4		Naseem Nagar						L/M	L/M				L/M	L/M				L/M	L/M				L/M	L/M			8
5		Baldia						L/M	L/M						L/M	L/M				L/M	L/M				L/M	L/M	8
6		Neron Kot							L/M	L/M				L/M	L/M				L/M	L/M				L/M	L/M		8
7		G.M. Shah									L/M	L/M				L/M	L/M				L/M	L/M			L/M	L/M	8
8		Douba								L/M	L/M			L/M	L/M				L/M	L/M			L/M	L/M			8
9		New Fort						L/M	L/M						L/M	L/M				L/M	L/M				L/M	L/M	8
10		Shahbaz						L/M	L/M						L/M	L/M				L/M	L/M				L/M	L/M	8
11		Qasimabad					L/M	L/M						L/M	L/M				L/M	L/M				L/M	L/M		8
12		Citizen Colony					L/M	L/M						L/M	L/M				L/M	L/M				L/M	L/M		8
13		Anwer Villas						L/M	L/M						L/M	L/M				L/M	L/M				L/M	L/M	8
14		G.O.R						L/M	L/M						L/M	L/M				L/M	L/M				L/M	L/M	8
15		M.E.S	EXEMPTED																								
16		Sarfaraz Baba				L/M	L/M						L/M	L/M				L/M	L/M				L/M	L/M			8
17		Hayat Baba				L/M	L/M						L/M	L/M				L/M	L/M				L/M	L/M			8
18		Sahrish Nagar					L/M	L/M						L/M	L/M				L/M	L/M				L/M	L/M		8
19		Shah Latif					L/M	L/M						L/M	L/M				L/M	L/M				L/M	L/M		8
20		H.D.A					L/M	L/M						L/M	L/M				L/M	L/M				L/M	L/M		8
21		Sadar					L/M	L/M						L/M	L/M				L/M	L/M				L/M	L/M		8
22		Mehran			L/M	L/M						L/M	L/M				L/M	L/M				L/M	L/M				8
23		Naseem S. Mall						L/M	L/M				L/M	L/M				L/M	L/M				L/M	L/M			8
24		Bohri Bazar					L/M	L/M						L/M	L/M				L/M	L/M				L/M	L/M		8
25		Nagash Villas							L/M	L/M				L/M	L/M				L/M	L/M				L/M	L/M		8
26	132kv Rajputana Qasimabad-II	Shah Bukhari			L/M	L/M						L/M	L/M				L/M	L/M				L/M	L/M				8
27		Agha Khan			L/M	L/M						L/M	L/M				L/M	L/M				L/M	L/M				8
28	220KV Hala Road	Firdous Colony						L/M	L/M					L/M	L/M					L/M	L/M			L/M	L/M		8
29		Market Tower					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
30		Hirabad					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
31		HDA					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
32		Liaquat Colony					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
33		Paretabad					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
34		Public Health					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
35		Miani Forest					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
36	220KV Tando Muhammad Khan Road	Link-2								L/M	L/M			L/M			L/M	L/M			L/M			L/M	L/M		8
37		Detha	L/M	L/M				L/M	L/M						L/M	L/M						L/M	L/M				8
38		Colony	L/M	L/M				L/M	L/M						L/M	L/M						L/M	L/M				8
39		New Airport	L/M	L/M				L/M	L/M						L/M	L/M						L/M	L/M				8
40	132KV Latifabad	Fateh			L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M				8
41		Fort					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
42		Bund					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
43		Airport			L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M				8
44		Stadium			L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M				8
45		L-7				L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M			8
46		L-3				L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M			8
47		Fazal Gulzar				L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M			8
48		L-8	L/M	L/M				L/M	L/M						L/M	L/M						L/M	L/M				8
49		L-10			L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M				8
50		Shah Bhitai				L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M			8
51		New F.Gulzar				L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M			8
52	132KV Kohsar	New L-10					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
53		L-9					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
54		Civil Avi: Authoriy					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
55		New L-5					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
56		New L-4					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
57		Kohsar			L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M				8
58		Bismillah City					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8

Appendix B.5

Sr. No.	Name of Grid Station	Name of 11KV Feeders	00:00 TO 01:00	01:00 TO 02:00	02:00 TO 03:00	03:00 TO 04:00	04:00 TO 05:00	05:00 TO 06:00	06:00 TO 07:00	07:00 TO 08:00	08:00 TO 09:00	09:00 TO 10:00	10:00 TO 11:00	11:00 TO 12:00	12:00 TO 13:00	13:00 TO 14:00	14:00 TO 15:00	15:00 TO 16:00	16:00 TO 17:00	17:00 TO 18:00	18:00 TO 19:00	19:00 TO 20:00	20:00 TO 21:00	21:00 TO 22:00	22:00 TO 23:00	23:00 TO 24:00	No. Of Hours
59	132KV NTPS	Poly-1					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
60		Poly-2					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
61		Ghee-2					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
62		Husri					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
63		Memon					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
64		Kathar	L/M	L/M				L/M	L/M						L/M	L/M						L/M	L/M				8
65		Ghee-1	L/M	L/M				L/M	L/M						L/M	L/M						L/M	L/M				8
66		Ghee-3	L/M	L/M				L/M	L/M						L/M	L/M						L/M	L/M				8
67		L-9	L/M	L/M				L/M	L/M						L/M	L/M						L/M	L/M				8
68		Gulzar	L/M	L/M				L/M	L/M						L/M	L/M						L/M	L/M				8
69		Site	L/M	L/M				L/M	L/M						L/M	L/M						L/M	L/M				8
70	132kv Ghangramori	Tando Yousuf					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
71		Indus					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
72		New Paretabad					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
73		N.Liaquat Colony	L/M	L/M				L/M	L/M						L/M	L/M						L/M	L/M				8
74		Indus Dyeing						L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M	8
75		Tando Haider						L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M	8
76	132kv Kalu Kohar	Sindh Glass						L/M	L/M	L/M											L/M	L/M	L/M	L/M	L/M		8
77		Seri						L/M	L/M	L/M											L/M	L/M	L/M	L/M	L/M		8
78		Huffaz				L/M	L/M				L/M	L/M				L/M	L/M				L/M	L/M					8
79		Feeder No.1						L/M	L/M	L/M											L/M	L/M	L/M	L/M	L/M		8
80		Feeder No.2						L/M	L/M	L/M											L/M	L/M	L/M	L/M	L/M		8
81		Feeder No.3						L/M	L/M	L/M											L/M	L/M	L/M	L/M	L/M		8
82		Feeder No.5						L/M	L/M	L/M											L/M	L/M	L/M	L/M	L/M		8
83		Feeder No.6						L/M	L/M	L/M											L/M	L/M	L/M	L/M	L/M		8
84		Feeder No.8						L/M	L/M	L/M											L/M	L/M	L/M	L/M	L/M		8
85	132KV Nooriabad	NG-2 (Anoud)						L/M	L/M	L/M											L/M	L/M	L/M	L/M	L/M		8
86		NG-3						L/M	L/M	L/M											L/M	L/M	L/M	L/M	L/M		8
87		Anoud Power						L/M	L/M	L/M											L/M	L/M	L/M	L/M	L/M		8
88		Zara Textile						L/M	L/M	L/M											L/M	L/M	L/M	L/M	L/M		8
89	132 KV Kotri	NG-2				L/M	L/M				L/M	L/M				L/M	L/M				L/M	L/M					8
90		NG-1						L/M	L/M	L/M											L/M	L/M	L/M	L/M	L/M		8
91		NG-5						L/M	L/M	L/M											L/M	L/M	L/M	L/M	L/M		8
92		NG-6						L/M	L/M	L/M											L/M	L/M	L/M	L/M	L/M		8
93		Rafhan						L/M	L/M	L/M											L/M	L/M	L/M	L/M	L/M		8
94		Hi Tech						L/M	L/M	L/M											L/M	L/M	L/M	L/M	L/M		8
95		NG-3						L/M	L/M	L/M											L/M	L/M	L/M	L/M	L/M		8
96		NG-4				L/M	L/M				L/M	L/M				L/M	L/M				L/M	L/M					8
97		Baba Salahuddin				L/M	L/M				L/M	L/M				L/M	L/M				L/M	L/M					8
98		NG-7						L/M	L/M	L/M											L/M	L/M	L/M	L/M	L/M		8
99		AGR-1						L/M	L/M	L/M											L/M	L/M	L/M	L/M	L/M		8
100	132KV Jamshoro	Old Petaro					L/M	L/M				L/M	L/M				L/M	L/M				L/M	L/M				8
101		LMC					L/M	L/M				L/M	L/M				L/M	L/M				L/M	L/M				8
102		New Petaro	EXEMPTED																								
103		Tube Well					L/M	L/M				L/M	L/M				L/M	L/M				L/M	L/M				8
104		OCF-1					L/M	L/M				L/M	L/M				L/M	L/M				L/M	L/M				8
105		OCF-2					L/M	L/M				L/M	L/M				L/M	L/M				L/M	L/M				8
106		Pak Army	EXEMPTED																								
107	132KV Jhampir	City							L/M	L/M					L/M	L/M					L/M	L/M			L/M	L/M	8
108		Steel Mill							L/M	L/M					L/M	L/M					L/M	L/M			L/M	L/M	8
109		Agriculture					L/M	L/M					L/M	L/M					L/M	L/M			L/M	L/M			8
110		Zepl's					L/M	L/M					L/M	L/M					L/M	L/M			L/M	L/M			8
111	132KV Jhirruck	City							L/M	L/M					L/M	L/M					L/M	L/M			L/M	L/M	8
112		Chulh							L/M	L/M					L/M	L/M					L/M	L/M			L/M	L/M	8
113	132KV G. Shahbaz	Khuda Ki Basti					L/M	L/M				L/M	L/M				L/M	L/M				L/M	L/M				8
114		University					L/M	L/M				L/M	L/M				L/M	L/M				L/M	L/M				8
115		Muslim Town								L/M	L/M			L/M	L/M			L/M	L/M			L/M	L/M				8
116	132kv Garho																										0
117																											0

Appendix B.5

Sr. No.	Name of Grid Station	Name of 11KV Feeders	00:00 TO 01:00	01:00 TO 02:00	02:00 TO 03:00	03:00 TO 04:00	04:00 TO 05:00	05:00 TO 06:00	06:00 TO 07:00	07:00 TO 08:00	08:00 TO 09:00	09:00 TO 10:00	10:00 TO 11:00	11:00 TO 12:00	12:00 TO 13:00	13:00 TO 14:00	14:00 TO 15:00	15:00 TO 16:00	16:00 TO 17:00	17:00 TO 18:00	18:00 TO 19:00	19:00 TO 20:00	20:00 TO 21:00	21:00 TO 22:00	22:00 TO 23:00	23:00 TO 24:00	No. Of Hours
118	132 Thana Bola Khan	City	L/M	L/M						L/M	L/M						L/M	L/M						L/M	L/M		8
119		Ahmed Khan	L/M	L/M						L/M	L/M						L/M	L/M						L/M	L/M		8
120	132kv Phulleli	O.P.H-1			L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M				8
121		City College					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
122		Domenwah					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
123		O.P.H-2			L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M				8
124		Paretabad-2			L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M				8
125		Islamabad				L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M			8
126		Fakir Ka Pir				L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M			8
127	132kv Khanote	Khanote City				L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M			8
128		Lakhra	L/M	L/M				L/M	L/M						L/M	L/M						L/M	L/M					8
129		Indus Coal			L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M				8
130	132kv M.P.Sakro	City				L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M			8
131		Garho				L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M			8
132		Tapal					L/M	L/M					L/M	L/M						L/M	L/M			L/M	L/M		8
133		Latt Stop					L/M	L/M					L/M	L/M						L/M	L/M			L/M	L/M		8
134	132kv Pir Patho	V.G.Ullah					L/M	L/M					L/M	L/M						L/M	L/M			L/M	L/M		8
135		Pirpatho	L/M	L/M				L/M	L/M						L/M	L/M						L/M	L/M					8
136		P.A.F			L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M				8
137	132kv Sujawal	Mirpur Bathoro				L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M			8
138		B-Talpur				L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M			8
139		City					L/M	L/M					L/M	L/M						L/M	L/M				L/M	L/M	8
140		Chohar Jamali					L/M	L/M					L/M	L/M						L/M	L/M				L/M	L/M	8
141	132kv Thatta	Islampur	L/M					L/M	L/M					L/M	L/M					L/M	L/M					L/M	8
142		Chilia Mill	L/M						L/M	L/M					L/M	L/M					L/M	L/M				L/M	8
143		Steel Mill	L/M						L/M	L/M					L/M	L/M					L/M	L/M				L/M	8
144		Jangshahi	L/M					L/M	L/M					L/M	L/M					L/M	L/M					L/M	8
145		Thatta (City)	L/M					L/M	L/M					L/M	L/M					L/M	L/M					L/M	8
146		Maaza	L/M					L/M	L/M					L/M	L/M					L/M	L/M					L/M	8
147	132kv T.M Khan	T.T.Mill			L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M				8
148		F.S.Mill					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
149		Digmori					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
150		Abadgar			L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M				8
151		Pandhiwah			L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M				8
152		Jamali				L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M			8
153		Lakhat				L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M			8
154		City New				L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M			8
155	132KV B.S.Karim	Banu	L/M					L/M	L/M						L/M	L/M						L/M	L/M			L/M	8
156		Jhoke			L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M				8
157		Daro				L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M			8
158	132KV Ladiun	City				L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M			8
159	132KV Tando Jam	Old University				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
160		City				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
161		New University				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
162		Scarp 4+3				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
163		Khatian		L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M				8
164		Tando Qaisar		L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M				8
165		S.A University				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
166	132KV Golarchi	Ahmed Rajo					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
167		City					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
168		Khorwah					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
169	132KV Sehwan	Sehwan City	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
170		Dargah	EXEMPTED																								
171		Jhangara	L/M	L/M				L/M	L/M					L/M	L/M						L/M	L/M					8
172		Old Bhan	L/M	L/M				L/M	L/M					L/M	L/M						L/M	L/M					8
173		City-3	L/M	L/M				L/M	L/M					L/M	L/M						L/M	L/M					8
174	132 KV Shalmani	Sann	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
175		Amri	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8

Appendix B.5

Sr. No.	Name of Grid Station	Name of 11KV Feeders	00:00 TO 01:00	01:00 TO 02:00	02:00 TO 03:00	03:00 TO 04:00	04:00 TO 05:00	05:00 TO 06:00	06:00 TO 07:00	07:00 TO 08:00	08:00 TO 09:00	09:00 TO 10:00	10:00 TO 11:00	11:00 TO 12:00	12:00 TO 13:00	13:00 TO 14:00	14:00 TO 15:00	15:00 TO 16:00	16:00 TO 17:00	17:00 TO 18:00	18:00 TO 19:00	19:00 TO 20:00	20:00 TO 21:00	21:00 TO 22:00	22:00 TO 23:00	23:00 TO 24:00	No. Of Hours
176	132 / 66KV Badin	Pero Lashari				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
177		Seerani				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
178		City-II				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
179		Khoski		L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M				8
180		P.A.F		L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M				8
181		City-I				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
182		Golarchi					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
183	66kv Kadhan	City					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
184		Badami					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
185	66kv Matli	Nazarpur	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
186		City	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
187		Channel	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
188		Pirwah						L/M	L/M					L/M	L/M					L/M	L/M				L/M	L/M	8
189		Omni	IMPORT																								
190		Omni-1	IMPORT																								
191		Omni-2	IMPORT																								
192	132KV T.G.Ali	T.G Ali	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
193		Ch: Abdullah				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
194		Thari				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
195	132KV Talhar	City				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
196		B.S.Mills		L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M				8
197		Rajo Khanani		L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M				8
198		D.E.H.I				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
199		New Channel					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
200	66KV Tando	City					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
201	Bago	Pahar Muree					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
202	132KV Hala	City-2	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
203		Bhitshah	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
204		Saeedabad	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
205		City-1						L/M	L/M					L/M	L/M					L/M	L/M				L/M	L/M	8
206		Mansora						L/M	L/M					L/M	L/M					L/M	L/M				L/M	L/M	8
207		S.Abdul Latif						L/M	L/M					L/M	L/M					L/M	L/M				L/M	L/M	8
208		Old Hala	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
209		T-Well-3	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
210		T-Well-4				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
211	132KV Kazi Ahmed	City				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
212		T.Well 4+5				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
213		T.Well 1+2		L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M				8
214		T.Well 3+4		L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M				8
215		Pir Noor Shah				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
216		Fathual Zardari					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
217		N. Wali Mohd.					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
218	132KV N/Shah- I	Gareebabad					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
219		Khadhar	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
220		Society	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
221		Dour	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
222		University						L/M	L/M					L/M	L/M					L/M	L/M				L/M	L/M	8
223		Khairshah						L/M	L/M					L/M	L/M					L/M	L/M				L/M	L/M	8
224		N'Shah	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
225		Hospital	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
226		Manuabad	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
227		Bola Ja Kuba				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
228	132kv N'Shah- II (Sanghar Road)	New Dour				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
229		Suguar Mill		L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M				8
230		City-3		L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M				8
231		NS-2				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
232		NS-3					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
233		NS-4					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
234		S.P.Chakar					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
235		Industrial	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8

Appendix B.5

Sr. No.	Name of Grid Station	Name of 11KV Feeders	00:00 TO 01:00	01:00 TO 02:00	02:00 TO 03:00	03:00 TO 04:00	04:00 TO 05:00	05:00 TO 06:00	06:00 TO 07:00	07:00 TO 08:00	08:00 TO 09:00	09:00 TO 10:00	10:00 TO 11:00	11:00 TO 12:00	12:00 TO 13:00	13:00 TO 14:00	14:00 TO 15:00	15:00 TO 16:00	16:00 TO 17:00	17:00 TO 18:00	18:00 TO 19:00	19:00 TO 20:00	20:00 TO 21:00	21:00 TO 22:00	22:00 TO 23:00	23:00 TO 24:00	No. Of Hours
236	132kv N'Shah Site (III)	Chemi Visco	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
237		New University	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
238		Dalail Dero						L/M	L/M					L/M	L/M					L/M	L/M				L/M	L/M	8
239		Cancer Hospatil						L/M	L/M					L/M	L/M					L/M	L/M				L/M	L/M	8
240	132kv S.P.Chakar	City (S.P.C)	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
241		SC-3	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
242		SC-4	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
243		SC-2				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
244		SC-5				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
245		SC-6				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
246		SC-7		L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M				8
247	132KV Sanghar	City-1		L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M				8
248		Routani				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
249		SR-4					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
250		SR-5					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
251		SR-1					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
252		SR-7					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
253		City-2 SR-3	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
254		Jhole	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
255		Dil Shakh						L/M	L/M					L/M	L/M					L/M	L/M				L/M	L/M	8
256		SR-6						L/M	L/M					L/M	L/M					L/M	L/M				L/M	L/M	8
257		SR-2						L/M	L/M					L/M	L/M					L/M	L/M				L/M	L/M	8
258	132KV Sakrand	S.S.C	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
259		City-1	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
260		T.Well 1+7				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
261		T.Well 3+4				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
262		Pir Zakri				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
263		Meh: Pur-2		L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M				8
264		Commando		L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M				8
265		Punhal K.C				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
266		City-3					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
267		City-2					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
268		T.Well-2					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
269		Meh: Pur-1		L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M				8
270		M.E.S	EXEMPTED																								
271	132KV Saeedabad	Katchi	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
272		Sohrab						L/M	L/M					L/M	L/M						L/M	L/M			L/M	L/M	8
273		City-1						L/M	L/M					L/M	L/M						L/M	L/M			L/M	L/M	8
274		City-2						L/M	L/M					L/M	L/M						L/M	L/M			L/M	L/M	8
275		Sikander	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
276	132KV Shahdadpur	City-1	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
277		R.B				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
278		Scarp-2				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
279		Scarp-1				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
280		Haji Appan		L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M				8
281		Hingoro		L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M				8
282		City-3				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
283		Scarp-2+3					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
284		City-2					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
285	132KV Tando Adam	TA-3					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
286		T.Well-2					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
287		T.Well-4	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
288		TA-2	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
289		T.Well-1						L/M	L/M					L/M	L/M					L/M	L/M				L/M	L/M	8
290		T.A-1						L/M	L/M					L/M	L/M					L/M	L/M				L/M	L/M	8
291		T.Well-3						L/M	L/M					L/M	L/M					L/M	L/M				L/M	L/M	8
292		T.Well-5	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
293		Express	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8

Appendix B.5

Sr. No.	Name of Grid Station	Name of 11KV Feeders	00:00 TO 01:00	01:00 TO 02:00	02:00 TO 03:00	03:00 TO 04:00	04:00 TO 05:00	05:00 TO 06:00	06:00 TO 07:00	07:00 TO 08:00	08:00 TO 09:00	09:00 TO 10:00	10:00 TO 11:00	11:00 TO 12:00	12:00 TO 13:00	13:00 TO 14:00	14:00 TO 15:00	15:00 TO 16:00	16:00 TO 17:00	17:00 TO 18:00	18:00 TO 19:00	19:00 TO 20:00	20:00 TO 21:00	21:00 TO 22:00	22:00 TO 23:00	23:00 TO 24:00	No. Of Hours
294	132KV Dour	DR-1				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
295		DR-2				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
296		DR-3				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
297		DR-4		L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M				8
298		DR-5		L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M				8
299		DR-6				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
300	66KV Matli	City					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
301		Jandal Kot					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
302		Sekhat					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
303		R/Pakistan					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
304		T.Well-1	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
305		T.Well-2	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
306	66kv Head Jamrao	Industrial Panel						L/M	L/M					L/M	L/M					L/M	L/M				L/M	L/M	8
307	132KV Sultanabad	Khuwaja						L/M	L/M					L/M	L/M					L/M	L/M				L/M	L/M	8
308		Masson						L/M	L/M					L/M	L/M					L/M	L/M				L/M	L/M	8
309		SLA-1	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
310	132kv Mirwah Gorchani	Mir Wah	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
311		Landhi					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
312		S.Mill					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
313		Jhilory					L/M	L/M							L/M	L/M				L/M	L/M			L/M	L/M		8
314		Scarp-1	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
315		Scarp-2	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
316		Scarp-3	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
317	66kv Digri	Digri				L/M	L/M				L/M	L/M							L/M	L/M					L/M	L/M	8
318		N.Kot				L/M	L/M				L/M	L/M							L/M	L/M					L/M	L/M	8
319		Dumbhalo					L/M	L/M				L/M	L/M							L/M	L/M				L/M	L/M	8
320		Kachalo					L/M	L/M				L/M	L/M							L/M	L/M				L/M	L/M	8
321		Deh - 170	L/M				L/M	L/M							L/M	L/M					L/M	L/M				L/M	8
322	132kv M.P.Khas	Mirwah				L/M	L/M				L/M	L/M				L/M	L/M				L/M	L/M					8
323		Nawazabad				L/M	L/M				L/M	L/M				L/M	L/M				L/M	L/M					8
324		M.P.K-6				L/M	L/M				L/M	L/M				L/M	L/M				L/M	L/M					8
325		MPK 2+3				L/M	L/M				L/M	L/M				L/M	L/M				L/M	L/M					8
326		Industrial				L/M	L/M				L/M	L/M				L/M	L/M				L/M	L/M					8
327		Kishori Lal				L/M	L/M				L/M	L/M				L/M	L/M				L/M	L/M					8
328		Hirabad				L/M	L/M				L/M	L/M				L/M	L/M				L/M	L/M					8
329		Chand Moro				L/M	L/M				L/M	L/M				L/M	L/M				L/M	L/M					8
330		Mehmoodabad				L/M	L/M				L/M	L/M				L/M	L/M				L/M	L/M					8
331		M.P.K 9+10		L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M				8
332		Satelite Town	L/M					L/M	L/M					L/M	L/M					L/M	L/M					L/M	8
333		Mirabad				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
334		Linking		L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M				8
335		City		L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M				8
336		Noor Shah		L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M				8
337		M.P.K 1+4		L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M				8
338		M.P.K 11+12		L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M				8
339	132kv T.A.Yar	Scarp 2+6					L/M	L/M					L/M	L/M						L/M	L/M				L/M	L/M	8
340		Nasarpur					L/M	L/M					L/M	L/M						L/M	L/M				L/M	L/M	8
341		Scarp-3				L/M	L/M					L/M	L/M						L/M	L/M					L/M	L/M	8
342		Scarp-1				L/M	L/M					L/M	L/M						L/M	L/M					L/M	L/M	8
343		City-1				L/M	L/M					L/M	L/M						L/M	L/M					L/M	L/M	8
344		Quba				L/M	L/M					L/M	L/M						L/M	L/M					L/M	L/M	8
345		City-2					L/M	L/M					L/M	L/M						L/M	L/M				L/M	L/M	8
346		City-4					L/M	L/M					L/M	L/M						L/M	L/M				L/M	L/M	8
347		City-3					L/M	L/M					L/M	L/M						L/M	L/M				L/M	L/M	8
348		Bukera				L/M	L/M					L/M	L/M						L/M	L/M					L/M	L/M	8
349		Chamber				L/M	L/M					L/M	L/M						L/M	L/M					L/M	L/M	8

Appendix B.5

Sr. No.	Name of Grid Station	Name of 11KV Feeders	00:00 TO 01:00	01:00 TO 02:00	02:00 TO 03:00	03:00 TO 04:00	04:00 TO 05:00	05:00 TO 06:00	06:00 TO 07:00	07:00 TO 08:00	08:00 TO 09:00	09:00 TO 10:00	10:00 TO 11:00	11:00 TO 12:00	12:00 TO 13:00	13:00 TO 14:00	14:00 TO 15:00	15:00 TO 16:00	16:00 TO 17:00	17:00 TO 18:00	18:00 TO 19:00	19:00 TO 20:00	20:00 TO 21:00	21:00 TO 22:00	22:00 TO 23:00	23:00 TO 24:00	No. Of Hours
350	132/66/11kv Samaro	S.Road				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
351		City				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
352		Pathoro				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
353		S-3				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
354		Kunri					L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M	8
355		S-2					L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M	8
356	66KV Mithi	City					L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M	8
357		Chaelahar		L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M				8
358	66KV Noukot	City		L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M				8
359		Judho					L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M	8
360		Khethory					L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M	8
361	66kv Tando Jan Muhammad	City						L/M	L/M					L/M	L/M					L/M	L/M				L/M	L/M	8
362		Chuck - 190						L/M	L/M					L/M	L/M					L/M	L/M				L/M	L/M	8
363		Jhudo	L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M					8
364	66KV Nabiser	City	L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M					8
365		Memon Kunri				L/M	L/M				L/M	L/M				L/M	L/M				L/M	L/M					8
366	66kv Islamkot	City				L/M	L/M				L/M	L/M				L/M	L/M				L/M	L/M					8
367		Thar col		L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M				8
368	66kv Pangrio	City	L/M					L/M	L/M					L/M	L/M					L/M	L/M					L/M	8
369	66kv Diplo	City				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
370	66kv Nagar Parkar	City				L/M	L/M				L/M	L/M				L/M	L/M				L/M	L/M					8
371	132KV Kolai	City		L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M				8
372	66kv Khipro	T.M.Khan	L/M					L/M	L/M					L/M	L/M					L/M	L/M					L/M	8
373		City				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
374	66kv Kandiari	Kandiari					L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M	8
375		Sidhri					L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M	8
376		LBODK-1				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
377		LBODK-2				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
378		LBODK-3					L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M	8
379		LBODK-4					L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M	8
380	132/66/11kv Umer Kot	Dhoronaro	L/M					L/M	L/M					L/M	L/M					L/M	L/M					L/M	8
381		City	L/M					L/M	L/M					L/M	L/M					L/M	L/M					L/M	8
382		Chhore	L/M					L/M	L/M					L/M	L/M					L/M	L/M					L/M	8
383		Bhagal				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
384		G.M.Talpur				L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M		8
385	66kv Chachro	City					L/M	L/M					L/M	L/M					L/M	L/M					L/M	L/M	8
386		Oddani						L/M	L/M					L/M	L/M					L/M	L/M				L/M	L/M	8
387	66kv Pithoro	City						L/M	L/M					L/M	L/M					L/M	L/M				L/M	L/M	8
388	66kv Kunri	City					L/M	L/M					L/M	L/M					L/M	L/M				L/M	L/M		8
389		City-II					L/M	L/M					L/M	L/M					L/M	L/M				L/M	L/M		8
390		Talpur						L/M	L/M					L/M	L/M					L/M	L/M				L/M	L/M	8

Appendix B.6

LOAD MANAGEMENT SCHEDULE FOR THE MONTH OF OCTOBER-2013
IN RESPECT OF SEPCO SUKKUR

S#	NAME OF			AVE. LOAD	0:00 TO 1:00	1:00 TO 2:00	2:00 TO 3:00	3:00 TO 4:00	4:00 TO 5:00	5:00 TO 6:00	6:00 TO 7:00	7:00 TO 8:00	8:00 TO 9:00	9:00 TO 10:00	10:00 TO 11:00	11:00 TO 12:00	12:00 TO 13:00	13:00 TO 14:00	14:00 TO 15:00	15:00 TO 16:00	16:00 TO 17:00	17:00 TO 18:00	18:00 TO 19:00	19:00 TO 20:00	20:00 TO 21:00	21:00 TO 22:00	22:00 TO 23:00	23:00 TO 0:00
	Grid	Tele No.	11KV Feeder																									
1			Bagargi-II	220	-	-	-	-	220	220	-	-	-	-	220	220	-	-	-	-	220	220	-	-	-	220	220	-
2			Station Road	210	-	-	-	-	-	210	-	-	-	-	-	210	-	-	-	-	210	210	-	-	-	-	210	210
3			Shahrah-e-Tasneem	105	-	-	105	-	-	-	-		105	-	-	-	-	-	105	105	-	-	-	105	105	-	-	-
4			Bagargi-I	190	-	-	-	-	190	190	-	-	-	-	190	190	-	-	-	-	190	190	-	-	-	190	190	-
5			Saeedabad	30	-	-	30	30	-	-	-	-	30	30	-	-	-	-	30	30	-	-	-	30	30	-	-
6			Sukkur Town Ship	20	20	-	-	-	-	-	20	-	-	-	-	-	20	20	-	-	-	-	20	20	-	-	-	-
7			IBA	30	-	-	30	-	-	-	-	-	30	-	-	-	-	-	30	30	-	-	-	-	30	30	-	-
8	**1. 132 kV	0315-3383135,	Saeedabad Industrial	110	-	-	110	110	-	-	-	-	110	110	-	-	-	-	110	110	-	-	-	-	110	110	-	-
9	Arain Road	071-5630298	Indus Valley	10	10	-	-	-	-	-	10	-	-	-	-	-	10	10	-	-	-	-	10	10	-	-	-	-
10			Naseerabad	45	45	45	-	-	-	-	45	45	-	-	-	-	45	45	-	-	-	-	45	45	-	-	-	-
11			PAF	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12			Shahrah-e-Abbasi	40	-	40	-	-	-	-	-	40	-	-	-	-	-	40	40	-	-	-	-	40	40	-	-	-
13			Airport Road	45	45	45	-	-	-	-	45	45	-	-	-	-	45	45	-	-	-	-	45	45	-	-	-	-
14			Sabzi Mandi	200	200	-	-	-	-	-	200	-	-	-	-	-	200	-	-	-	-	-	200	200	-	-	-	200
15			Civil Aviation Auth:	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16			New Bachal Shah	125	125	125	-	-	-	-	125	125	-	-	-	-	125	125	-	-	-	-	125	125	-	-	-	-
			TOTAL (AMPS)	1,430	445	255	275	140	410	620	445	255	275	140	410	620	445	285	315	275	620	620	445	590	315	580	620	410
1			Qureshi Road	280	-	-	-	280	-	-	-	-	-	280	-	-	-	-	-	280	280	-	-	-	-	280	280	-
2			New Pind	100	-	-	-	-	100	-	-	-	-	-	100	-	-	-	-	-	100	100	-	-	-	-	100	100
3			Royal Road	185	-	-	-	185	-	-	-	-	-	185	-	-	-	-	-	185	185	-	-	-	-	185	185	-
4			Jinnah Chowk	235	-	-	-	-	-	235	-	-	-	-	-	235	-	-	-	-	235	235	-	-	-	-	235	235
5			Shalimar	230	-	-	-	230	-	-	-	-	-	230	-	-	-	-	-	230	230	-	-	-	230	230	-
6	**2. 132 kV	0311-8481673,	Golimar	150	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	150	150	150	150	-	-
7	Sukkur Site	071-5630275	Ahmed Nagar	145	-	145	-	-	-	-	-	145	-	-	-	-	-	145	145	-	-	-	-	145	145	-	-	-
8			Society	190	-	-	-	-	190	-	-	-	-	-	190	-	-	-	-	-	190	190	-	-	-	-	190	190
9			Qasimabad	255	-	-	-	-	255	-	-	-	-	-	255	-	-	-	-	-	255	255	-	-	-	-	255	255
10			ADC	185	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	185	185	185	185	-	-
11			Sarafa Bazaar	220	-	-	-	220	-	-	-	-	-	220	-	-	-	-	-	220	220	-	-	-	-	220	220	-
12			G.A Shah	195	-	-	195	-	-	-	-	-	195	-	-	-	-	-	195	195	-	-	-	-	195	195	-	-
			TOTAL (AMPS)	2,370	0	145	195	915	545	235	0	145	195	915	545	235	0	145	340	1,110	1,695	780	335	480	675	1,445	1,695	780
1			Military Road	70	-	-	70	-	-	-	-	-	70	-	-	-	-	-	70	70	-	-	-	-	70	70	-	-
2			High Court Road	125	-	125	-	-	-	-	-	125	-	-	-	-	-	-	125	125	-	-	-	125	125	-	-	-
3			Minara Road	210	-	-	-	-	-	210	-	-	-	-	-	210	-	-	-	-	-	210	210	-	-	-	210	210
4			Mir Masoom Shah	110	-	-	-	-	-	110	-	-	-	-	-	110	-	-	-	-	-	110	110	-	-	-	110	110
5	**3. 66 kV	0314-2909245,	Shahi Bazar	160	-	-	-	160	-	-	-	-	-	160	-	-	-	-	-	160	160	-	-	-	-	160	160	-
6	Sukkur City	071-5631320	Nishtar Road	65	-	-	-	65	-	-	-	-	-	65	-	-	-	-	-	65	65	-	-	-	-	65	65	-
7			Pak: Railway	35	35	-	-	-	-	-	35	-	-	-	-	-	-	-	-	-	-	35	35	-	-	35	35	-
8			Queens Road	195	195	-	-	-	-	-	195	-	-	-	-	-	195	195	-	-	-	-	195	195	-	-	-	-
9			Shamsabad	140	-	-	-	-	140	-	-	-	-	-	140	-	-	-	-	-	140	140	-	-	-	-	140	140
10			Bunder Road	120	-	-	-	-	120	-	-	-	-	-	120	-	-	-	-	-	120	120	-	-	-	-	120	120
			TOTAL (AMPS)	1,230	230	125	70	225	260	320	230	125	70	225	260	320	195	195	195	420	485	615	550	320	195	330	840	580
1			Sorah Gate	105	-	-	-	-	-	-	-	-	105	105	105	-	-	-	-	105	105	105	-	-	-	-	-	-
2	**4. 66 kV	0315-3775024	Sangrar	120	-	-	-	-	-	120	120	120	-	-	-	-	-	-	-	-	-	-	120	120	120	-	-	-
3	Nara-I		Khabri Bhit	130	-	-	-	-	-	-	-	-	-	-	-	130	130	130	-	-	-	-	-	-	130	130	130	-
4			Salehpat	165	-	-	-	-	-	-	-	-	-	-	-	165	165	165	-	-	-	-	-	-	165	165	165	-
			TOTAL (AMPS)	520	0	0	0	0	0	120	120	120	105	105	105	295	295	295	0	105	105	105	120	120	415	295	295	0
1	**5. 66KV	0302-3636204	Tajjal	85	-	-	85	85	-	-	-	-	85	85	-	-	-	-	85	85	-	-	-	-	85	85	-	-
2	Nara-II		New Choondko	100	-	-	-	-	100	100	-	-	-	-	100	100	-	-	-	-	100	100	-	-	-	-	100	100
3			Pirano Patan	145	145	145	-	-	-	-	145	145	-	-	-	-	145	145	-	-	-	-	145	145	-	-	-	-
			TOTAL (AMPS)	330	145	145	85	85	100	100	145	145	85	85	100	100	145	145	85	85	100	100	145	145	85	85	100	100

Appendix B.6

S#	NAME OF			AVE. LOAD	0:00 TO 1:00	1:00 TO 2:00	2:00 TO 3:00	3:00 TO 4:00	4:00 TO 5:00	5:00 TO 6:00	6:00 TO 7:00	7:00 TO 8:00	8:00 TO 9:00	9:00 TO 10:00	10:00 TO 11:00	11:00 TO 12:00	12:00 TO 13:00	13:00 TO 14:00	14:00 TO 15:00	15:00 TO 16:00	16:00 TO 17:00	17:00 TO 18:00	18:00 TO 19:00	19:00 TO 20:00	20:00 TO 21:00	21:00 TO 22:00	22:00 TO 23:00	23:00 TO 0:00
	Grid	Tele No.	11KV Feeder		1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	0:00
1	**6. 132 kV Ghotki	0315-6819131	Adilpur	150	150	150	-	-	-	-	150	150	-	-	-	-	150	150	-	-	-	-	150	150	-	-	-	-
2			Rehmoo Wali/City-II	270	-	-	270	270	-	-	-	-	270	270	-	-	-	-	270	270	-	-	-	-	270	270	-	-
3			Kacho Bindi	160	160	160	-	-	-	-	160	160	-	-	-	-	160	160	-	-	-	-	160	160	-	-	-	-
4			Ghota	220	220	220	-	-	-	-	220	220	-	-	-	-	220	220	-	-	-	-	220	220	-	-	-	-
5			Attal Muradani	80	-	-	-	-	80	80	-	-	-	-	80	80	-	-	-	-	80	80	-	-	-	-	80	80
6			Dari	85	-	-	-	-	85	85	-	-	-	-	85	85	-	-	-	-	85	85	-	-	-	-	85	85
7			Qadirpur	90	90	90	-	-	-	-	90	90	-	-	-	-	90	90	-	-	-	-	90	90	-	-	-	-
8			Shahi Bazar/City-I	270	-	-	270	270	-	-	-	-	270	270	-	-	-	-	270	270	-	-	-	-	270	270	-	-
9			Engro	0	-	-	-	-	0	0	-	-	-	-	0	0	-	-	-	-	0	0	-	-	-	-	0	0
10			Sarhad	145	-	-	-	-	145	145	-	-	-	-	145	145	-	-	-	-	145	145	-	-	-	-	145	145
11			Industrial	210	-	-	210	210	-	-	-	-	210	210	-	-	-	-	210	210	-	-	-	-	210	210	-	-
12			Sugar Mill	18	-	-	-	-	-	18	18	-	-	-	-	-	18	18	-	-	-	-	18	18	-	-	-	-
			TOTAL (AMPS)	1,698	620	620	750	750	310	328	638	620	750	750	310	310	638	638	750	750	310	310	638	638	750	750	310	310
1	**7. 132 kV Pano Akil	0312-3913284	Cantt-II	120	120	120	-	-	-	-	-	-	-	120	120	-	-	120	-	-	-	120	-	-	-	-	-	-
2			Hussain Kalwar	145	-	-	145	145	-	-	-	-	145	145	-	-	-	-	145	145	-	-	-	-	145	145	-	-
3			City-I	280	-	-	-	-	280	280	-	-	-	-	280	280	-	-	-	-	280	280	-	-	-	-	280	280
4			Hingoro	120	120	120	-	-	-	-	120	120	-	-	-	-	120	120	-	-	-	-	120	120	-	-	-	-
5			Haleji	80	80	80	-	-	-	-	80	80	-	-	-	-	80	80	-	-	-	-	80	80	-	-	-	-
6			StationRoad	260	-	-	-	-	260	260	-	-	-	-	260	260	-	-	-	-	260	260	-	-	-	-	260	260
7			Cantt-I	70	-	-	70	70	-	-	-	-	70	70	-	-	70	-	-	-	-	70	-	-	-	-	-	-
8			Kot Bulla	145	-	-	-	-	145	145	-	-	-	-	145	145	-	-	-	-	145	145	-	-	-	-	145	145
9			Salhani	110	-	-	-	-	110	110	-	-	-	-	110	110	-	-	-	-	110	110	-	-	-	-	110	110
10			Noraja	100	100	100	-	-	-	-	100	100	-	-	-	-	100	100	-	-	-	-	100	100	-	-	-	-
11			Samo Chachar	20	-	-	20	20	-	-	-	-	20	20	-	-	-	-	20	20	-	-	-	-	20	20	-	-
12			Moula Ali	95	-	-	95	95	-	-	-	-	95	95	-	-	-	-	95	95	-	-	-	-	95	95	-	-
13			Cadet College	10	-	-	-	-	10	10	-	-	-	-	10	10	-	-	-	-	10	10	-	-	-	-	10	10
			TOTAL (AMPS)	1,555	420	420	330	330	805	805	300	300	330	450	925	805	370	420	260	260	805	995	300	300	260	260	805	805
1	**8. 132 kV M'Mathelo	0313-7270954	Nau Kot	140	-	-	140	140	-	-	-	-	140	140	-	-	-	-	140	140	-	-	-	-	140	140	-	-
2			Jahanpur/TW-I	170	170	170	-	-	-	-	170	170	-	-	-	-	170	170	-	-	-	-	170	170	-	-	-	-
3			Yaro Lund/M'Minor	135	135	135	-	-	-	-	135	135	-	-	-	-	135	135	-	-	-	-	135	135	-	-	-	-
4			City-I	125	-	-	-	-	125	125	-	-	-	-	125	125	-	-	-	-	125	125	-	-	-	-	125	125
5			Old Market	145	-	-	-	-	145	145	-	-	-	-	145	145	-	-	-	-	145	145	-	-	-	-	145	145
6			Dad Laghari	110	-	-	110	110	-	-	-	-	110	110	-	-	-	-	110	110	-	-	-	-	110	110	-	-
7			Jarwar	185	-	-	185	185	-	-	-	-	185	185	-	-	-	-	185	185	-	-	-	-	185	185	-	-
			TOTAL (AMPS)	1,010	305	305	435	435	270	270	305	305	435	435	270	270	305	305	435	435	270	270	305	305	435	435	270	270
1	**9. 132kV Mubarakpur	0313-8113287	Mubarakpur City	115	115	115	-	-	-	-	115	115	-	-	-	-	115	115	-	-	-	-	115	115	-	-	-	-
			TOTAL (AMPS)	115	115	115	0	0	0	0	115	115	0	0	0	0	115	115	0	0	0	0	115	115	0	0	0	0
1	**10.132kV Kh'Mahar	0312-3903140	Khan Garh	80	-	-	-	-	80	80	-	-	-	-	80	80	-	-	-	-	80	80	-	-	-	-	80	80
2			Khanpur City	195	-	-	-	-	195	195	-	-	-	-	195	195	-	-	-	-	195	195	-	-	-	-	195	195
3			Saleh Mahar	55	55	55	-	-	-	-	55	55	-	-	-	-	55	55	-	-	-	-	55	55	-	-	-	-
4			Moomal Ji Mari	85	-	-	85	85	-	-	-	-	85	85	-	-	-	-	85	85	-	-	-	-	85	85	-	-
			TOTAL (AMPS)	415	55	55	85	85	275	275	55	55	85	85	275	275	55	55	85	85	275	275	55	55	85	85	275	275
1	**11. 132 kV Daharki	0311-2153958	Pak Saudi	0	-	-	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0
2			Shahi Bazar	205	-	-	-	-	205	205	-	-	-	-	205	205	-	-	-	-	205	205	-	-	-	-	205	205
3			Bharchoondi	145	-	-	145	145	-	-	-	-	145	145	-	-	-	-	145	145	-	-	-	-	145	145	-	-
4			Hafizabad	190	-	-	-	-	190	190	-	-	-	-	190	190	-	-	-	-	190	190	-	-	-	-	190	190
5			Khenjo	145	145	145	-	-	-	-	145	145	-	-	-	-	145	145	-	-	-	-	145	145	-	-	-	-
6			Industrial	140	-	-	-	-	140	140	-	-	-	-	140	140	-	-	-	-	140	140	-	-	-	-	140	140
			TOTAL (AMPS)	825	145	145	145	145	535	535	145	145	145	145	535	535	145	145	145	145	535	535	145	145	145	145	535	535
1	**12. 132 kV Ubauro	0315-3368245	Rati	120	120	120	-	-	-	-	120	120	-	-	-	-	120	120	-	-	-	-	120	120	-	-	-	-
2			Raunty	90	-	-	90	90	-	-	-	-	90	90	-	-	-	-	90	90	-	-	-	-	90	90	-	-
3			Dilwaro	70	-	-	70	70	-	-	-	-	70	70	-	-	-	-	70	70	-	-	-	-	70	70	-	-
4			City	200	-	-	-	-	200	200	-	-	-	-	200	200	-	-	-	-	200	200	-	-	-	-	200	200
5			Kamoo Shaheed	95	95	95	-	-	-	-	95	95	-	-	-	-	95	95	-	-	-	-	95	95	-	-	-	-
6			Daharki Sugar Mill	18	-	-	-	-	18	18	-	-	-	-	-	-	-	-	18	18	-	-	-	-	18	18	-	-
			TOTAL (AMPS)	593	215	215	160	160	218	218	215	215	160	160	200	200	215	215	178	178	200	200	215	215	178	178	200	200

Appendix B.6

S#	NAME OF			AVE. LOAD	0:00 TO 1:00	1:00 TO 2:00	2:00 TO 3:00	3:00 TO 4:00	4:00 TO 5:00	5:00 TO 6:00	6:00 TO 7:00	7:00 TO 8:00	8:00 TO 9:00	9:00 TO 10:00	10:00 TO 11:00	11:00 TO 12:00	12:00 TO 13:00	13:00 TO 14:00	14:00 TO 15:00	15:00 TO 16:00	16:00 TO 17:00	17:00 TO 18:00	18:00 TO 19:00	19:00 TO 20:00	20:00 TO 21:00	21:00 TO 22:00	22:00 TO 23:00	23:00 TO 0:00
	Grid	Tele No.	11KV Feeder		1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	0:00
1	**13. 132 kV Guddu Left	0312-3912403	Mashka	210	-	-	-	-	210	210	-	-	-	-	210	210	-	-	-	-	210	210	-	-	-	-	210	210
2			Guddu City	80	80	80	-	-	-	-	80	80	-	-	-	-	80	80	-	-	-	-	80	80	-	-	-	-
3			Khambra	125	125	125	-	-	-	-	125	125	-	-	-	-	125	125	-	-	-	-	125	125	-	-	-	-
4			Dau Wala	90	-	-	90	90	-	-	-	-	90	90	-	-	-	-	90	90	-	-	-	-	90	90	-	-
			TOTAL (AMPS)	505	205	205	90	90	210	210	205	205	90	90	210	210	205	205	90	90	210	210	205	205	90	90	210	210
1	**14. 132 kV Rohri	0314-7515066, 071-5651448	Rohri City-I	215	215	215	-	-	-	-	215	215	-	-	-	-	215	215	-	-	-	-	215	215	-	-	-	-
2			Ali Wahan	98	-	-	98	98	-	-	-	-	98	98	-	-	-	-	98	98	-	-	-	-	98	98	-	-
3			Hajna Shah City-II	200	215	215	-	-	-	-	215	215	-	-	-	-	215	215	-	-	-	-	215	215	-	-	-	-
4			Central Jail	250	-	-	-	-	250	250	-	-	-	-	250	250	-	-	-	-	250	250	-	-	-	-	250	250
5			Industral	125	125	-	-	-	-	-	125	-	-	-	-	-	125	125	-	-	-	-	125	125	-	-	-	-
6			Locoshed	65	215	215	-	-	-	-	215	215	-	-	-	-	215	215	-	-	-	-	215	215	-	-	-	-
7			Kandhra	143	-	-	143	143	-	-	-	-	143	143	-	-	-	-	143	143	-	-	-	143	143	-	-	-
8			Arore	83	-	-	-	-	83	83	-	-	-	-	83	83	-	-	-	-	83	83	-	-	-	-	83	83
9			Bin Qasim	145	-	-	-	-	-	145	145	145	145	-	-	-	-	-	-	-	-	145	145	145	145	-	-	-
10			Mari (Left Bank)	90	-	-	90	90	-	-	-	-	90	90	-	-	-	-	90	90	-	-	-	90	90	-	-	-
			TOTAL (AMPS)	1,413	770	645	330	330	333	478	915	790	475	330	333	333	770	770	330	330	333	478	915	1,148	475	98	333	333
1	**15. 132 kV Khairpur	0311-3920883, 0243-9280036	Faiz Abad/Thehri	58	-	-	-	-	58	58	-	-	-	-	58	58	-	-	-	-	58	58	-	-	-	-	58	58
2			Khaki Shah Pul	180	-	-	-	-	180	180	-	-	-	-	180	180	-	-	-	-	180	180	-	-	-	-	180	180
3			Radio Pak	190	-	-	190	190	-	-	-	-	190	190	-	-	-	-	190	190	-	-	-	-	190	190	-	-
4			Tando Masti	48	48	48	-	-	-	-	48	48	-	-	-	-	48	48	-	-	-	-	48	48	-	-	-	-
5			Shah Ladhani	80	-	-	-	-	80	80	-	-	-	-	80	80	-	-	-	-	80	80	-	-	-	-	80	80
6			Shah Hussian	58	58	58	-	-	-	-	58	58	-	-	-	-	58	58	-	-	-	-	58	58	-	-	-	-
7			Shahi Bazar	120	-	-	-	-	120	120	-	-	-	-	120	120	-	-	-	-	120	120	-	-	-	-	120	120
8			Panj Hati	260	-	-	-	-	260	260	-	-	-	-	260	260	-	-	-	-	260	260	-	-	-	-	260	260
9			Luqman	120	-	-	-	-	120	120	-	-	-	-	120	120	-	-	-	-	120	120	-	-	-	-	120	120
10			Dargha Rampuri	210	-	-	-	-	210	210	-	-	-	-	210	210	-	-	-	-	210	210	-	-	-	-	210	210
11			Long Fakeer	95	-	-	95	95	-	-	-	-	95	95	-	-	-	-	95	95	-	-	-	95	95	-	-	-
12			Hospital Road	98	-	-	-	-	98	98	-	-	-	-	98	98	-	-	-	-	98	98	-	-	-	-	98	98
13			University	135	-	-	-	-	135	135	-	-	-	-	135	135	-	-	-	-	135	135	-	-	-	-	135	135
14			Ulra	96	96	96	-	-	-	-	96	96	-	-	-	-	96	96	-	-	-	-	96	96	-	-	-	-
15			Shah Latif University	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16			Nareja/TW	53	53	53	-	-	-	-	53	53	-	-	-	-	53	53	-	-	-	-	53	53	-	-	-	-
			TOTAL (AMPS)	1,828	253	253	285	285	1,260	1,260	253	253	285	285	1,260	1,260	253	253	285	285	1,260	1,260	253	253	285	285	1,260	1,260
1	**16. 132KV Pir-Jo- Goth	0243-611080	Noorpur	85	85	85	-	-	-	-	85	85	-	-	-	-	85	85	-	-	-	-	85	85	-	-	-	-
2			City-I	265	-	-	-	-	265	265	-	-	-	-	265	265	-	-	-	-	265	265	-	-	-	-	265	265
3			Ahmedpur	165	165	165	-	-	-	-	165	165	-	-	-	-	165	165	-	-	-	-	165	165	-	-	-	-
4			Piryalo	190	-	-	-	-	190	190	-	-	-	-	190	190	-	-	-	-	190	190	-	-	-	-	190	190
5			K.T Pagaro	105	-	-	105	105	-	-	-	-	105	105	-	-	-	-	105	105	-	-	-	-	105	105	-	-
6			Hadal Shah	170	-	-	170	170	-	-	-	-	170	170	-	-	-	-	170	170	-	-	-	-	170	170	-	-
			TOTAL (AMPS)	980	250	250	275	275	455	455	250	250	275	275	455	455	250	250	275	275	455	455	250	250	275	275	455	455
1	**17. 132 kV Kot Diji	0243-556399	New Kumb	150	-	-	-	-	150	150	-	-	-	-	-	-	150	150	-	-	-	-	150	150	-	-	150	150
2			Kot Diji City	95	-	-	-	-	95	95	-	-	-	-	-	-	95	95	-	-	-	-	95	95	-	-	95	95
3			Chodahoo/Bay-6	115	115	115	-	-	-	-	115	115	-	-	-	-	115	115	-	-	-	-	115	115	-	-	-	-
4			SZB Sultan/Umul Quroom	10	10	10	-	-	-	-	10	10	-	-	-	-	10	10	-	-	-	-	10	10	-	-	-	-
5			Hami	60	-	-	60	60	-	-	-	-	60	60	-	-	-	-	60	60	-	-	-	-	60	60	-	-
6			Hussain Abad	75	-	-	75	75	-	-	-	-	75	75	-	-	-	-	75	75	-	-	-	-	75	75	-	-
			TOTAL (AMPS)	505	125	125	135	135	245	245	125	125	135	135	0	0	370	370	135	135	0	0	370	370	135	135	245	245
1	**18. 132 kV Gambat	0243-640974, 0333-7297947	Kumb	105	105	105	-	-	-	-	105	105	-	-	-	-	105	105	-	-	-	-	105	105	-	-	-	-
2			Gambat City	260	-	-	-	-	260	260	-	-	-	-	260	260	-	-	-	-	260	260	-	-	-	-	260	260
3			Sohbo Dero	170	-	-	-	-	170	170	-	-	-	-	170	170	-	-	-	-	170	170	-	-	-	-	170	170
4			Ranipur City	190	-	-	-	-	190	190	-	-	-	-	190	190	-	-	-	-	190	190	-	-	-	-	190	190
5			Rippri/ TW-I	195	195	195	-	-	-	-	195	195	-	-	-	-	195	195	-	-	-	-	195	195	-	-	-	-
6			Wada Maheser/TW-II	120	-	-	120	120	-	-	-	-	120	120	-	-	-	-	120	120	-	-	-	-	120	120	-	-
7			Ugra	185	185	185	-	-	-	-	185	185	-	-	-	-	185	185	-	-	-	-	185	185	-	-	-	-
8			Sagyoon/TW-IV	190	-	-	190	190	-	-	-	-	190	190	-	-	-	-	190	190	-	-	-	-	190	190	-	-
9			Noorpur	125	-	-	-	-	125	125	-	-	-	-	125	125	-	-	-	-	125	125	-	-	-	-	125	125
10			Khuhra City	190	-	-	-	-	190	190	-	-	-	-	190	190	-	-	-	-	190	190	-	-	-	-	190	190
11			Nangrega/TW-III	90	-	-	90	90	-	-	-	-	90	90	-	-	-	-	90	90	-	-	-	-	90	90	-	-
			TOTAL (AMPS)	1,820	485	485	400	400	935	935	485	485	400	400	935	935	485	485	400	400	935	935	485	485	400	400	935	935

Appendix B.6

S#	NAME OF			AVE. LOAD	0:00 TO 1:00	1:00 TO 2:00	2:00 TO 3:00	3:00 TO 4:00	4:00 TO 5:00	5:00 TO 6:00	6:00 TO 7:00	7:00 TO 8:00	8:00 TO 9:00	9:00 TO 10:00	10:00 TO 11:00	11:00 TO 12:00	12:00 TO 13:00	13:00 TO 14:00	14:00 TO 15:00	15:00 TO 16:00	16:00 TO 17:00	17:00 TO 18:00	18:00 TO 19:00	19:00 TO 20:00	20:00 TO 21:00	21:00 TO 22:00	22:00 TO 23:00	23:00 TO 0:00
	Grid	Tele No.	11KV Feeder		1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	0:00
1	**19. 132KV Shah Ladhani	0243-530141	Therhi	185	-	-	-	-	185	185	-	-	-	-	185	185	-	-	-	-	185	185	-	-	-	-	185	185
2			New Shah Ladhani	90	90	90	-	-	-	-	90	90	-	-	-	-	90	90	-	-	-	-	90	90	-	-	-	-	-
3			New Tuniya Pull	65	-	-	65	65	-	-	-	-	65	65	-	-	-	-	65	65	-	-	-	-	65	65	-	-
			TOTAL (AMPS)	340	90	90	65	65	185	185	90	90	65	65	185	185	90	90	65	65	185	185	90	90	65	65	185	185
1	**20. 66KV Thari Mirwah	0243-790398	Thariwah	120	-	-	120	120	-	-	-	-	120	120	-	-	-	-	120	120	-	-	-	-	120	120	-	-
2			Zafarabad	115	-	-	115	115	-	-	-	-	115	115	-	-	-	-	115	115	-	-	-	-	115	115	-	-
3			Bozdar Wada	160	160	160	-	-	-	-	160	160	-	-	-	-	160	160	-	-	-	-	160	160	-	-	-	-
4			Akri Mirwah	140	-	-	-	-	140	140	-	-	-	-	140	140	-	-	-	-	140	140	-	-	-	-	140	140
			TOTAL (AMPS)	535	160	160	235	235	140	140	160	160	235	235	140	140	160	160	235	235	140	140	160	160	235	235	140	140
1	**21. 66KV Rasoolabad	0243-504748	Setharja	230	-	-	-	-	230	230	-	-	-	-	230	230	-	-	-	-	230	230	-	-	-	-	230	230
2			Gadeji	120	-	-	-	-	-	-	120	120	-	-	-	120	120	-	-	-	120	120	-	-	120	120	-	-
3			New Hingorja	165	-	-	165	165	-	-	-	-	165	165	-	-	-	-	165	165	-	-	-	-	165	165	-	-
4			Akri	15	15	15	-	-	-	-	15	15	-	-	-	-	15	15	-	-	-	-	15	15	-	-	-	-
			TOTAL (AMPS)	530	15	15	165	165	230	230	135	135	165	165	230	350	135	15	165	165	350	350	15	15	285	285	230	230
1	**22. 132 kV Mehrabpur	0242-537758	City-I	200	-	-	200	200	-	-	-	-	200	200	-	-	-	-	200	200	-	-	-	-	200	200	-	-
2			New Kotri Kabir	100	100	100	-	-	-	-	100	100	-	-	-	-	100	100	-	-	-	-	100	100	-	-	-	-
3			City-II	135	-	-	135	135	-	-	-	-	135	135	-	-	-	-	135	135	-	-	-	-	135	135	-	-
4			New Lakha Road	10	-	-	-	-	10	10	-	-	-	-	10	10	-	-	-	-	10	10	-	-	-	-	10	10
			TOTAL (AMPS)	445	100	100	335	335	10	10	100	100	335	335	10	10	100	100	335	335	10	10	100	100	335	335	10	10
1	**23. 132 kV Moro	0242-411224, 526538, 0314-6178260	Jamali	135	-	-	135	135	-	-	-	-	135	135	-	-	-	-	135	135	-	-	-	-	135	135	-	-
2			Jatoi-II	230	-	-	-	-	230	230	-	-	-	-	230	230	-	-	-	-	230	230	-	-	-	-	230	230
3			City-II	235	235	235	-	-	-	-	235	235	-	-	-	-	235	235	-	-	-	-	235	235	-	-	-	-
4			City-III	250	250	250	-	-	-	-	250	250	-	-	-	-	250	250	-	-	-	-	250	250	-	-	-	-
5			TV Booster	120	-	-	120	120	-	-	-	-	120	120	-	-	-	-	120	120	-	-	-	-	120	120	-	-
6			MDF-B	145	-	-	-	-	145	145	-	-	-	-	-	-	-	-	-	-	-	-	145	145	145	145	-	-
7			City-I	350	350	350	-	-	-	-	350	350	-	-	-	-	350	350	-	-	-	-	350	350	-	-	-	-
8			Mubeja	35	-	-	-	-	35	35	-	-	-	-	35	35	-	-	-	-	35	35	-	-	-	-	35	35
			TOTAL (AMPS)	1,500	835	835	255	255	410	410	835	835	255	255	265	265	835	835	255	255	265	265	980	980	400	400	265	265
1	**24. 132 kV Kandiaro	0242-533590, 0331-2906893	Kamal Dero	180	180	180	-	-	-	-	180	180	-	-	-	-	180	180	-	-	-	-	180	180	-	-	-	-
2			Khan Wahan	105	-	-	105	105	-	-	-	-	105	105	-	-	-	-	105	105	-	-	-	-	105	105	-	-
3			S.Z Ali Shah	103	103	103	-	-	-	-	103	103	-	-	-	-	103	103	-	-	-	-	103	103	-	-	-	-
4			Kotri Kabir	150	-	-	-	-	150	150	-	-	-	-	150	150	-	-	-	-	150	150	-	-	-	-	150	150
5			Kandiaro City	173	-	-	-	-	173	173	-	-	-	-	173	173	-	-	-	-	173	173	-	-	-	-	173	173
6			R.S.K.K	200	200	200	-	-	-	-	200	200	-	-	-	-	200	200	-	-	-	-	200	200	-	-	-	-
7			Muhabat Dero	125	-	-	125	125	-	-	-	-	125	125	-	-	-	-	125	125	-	-	-	-	125	125	-	-
8			Bhira Road	38	-	-	38	38	-	-	-	-	38	38	-	-	-	-	38	38	-	-	-	-	38	38	-	-
9			Darbelo	110	110	110	-	-	-	-	110	110	-	-	-	-	110	110	-	-	-	-	110	110	-	-	-	-
10			Lakha Road	180	-	-	180	180	-	-	-	-	180	180	-	-	-	-	180	180	-	-	-	-	180	180	-	-
11			Express	50	-	-	-	-	50	50	-	-	-	-	50	50	-	-	-	-	50	50	-	-	-	-	50	50
12			Dali	105	-	-	-	-	105	105	-	-	-	-	105	105	-	-	-	-	105	105	-	-	-	-	105	105
			TOTAL (AMPS)	1,518	593	593	448	448	478	478	593	593	448	448	478	478	593	593	448	448	478	478	593	593	448	448	478	478
1	**25.132kV N.Jatoi	0242-526537	S.Bachal Shah	120	-	-	-	-	120	120	-	-	-	-	120	120	-	-	-	-	120	120	-	-	-	-	120	120
2			New Jatoi	175	-	-	175	175	-	-	-	-	175	175	-	-	-	-	175	175	-	-	-	-	175	175	-	-
3			Deparja	200	200	200	-	-	-	-	200	200	-	-	-	-	200	200	-	-	-	-	200	200	-	-	-	-
			TOTAL (AMPS)	495	200	200	175	175	120	120	200	200	175	175	120	120	200	200	175	175	120	120	200	200	175	175	120	120
1	**26. 66KV Pad Eidan	0242-482262	Baghar	185	-	-	-	-	185	185	-	-	-	-	185	185	-	-	-	-	185	185	-	-	-	-	185	185
2			Karondi	145	145	145	-	-	-	-	145	145	-	-	-	-	145	145	-	-	-	-	145	145	-	-	-	-
3			City	150	-	-	-	-	150	150	-	-	-	-	150	150	-	-	-	-	150	150	-	-	-	-	150	150
4			Pacca Chang	115	-	-	115	115	-	-	-	-	115	115	-	-	-	-	115	115	-	-	-	-	115	115	-	-
5			D.K Mari	150	150	150	-	-	-	-	150	150	-	-	-	-	150	150	-	-	-	-	150	150	-	-	-	-
			TOTAL (AMPS)	745	295	295	115	115	335	335	295	295	115	115	335	335	295	295	115	115	335	335	295	295	115	115	335	335
1	**27. 132 kV Doulatpur	0244-320712	Shahpur Jahania	105	-	-	-	-	105	105	-	-	-	-	105	105	-	-	-	-	105	105	-	-	-	-	105	105
2			Haberi	110	110	110	-	-	-	-	110	110	-	-	-	-	110	110	-	-	-	-	110	110	-	-	-	-
3			Scarp-11-12	105	-	-	105	105	-	-	-	-	105	105	-	-	-	-	105	105	-	-	-	-	105	105	-	-
4			City	115	-	-	-	-	115	115	-	-	-	-	115	115	-	-	-	-	115	115	-	-	-	-	115	115
5			Gachero	65	-	-	65	65	-	-	-	-	65	65	-	-	-	-	65	65	-	-	-	-	65	65	-	-
			TOTAL (AMPS)	500	110	110	170	170	220	220	110	110	170	170	220	220	110	110	170	170	220	220	110	110	170	170	220	220

Appendix B.6

S#	NAME OF			AVE. LOAD	0:00 TO 1:00	1:00 TO 2:00	2:00 TO 3:00	3:00 TO 4:00	4:00 TO 5:00	5:00 TO 6:00	6:00 TO 7:00	7:00 TO 8:00	8:00 TO 9:00	9:00 TO 10:00	10:00 TO 11:00	11:00 TO 12:00	12:00 TO 13:00	13:00 TO 14:00	14:00 TO 15:00	15:00 TO 16:00	16:00 TO 17:00	17:00 TO 18:00	18:00 TO 19:00	19:00 TO 20:00	20:00 TO 21:00	21:00 TO 22:00	22:00 TO 23:00	23:00 TO 0:00
	Grid	Tele No.	11KV Feeder																									
1	**28. 132 kV Naushehro Feroze	0242-448203, 0242-531689, 0314-7511977	Chai Manumal	130	130	130	-	-	-	-	130	130	-	-	-	-	130	130	-	-	-	-	130	130	-	-	-	-
2			Dali Pota	135	135	135	-	-	-	-	135	135	-	-	-	-	135	135	-	-	-	-	135	135	-	-	-	-
3			Abran	105	-	-	-	-	105	105	-	-	-	-	105	105	-	-	-	-	105	105	-	-	-	-	105	105
4			Tharoo Shah	235	-	-	235	235	-	-	-	-	235	235	-	-	-	-	235	235	-	-	-	-	235	235	-	-
5			N'Feroze City-II	45	-	-	45	45	-	-	-	-	45	45	-	-	-	-	45	45	-	-	-	-	45	45	-	-
6			N'Feroze City-III	120	-	-	120	120	-	-	-	-	120	120	-	-	-	-	120	120	-	-	-	-	120	120	-	-
7			Bhira Road	140	140	140	-	-	-	-	140	140	-	-	-	-	140	140	-	-	-	-	140	140	-	-	-	-
8			Bhirya City-II	115	-	-	115	115	-	-	-	-	115	115	-	-	-	-	115	115	-	-	-	-	115	115	-	-
9			Pull	120	-	-	-	-	120	120	-	-	-	-	120	120	-	-	-	-	120	120	-	-	-	-	120	120
10			Mithiani	220	-	-	-	-	220	220	-	-	-	-	220	220	-	-	-	-	220	220	-	-	-	-	220	220
11			Bhirya City	105	105	105	-	-	-	-	105	105	-	-	-	-	105	105	-	-	-	-	105	105	-	-	-	-
12			N.S.F City	160	-	-	160	160	-	-	-	-	160	160	-	-	-	-	160	160	-	-	-	-	160	160	-	-
13			Bhurti	160	-	-	-	-	160	160	-	-	-	-	160	160	-	-	-	-	160	160	-	-	-	-	160	160
14			Munjuth	140	-	-	-	-	140	140	-	-	-	-	140	140	-	-	-	-	140	140	-	-	-	-	140	140
			TOTAL (AMPS)	1,930	510	510	675	675	745	745	510	510	675	675	745	745	510	510	675	675	745	745	510	510	675	675	745	745
1	**29. 132 kV Dadu	071-5001134	Sui Gas	135	-	-	135	135	-	-	-	-	135	135	-	-	-	-	135	135	-	-	-	-	135	135	-	-
2			City-II	275	-	-	-	-	275	275	-	-	-	-	275	275	-	-	-	-	275	275	-	-	-	-	275	275
3			Phulgi	275	275	275	-	-	-	-	275	275	-	-	-	-	275	275	-	-	-	-	275	275	-	-	-	-
4			Express	255	-	-	-	-	255	255	-	-	-	-	255	255	-	-	-	-	255	255	-	-	-	-	255	255
5			S.M Bilawal	130	-	-	130	130	-	-	-	-	130	130	-	-	-	-	130	130	-	-	-	-	130	130	-	-
6			City-I	230	-	-	230	230	-	-	-	-	230	230	-	-	-	-	230	230	-	-	-	-	230	230	-	-
7			City-III	295	-	-	-	-	295	295	-	-	-	-	295	295	-	-	-	-	295	295	-	-	-	-	295	295
8			City-IV	265	-	-	-	-	265	265	-	-	-	-	265	265	-	-	-	-	265	265	-	-	-	-	265	265
9			Talti	185	-	-	185	185	-	-	-	-	185	185	-	-	-	-	185	185	-	-	-	-	185	185	-	-
10			Khuda Abad	225	225	225	-	-	-	-	225	225	-	-	-	-	225	225	-	-	-	-	225	225	-	-	-	-
			TOTAL (AMPS)	2,270	500	500	680	680	1,090	1,090	500	500	680	680	1,090	1,090	500	500	680	680	1,090	1,090	500	500	680	680	1,090	1,090
1	**30. 132 kV Johi	071-5001098	City	185	-	-	185	185	-	-	-	-	185	185	-	-	-	-	185	185	-	-	-	-	185	185	-	-
2			Drigh Bala	180	-	-	-	-	180	180	-	-	-	-	180	180	-	-	-	-	180	180	-	-	-	-	180	180
3			Haji Khan	140	140	140	-	-	-	-	140	140	-	-	-	-	140	140	-	-	-	-	140	140	-	-	-	-
4			Kamal Khan	100	100	100	-	-	-	-	100	100	-	-	-	-	100	100	-	-	-	-	100	100	-	-	-	-
			TOTAL (AMPS)	605	240	240	185	185	180	180	240	240	185	185	180	180	240	240	185	185	180	180	240	240	185	185	180	180
1	**31. 132 kV K.N Shah	071-5001127	Khanpur	165	-	-	-	-	165	165	-	-	-	-	165	165	-	-	-	-	165	165	-	-	-	-	165	165
2			Theeba	95	-	-	95	95	-	-	-	-	95	95	-	-	-	-	95	95	-	-	-	-	95	95	-	-
3			Gozo	75	75	75	-	-	-	-	75	75	-	-	-	-	75	75	-	-	-	-	75	75	-	-	-	-
4			City-II	200	-	-	200	200	-	-	-	-	200	200	-	-	-	-	200	200	-	-	-	-	200	200	-	-
5			K.N Shah City-I	150	-	-	150	150	-	-	-	-	150	150	-	-	-	-	150	150	-	-	-	-	150	150	-	-
6			Rehmani Nager	365	365	365	-	-	-	-	365	365	-	-	-	-	365	365	-	-	-	-	365	365	-	-	-	-
7			T/Well	135	135	135	-	-	-	-	135	135	-	-	-	-	135	135	-	-	-	-	135	135	-	-	-	-
			TOTAL (AMPS)	1,185	575	575	445	445	165	165	575	575	445	445	165	165	575	575	445	445	165	165	575	575	445	445	165	165
1	**32. 132 kV Mehar	074-4109258	City-I	270	-	-	270	270	-	-	-	-	270	270	-	-	-	-	270	270	-	-	-	-	270	270	-	-
2			City-II	190	-	-	190	190	-	-	-	-	190	190	-	-	-	-	190	190	-	-	-	-	190	190	-	-
3			City-III	140	-	-	140	140	-	-	-	-	140	140	-	-	-	-	140	140	-	-	-	-	140	140	-	-
4			Faridabad	130	-	-	-	-	130	130	-	-	-	-	130	130	-	-	-	-	130	130	-	-	-	-	130	130
5			Old Beto	85	85	85	-	-	-	-	85	85	-	-	-	-	85	85	-	-	-	-	85	85	-	-	-	-
6			VIP Betto	60	-	-	-	-	60	60	-	-	-	-	60	60	-	-	-	-	60	60	-	-	-	-	60	60
7			Tube Well	75	75	75	-	-	-	-	75	75	-	-	-	-	75	75	-	-	-	-	75	75	-	-	-	-
			TOTAL (AMPS)	950	160	160	600	600	190	190	160	160	600	600	190	190	160	160	600	600	190	190	160	160	600	600	190	190
1	**33. 132 kV R'Nagar	071-5001091	City	180	-	-	-	-	180	180	-	-	-	-	180	180	-	-	-	-	180	180	-	-	-	-	180	180
2			Muhammad Shah	140	140	140	-	-	-	-	140	140	-	-	-	-	140	140	-	-	-	-	140	140	-	-	-	-
3			Bughia	45	-	-	45	45	-	-	-	-	45	45	-	-	-	-	45	45	-	-	-	-	45	45	-	-
4			Piyaro	115	-	-	115	115	-	-	-	-	115	115	-	-	-	-	115	115	-	-	-	-	115	115	-	-
			TOTAL (AMPS)	480	140	140	160	160	180	180	140	140	160	160	180	180	140	140	160	160	180	180	140	140	160	160	180	180
1	**34. 132 kV W'Pandhi	071-5001107	Wahi Pandhi	280	-	-	-	-	280	280	-	-	-	-	280	280	-	-	-	-	280	280	-	-	-	-	280	280
2			Gaji Shah	263	-	-	-	-	263	263	-	-	-	-	263	263	-	-	-	-	263	263	-	-	-	-	263	263
			TOTAL (AMPS)	543	0	0	0	0	543	543	0	0	0	0	543	543	0	0	0	0	543	543	0	0	0	0	543	543
1	**35. 132 kV Faridabad	074-4119033	City	33	33	33	-	-	-	-	33	33	-	-	-	-	33	33	-	-	-	-	33	33	-	-	-	-
2			Khan jo Goth	83	83	83	-	-	-	-	83	83	-	-	-	-	83	83	-	-	-	-	83	83	-	-	-	-
			TOTAL (AMPS)	116	116	116	0	0	0	0	116	116	0	0	0	0	116	116	0	0	0	0	116	116	0	0	0	0

Appendix B.6

S#	NAME OF			AVE. LOAD	0:00 TO 1:00	1:00 TO 2:00	2:00 TO 3:00	3:00 TO 4:00	4:00 TO 5:00	5:00 TO 6:00	6:00 TO 7:00	7:00 TO 8:00	8:00 TO 9:00	9:00 TO 10:00	10:00 TO 11:00	11:00 TO 12:00	12:00 TO 13:00	13:00 TO 14:00	14:00 TO 15:00	15:00 TO 16:00	16:00 TO 17:00	17:00 TO 18:00	18:00 TO 19:00	19:00 TO 20:00	20:00 TO 21:00	21:00 TO 22:00	22:00 TO 23:00	23:00 TO 0:00
	Grid	Tele No.	11KV Feeder																									
1	**36. 66 kV Radhan	071-5001126	City	135	-	-	-	-	135	135	-	-	-	-	135	135	-	-	-	-	135	135	-	-	-	-	135	135
2			Old Warah	100	100	100	-	-	-	-	100	100	-	-	-	-	100	100	-	-	-	-	100	100	-	-	-	-
3			Old Mehar	130	130	130	-	-	-	-	130	130	-	-	-	-	130	130	-	-	-	-	130	130	-	-	-	-
4			Old Seeta	205	-	-	205	205	-	-	-	-	205	205	-	-	-	-	205	205	-	-	-	-	205	205	-	-
			TOTAL (AMPS)	570	230	230	205	205	135	135	230	230	205	205	135	135	230	230	205	205	135	135	230	230	205	205	135	135
1	**37. 132 kV B.S Abad	071-5001130	B.S Abad City	195	-	-	-	-	195	195	-	-	-	-	195	195	-	-	-	-	195	195	-	-	-	-	195	195
2			Bhan-I	0	HESCO																							
3			Bhan-II	155	-	-	155	155	-	-	-	-	155	155	-	-	-	-	155	155	-	-	-	-	155	155	-	-
4			Talti	75	75	75	-	-	-	-	75	75	-	-	-	-	75	75	-	-	-	-	75	75	-	-	-	-
			TOTAL (AMPS)	425	75	75	155	155	195	195	75	75	155	155	195	195	75	75	155	155	195	195	75	75	155	155	195	195
1	**38. 132 kV Naseerabad	071-5015906, 074-4710220	Dera	95	95	95	-	-	-	-	95	95	-	-	-	-	95	95	-	-	-	-	95	95	-	-	-	-
2			Nasirabad	150	-	-	-	-	150	150	-	-	-	-	150	150	-	-	-	-	150	150	-	-	-	-	150	150
3			Kandhra	35	-	-	-	-	35	35	-	-	-	-	35	35	-	-	-	-	35	35	-	-	-	-	35	35
4			New A.T.M	25	25	25	-	-	-	-	25	25	-	-	-	-	25	25	-	-	-	-	25	25	-	-	-	-
5			Badah	170	-	-	170	170	-	-	-	-	170	170	-	-	-	-	170	170	-	-	-	-	170	170	-	-
			TOTAL (AMPS)	475	120	120	170	170	185	185	120	120	170	170	185	185	120	120	170	170	185	185	120	120	170	170	185	185
1	**39. 132 kV Larkana	074-4120920	Station Road	165	-	-	165	165	-	-	-	-	-	-	165	165	-	-	-	-	165	165	-	-	165	165	-	-
2			City-I	230	-	-	-	-	230	230	-	-	230	230	-	-	-	-	230	230	-	-	-	-	-	-	230	230
3			City-II	190	-	-	-	-	190	190	-	-	-	-	190	190	-	-	-	-	190	190	-	-	-	-	190	190
4			Industrial	115	-	-	115	115	-	-	-	-	115	115	-	-	-	-	115	115	-	-	-	-	115	115	-	-
5			Old Murad Wahan	260	260	260	-	-	-	-	260	260	-	-	-	-	260	260	-	-	-	-	260	260	-	-	-	-
6			Empire Road	260	-	-	-	-	260	260	-	-	-	-	260	260	-	-	-	-	260	260	-	-	-	-	260	260
7			Khurshid Junejo/Dhamra	120	-	-	-	-	120	120	-	-	-	-	120	120	-	-	-	-	120	120	-	-	-	-	120	120
8			Baharpur	190	-	-	190	190	-	-	-	-	190	190	-	-	-	-	190	190	-	-	-	-	190	190	-	-
9			Old Miro Khan	155	-	-	-	-	155	155	-	-	-	-	155	155	-	-	-	-	155	155	-	-	-	-	155	155
10			Waleed	65	-	-	65	65	-	-	-	-	65	65	-	-	-	-	65	65	-	-	-	-	65	65	-	-
11			Shaikh Zaid	95	95	95	-	-	-	-	95	95	-	-	-	-	95	95	-	-	-	-	95	95	-	-	-	-
12			Colony	45	45	45	-	-	-	-	45	45	-	-	-	-	45	45	-	-	-	-	45	45	-	-	-	-
13			Sachal	220	-	-	-	-	220	220	-	-	-	-	220	220	-	-	-	-	220	220	-	-	-	-	220	220
14			Nazar	245	-	-	245	245	-	-	-	-	245	245	-	-	-	-	245	245	-	-	-	-	245	245	-	-
15			T/Well IV	195	-	-	195	195	-	-	-	-	195	195	-	-	-	-	195	195	-	-	-	-	195	195	-	-
16			Old Naudero	240	-	-	-	-	240	240	-	-	-	-	240	240	-	-	-	-	240	240	-	-	-	-	240	240
17			S.M.B.B University	210	210	210	-	-	-	-	210	210	-	-	-	-	210	210	-	-	-	-	210	210	-	-	-	-
			TOTAL (AMPS)	3,000	610	610	975	975	1,415	1,415	610	610	1,040	1,040	1,350	1,350	610	610	1,040	1,040	1,350	1,350	610	610	975	975	1,415	1,415
1	**40. 132 kV Larkana Site	074-4120992	Atta Turk	245	-	-	-	-	245	245	-	-	-	-	245	245	-	-	-	-	245	245	-	-	-	-	245	245
2			New Murad Wahan	245	-	-	-	-	245	245	-	-	-	-	245	245	-	-	-	-	245	245	-	-	-	-	245	245
3			Allah Abad	245	-	-	-	-	245	245	-	-	-	-	245	245	-	-	-	-	245	245	-	-	-	-	245	245
4			T/Well-II	75	-	-	75	75	-	-	-	-	75	75	-	-	-	-	75	75	-	-	-	-	75	75	-	-
5			Bakrani	40	40	40	-	-	-	-	40	40	-	-	-	-	40	40	-	-	-	-	40	40	-	-	-	-
6			Fareedabad	40	-	-	40	40	-	-	-	-	40	40	-	-	-	-	40	40	-	-	-	-	40	40	-	-
7			Ali Abad	70	70	70	-	-	-	-	70	70	-	-	-	-	70	70	-	-	-	-	70	70	-	-	-	-
			TOTAL (AMPS)	960	40	40	115	115	735	735	40	40	115	115	735	735	40	40	115	115	735	735	40	40	115	115	735	735
1	**41. 132/66KV Naudero	074-4047132	Izat-Ji-Wand	145	-	-	145	145	-	-	-	-	145	145	-	-	-	-	145	145	-	-	-	-	145	145	-	-
2			G.Khuda Bux	105	-	-	105	105	-	-	-	-	105	105	-	-	-	-	105	105	-	-	-	-	105	105	-	-
3			City-III	40	-	-	40	40	-	-	-	-	40	40	-	-	-	-	40	40	-	-	-	-	40	40	-	-
4			City-I	95	-	-	-	-	-	-	95	95	-	-	-	95	95	-	-	-	95	95	-	-	-	-	-	-
5			City-II	240	-	-	-	-	-	-	240	240	-	-	-	240	240	-	-	-	240	240	-	-	-	-	-	-
6			Naudero Express	8	-	-	-	-	-	-	8	8	-	-	-	8	8	-	-	-	8	8	-	-	-	-	-	-
7			S.Benazir Bhutto	45	-	-	-	-	-	-	45	45	-	-	-	45	45	-	-	-	45	45	-	-	-	-	-	-
			TOTAL (AMPS)	678	0	0	290	290	0	0	388	388	290	290	0	388	388	0	290	290	388	388	0	0	290	290	0	0

Appendix B.6

S#	NAME OF			AVE. LOAD	0:00 TO 1:00	1:00 TO 2:00	2:00 TO 3:00	3:00 TO 4:00	4:00 TO 5:00	5:00 TO 6:00	6:00 TO 7:00	7:00 TO 8:00	8:00 TO 9:00	9:00 TO 10:00	10:00 TO 11:00	11:00 TO 12:00	12:00 TO 13:00	13:00 TO 14:00	14:00 TO 15:00	15:00 TO 16:00	16:00 TO 17:00	17:00 TO 18:00	18:00 TO 19:00	19:00 TO 20:00	20:00 TO 21:00	21:00 TO 22:00	22:00 TO 23:00	23:00 TO 0:00
	Grid	Tele No.	11KV Feeder		1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	0:00
1	**42. 132 kV Ratodero	074-4118484	T/Well-I	75	-	-	75	75	-	-	-	-	75	75	-	-	-	-	75	75	-	-	-	-	75	75	-	-
2			T/Well-II	50	-	-	50	50	-	-	-	-	50	50	-	-	-	-	50	50	-	-	-	-	50	50	-	-
3			T/Well-III	78	-	-	78	78	-	-	-	-	78	78	-	-	-	-	78	78	-	-	-	-	78	78	-	-
4			Naudero	80	80	80	-	-	-	-	80	80	-	-	-	-	80	80	-	-	-	-	80	80	-	-	-	-
5			City-II	195	-	-	-	-	195	195	-	-	-	-	195	195	-	-	-	-	195	195	-	-	-	-	195	195
6			Madeji	85	85	85	-	-	-	-	85	85	-	-	-	-	85	85	-	-	-	-	85	85	-	-	-	-
7			City-I	195	-	-	-	-	195	195	-	-	-	-	195	195	-	-	-	-	195	195	-	-	-	-	195	195
8			Nabi Shah	55	55	55	-	-	-	-	55	55	-	-	-	-	55	55	-	-	-	-	55	55	-	-	-	-
9			Bunguldero	70	70	70	-	-	-	-	70	70	-	-	-	-	70	70	-	-	-	-	70	70	-	-	-	-
10			Madeji-2/Chandia	255	-	-	-	-	255	255	-	-	-	-	255	255	-	-	-	-	255	255	-	-	-	-	255	255
			TOTAL (AMPS)	1,138	290	290	203	203	645	645	290	290	203	203	645	645	290	290	203	203	645	645	290	290	203	203	645	645
1	**43. 132 kV Miro Khan	074-4120968	Lashari	120	-	-	-	-	120	120	-	-	-	-	120	120	-	-	-	-	120	120	-	-	-	-	120	120
2			City	140	-	-	140	140	-	-	-	-	140	140	-	-	-	-	140	140	-	-	-	-	140	140	-	-
3			Sijawal	115	115	115	-	-	-	-	115	115	-	-	-	-	115	115	-	-	-	-	115	115	-	-	-	-
4			RTD Pumping Station	40	40	40	-	-	-	-	40	40	-	-	-	-	40	40	-	-	-	-	40	40	-	-	-	-
			TOTAL (AMPS)	415	155	155	140	140	120	120	155	155	140	140	120	120	155	155	140	140	120	120	155	155	140	140	120	120
1	**44. 132 kV Shahdad Kot	074-4164028, 074-4120971	City-I	128	-	-	-	-	-	-	128	128	-	-	-	128	128	-	-	-	128	128	-	-	-	128	128	-
2			City-II	143	-	-	-	-	-	-	143	143	-	-	-	143	143	-	-	-	143	143	-	-	-	143	143	-
3			City-III	118	-	-	-	-	-	-	118	118	-	-	-	118	118	-	-	-	118	118	-	-	-	118	118	-
4			Behram	110	-	-	110	110	-	-	-	-	110	110	-	-	-	-	110	110	-	-	-	-	110	110	-	-
5			Chandia	180	-	-	-	-	180	180	-	-	-	-	180	180	-	-	-	-	180	180	-	-	-	-	180	180
6			Garhi Khairo	50	-	-	-	-	50	50	-	-	-	-	50	50	-	-	-	-	50	50	-	-	-	-	50	50
7			Q.S Khan	65	-	-	65	65	-	-	-	-	65	65	-	-	-	-	65	65	-	-	-	-	65	65	-	-
			TOTAL (AMPS)	793	0	0	175	175	230	230	388	388	175	175	230	618	388	0	175	175	618	618	0	0	175	563	618	230
1	**45. 66 kV Larkana	074-41209676	A.T.M	130	-	-	130	130	-	-	-	-	130	130	-	-	-	-	130	130	-	-	-	-	130	130	-	-
2			City-III	130	-	-	-	-	130	130	-	-	-	-	130	130	-	-	-	-	130	130	-	-	-	-	130	130
3			Bakrani	105	105	105	-	-	-	-	105	105	-	-	-	-	105	105	-	-	-	-	105	105	-	-	-	-
4			Allah Abad	90	-	-	-	-	90	90	-	-	-	-	90	90	-	-	-	-	90	90	-	-	-	-	90	90
5			T/Well-I	85	-	-	85	85	-	-	-	-	85	85	-	-	-	-	85	85	-	-	-	-	85	85	-	-
6			T/Well-ll	50	50	50	-	-	-	-	50	50	-	-	-	-	50	50	-	-	-	-	50	50	-	-	-	-
7			Almurtaza	150	-	-	-	-	150	150	-	-	-	-	150	150	-	-	-	-	150	150	-	-	-	-	150	150
8			Jinnah Bagh	75	-	-	-	-	75	75	-	-	-	-	75	75	-	-	-	-	75	75	-	-	-	-	75	75
			TOTAL (AMPS)	815	155	155	215	215	445	445	155	155	215	215	445	445	155	155	215	215	445	445	155	155	215	215	445	445
1	**46. 66 kV Kambar	074-4120645	Abri	125	125	125	-	-	-	-	125	125	-	-	-	-	125	125	-	-	-	-	125	125	-	-	-	-
2			City-I	260	-	-	-	-	260	260	-	-	-	-	260	260	-	-	-	-	260	260	-	-	-	-	260	260
3			City-II	220	-	-	-	-	220	220	-	-	-	-	220	220	-	-	-	-	220	220	-	-	-	-	220	220
4			City-III	50	-	-	-	-	50	50	-	-	-	-	50	50	-	-	-	-	50	50	-	-	-	-	50	50
5			T/Well	100	100	100	-	-	-	-	100	100	-	-	-	-	100	100	-	-	-	-	100	100	-	-	-	-
6			Chajra	125	-	-	125	125	-	-	-	-	125	125	-	-	-	-	125	125	-	-	-	-	125	125	-	-
			TOTAL (AMPS)	880	225	225	125	125	530	530	225	225	125	125	530	530	225	225	125	125	530	530	225	225	125	125	530	530
1	**47. 66 kV G'Khairo	0332-8064150	City	135	-	-	-	-	135	135	-	-	-	-	135	135	-	-	-	-	135	135	-	-	-	-	135	135
2			Dodapur	100	-	-	100	100	-	-	-	-	100	100	-	-	-	-	100	100	-	-	-	-	100	100	-	-
			TOTAL (AMPS)	235	0	0	100	100	135	135	0	0	100	100	135	135	0	0	100	100	135	135	0	0	100	100	135	135
1	**48. 66 kV Warah	074-4120965	Warah	165	-	-	-	-	165	165	-	-	-	-	165	165	-	-	-	-	165	165	-	-	-	-	165	165
2			Naseerabad	85	85	85	-	-	-	-	85	85	-	-	-	-	85	85	-	-	-	-	85	85	-	-	-	-
3			Pechoha	170	-	-	170	170	-	-	-	-	170	170	-	-	-	-	170	170	-	-	-	-	170	170	-	-
4			Najam	20	20	20	-	-	-	-	20	20	-	-	-	-	20	20	-	-	-	-	20	20	-	-	-	-
			TOTAL (AMPS)	440	105	105	170	170	165	165	105	105	170	170	165	165	105	105	170	170	165	165	105	105	170	170	165	165
1	**49. 66 kV Dokri	074-4167386, 071-5001092	Dokri	150	-	-	-	-	150	150	-	-	-	-	150	150	-	-	-	-	150	150	-	-	-	-	150	150
2			Cadet College	10	-	-	-	-	10	10	-	-	-	-	10	10	-	-	-	-	10	10	-	-	-	-	10	10
3			Garelo	140	-	-	140	140	-	-	-	-	140	140	-	-	-	-	140	140	-	-	-	-	140	140	-	-
4			Gudd	35	35	35	-	-	-	-	35	35	-	-	-	-	35	35	-	-	-	-	35	35	-	-	-	-
5			Bakrani	140	140	140	-	-	-	-	140	140	-	-	-	-	140	140	-	-	-	-	140	140	-	-	-	-
6			Colony	115	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			TOTAL (AMPS)	590	175	175	140	140	160	160	175	175	140	140	160	160	175	175	140	140	160	160	175	175	140	140	160	160

Appendix B.6

S#	NAME OF			AVE. LOAD	0:00 TO 1:00	1:00 TO 2:00	2:00 TO 3:00	3:00 TO 4:00	4:00 TO 5:00	5:00 TO 6:00	6:00 TO 7:00	7:00 TO 8:00	8:00 TO 9:00	9:00 TO 10:00	10:00 TO 11:00	11:00 TO 12:00	12:00 TO 13:00	13:00 TO 14:00	14:00 TO 15:00	15:00 TO 16:00	16:00 TO 17:00	17:00 TO 18:00	18:00 TO 19:00	19:00 TO 20:00	20:00 TO 21:00	21:00 TO 22:00	22:00 TO 23:00	23:00 TO 0:00
	Grid	Tele No.	11KV Feeder																									
1	**50. 132 kV Jacobabad	071-5001067	City-I	280	-	-	-	-	280	280	-	-	-	-	280	280	-	-	-	-	280	280	-	-	-	-	280	280
2			Shahbaz	170	-	-	170	170	-	-	-	-	170	170	-	-	-	-	170	170	-	-	-	-	170	170	-	-
3			Madadpur	110	110	110	-	-	-	-	110	110	-	-	-	-	110	110	-	-	-	-	110	110	-	-	-	-
4			City-II	250	-	-	250	250	-	-	-	-	250	250	-	-	-	-	250	250	-	-	-	-	250	250	-	-
5			Abad	105	105	105	-	-	-	-	105	105	-	-	-	-	105	105	-	-	-	-	105	105	-	-	-	-
6			City-IV	50	50	50	-	-	-	-	50	50	-	-	-	-	50	50	-	-	-	-	50	50	-	-	-	-
7			Express	160	160	160	-	-	-	-	160	160	-	-	-	-	160	160	-	-	-	-	160	160	-	-	-	-
8			PAF	0	-	-	0	0	-	-	-	-	0	0	-	-	-	-	0	0	-	-	-	-	0	0	-	-
9			Moladad	135	135	135	-	-	-	-	135	135	-	-	-	-	135	135	-	-	-	-	135	135	-	-	-	-
10			Pir Bukhari	290	-	-	290	290	-	-	-	-	290	290	-	-	-	-	290	290	-	-	-	-	290	290	-	-
11			Hospital	255	-	-	-	-	255	255	-	-	-	-	255	255	-	-	-	-	255	255	-	-	-	-	255	255
12			City-III	220	-	-	-	-	220	220	-	-	-	-	220	220	-	-	-	-	220	220	-	-	-	-	220	220
			TOTAL (AMPS)	2,025	560	560	710	710	755	755	560	560	710	710	755	755	560	560	710	710	755	755	560	560	710	710	755	755
1	**51. 132 kV Shikarpur	071-5001087	City-III	275	-	-	-	-	275	275	-	-	-	-	275	275	-	-	-	-	275	275	-	-	-	-	275	275
2			Industrial	270	-	-	-	-	270	270	-	-	-	-	270	270	-	-	-	-	270	270	-	-	-	-	270	270
3			Wazirabad	160	160	160	-	-	-	-	160	160	-	-	-	-	160	160	-	-	-	-	160	160	-	-	-	-
4			Lakhi	180	-	-	180	180	-	-	-	-	180	180	-	-	-	-	180	180	-	-	-	-	180	180	-	-
5			Azad	155	155	155	-	-	-	-	155	155	-	-	-	-	155	155	-	-	-	-	155	155	-	-	-	-
6			City-I	240	-	-	-	-	240	240	-	-	-	-	240	240	-	-	-	-	240	240	-	-	-	-	240	240
7			City-II	275	-	-	-	-	275	275	-	-	-	-	275	275	-	-	-	-	275	275	-	-	-	-	275	275
8			City-IV	240	-	-	-	-	240	240	-	-	-	-	-	240	-	-	-	-	240	240	-	240	-	-	240	240
9			T/Well-III	38	-	-	38	38	-	-	-	-	38	38	-	-	-	-	38	38	-	-	-	-	38	38	-	-
10			Khanpur	220	-	-	220	220	-	-	-	-	220	220	-	-	-	-	220	220	-	-	-	-	220	220	-	-
11			Chak	110	110	110	-	-	-	-	110	110	-	-	-	-	110	110	-	-	-	-	110	110	-	-	-	-
12			Garhi Yasin	305	-	-	-	-	305	305	-	-	-	-	305	305	-	-	-	-	305	305	-	-	-	-	305	305
			TOTAL (AMPS)	2,468	425	425	438	438	1,605	1,605	425	425	438	438	1,365	1,605	425	425	438	438	1,605	1,605	425	665	438	438	1,605	1,605
1	**52. 132 kV Hamayun	071-5015596	Vakro	110	110	110	-	-	-	-	110	110	-	-	-	-	110	110	-	-	-	-	110	110	-	-	-	-
2			Sultankot Old	45	45	45	-	-	-	-	45	45	-	-	-	-	45	45	-	-	-	-	45	45	-	-	-	-
3			Sultankot New	80	80	80	-	-	-	-	80	80	-	-	-	-	80	80	-	-	-	-	80	80	-	-	-	-
4			Mian-Jo-Goth	100	100	100	-	-	-	-	100	100	-	-	-	-	100	100	-	-	-	-	100	100	-	-	-	-
			TOTAL (AMPS)	335	335	335	0	0	0	0	335	335	0	0	0	0	335	335	0	0	0	0	335	335	0	0	0	0
1	**53. 132 kV G.Yasin	071-5028145	Garhi Yasin City	165	-	-	-	-	165	165	-	-	-	-	165	165	-	-	-	-	165	165	-	-	-	-	165	165
2			Golo Daro	50	50	50	-	-	-	-	50	50	-	-	-	-	50	50	-	-	-	-	50	50	-	-	-	-
3			Amrot Sharif	120	-	-	120	120	-	-	-	-	120	120	-	-	-	-	120	120	-	-	-	-	120	120	-	-
4			Sonwah	70	70	70	-	-	-	-	70	70	-	-	-	-	70	70	-	-	-	-	70	70	-	-	-	-
			TOTAL (AMPS)	405	120	120	120	120	165	165	120	120	120	120	165	165	120	120	120	120	165	165	120	120	120	120	165	165
1	**54. 132 kV Karampur	0722-718664	City	85	-	-	85	85	-	-	-	-	85	85	-	-	-	-	85	85	-	-	-	-	85	85	-	-
2			Karampur	100	100	100	-	-	-	-	100	100	-	-	-	-	100	100	-	-	-	-	100	100	-	-	-	-
3			Ghouspur	130	-	-	130	130	-	-	-	-	130	130	-	-	-	-	130	130	-	-	-	-	130	130	-	-
4			Parco (Ghazi)	150	-	-	-	-	150	150	-	-	-	-	150	150	-	-	-	-	150	150	-	-	-	-	150	150
5			Nasrullah khan	35	-	-	-	-	35	35	-	-	-	-	35	35	-	-	-	-	35	35	-	-	-	-	35	35
6			Ghouspur City	160	160	160	-	-	-	-	160	160	-	-	-	-	160	160	-	-	-	-	160	160	-	-	-	-
			TOTAL (AMPS)	660	100	100	215	215	185	185	100	100	215	215	185	185	100	100	215	215	185	185	100	100	215	215	185	185
1	**55. 132 kV Kandh Kot	0722-573296, 071-5001123	City-II	195	-	-	-	-	195	195	-	-	-	-	195	195	-	-	-	-	195	195	-	-	-	-	195	195
2			Dari	250	250	250	-	-	-	-	250	250	-	-	-	-	250	250	-	-	-	-	250	250	-	-	-	-
3			Industrial	35	-	-	35	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35	35	35	35	-	-
4			City-I	270	-	-	-	-	270	270	-	-	-	-	270	270	-	-	-	-	270	270	-	-	-	-	270	270
5			City-III	90	-	-	-	-	90	90	-	-	-	-	90	90	-	-	-	-	90	90	-	-	-	-	90	90
6			City-IV	240	-	-	-	-	240	240	-	-	-	-	240	240	-	-	-	-	240	240	-	-	-	-	240	240
7			Resaldar	90	90	90	-	-	-	-	90	90	-	-	-	-	90	90	-	-	-	-	90	90	-	-	-	-
8			Tangwani	135	-	-	135	135	-	-	-	-	135	135	-	-	-	-	135	135	-	-	-	-	135	135	-	-
9			Buxapur	150	-	-	150	150	-	-	-	-	150	150	-	-	-	-	150	150	-	-	-	-	150	150	-	-
			TOTAL (AMPS)	1,455	340	340	320	320	795	795	340	340	285	285	795	795	340	340	285	285	795	795	375	375	320	320	795	795

Appendix B.6

S#	NAME OF			AVE. LOAD	0:00 TO 1:00	1:00 TO 2:00	2:00 TO 3:00	3:00 TO 4:00	4:00 TO 5:00	5:00 TO 6:00	6:00 TO 7:00	7:00 TO 8:00	8:00 TO 9:00	9:00 TO 10:00	10:00 TO 11:00	11:00 TO 12:00	12:00 TO 13:00	13:00 TO 14:00	14:00 TO 15:00	15:00 TO 16:00	16:00 TO 17:00	17:00 TO 18:00	18:00 TO 19:00	19:00 TO 20:00	20:00 TO 21:00	21:00 TO 22:00	22:00 TO 23:00	23:00 TO 0:00
	Grid	Tele No.	11KV Feeder																									
1	**56. 132 kV Thull	071-5001120	City-I	255	-	-	-	-	255	255	-	-	-	-	255	255	-	-	-	-	255	255	-	-	-	-	255	255
2			Ali Shah	65	65	65	-	-	-	-	65	65	-	-	-	-	65	65	-	-	-	-	65	65	-	-	-	-
3			Toj	50	50	50	-	-	-	-	50	50	-	-	-	-	50	50	-	-	-	-	50	50	-	-	-	-
4			Rural	200	-	-	200	200	-	-	-	-	200	200	-	-	-	-	200	200	-	-	-	-	200	200	-	-
5			City-II	225	-	-	-	-	225	225	-	-	-	-	225	225	-	-	-	-	225	225	-	-	-	-	225	225
6			UDI	55	-	-	55	55	-	-	-	-	55	55	-	-	-	-	55	55	-	-	-	-	55	55	-	-
7			Mirpur Buriro	200	200	200	-	-	-	-	200	200	-	-	-	-	200	200	-	-	-	-	200	200	-	-	-	-
			TOTAL (AMPS)	1,050	315	315	255	255	480	480	315	315	255	255	480	480	315	315	255	255	480	480	315	315	255	255	480	480
1	**57. 132 kV Kashmore	0334-2669303	Khosamori	245	-	-	-	-	245	245	-	-	-	-	245	245	-	-	-	-	245	245	-	-	-	-	245	245
2			Industrial	115	-	-	115	115	-	-	-	-	115	115	-	-	-	-	115	115	-	-	-	-	115	115	-	-
3			Army	30	-	-	-	-	-	30	30	-	-	-	30	-	-	-	30	-	-	30	-	-	-	-	-	-
4			Colony Old	225	225	225	-	-	-	-	225	225	-	-	-	-	225	225	-	-	-	-	225	225	-	-	-	-
5			City-I	240	-	-	240	240	-	-	-	-	240	240	-	-	-	-	240	240	-	-	-	-	240	240	-	-
6			City-II	180	-	-	-	-	180	180	-	-	-	-	180	180	-	-	-	-	180	180	-	-	-	-	180	180
7			Guddu	110	110	110	-	-	-	-	110	110	-	-	-	-	110	110	-	-	-	-	110	110	-	-	-	-
			TOTAL (AMPS)	1,145	335	335	355	355	425	455	365	335	355	355	455	425	335	335	385	355	425	455	335	335	355	355	425	425
1	**58. 220 kV Lodra	0346-3405848	Alif Shah Shaheed	155	-	-	-	-	155	155	-	-	-	-	155	155	-	-	-	-	155	155	-	-	-	-	155	155
2			Lodra	100	-	-	100	100	-	-	-	-	100	100	-	-	-	-	100	100	-	-	-	-	100	100	-	-
3			TV Booster	10	10	10	-	-	-	-	10	10	-	-	-	-	10	10	-	-	-	-	10	10	-	-	-	-
TOTAL (AMPS)				265	10	10	100	100	155	155	10	10	100	100	155	155	10	10	100	100	155	155	10	10	100	100	155	155
G.TOTAL (AMP)				55,047	14,142	13,867	14,443	15,183	22,045	22,318	15,229	14,907	14,723	15,438	21,588	22,723	15,509	14,649	14,760	15,790	24,158	23,738	15,384	15,917	15,860	16,920	24,505	22,438
TOTAL (MW)				917	236	231	241	253	367	372	254	248	245	257	360	379	258	244	246	263	403	396	256	265	264	282	408	374

Note:

1 Average 06 to 08 hours loadshedding carried out on all feeders.
2 In case of overloading/ protection of Grid Station Equipment, the schedule/ duration can be revised of time being
3 Load shedding duration depends upon allocated Quota/Share given by NPCC.

Appendix B.7

HOURLY LOAD MANAGEMENT PROGRAMME THROUGH SHEDDING OF 11 KV FEEDERS IN RESPECT OF IESCO CIRCLE ISLAMABAD (02-10-2013)																											
S No	Name of G/Station	Feeder Code	Name of Feeder	0000-0100	0100-0200	0200-0300	0300-0400	0400-0500	0500-0600	0600-0700	0700-0800	0800-0900	0900-1000	1000-1100	1100-1200	1200-1300	1300-1400	1400-1500	1500-1600	1600-1700	1700-1800	1800-1900	1900-2000	2000-2100	2100-2200	2200-2300	2300-2400	
1	ZERO POINT	022317	Marvi		30				20				20				30				30				30			6
2		022326	G-8			40				30				30				80				80				80		6
3		022318	Ayub Market				40				40				40				80				80				80	6
4		022301	Sitra Market	100				100				80				80				110				100				6
5		022310	Faisal Mosque		50				50				50				100				100				100			6
6		022315	High Way (Tarlai)		180				180				160				200				200					240		6
7		022314	Iqbal Town			160				140				140				190				190					220	6
8		022309	HC-2 (PIMS)																									
9		022320	VIP																									
10		022303	Aabpara *	40				40				40				40				40					70			6
11		022306	F-7 Mkz *			20				30				70				60				60				80		6
12		022325	H-8				40				40				40				100				100				50	6
13		022324	Aziz Chowk	50				50				40				40				50				40				6
14		022333	Tarlai				70				70				70				90				90				90	6
15		022302	CDA Office																									
16		022304	Wapda Colony										50					60				60						3
17		022305	ADBP																									
18		022323	NPCC-1																									
19		022332	G-9/Markaz *		40				20				20				100				90			100				6
20		022321	Pesh: Chowk / G-9/3			30				30				30				20				20				30		6
21		022334	G-9 Express				40				30				30				90				90				60	6
22		022319	T&T	70				70				70				70				90				120				6
23		022327	PAF (K.Compay) / G-9/2		80				120				120				120				120				120			6
24		022331	PTCL			10				10				10				100				100				60		6
25		022330	G-8/1				60				50				50					120				100			100	6
26		022335	AIOU	10				10				10				10				60				20				6
27		022322	HC-1 (PIMS)																									
28		022336	I-8/2		90				80				80				80				90				100			6
29		022337	I-8/3			110				100				100				110				110				120		6
30		022338	G-8/Markaz	20				20				20				40				40				40				6

Appendix B.7

S No	Name of G/Station	Feeder Code	Name of Feeder	0000-0100	0100-0200	0200-0300	0300-0400	0400-0500	0500-0600	0600-0700	0700-0800	0800-0900	0900-1000	1000-1100	1100-1200	1200-1300	1300-1400	1400-1500	1500-1600	1600-1700	1700-1800	1800-1900	1900-2000	2000-2100	2100-2200	2200-2300	2300-2400	
31		017407	Pak Sectt:1																									
32		017408	Pak Sectt:2																									
33		017418	Awan-e-Sadr																									
34		017414	PM House																									
35		017428	Islamabad Club-2				20				20				20				50				50				30	6
36		017409	Frontier House	70				70				50				50				150				100				6
37		017415	Parliament house																									
38		017410	Parliament lodges										20			20			20			40						4
39		017401	Kohsar Mkt		100				90				90				90				80						100	6
40		017417	Islamabad Club-I	140				140				130				130				140				140				6
41		017413	Melody Market			60					60			60				70				70				70		6
42		017406	PTV	20				20				20				20				20				20				6
43		017419	Sports Complex	10				10				10				10				10				10				6
44		017411	Shakarparian		20				20			20							20				20			20		6
45		017420	Convention Center	5				5				5				5				5				5				6
46	RAWAL	017416	State Bank																									0
47		017403	Poly Clinic																									
48		017427	NPCC-II																									
49		017422	ETBP				20				80				110				110				110				110	6
50		017426	NTC		30				30				30				70				70				50			6
51		017424	Meh. Shaheed				150				100				120				120				140				140	6
52		017423	G-6	110				110				100				100				110				110				6
53		017430	Scheme-II		100				80				80				80				90				100			6
54		017434	Pindorian		100				100				100				100				70				100			6
55		017432	CDA Flats			100				100				100				100				100				120		6
56		017435	Rest House																									
57		017436	Filtiration plant																									
58		017429	ISI																									
59		017433	Pak China			5				5				5				5				5				5		6
60		017438	Foreign Office																									
61		NA	Hospital																									
62		089212	Bari Imam			150				175				180				170				220				200		6
63		089205	University			40				40				70				80				50				50		6
64		089211	Punjab House							30				60					35					30				4
65		089207	Dama-e-Koh				50				60				70				75				75				80	6
66		089215	NCP	5		5		10				5									10				15			6
67		089209	Bani Gala(C/ Shahzad)		30			30				40				40				35				35				6
68		089206	Diplomatic enclave																									
69		089208	Mandala																									
70	University	089216	Golf City		10				10				10				10				10				10			6
71		089203	Tret			90				40				45				40				80				70		6
72		089210	NIH				195				180				240				250				230				220	6
73		089213	Shah Dara	210				210				220				200				285				285				6
74		089201	B/Kahu		210				210				235				240				280				280			6
75		089202	Desto			10			10		40												40			10	10	6
76		089204	T&T		70			85			85						90				90		90					6
77		089214	Angori	150				125				130				120				125				150				6

Appendix B.7

S No	Name of G/Station	Feeder Code	Name of Feeder	0000-0100	0100-0200	0200-0300	0300-0400	0400-0500	0500-0600	0600-0700	0700-0800	0800-0900	0900-1000	1000-1100	1100-1200	1200-1300	1300-1400	1400-1500	1500-1600	1600-1700	1700-1800	1800-1900	1900-2000	2000-2100	2100-2200	2200-2300	2300-2400	
78		014701	Ali pur		150				190				190				190				200				180			6
79		014704	Karor			60				60				100				100				100				80		6
80		014719	Irfanabad				80				80				100				100				110				110	6
81		014711	Pinstech-III																									
82		014705	New Lab-II																									
83		014710	Pintech-I																									
84		014717	Frash Town	90				95				90				85				85				90				6
85		014716	Tufail Shaheed		60				100				110				120				150				170			6
86	Nilore	014763	Simly Dam																									
87		014715	Tumair			95				95				80				80				80				120		6
88		014713	INUP																									
89		014712	CNS Lab																									
90		014702	New Lab-I																									
91		014709	O-Lab																									
92		014708	CNS-I																									
93		014707	Pinstech-II																									
94		014718	New lab-III																									
95		014720	NILOP																									
96		105502	Burma	40				50				50				50				50				60				6
97		105503	Tramri				40				50				50				50				40				30	6
98		105504	Sudhran Road		40				50				50				60				60				70			6
99		105505	ISI																									
100	Tramri	NA	Tarlai Chowk			30				40				60				50				60				60		6
101		105501	Scheme-I				30				40				40				50				60				60	6
102		105508	Comstech	10				10				20				100				80				20				6
103		NA	Behria	5				5				5				10				20				10				6
104		105507	Chata Bakhtawar		40				50				70				80				90				60			6
105		013707	Pindi Point	30				25				50				40				30				60				6
106		013706	Barian		40				30				50				50				60				50			6
107		013713	Company Bagh			50				50				50				50				60				110		6
108		013709	Public Health																									
109		013711	Gharail				80				80				80				100				140				110	6
110		013710	PAF	10				10				10				10				10				10				6
111	Murree	013705	Upper Topa			10			20				10				10				40				50			6
112		013712	Patraita				40			40				50				110				120				100		6
113		013714	Cecil	10				10			10				10				10				10					6
114		013701	Kohala		50				60			50				70				100				80				6
115		013704	Sunny Bank			40				30				30				70				80				120		6
116		013702	Kuldana				70				50				90				100				40				100	6
117		013708	PC Borban		10				10				10				10				10				10			6
118	C/Bharian	103702	Kotli Sattian			30				30				40				40				60				40		6
119		103703	Balawra				10				10				20				20				20				20	6
120		079401	Dheer Kot	90				90				80				90				90				140				6
121		079402	Chamman Kot		30				20				20				20				20				20			6
122	Minhasa	079407	Rangla			40				50				40				40				70				50		6
123		079406	Sohawa / Minhasa				90				100				70				70				100				100	6
124		079405	Numbel	50				40				40				50				40				80				6
125		079408	Berot (Kazmai)		60				60				70				40				50				60			6

Appendix B.7

S No	Name of G/Station	Feeder Code	Name of Feeder	0000-0100	0100-0200	0200-0300	0300-0400	0400-0500	0500-0600	0600-0700	0700-0800	0800-0900	0900-1000	1000-1100	1100-1200	1200-1300	1300-1400	1400-1500	1500-1600	1600-1700	1700-1800	1800-1900	1900-2000	2000-2100	2100-2200	2200-2300	2300-2400	
126		069203	F-10				60				50				50				60				60				70	6
127		069202	F-11	110				110				80				80				90				100				6
128		069205	G-11/1				90				70				70				80				80				80	6
129		069206	G-11/2	60				60				50				50				50				50				6
130		069212	F-9 Park			30				20				30				30				30				30		6
131		069213	G-11/3	60				60				50				50				50			50					6
132		069214	G-11/4		60				50				50				45				45					50		6
133		069215	Golden Height			30				30				30				20				30				40		6
134		069207	Golra				180				180				170				170				190				220	6
135		069217	GHQ					30						30						30						30		4
136	F-11	069210	F-10/2		70				60				60				60				70				70			6
137		069221	F-10/4 / Aziz Chowk			60				60				40				50				50				60		6
138		069209	F-11/2		90				90				80				80				90				90			6
139		069208	Margalla tower *				60				40				70				70			70			70			6
140		069211	F-11/Markaz *				50				30				30				50				80			80		6
141		069216	NPF	90				100				70				70				80			80					6
142		069219	Dargah		110				110				100				100				100				100			6
143		069218	MPCHS			65				60				60				70				70				70		6
144		069220	F-11 Tower		60				60				40				40				70			60				6
145		069222	G-11 Markaz *			40				20				20				50				50			50			6
146		069223	E-11/1				10				10				10				10				10				10	6
147		069224	Khudadad Heights	5				5				5				5				5				5				6
148		104001	D-12/1		2				2				2				2				2				2			6
149		104002	D-12/2		4				4				4				4				4				4			6
150		104006	D-12/3	1				1				1				1				1				1				
151	D-12	104007	D-12/4	1				1				1				1				1				1				6
152		104005	Services			10				10				10				10				10				10		6
153		104003	FECHS-E-11			10				20				20				20				20				20		6
154		104004	Railway road				40				50				50				70				70					6
155		NA	MPCHS		60				60				60				60				60				60			6
156		106703	G-13/1	20				20				30				30				30				20				6
157	G-13	106701	G-13/2		10				10				20				20				20				20			6
158		106702	G-13/3			10				10				20				20				20				20		6
159		106704	G-13/4				10				20				20				30				30				30	6
160		006406	Inter: School	30				30				20				20				20				30				6
161		006426	Mumtaz Steel	180	180	180	180	180													180	180	180	180	180	180	180	12
162		006403	Pak Iron (Furnace)	190	190	190	190	190													190	190	190	190	190	190	190	12
163		006424	Modern Steel	140	140	140	140	140													140	140	140	140	140	140	140	12
164		006414	Capital Steel	180	180	180	180	180													180	180	180	180	180	180	180	12
165		006405	PTN	200																			200	200	200	200	200	6
166		006408	I-10/4	80				80				60					60				60				100			6
167		006413	Old United Feeder	200																			200	200	200	200	200	6
168		006417	Exchange Old	140																			140	140	140	140	140	6
169		006425	SH Steel	160	160	160	160	160													160	160	160	160	160	160	160	12
170	I-10	006428	Potohar Steel	140	140	140	140	140													140	140	140	140	140	140	140	12
171		006409	Indstrial-I	70																			70	70	70	70	70	6
172		006422	Indstrial-II	100																			100	100	100	100	100	6
173		006431	Industrial-III	140																			140	140	140	140	140	6
174		006419	New united steel	130	130	130	130	130													130	130	130	130	130	130	130	12
175		006427	M.H Steel	120	120	120	120	120													120	120	120	120	120	120	120	12
176		006430	Itehad Steel	130	130	130	130	130													130	130	130	130	130	130	130	12
177		006407	G-10/3 (G-10 Sec)		80				80				60					60				60				100		6
178		006429	Fazal Rebar Steel	80																			80	80	80	80	80	6
179		006401	Karachi Co.			30				30				30				30				30				30		6
180		006432	I-10/1 (Frt/Mkt)	90					50			50				50				80				120				6
181		006415	PTV-2	10							10					20				20								4

Appendix B.7

S No	Name of G/Station	Feeder Code	Name of Feeder	0000-0100	0100-0200	0200-0300	0300-0400	0400-0500	0500-0600	0600-0700	0700-0800	0800-0900	0900-1000	1000-1100	1100-1200	1200-1300	1300-1400	1400-1500	1500-1600	1600-1700	1700-1800	1800-1900	1900-2000	2000-2100	2100-2200	2200-2300	2300-2400	
182		075501	E-8 Navy		40				30				30				30				90				90			6
183		075504	NIC				20				20				20				30				30			30		6
184		075503	NDU			30				30				30				60				60				40		6
185		075506	NHQ				10				10				10				20				20				10	6
186		075515	NHQ-II	5				5				5				5				5				5				6
187		075516	Centurous Flats		2				2				2				2				2				2			6
188		075517	Silver Oks			5				5				5				5				5				5		6
189		075509	Shaheen			40				30				30				110				110				90		6
190	E-8	075502	F-8/3			100				80				80				130				130				120		6
191		075508	Al MustafaTower	20				20				20				20				40				30				6
192		075505	E-7		50				50				50				50				80				80			6
193		075507	PAF	100					90			90				90				120				120				6
194		075510	Cortyle*		10				10				10				10				10				20			6
195		075512	Madina Market			40				30				30				50				50				40		6
196		075513	Abbassi Market*				50				60				60				110				90				80	6
197		075514	Centurous Mall	5				5				5				5				10				5				6
198		075511	Air University	10				10				10				10				20						10		6
199		086403	Abdul Raheem				72				68				70				164				170				180	6
200		086401	Malik Altaf *	20				20				20				20				80				100				6
201		086402	Shakir Ullah		70				70				65				65				100				100			6
202		086404	Perbat Road	30				45				70				70				90				90				6
203		086411	Jinnah Super*				50				50				50				130				90			90		6
204		086415	New NIC			2				2				2				10				10				4		6
205		086414	FPSC			10				10				10				75				80				30		6
206		086405	Jinnah Avenue *			40				30				30				100					40				40	6
207		086406	Shaheed Millat				20				20				20				30				30				25	6
208		086407	Saudi Tower		70				70				100				100				130				100			
209	Taimoor Shaheed	086408	PHA Flats			60				60				60				60				60				70		6
210		086409	G. Jinnah	20				20				20				20				70						30		6
211		086412	New Marvi *		60				60				50				50				120				160			6
212		086413	Stock Exchange				12				10				10				60				60				130	6
213		086410	Minister Enclave		30				30				30				30				50				40			6
214		086416	PTET	40				40				40				40				100				60				6
215		086418	MC & BC			10				10				20				20				20				20		6
216		086417	Pak Saudi *				40				40				40				80					40			40	6
217		086419	Super Market *					40				60				80				120					140			6
218		086421	Shmas		60				60				70				80				70				60			6
219		086420	Babul Islam			100				100				110				120				140				120		6

Appendix B.7

S No	Name of G/Station	Feeder Code	Name of Feeder	0000-0100	0100-0200	0200-0300	0300-0400	0400-0500	0500-0600	0600-0700	0700-0800	0800-0900	0900-1000	1000-1100	1100-1200	1200-1300	1300-1400	1400-1500	1500-1600	1600-1700	1700-1800	1800-1900	1900-2000	2000-2100	2100-2200	2200-2300	2300-2400	
220		072706	G-9/1	80					60			60				60				30				30				6
221		072705	Fazal Ghee	170																			170	170	170	170	170	6
222		072719	New Exchange	100																			100	100	100	100	100	6
223		072704	I-10/2			110				90				90				110				110				130		6
224		072724	Matro Cash & Carry *	20				20				20				20				20				20				6
225		072717	I-11/3	10				10				10				10				10				10				6
226		072728	PTCL		10				20				20				20				20				10			6
227		072718	NDC-II	10				10				20				20				10				10				6
228		072708	CWO																									
229		072709	Kidney Center																									
230		072703	G-9/4				80				70				70				110				110			120		6
231	H-11	072710	Islamic University		80				80				50				50				130					90		6
232		072707	G-10/4 (H/ Court)			100				70				70				120				120				100		6
233		072711	C.Taimor Sh.				40				50				50				40				40			60		6
234		072726	PHA (I-11)	20				30				30				30				25				30				6
235		072712	NDC-1				25				20				20				20				20			20	6
236		072727	Police line																									
237		072721	I-10/3(Auto W/S)*				10				10				10				10				10			10	6
238		072720	G-10/1			100				60				60				120				120			130		6
239		072723	Bela Road				90				80				80				90				90			100	6
240		072729	EOBI	10				10				10				10				10				10				6
241		072713	Itwar Bazar		10				10				10				10				10				10			6
242		072722	NUST				50				40				40				100				100			50	6
243		072730	IGC (IGP)	10				10				10				10				10				10				6
244	NPF	090009	Navy-1		5				5				5				5				5				5			6
245		090002	Safari Park (Koral)	120				150				110				110				130				150				6
246	P/Wadahi	043321	Carriage Factory			100				100				100				110				110			110		6
247		075001	Supereme Court																									
248		075014	Rab Nawaz																									
249		075019	US Embassy																									
250		075012	HBL	5				5				5				5				30					5			6
251		075009	Parliament lodges										20			20			20			40						4
252		075006	Royal Enclave	10				10				10				10				10				160				6
253		075008	Convention Center																									
254		075003	PM Sectt:																									
255		075016	Saudi Residence																									
256		075017	Saudi Embassy																									
257	G-5	075010	Blue Area *				20				10				10				80				40			30	6
258		075005	F-6/2					90						70				90				90						4
259		075011	OGDC		10				10								10				120				20			5
260		075020	University (QAU Standby)			30				35				70				70				50				50		6
261		075007	PM Staff Colony				60				70				70				70				70			50	6
262		075004	CBR		5				10				10				10				20				5			6
263		075021	K-Block																									
264		075015	Comstech		5				5				5				5				10					5		6
265		075018	Serena Complex				60				50				50				80				80				70	6
266		075013	Serena Hotel				30				20				20				40				40				40	6
267		075002	Civic Centre																									

Appendix B.7

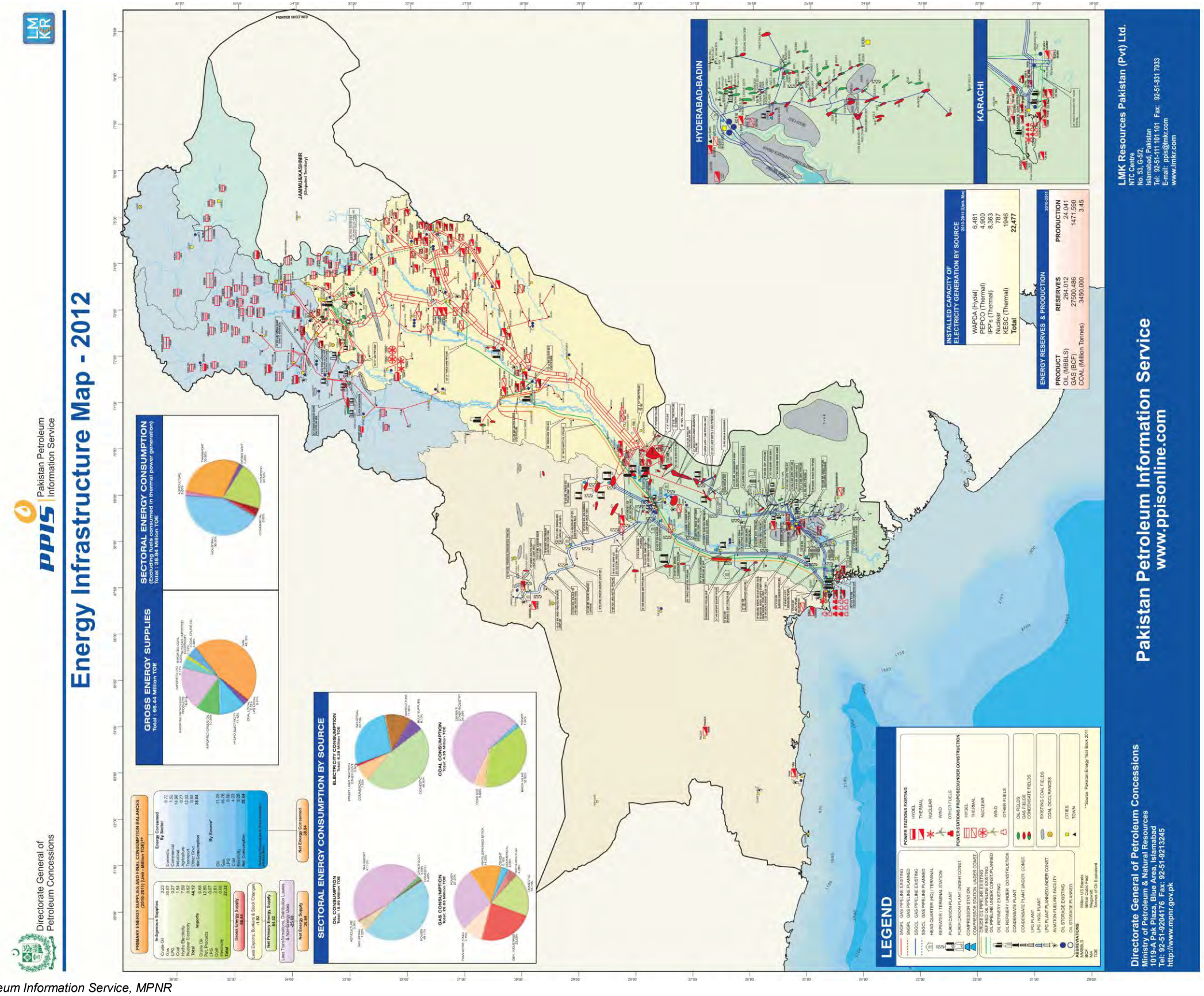
S No	Name of G/Station	Feeder Code	Name of Feeder	0000-0100	0100-0200	0200-0300	0300-0400	0400-0500	0500-0600	0600-0700	0700-0800	0800-0900	0900-1000	1000-1100	1100-1200	1200-1300	1300-1400	1400-1500	1500-1600	1600-1700	1700-1800	1800-1900	1900-2000	2000-2100	2100-2200	2200-2300	2300-2400	
268		061109	I-8/1 (I-8/2)			40				30				30				40				40				50		6
269		061120	FHC (I-8/3)	50					50			50				50					40					50		6
270		061110	Al-Catal				10				20				20				30				20				20	6
271		061128	I-9/4		30				30				30				30				40					70		6
272		061115	CDA Water T/Plant																									
273		061108	Chashnap																									
274	I-8	061129	1-8 Markaz*				10				10				10					40				10			10	6
275		061126	Severage T/Plant																									
276		061103	GOR		90				80				80				80					110				130		6
277		061107	Flour Mill	120																			150	150	150	150	150	6
278		061111	H-8/2			40				40				60				80			60					60		6
279		061121	I-8/4	40				40				40				40				40				60				6
280		061127	Industrial-II	100																			100	100	100	100	100	6
TOTAL AMP				5,327	4,143	3,757	3,714	3,897	3,018	2,167	2,423	2,517	2,738	2,567	2,410	2,612	2,968	3,385	3,314	3,372	4,978	5,000	6,175	6,112	5,848	6,659	6,185	
TOTAL MW				89	69	63	62	65	50	36	40	42	46	43	40	44	49	56	55	56	83	83	103	102	97	111	103	

Appendix C

Energy Infrastructure Map

(Source: PPIS, MPNR)

C Energy Infrastructure Map

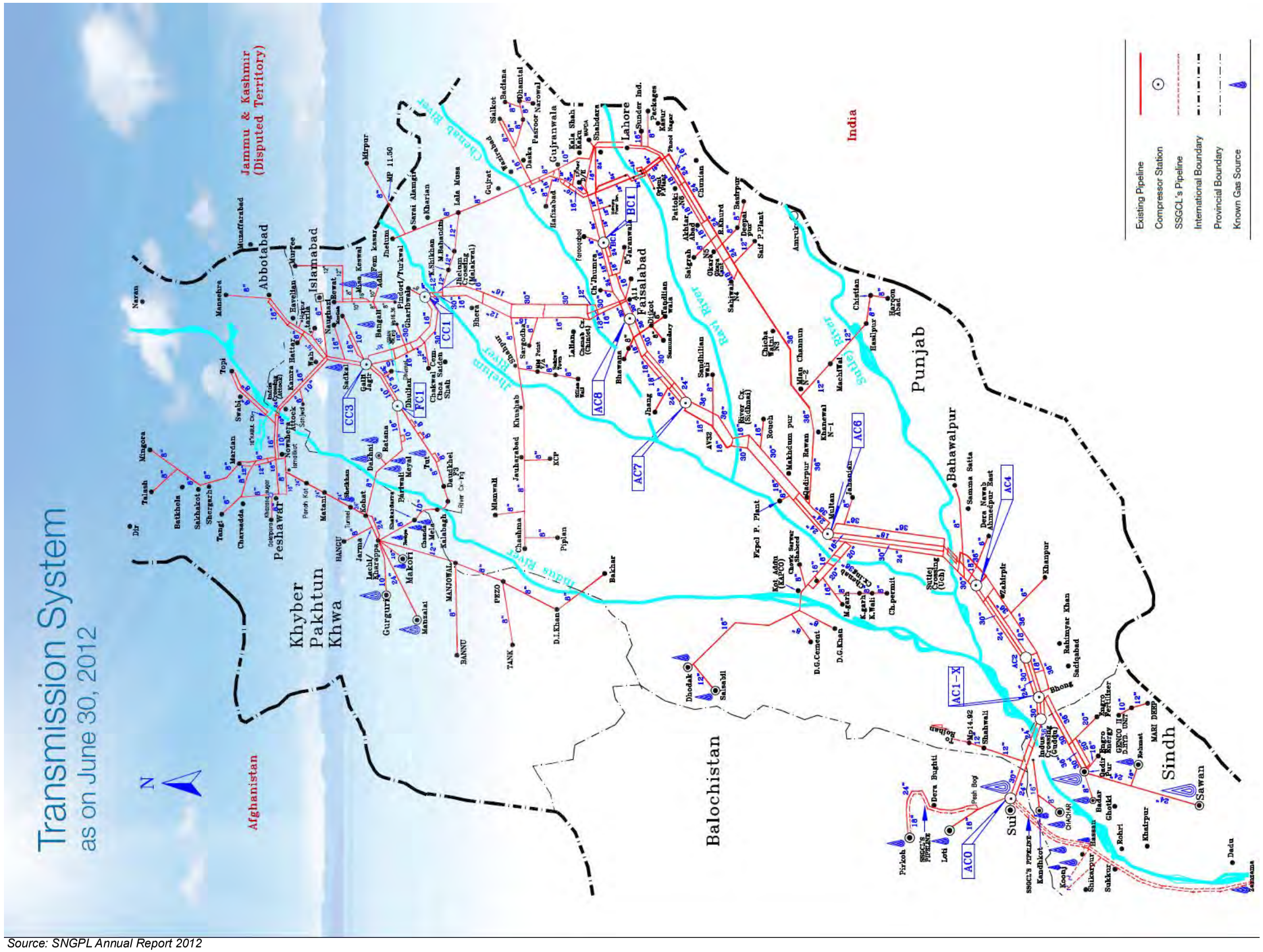


Source: Pakistan Petroleum Information Service, MPNR

Appendix D

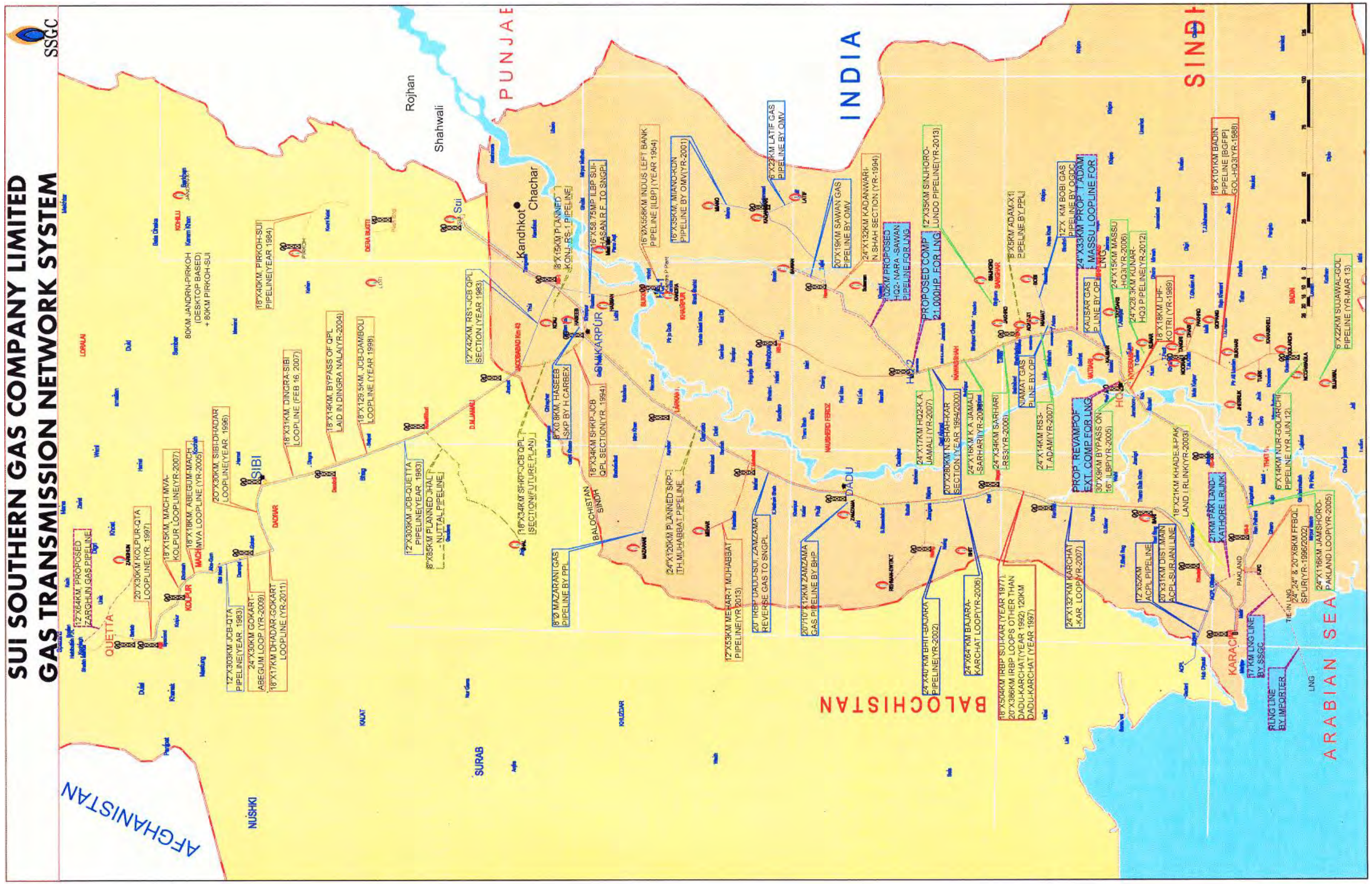
Natural Gas Distribution Networks

D.1 Natural Gas Distribution Network of SNGPL



Source: SNGPL Annual Report 2012

D.2 Natural Gas Distribution Network of SSGCL



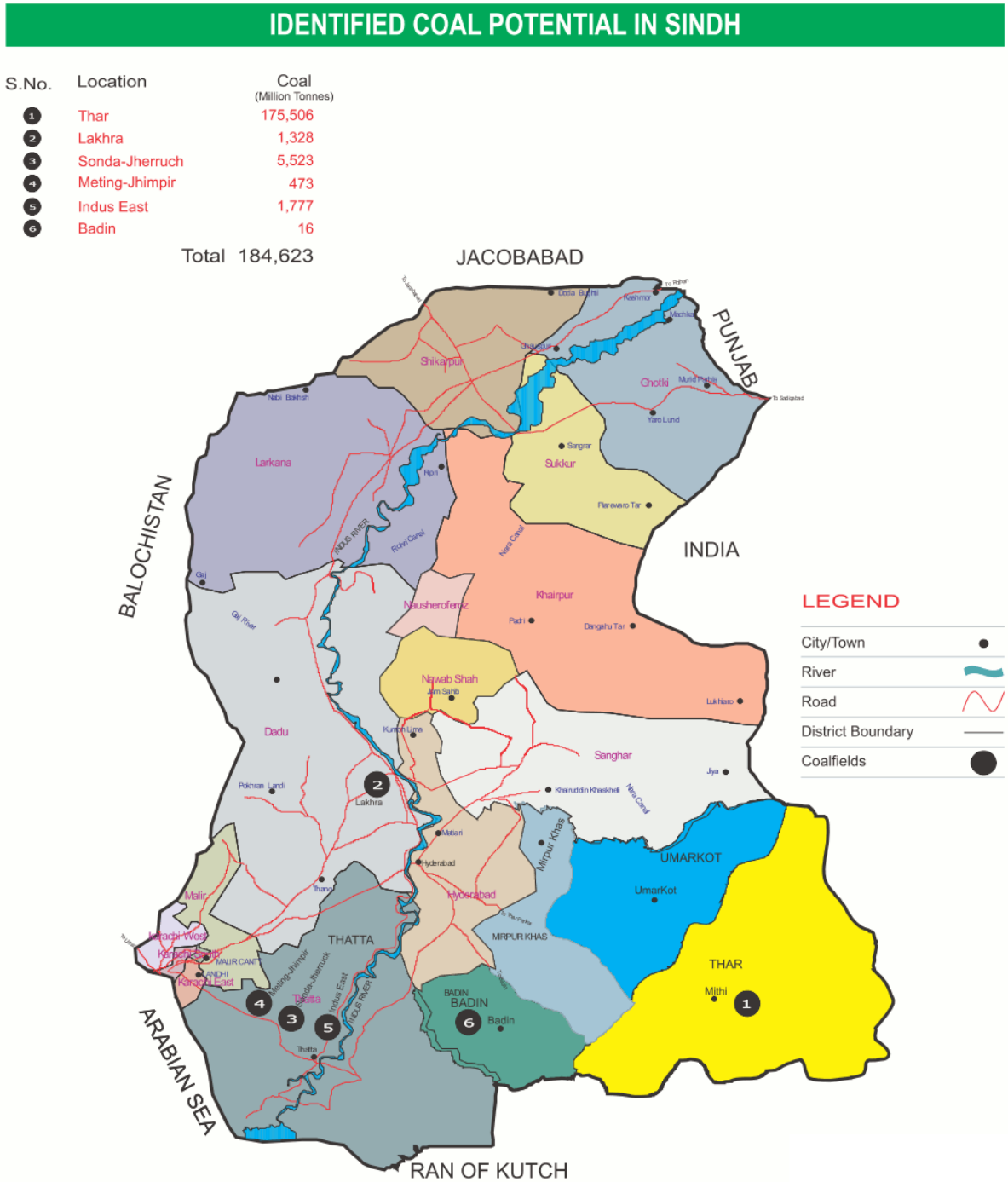
Source: Provided by SSGCL

Appendix E

Identified Coal Potential

E.1 Identified Coal Potential in Sindh

Of the total coal reserves 184,623 million tonnes are located in the Province of Sindh. The Thar area of Sindh alone has a potential of 175,505 million tonnes of coal. The coal quality is from lignite-B to lignite-A. The coal reserves in Sindh shown in **Figure E.1-1** below. The quality and quantities of each area is given in subsequent tables below.



Source: "Pakistan Coal Power Generation Potential", June 2004, PPIB (Reproduced by JICA Survey Team)

Figure E.1-1 Location of Coal Fields in Sindh

Table E.1-1 Thar Coal Quality and Reserves

Quality	
Moisture (%)	29.6 - 55.50
Ash Content (%)	02.90 - 11.50
Volatile Matter (%)	23.10 - 36.60
Fixed Carbon (%)	14.20 - 34.00
Sulfur (%)	00.40 - 02.90
Heating Value (Btu/lb)	
As Received Basis	6,244 - 11,045
Dry Basis	10,723 - 11,353
The Quality of Coal is Lignite-B to Lignite-A	
Coal Reserves (Million Tonnes)	
Measured	2,700
Indicated	9,395
Inferred	50,706
Hypothetical	112,705
Total	**175,506**

Source: "Pakistan Coal Power Generation Potential", June 2004, PPIB

Table E.1-2 Lakhra Coal Quality and Reserves

Quality	
Moisture (%)	9.70 - 38.10
Ash Content (%)	04.30 - 49.00
Volatile Matter (%)	18.30 - 38.60
Fixed Carbon (%)	09.80 - 38.20
Sulfur (%)	01.20 - 14.80
Heating Value (Btu/lb)	5,503 - 9,158
The Quality of Coal is Lignite-A	
Coal Reserves (Million Tonnes)	
Measured	244
Indicated	629
Inferred	455
Total	**1,328**

Source: "Pakistan Coal Power Generation Potential", June 2004, PPIB

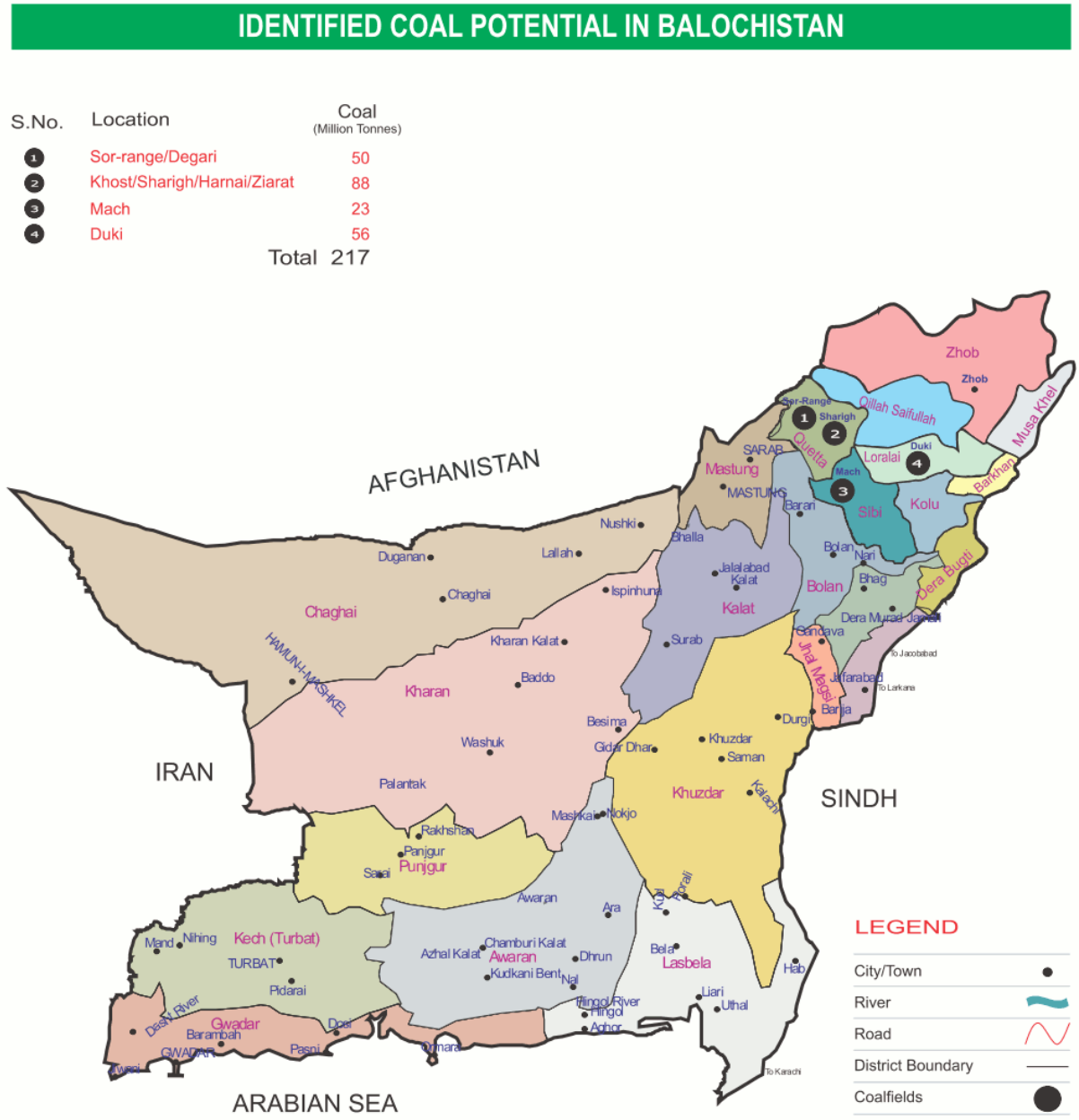
Table E.1-3 Sonda-Jherruk (Including Indus East & Meting-Jhimpir) Coal Quality and Reserves

Quality	
Moisture (%)	9.00 - 48.00
Ash Content (%)	02.70 - 52.00
Volatile Matter (%)	16.10 - 44.20
Fixed Carbon (%)	08.90 - 58.80
Sulfur (%)	00.20 - 15.00
Heating Value (Btu/lb)	5,219 - 13,555
The Quality of Coal is Lignite-A	
Coal Reserves (Million Tonnes)	
Measured	245
Indicated	1,611
Inferred	5,917
Total	**7,773**

Source: "Pakistan Coal Power Generation Potential", June 2004, PPIB

E.2 Identified Coal Potential in Balochistan

There are 217 million tonnes of identified coal reserves in the Province of Balochistan. The coal quality is sub-butimunious. The map showing location of coal fields in Balochistan is given in **Figure E.2-1** below. The quality and quantities of each area is given in subsequent tables below.



Source: "Pakistan Coal Power Generation Potential", June 2004, PPIB (Reproduced by JICA Survey Team)

Figure E.2-1 Location of Coal Fields in Balochistan

Table E.2-1 Sor-Range & Degari Coal Quality and Reserves

Quality	
Moisture (%)	03.90 - 18.90
Ash Content (%)	04.30 - 17.20
Volatile Matter (%)	20.70 - 37.50
Fixed Carbon (%)	41.00 - 50.80
Sulfur (%)	00.60 - 05.50
Heating Value (Btu/lb)	11,245 - 13,900
The Quality of Coal is Sub-Bituminous	
Coal Reserves (Million Tonnes)	
Measured	15
Indicated	16
Inferred	19
Total	**50**

Source: "Pakistan Coal Power Generation Potential", June 2004, PPIB

Table E.2-2 Khost, Sharigh & Harnai Coal Quality and Reserves

Quality	
Moisture (%)	01.70 - 11.20
Ash Content (%)	09.30 - 34.00
Volatile Matter (%)	09.30 - 45.30
Fixed Carbon (%)	25.50 - 43.80
Sulfur (%)	03.50 - 09.55
Heating Value (Btu/lb)	9,637 - 15, 499
The Quality of Coal is Sub-Bituminous	
Coal Reserves (Million Tonnes)	
Measured	13
Indicated	0
Inferred	63
Total	**76**

Source: "Pakistan Coal Power Generation Potential", June 2004, PPIB

Table E.2-3 Mach Coal Quality and Reserves

Quality	
Moisture (%)	07.10 - 12.00
Ash Content (%)	09.60 - 20.30
Volatile Matter (%)	34.20 - 43.00
Fixed Carbon (%)	32.40 - 41.50
Sulfur (%)	03.20 - 07.40
Heating Value (Btu/lb)	11,110 - 12,937
The Quality of Coal is Sub-Bituminous	
Coal Reserves (Million Tonnes)	
Measured	9
Indicated	14
Inferred	0
Total	**23**

Source: "Pakistan Coal Power Generation Potential", June 2004, PPIB

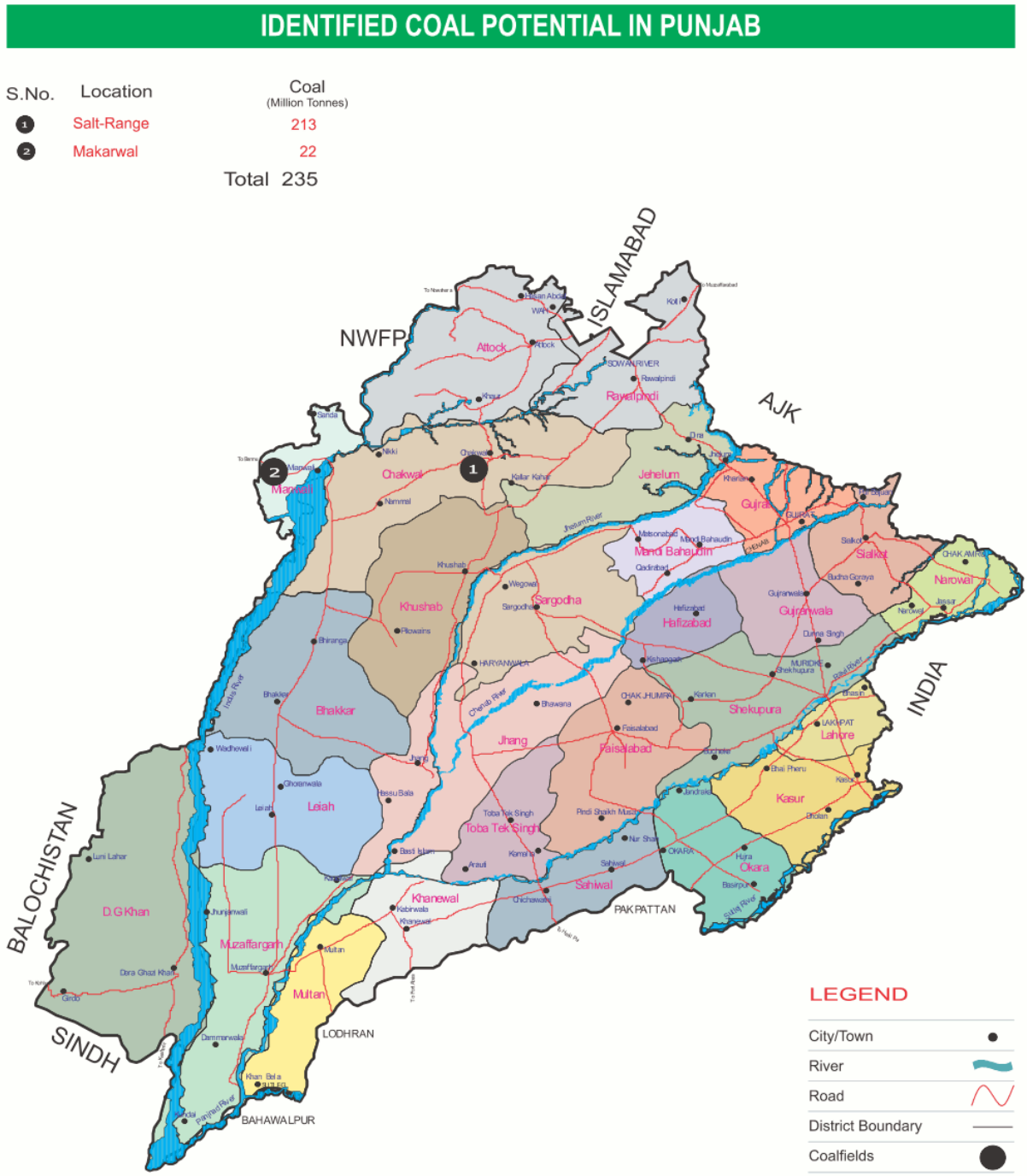
Table E.2-4 Duki Coal Quality and Reserves

Quality	
Moisture (%)	03.50 - 11.50
Ash Content (%)	05.00 - 38.00
Volatile Matter (%)	32.00 - 50.00
Fixed Carbon (%)	28.00 - 42.00
Sulfur (%)	04.00 - 06.00
Heating Value (Btu/lb)	10,131 - 14,164
The Quality of Coal is Sub-Bituminous	
Coal Reserves (Million Tonnes)	
Measured	14
Indicated	11
Inferred	25
Total	**50**

Source: "Pakistan Coal Power Generation Potential", June 2004, PPIB

E.3 Identified Coal Potential in Punjab

According to the data given by NEPRA report of 2004 "Coal potential in Pakistan" there are 235 million tonnes of identified coal reserves in the Province of Punjab. The coal quality is sub-bituminous-Rank D. Recently the Punjab government has completed a resource potential and estimation study of coal by Snowden, a well reputed Australian company, and according to the report the coal reserves in Punjab now stand at 596 MT spread over an area of 614 Sq.kms. The map showing location of coal fields in Punjab is given in **Figure E.3-1** below. The quality and quantities of each area is given in subsequent tables below.



Source: "Pakistan Coal Power Generation Potential", June 2004, PPIB (Reproduced by JICA Survey Team)

Figure E.3-1 Location of Coal Fields in Punjab

Table E.3-1 Salt-Range Coal Quality and Reserves

Quality	
Moisture (%)	03.20 - 10.80
Ash Content (%)	12.30 - 44.20
Volatile Matter (%)	21.50 - 38.80
Fixed Carbon (%)	25.70 - 44.80
Sulfur (%)	02.60 - 10.70
Heating Value (Btu/lb)	9,472 - 15,801
The Quality of Coal is Sub-Bituminous	
Coal Reserves (Million Tonnes)	
Measured	18.94
Indicated	106.02
Inferred	318.66
Total	**465.09**

Source: "Pakistan Coal Power Generation Potential", June 2004, PPIB

Table E.3-2 Makarwal Coal Quality and Reserves

Quality	
Moisture (%)	02.80 - 06.00
Ash Content (%)	06.40 - 30.80
Volatile Matter (%)	31.50 - 48.10
Fixed Carbon (%)	34.90 - 44.90
Sulfur (%)	02.80 - 06.30
Heating Value (Btu/lb)	10,688 - 14,029
The Quality of Coal is Sub-Bituminous	
Coal Reserves (Million Tonnes)	
Measured	5
Indicated	8
Inferred	9
Total	**22**

Source: "Pakistan Coal Power Generation Potential", June 2004, PPIB

E-4 Identified Coal Potential in Khyber Pukhtunkhuwa (KPK)

There are 91 million tonnes of identified coal reserves in the Province of KPK. The coal quality is sub-butimunious. The map showing location of coal fields in KPK is given in **Figure E.4-1** below. The quality and quantities of each area is given in subsequent tables below.

Source: "Pakistan Coal Power Generation Potential", June 2004, PPIB (Reproduced by JICA Survey Team)

Figure E.4-1 Location of Coal Fields in KPK

Table E.4-1 KPK Coal Quality and Reserves

Quality	
Moisture (%)	00.10 - 07.10
Ash Content (%)	05.30 - 43.30
Volatile Matter (%)	14.00 - 33.40
Fixed Carbon (%)	21.80 - 76.90
Sulfur (%)	01.10 - 09.50
Heating Value (Btu/lb)	9,386 - 14,217
The Quality of Coal is Sub-Bituminous	
Coal Reserves (Million Tonnes)	
Measured	2
Indicated	5
Inferred	84
Total	**91**

Source: "Pakistan Coal Power Generation Potential", June 2004, PPIB

Appendix F

Donors Activity

F.1 Asian Development Bank (ADB)

The table was based on the website of ADB http://www.adb.org/projects/search/498,21303?ref=countries/pakistan

Serial No.: 1
1. Title of Activity:
Pak: Foundation Wind Energy I and II Projects
2. Field: generation, transmission, distribution, rural electrification, energy conservation, renewable energy, institutional reform, and others
Renewable Energy
3. Type of Activity: loan, grant project, grant technical assistance, and others
Loan
4. Budget:
USD. 65.2 million
5. Period:
18th May, 2012 to (No information on completion date)
6. Counterpart Organization:
Private Sector Pak Foundation Wind Energy
7. Other Donors involved:
None
8. Outline and Target of Activity:
Financing in Private sector for construction of 2x50 MW wind farms at Kutti Kun in Sindh Province.
9. Progress:
No Information
10. Challenging Problem if any:

Serial No.: 2
1. Title of Activity:
Pak: Zorlu Enerji Power Project
2. Field: generation, transmission, distribution, rural electrification, energy conservation, renewable energy, institutional reform, and others
Renewable Energy
3. Type of Activity: loan, grant project, grant technical assistance, and others
Loan
4. Budget:
USD 36.80 million
5. Period:
April 2009 to July, 2013
6. Counterpart Organization:
Private Sector Pak Zorlu Enerji
7. Other Donors involved:
None
8. Outline and Target of Activity:
Financing in private sector for construction of 56.4 MW wind farms at Jhimpir in Sindh Province
9. Progress:
Completed
10. Challenging Problem if any:

Serial No.: 3
1. Title of Activity:
Patrind Hydropower Project
2. Field: generation, transmission, distribution, rural electrification, energy conservation, renewable energy, institutional reform, and others
Generation
3. Type of Activity: loan, grant project, grant technical assistance, and others
Loan
4. Budget:

USD 97 million
5. Period:
December 2011 to (No information on Completion)
6. Counterpart Organization:
Private Sector
7. Other Donors involved:
None
8. Outline and Target of Activity:
Financing in private sector for construction of 147 MW run-off-river hydro power plant between Kunhar and Jehlum rivers near Muzzafagarh
9. Progress:
No Information
10. Challenging Problem if any:

Serial No.: 4
1. Title of Activity:
Pak-Daharki Power Project
2. Field: generation, transmission, distribution, rural electrification, energy conservation, renewable energy, institutional reform, and others
Generation
3. Type of Activity: loan, grant project, grant technical assistance, and others
Loan plus 25% equity sharing
4. Budget:
USD 46.75 million
5. Period:
2008 to (No information on completion)
6. Counterpart Organization:
Private Sector organization
7. Other Donors involved:
None
8. Outline and Target of Activity:
Financing in private sector for construction of 175 MW low-BTU gas-powered combined cycle power plant near Mari gas field
9. Progress:
Completed
10. Challenging Problem if any:

Serial No.: 5
1. Title of Activity:
Jamshoro Power Generation Project
2. Field: generation, transmission, distribution, rural electrification, energy conservation, renewable energy, institutional reform, and others
Others (Capacity Building)
3. Type of Activity: loan, grant project, grant technical assistance, and others
Grant Technical Assistance
4. Budget:
USD 375,000
5. Period:
May 27, 2013 to April 30, 2014
6. Counterpart Organization:
GENCO
7. Other Donors involved:
None
8. Outline and Target of Activity:
Technical assistance for preparation of feasibility study, EIA, and bidding documents.
9. Progress:
No Information
10. Challenging Problem if any:

Serial No.: 6
1. Title of Activity:
Energy Efficiency Investment Program(Multi Tranche Financing Facility)
2. Field: generation, transmission, distribution, rural electrification, energy conservation, renewable energy, institutional reform, and others
Energy Conservation
3. Type of Activity: loan, grant project, grant technical assistance, and others
Loan
4. Budget:
USD 780 million
5. Period:
September 22, 2009 to (no information on completion date)
6. Counterpart Organization:
GOP (no other information on involved departments)
7. Other Donors involved:
AFD (Agence Francaise de Development)
8. Outline and Target of Activity:
Application of clean & efficient technology to save18% of primary energy use
9. Progress:
No Information
10. Challenging Problem if any:

Serial No.: 7
1. Title of Activity:
Power Distribution Enhancement Investment Program
2. Field: generation, transmission, distribution, rural electrification, energy conservation, renewable energy, institutional reform, and others
Distribution
3. Type of Activity: loan, grant project, grant technical assistance, and others
Loan
4. Budget:
USD 272 million
5. Period:
No Information
6. Counterpart Organization:
FESCO, GEPCO, HESCO, MEPCO, IESCO, PESCO, QESCO
7. Other Donors involved:
None
8. Outline and Target of Activity:
Replacement of existing transmission lines of DISCOs: 66kV line and 132kV line, and substitution of transformers,
9. Progress:
No Information
10. Challenging Problem if any:

Serial No.: 8
1. Title of Activity:
Power Transmission Enhancement Investment Program
2. Field: generation, transmission, distribution, rural electrification, energy conservation, renewable energy, institutional reform, and others
Transmission
3. Type of Activity: loan, grant project, grant technical assistance, and others
Loan
4. Budget:
USD 287.44 million
5. Period:
No Information
6. Counterpart Organization:
NTDC
7. Other Donors involved:

No information
8. Outline and Target of Activity:
Replacement of existing transmission lines of NTDC. This involves construction of new 600 km long 500kV transmission and grid station and expansion of 4 existing 500 kV grid stations
9. Progress:
No Information
10. Challenging Problem if any:

F.2 JICA

The table was based on the website of JICA http://www.jica.go.jp/pakistan/english/activities/activity02.html

Serial No.: 1
1. Title of Activity:
Load Dispatch System Upgrade Project
2. Field: generation, transmission, distribution, rural electrification, energy conservation, renewable energy, institutional reform, and others
Others (Grid Operation)
3. Type of Activity: loan, grant project, grant technical assistance, and others
Loan
4. Budget:
USD. 39.40 million (Yen 3839 million)
5. Period:
No Information
6. Counterpart Organization:
NTDC, NPCC
7. Other Donors involved:
None
8. Outline and Target of Activity:
Modernization & up-gradation of Local Dispatch Center at NPCC in Islamabad by converting existing analogue system to digital system.
9. Progress:
Completed
10. Challenging Problem if any:

Serial No.: 2
1. Title of Activity:
Dadu-Khuzdar Transmission System Project
2. Field: generation, transmission, distribution, rural electrification, energy conservation, renewable energy, institutional reform, and others
Transmission
3. Type of Activity: loan, grant project, grant technical assistance, and others
Loan
4. Budget:
USD 38 million (Yen 3702 million)
5. Period:
No Information
6. Counterpart Organization:
NTDC
7. Other Donors involved:
None
8. Outline and Target of Activity:
Stabilization of power supply in QESCO Network by construction of 300 km long 220 kV transmission line and grid station at Khuzdar and extension of existing 200kV grid station at Dadu
9. Progress:
Completed

10. Challenging Problem if any:

Serial No.: 3
1. Title of Activity:
Punjab Transmission Lines and Grid Station Project
2. Field: generation, transmission, distribution, rural electrification, energy conservation, renewable energy, institutional reform, and others
Transmission
3. Type of Activity: loan, grant project, grant technical assistance, and others
Loan
4. Budget:
USD 122.57 million (Yen 11,943 million)
5. Period:
No Information
6. Counterpart Organization:
NTDC
7. Other Donors involved:
None
8. Outline and Target of Activity:
Extension of existing NTDC network by construction of 500kV grid station at R.Y.Khan and 220kV grid station at Lahore along with associated transmission lines.
9. Progress:
No Information
10. Challenging Problem if any:

Serial No.: 4
1. Title of Activity:
National Transmission Lines and Grid Stations Strengthening Project
2. Field: generation, transmission, distribution, rural electrification, energy conservation, renewable energy, institutional reform, and others
Transmission
3. Type of Activity: loan, grant project, grant technical assistance, and others
Loan
4. Budget:
USD 239.13 million (Yen 23,300 million)
5. Period:
No Information
6. Counterpart Organization:
NTDC
7. Other Donors involved:
None
8. Outline and Target of Activity:
Extension & Strengthening of existing NTDC network by construction of 500kV grid stations at New Lahore and Sheikhupura, and 220kV grid stations at Gujrat & Chistian with associated transmission lines.
9. Progress:
Completed
10. Challenging Problem if any:

Serial No.: 5
1. Title of Activity:
Project for Improvement of Training Capacity on Grid System O&M
2. Field: generation, transmission, distribution, rural electrification, energy conservation, renewable energy, institutional reform, and others
Institutional Reforms
3. Type of Activity: loan, grant project, grant technical assistance, and others
Grant Technical Assistance
4. Budget:
USD 4.86 million (Yen 474 million)

5. Period:
No Information
6. Counterpart Organization:
NTDC, DISCOs
7. Other Donors involved:
None
8. Outline and Target of Activity:
Technical assistance for upgrading of training system at NTDC Training centers
9. Progress:
Completed
10. Challenging Problem if any:

Serial No.: 6
1. Title of Activity:
Introduction of Clean Energy by Solar Electricity Generation System
2. Field: generation, transmission, distribution, rural electrification, energy conservation, renewable energy, institutional reform, and others
Renewable Energy
3. Type of Activity: loan, grant project, grant technical assistance, and others
Grant Project
4. Budget:
USD 4.93 million (Yen 480 million)
5. Period:
February 2010 to March 2012
6. Counterpart Organization:
Planning Commission (PC), Pakistan Engineering Council (PEC)
7. Other Donors involved:
None
8. Outline and Target of Activity:
Installation of 178.08 kW PV on-grid solar systems each on PC car parking roof top and at public green space in front of PEC in Islamabad
9. Progress:
Completed
10. Challenging Problem if any:

F.3 USAID

The table was based on the website of USAID http://www.usaid.gov/pakistan/energy

Serial No.: 1
1. Title of Activity:
Energy Policy Project
2. Field: generation, transmission, distribution, rural electrification, energy conservation, renewable energy, institutional reform, and others
Institutional Reforms
3. Type of Activity: loan, grant project, grant technical assistance, and others
Grant Technical Assistance
4. Budget:
No Information
5. Period:
No Information
6. Counterpart Organization:
WAPDA, MoWP, Ministry of Finance, MPNR, PC and related energy sector bodies
7. Other Donors involved:
None
8. Outline and Target of Activity:
Energy policy reforms and advise all energy related bodies for improvement of energy sector
9. Progress:

No Information
10. Challenging Problem if any:

Serial No.: 2
1. Title of Activity:
Power Distribution Program
2. Field: generation, transmission, distribution, rural electrification, energy conservation, renewable energy, institutional reform, and others
Distribution
3. Type of Activity: loan, grant project, grant technical assistance, and others
Grant Technical Assistance
4. Budget:
No Information
5. Period:
No Information
6. Counterpart Organization:
DISCOs
7. Other Donors involved:
None
8. Outline and Target of Activity:
Strengthening of power distribution system by improving performance of distribution companies. Provide technical assistance to all power related bodies in the country
9. Progress:
No Information
10. Challenging Problem if any:

Serial No.: 3
1. Title of Activity:
Renovation of Tarbela Dam
2. Field: generation, transmission, distribution, rural electrification, energy conservation, renewable energy, institutional reform, and others
Generation
3. Type of Activity: loan, grant project, grant technical assistance, and others
Grant Project
4. Budget:
No Information
5. Period:
No Information
6. Counterpart Organization:
WAPDA
7. Other Donors involved:
None
8. Outline and Target of Activity:
Rehabilitation of existing generators at Tarbela to get additional 128MW power.
9. Progress:
No Information
10. Challenging Problem if any:

Serial No.: 4
1. Title of Activity:
Modernizing the Mangla Dam
2. Field: generation, transmission, distribution, rural electrification, energy conservation, renewable energy, institutional reform, and others
Generation
3. Type of Activity: loan, grant project, grant technical assistance, and others
Grant Project
4. Budget:
No Information

5. Period:
No Information
6. Counterpart Organization:
WAPDA
7. Other Donors involved:
None
8. Outline and Target of Activity:
Rehabilitation and up gradation of generators at Mangla Dam. This involves modernizing existing generators to get additional 100MW of Power at Mangla Dam
9. Progress:
No Information
10. Challenging Problem if any:

Serial No.: 5
1. Title of Activity:
Upgrading Thermal Power Plants
2. Field: generation, transmission, distribution, rural electrification, energy conservation, renewable energy, institutional reform, and others
Generation
3. Type of Activity: loan, grant project, grant technical assistance, and others
No Information
4. Budget:
USD 54.321 Million
5. Period:
No Information
6. Counterpart Organization:
GENCO
7. Other Donors involved:
None
8. Outline and Target of Activity:
Upgrading of existing thermal power plant to improve thermal efficiency that will result in addition of 750 MW of power. This involves upgrading of Jamshoro and Muzzafargarh thermal power plants.
9. Progress:
Most of the work has already been completed.
10. Challenging Problem if any:

Serial No.: 6
1. Title of Activity:
Construction of Gomal Zam Dam
2. Field: generation, transmission, distribution, rural electrification, energy conservation, renewable energy, institutional reform, and others
Renewable Energy, Generation
3. Type of Activity: loan, grant project, grant technical assistance, and others
Grant Project
4. Budget:
No Information
5. Period:
No Information
6. Counterpart Organization:
WAPDA
7. Other Donors involved:
None
8. Outline and Target of Activity:
Construction of multipurpose dam in KPK province to generate 17.4MW of power. Besides, the dam will also provide water for irrigation purposes.
9. Progress:
No Information
10. Challenging Problem if any:

Serial No.: 7
1. Title of Activity:
Kuram Tangi Dam Project
2. Field: generation, transmission, distribution, rural electrification, energy conservation, renewable energy, institutional reform, and others
Others (Capacity Building)
3. Type of Activity: loan, grant project, grant technical assistance, and others
Grant Technical Assistance
4. Budget:
No Information
5. Period:
No Information
6. Counterpart Organization:
WAPDA
7. Other Donors involved:
None
8. Outline and Target of Activity:
Environment & social impact analysis for construction of multipurpose dam in FATA Area.
9. Progress:
Completed
10. Challenging Problem if any:

Serial No.: 8
1. Title of Activity:
Construction of Satpara Dam
2. Field: generation, transmission, distribution, rural electrification, energy conservation, renewable energy, institutional reform, and others
Generation , Renewable Energy
3. Type of Activity: loan, grant project, grant technical assistance, and others
No Information
4. Budget:
No Information
5. Period:
No Information
6. Counterpart Organization:
WAPDA
7. Other Donors involved:
None
8. Outline and Target of Activity:
Construction of multipurpose dam in Gilgit-Baltistan. This dam will generate 17.7MW of power and also provide water for irrigation purposes.
9. Progress:
No Information
10. Challenging Problem if any:

F.4 World Bank

The table was based on the website of WB http://www.worldbank.org/en/country/pakistan/projects , and updated by the review by WB.

Serial No.: 1
1. Title of Activity:
Pakistan Community-Based Renewable Energy Development in Northern Areas
2. Field: generation, transmission, distribution, rural electrification, energy conservation, renewable energy, institutional reform, and others
Rural electrification, renewable energy, livelihood
3. Type of Activity: loan, grant project, grant technical assistance, and others
Carbon Finance

4. Budget:
US $ 5.94 million
5. Period:
2009 to 2015
6. Counterpart Organization:
Aga Khan Rural Support Program (AKRSP)
7. Other Donors involved:
GIZ, AKRSP (Aga Khan Rural Support Program), SDC, PPAF
8. Outline and Target of Activity:
Reduce global emissions of carbon dioxide (the current project target is approximately 180,000 tCO2e between October 2009 and October 2016. Out of 180,000 tCO2e, the IBRD as trustees of the two carbon funds is expected to purchase 84,859 CERs in total unless the IBRD as Trustee of the UCF T2 exercises a call option specified in the UCF T2 ERPA.): (i) the CBREDP generated 6,107 tCO2e of CERs for the monitoring period from October 29, 2009 to March 31, 2011. (ii) Verification of an additional 21,285 tCO2e of CERs for the period from April 1, 2011 to March 31, 2013 is in progress. (iii) The total for the CBREDP, thus far, is 27,392 tCO2e of CERs
9. Progress:
38 MHPs are operational, construction of another 5 has been completed and 10 more are under construction
10. Challenging Problem if any:
Project implementation continues to be slow as difficulties in fund raising required to install MHPs have not been resolved. Work on 37 projects has still not started because of lack of funds and, as a result, counterpart funding continues to be rated MU. Negotiations for funds with the principal financial sources, PPAF, as well as SDC, have not made progress. Load factor for majority of the plant is too small to earn sizeable carbon revenues.

Serial No.: 2
1. Title of Activity:
Electricity Distribution and Transmission Improvement Project
2. Field: generation, transmission, distribution, rural electrification, energy conservation, renewable energy, institutional reform, and others
Transmission, Distribution
3. Type of Activity: loan, grant project, grant technical assistance, and others
Loan and Credit
4. Budget:
USD 194.6 million
5. Period:
June 17, 2008 to February 28, 2014
6. Counterpart Organization:
NTDC, IESCO, LESCO, MEPCO, HESCO
7. Other Donors involved:
None
8. Outline and Target of Activity:
Strengthening distribution & transmission network and capacity building of related organizations i.e. NTDC, IESCO, LESCO, MEPCO, and HESCO
9. Progress:
Project is closing in 3 weeks (Feb 28, 2014)
10. Challenging Problem if any:
Slow implementation and delay in contract awards.

Serial No.: 3
1. Title of Activity:
Natural Gas Efficiency Program
2. Field: generation, transmission, distribution, rural electrification, energy conservation, renewable energy, institutional reform, and others
Energy Conservation
3. Type of Activity: loan, grant project, grant technical assistance, and others
Loan and Credit
4. Budget:
USD 200 million
5. Period:
October 31, 2012 to December 31, 2017
6. Counterpart Organization:
SSGCL (Sui Southern Gas Company Limited)
7. Other Donors involved:
None

8. Outline and Target of Activity:
Reduction in losses through reduction in Unaccounted-for Gas (UFG). Reduce UFG in SSGCL Network.
9. Progress:
Project is being restructured.
10. Challenging Problem if any:
Slow progress

Serial No.: 4
1. Title of Activity:
Tarbela 4th Extension Hydropower Project
2. Field: generation, transmission, distribution, rural electrification, energy conservation, renewable energy, institutional reform, and others
Generation
3. Type of Activity: loan, grant project, grant technical assistance, and others
Loan and Credit
4. Budget:
USD 840 million
5. Period:
April 27, 2012 to December 31, 2018
6. Counterpart Organization:
WAPDA
7. Other Donors involved:
None
8. Outline and Target of Activity:
Installation of 1,410 MW of power at existing tunnel. This will help increase hydro power generation during peak summer months.
9. Progress:
Civil works have started. E&M contract is at final stage of award.
10. Challenging Problem if any:
Nil – project is rated satisfactory.

Appendix G

Environmental Law on Energy Sector

G.1 Pakistan Environmental Protection Act (PEPA) 1997

(1) Outline

Pakistan Environmental Protection Act (PEPA) 1997 is environmental basic law in Pakistan. This Act define establish of Pakistan Environmental Protection Council and Pakistan environmental protection agency. And this Act also defines execution of the Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA).

(2) Pakistan Environmental Protection Agency Review of Initial Environmental Examination and Environmental Impact Assessment Regulations, 2000

These regulations, framed under Section 33 of PEPA, define projects requiring IEE or EIA. These regulations also define guidelines and procedures of environmental assessment.

In the energy sector, these regulations require that specified types of energy generation and dam construction projects undergo prior environmental assessment.（See the table below）

Table G.1-1 List of Projects requiring IEE/EAI in energy sector

SCHEDULE1:List of Projects requiring an IEE in Energy Sector
1.Hydroelectric power generation less than 50MW 2.Thermal power generation less than 200MW 3.Transmission lines less than 11KV and large distribution projects 4.Oil and gas transmission systems 5.Oil and gas extraction projects including exploration, production, gathering systems, separation and storage 6.Waste-to-energy generation projects
SCHEDULE2:List of Projects requiring an EIA in Energy Sector
1.Hydroelectric power generation over 50MW 2.Thermal power generation over 200MW 3.Transmission lines (11KV and above)and grid stations 4.Nuclear power plans 5.Petroleum refineries

Source: Pakistan Environmental Protection Agency Review of Initial Environmental Examination and Environmental Impact Assessment Regulations, 2000

(3) Result of interview to Environmental Protection Agency Punjab

In Punjab province, Pakistan Environmental Act is enforced by Punjab Government as Punjab environmental Protection Act since 2010. And solar power generation less than 200 MW is required IEE and above 200 MW project is required EIA.

G.2 The Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997

(1) Outline

This act regulates the generation, transmission and distribution of electric power. It establishes the National Electric Power Regulatory Authority (NEPRA). The Authority is given exclusive responsibility for regulating the provision of electric power services. The act requires licensing for generation, transmission and distribution of electric power. License holders are required to follow performance standards, including "safety, health and environmental protection instructions issued by the Authority or any government agency"

(2) Result of interview to NEPRA

Necessities of environmental consideration are based on environmental law of Pakistan. And license holders should comply with the Pakistan Environmental Protection Act and National Environmental Quality Standards (NEQS).

(3) Result of interview to PEC

PEC (Pakistan Engineering Council) installed the Pakistan's first grid-connected solar power generation system in 2012. In their application of electricity generation license, IEE approval from Pak-EPA was attached as environmental approval of the project.

Appendix H

Field Reconnaissance Survey of Some Operating Districts of MEPCO

H.1 Lodhran

Lodhran is located 80 km south from Multan city. Surrounding of Lodhran is belonging to Lodhran operation district of MEPCO. There are many tube wells and canals for irrigated agriculture.

Tube well

	Motor house and tube-well pump
	Tube-well pump
	Motor in the house

	11kV distribution line and transformer for tube-well
	Electricity meter
	Watercourse from tube-well

Canal

	Lodhran-No.1 point Canal (Distributary)
	Lodhran-No.1 point Canal (Distributary)
	Lodhran-No.1 point Road on the top of bank
	Lodhran-No.2 point Canal (Distributary)

	Lodhran-No.2 point Canal (Distributary)
	Lodhran-No.2 point Canal (Distributary)
	Lodhran-No.2 point Canal (Distributary)

H.2 Chichawatni

Chichawatni is located in east of Multan and about 130 km. This city is belonging to Chichawatni operation district of MEPCO.

	Chichawatni -No.1 point Canal(Distributary)
	Chichawatni -No.1 point Canal(Distributary) and 11kV distribution line
	Chichawatni -No.1 point Canal(Distributary) and 11kV distribution line

	Chichawatni -No.1 point 11kV distribution line
	Chichawatni -No.1 point hydraulic drop
	Chichawatni -No.1 point hydraulic drop
	Chichawatni -No.1 point Canal (Distributary)

	Chichawatni -No.2 point Canal bank and 11kV distribution line
	Chichawatni -No.2 point Canal (Distributary)
	Chichawatni -No.2 point Canal (Distributary) and bridge
	Chichawatni -No.3 point Canal(Distributary) and 11kV distribution line

	Chichawatni -No.3 point Canal(Distributary) and 11kV distribution line
	Chichawatni -No.3 point Canal (Distributary)

Appendix I

Field Reconnaissance Survey of Lal-Kamal Feeder

Overview

Length of the main line of Lal-Kamal is 24 km. Lal-Kamal had more long length, but this feeder is divided to the two sections. Most of the feeder line is passing the rural area.

Crossing point of Main Line and canal

Survey team confirmed one crossing point to the canal. Crossing point is located at the 11 km from the grid station. The name of the crossing canal is Jalal Pur Distributary.

According to the topographical map, there is another canal crossing point. That point is located at the 8km from the grid station. The name of crossing canal is Gogran Minor. Survey team didn't confirm this crossing point.

Crossing point of branch Line and canal

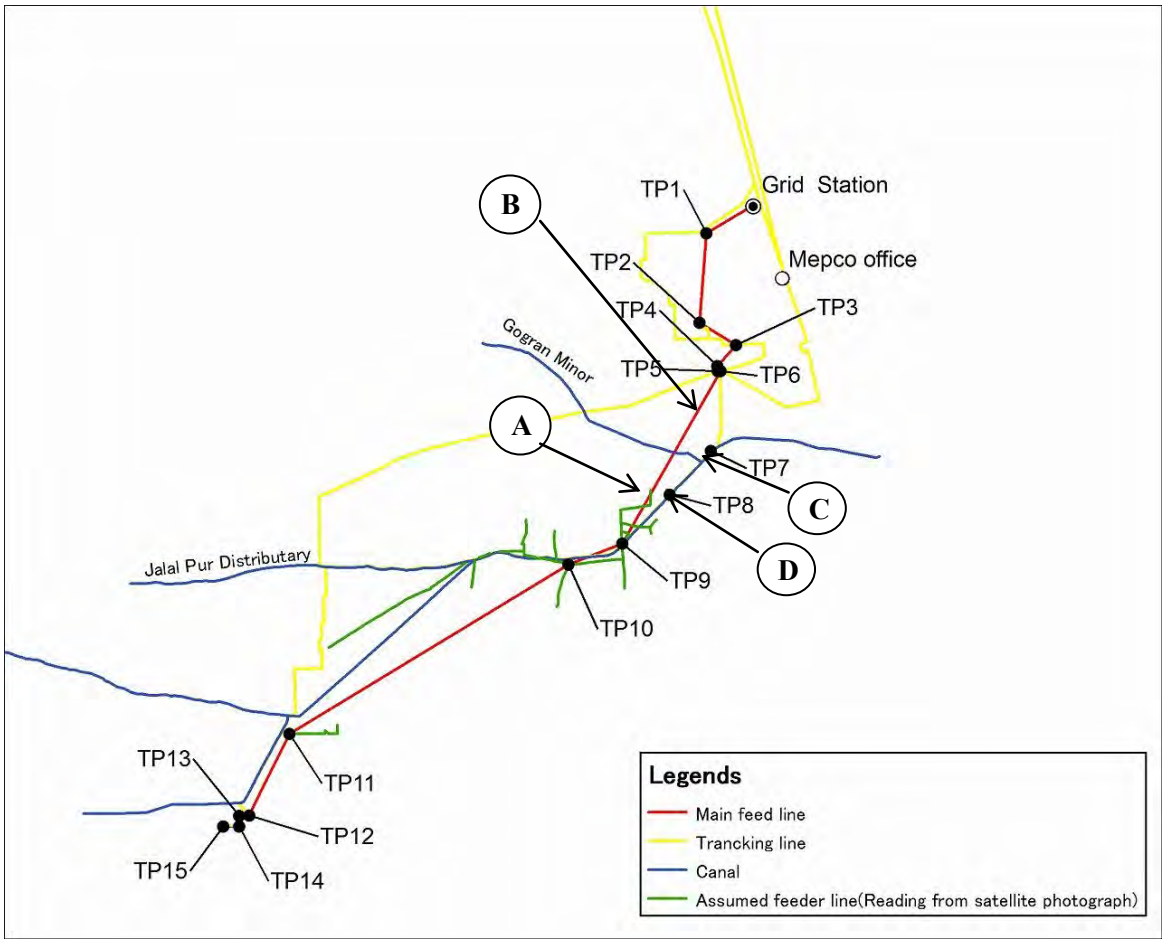
Survey team didn't move along branch line of Lal-Kamal, but team confirmed two crossing points of branch feeder line and Jalal Pur Distributary.

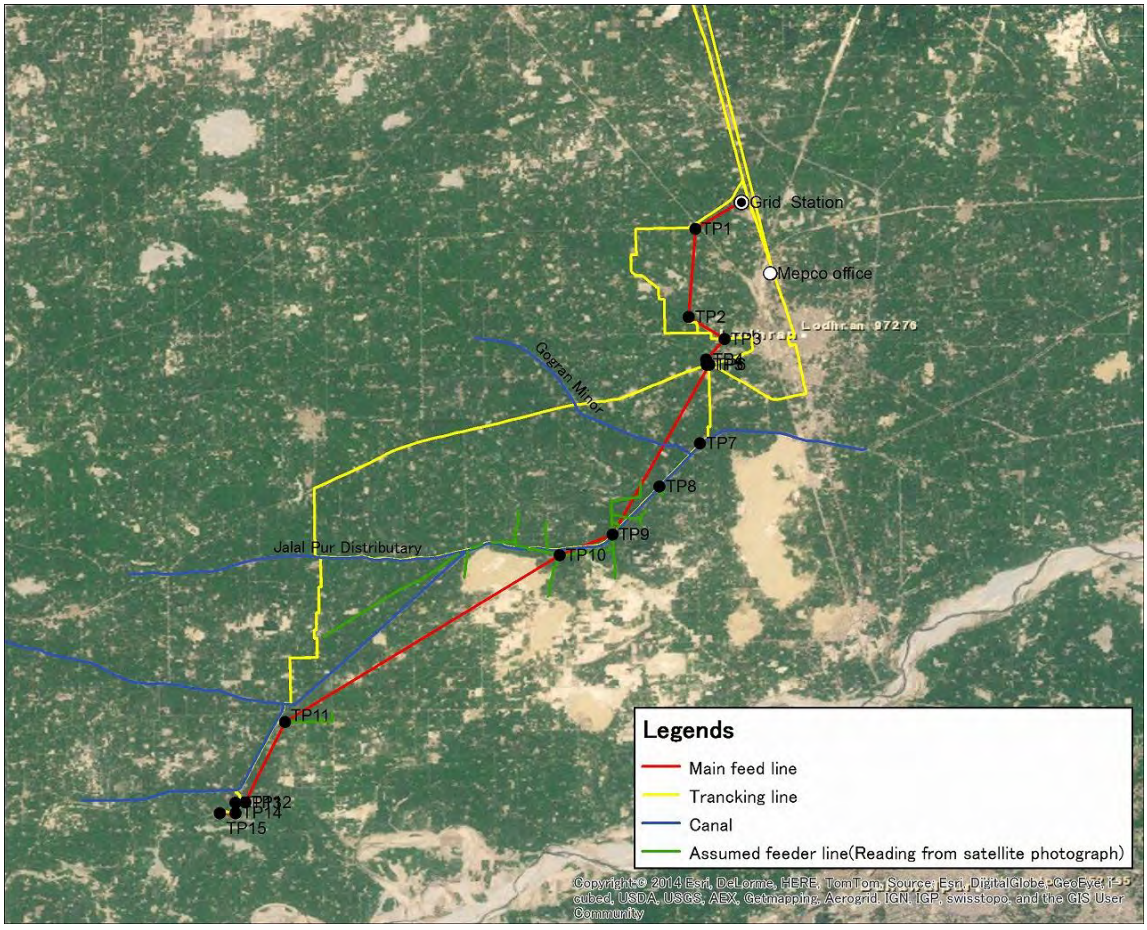
Table G-1 Crossing points feeder line and canal

Feeder line	Mark	Crossing Canal	
		Canal name	Canal width
Lal-Kamal main	A	Jalal Pur Distributary	App.20m
	B	Gogran Minor	App.10m
Lal-Kamal branch	C	Jalal Pur Distributary	App.20m
	D	Jalal Pur Distributary	App.20m

Impressions

Survey team didn't confirm the all crossing points of feeder and canal. But the possibility of crossing point's existence is high. At least, there are many near points between feeders and canals.


B
TP1
Grid Station
TP2
Mepco office
TP4
TP3
Gogran Minor
TP5
TP6
A
TP7
TP8
C
D
Jalal Pur Distributary
TP9
TP10
TP13
TP11
TP12
TP15
TP14
Legends
Main feed line
Trancking line
Canal
Assumed feeder line(Reading from satellite photograph)


Grid Station
TP1
Mepco office
TP2
Gogran Minor
TP7
TP8
TP9
Jalal Pur Distributary
TP10
TP11
TP15
Legends
Main feed line
Trancking line
Canal
Assumed feeder line(Reading from satellite photograph)
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	Lal-Kamal Main feeder (from Lodhran grid station)
	Crossing point of Lal-Kamal Main feeder and Jalal Pur Distributary
	Minor Canal close to Lal-Kamal Main feeder (These crossing conductors are not Lal-Kamal Main feeder.)