CHAPTER 11

ENERGY

Energy is the foundation upon which development and growth and human well-being in particular reposes. Delhi has already achieved 100% electrification. Modern energy access typically entails three forms of energy that is deemed essential for social and economic development : a) less polluting household energy for cooking and heating involving improved cook stoves with traditional solid biomass fuels, from liquid and gaseous fuels such as kerosene and Liquefied Petroleum Gas (LPG) and renewable energy sources such as solar b) electricity which is a secondary energy source for powering household electrical appliances and equipments and c) energy services at public facilities like schools, health clinics, government offices, industrial and commercial activities, mechanical power from electricity or other energy sources that improve the productivity of labour.

2 Delhi has its unique load pattern and peak load problem due to predominant share of domestic consumption and extreme weather conditions. Power sector of Delhi is different compared to other states, while other states have power deficit, Delhi has tied up surplus power in order to cater to the increasing demand and peak load. To ensure sustainable development, Delhi Government has initiated many programmes for capacity addition, augmentation of power infrastructure, promotion of renewable energy, energy efficiency and energy conservation for increasing the share of clean power.

3 Delhi has been the pioneer in unbundling and privatizing the power distribution with effect from 1st July 2002. The power establishment of Delhi after unbundling of Delhi Vidyut Board is shared by Generation Companies (Indraprastha Power Generation Company Limited (IPGCL) and Pragati Power Corporation Limited (PPCL), transmission by Delhi Transco Limited, and five DISCOMs (BYPL, BRPL, TPDDL, NDMC and MES).

4 Power Generation

4.1 Indraprastha Power Generation Company Limited (IPGCL) and Pragati Power Corporation Limited (PPCL) are managing following power plants in Delhi having a total installed generation capacity of 1983.2 MW. In addition to this, there is 1500 MW Coal Based Indira Gandhi Super Thermal Power Plant set-up in Jhajjar, Haryana by Aravali Power Company Private Limited, a joint Venture of IPGCL, HPGCL and NTPC Limited. The power generated is being shared equally by Delhi and Haryana. The Commercial Operation of this plant started on 26th April 2013. The Plant, under Stage-I, has 3 units of 500 MW capacity, and all the units have been fully commissioned. There is a future provision of augmenting the capacity by 1320 MW (2 x 660 MW) under Stage-II. Delhi Pollution Control Committee (DPCC) issued direction vide letter dated 22.3.2016 that Rajghat Power House (RPH) shall remain closed as it is not able to meet standard of particulates matter 50 mg/Nm^3. A committee has been constituted for closer of Rajghat Power House on 22.2.2016 by GNCTD and committee has submitted its recommendation for closer of RPH in June 2016. Formal closing of Rajghat Power House is awaiting the approval of the Cabinet, GNCTD.

Statement 11.1

Installed Capacity of Power Generation in Delhi

(As on 30th November 2017)

S. No	Companies/Station	Fuel	Units
1.	Indraprastha Power Generation Company Limited (IPGCL)		
	a. Gas Turbine Power Station (GTPS)	Gas	6 x 30 MW (GTs) + 3 x 34 MW (STGs) = 282 MW*
2.	Pragati Power Corporation Limited (PPCL)		
	b. Pragati-I Power Station	Gas	2 x 104 MW (GTs) + 1 x 122 MW (STGs) = 330 MW
	c. Pragati-III Power Station, Bawana	Gas	4 x 216 MW (GTs) + 2 x 253.6 MW (STGs) = 1371.2 MW
	Total	**--**	**1983.2 MW****

Source: Indraprastha Power Generation Company Limited and Pragati Power Corporation Limited.

* *Derated to 270 MW*

** *Total Capacity 1971.2 MW (Derated & Barring RPH)*

5 Plant Load Factor

5.1 In the electricity industry, plant load factor is a measure of the gross output of a power plant compared to the maximum output it could produce. The performance of the generation stations owned by Delhi Government in terms of Plant Load Factor and Availability Factor is as under:

Statement 11.2

Plant Load Factor / Availability Factor of Power Plants in Delhi-2010-17

(Percentage)

S. No	Year	Indraprastha Power Station	Rajghat Power House	Gas Turbine Plants	Pragati-I Power Station	Pragati-III Power Station	Average
1.	2010-11	Decommissioned on 31.12.2009	66.05 (75.98)	57.85 (81.91)	80.80 (86.32)		68.23 (81.40)
2.	2011-12	--	69.01 (68.37)	52.21 (79.41)	88.32 (92.61)	38.36 (68.65)	69.14 (82.31)
3.	2012-13	--	67.04 (66.94)	55.28 (84.22)	86.77 (90.50)	30.24 (88.04)	54.15 (85.71)
4.	2013-14	--	32.12 (67.55)	44.01 (85.76)	83.90 (92.62)	9.16 (95.69)	33.71 (91.13)

S. No	Year	Indraprastha Power Station	Rajghat Power House	Gas Turbine Plants	Pragati-I Power Station	Pragati-III Power Station	Average
5.	2014-15	--	35.82 (56.50)	39.59 (68.80)	63.91 (85.62)	18.60 (92.32)	29.49 (91.52)
6.	2015-16	--	3.93# (56.16)#	19.69 (74.81)	53.11 (90.25)	15.87 (64.55)	21.77 (72.88)
7.	2016-17	--	0.00 (0.00)	29.41 (82.84)	62.46 (90.62)	17.04 (80.70)	26.31 (82.94)

Sources: Indraprastha Power Generation Company Limited and Pragati Power Corporation Limited.
Figures in parenthesis relates to availability factor.
upto December 2015.

5.2 The average plant load factor of power plant of Delhi during 2015-16 to 2016-17 is consistently low due to less schedule by system control. The reason for low plant load factor attributed to non-availability of sufficient domestic gas for Bawana power plant.

6 Capacity Addition Programme

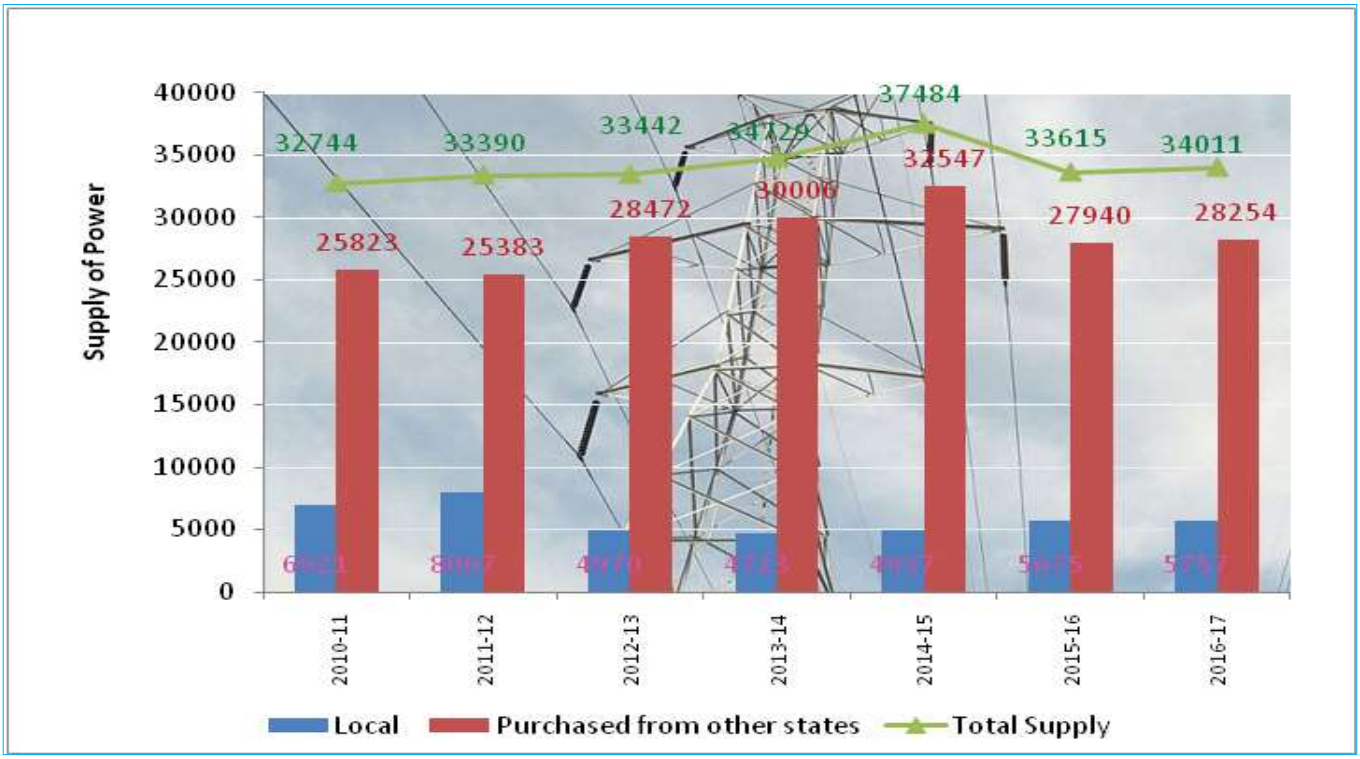
A new 750 MW Gas Based Combined Cycle Gas Turbine (CCGT) Pragati-II Power Project at Bamnauli is proposed to be set up by Pragati Power Corporation Limited (PPCL). The project has been kept on hold by the Government due to non availability of gas.

7 Power Distribution

7.1 The total power purchase in Delhi has grown by 46.64% during the last ten years. The power purchased in Delhi has increased from 32744 MU in 2010-11 to 34011 MU in 2016-17. While 16.93% of total power purchase is sourced from own generation by Delhi Govt. Power Plants, 83.07% is purchased from Central Govt. and other sources.

Chart 11.1

Power purchase in Delhi (in MUs)



Source: - Delhi Statistical Handbook, Power Department letter dated 08.02.2018

7.2 The supply of electricity in Delhi periphery increased from 32744 million units in 2010-11 to 34011 million units in 2016-17.

7.3 The distribution of electricity in Delhi to various categories of consumers increased from 19758 million units in 2010-11 to 26865 million units in 2016-17. Category wise consumption of electricity in Delhi during 2010-11 to 2016-17 is presented in Chart11.2.

Statement 11.3

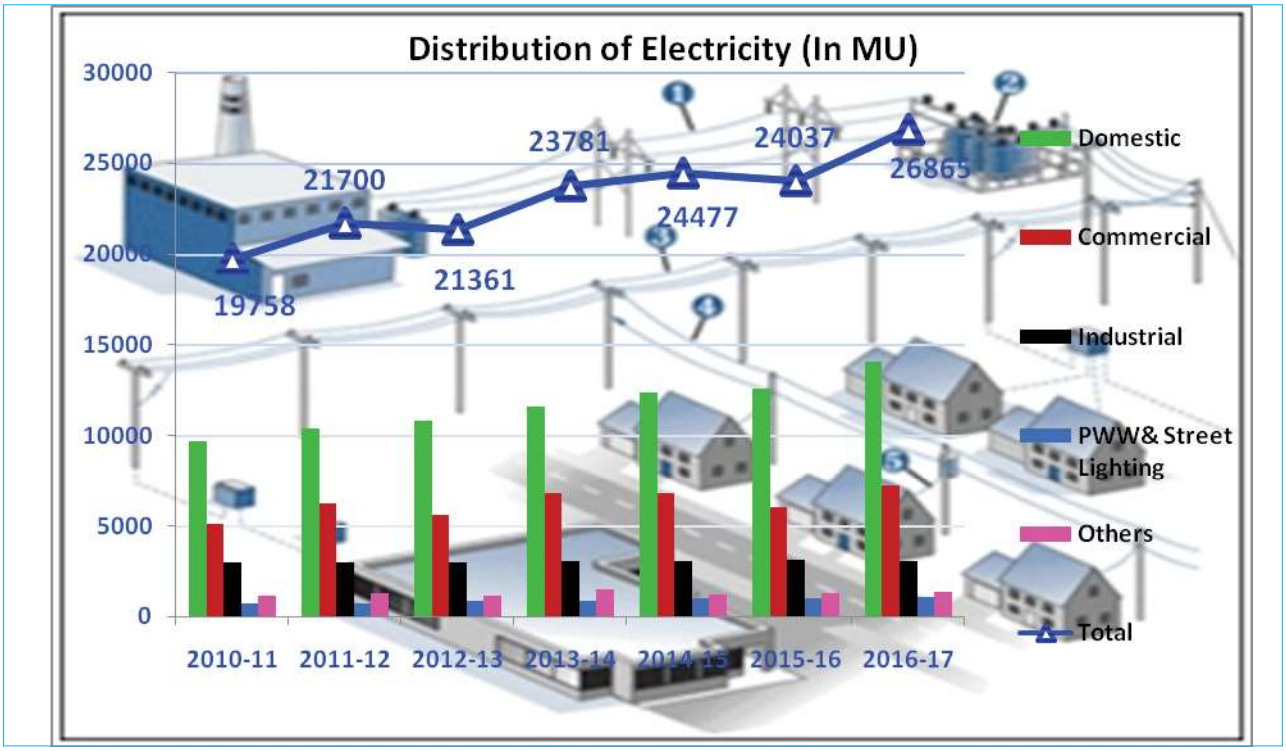
PATTERN OF ELECTRICITY DISTRIBUTION IN DELHI

(In Million Unit)

Year	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
Domestic	9723	10396	10796	11609	12386	12560	14060
Commercial	5074	6253	5569	6786	6814	6053	7257
Industrial	3008	2989	2979	3064	3068	3135	3088
PWW & Street Lighting	734	748	870	838	1007	1027	1098
Others	1219	1314	1147	1484	1202	1262	1362
Total	**19758**	**21700**	**21361**	**23781**	**24477**	**24037**	**26865**

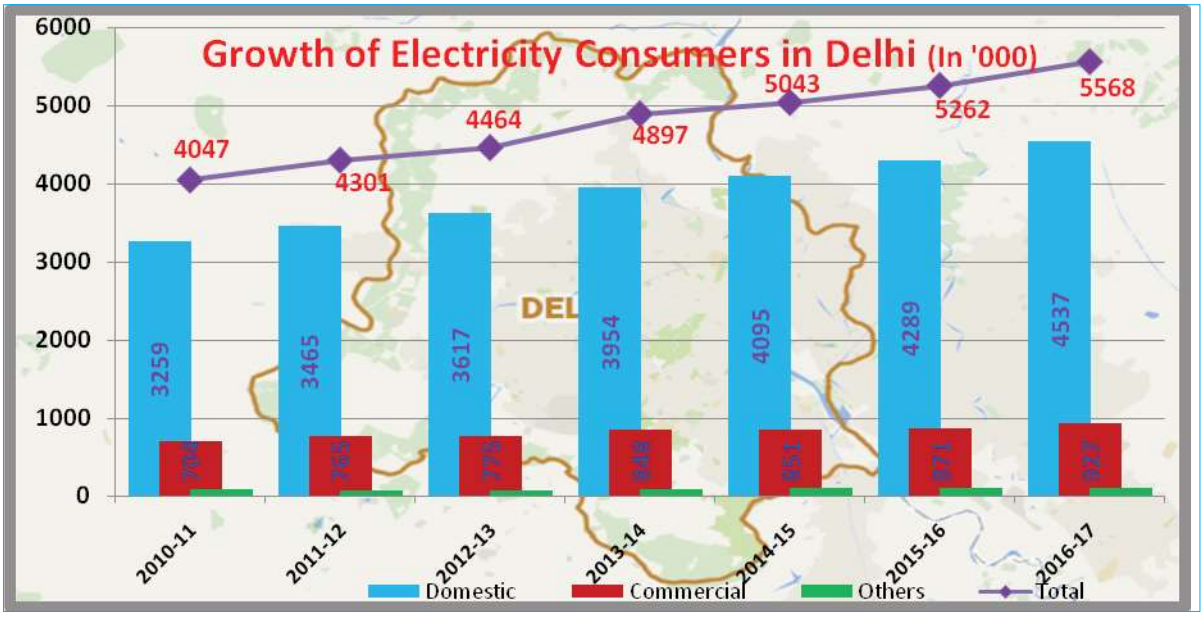
Source: - Delhi Statistical Handbook

Chart 11.2



7.4 During the period 2010-11 to 2016-17, the number of consumers of electricity in Delhi increased from 40.47 lakh to 55.68 lakh. The information regarding number of consumers of electricity in Delhi during 2010-17 is presented in Chart 11.3.

Chart 11.3

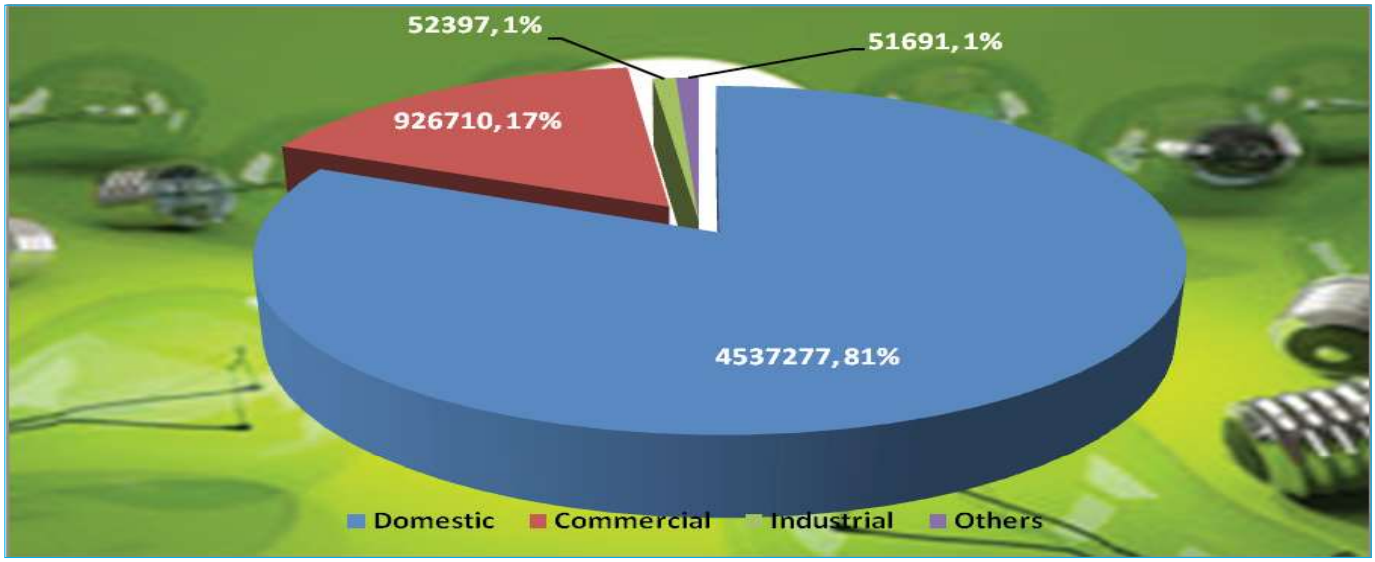


Source: - Delhi Statistical Handbook

7.5 The number of electricity consumers in Delhi has grown by 94.11% during the last ten years. The electricity consumers has increased 15.21 lakh consumers from 2010-11 to 2016-17. Number of consumers in domestic increased every year in the period covered under the study. While all other consumers mentioned in the chart showed an up and down situation in the period covered. The information regarding number of consumers of electricity in Delhi during 2016-17 is depicted in Chart11.4.

Chart 11.4

Number of Consumers of Electricity in Delhi: 2016-17



8 Aggregate Technical and Commercial Losses (AT&C)

8.1 Aggregate Technical and Commercial Losses (AT&C) is the difference between energy units put into the system and the units for which the payment is collected. Transmission and distribution loss do not capture losses on account of non-realization of payments. AT&C loss is the actual measure of overall efficiency of the distribution business as it measures both technical as well as commercial losses. The main reasons for technical losses may be due to overloading of existing lines and substation equipments, absence of up-gradation of old lines and equipments, low HT:LT Ratio, poor repair and maintenance of equipments, non- installation of capacitors for power correction, etc. On the contrary, commercial losses may be due to low metering/billing/collection efficiency, theft, tampering of metering system, low accountability of employees, absence of energy audit and accounting etc.

8.2 After reforms in power sector the AT & C losses in Delhi reduced significantly from 52% in the pre-reform era to 10.66% in 2016-17. The information regarding AT&C losses in Delhi during 2010-17 is presented in Statement 11.4.

Statement 11.4

AT&C Losses in Delhi – post Power Sector Reforms period

(Percentage)

S. No.	Year	BYPL	BRPL	TPDDL
1.	2010-11			
	a. Target	22.00	17.00	17.00
	b. Achievement	21.95	18.82	14.15
2.	2011-12			
	a. Target	18.00	15.00	15.33
	b. Achievement	22.07	18.11	11.49
3.	2012-13			
	a. Target	16.82	14.16	12.50
	b. Achievement	22.14	17.74	10.73
4.	2013-14			
	a. Target	15.66	13.33	12.00
	b. Achievement	22.19	16.93	10.35
5.	2014-15			
	a. Target	14.50	12.50	11.50
	b. Achievement	18.93	13.65	NA
6.	2015-16			
	a. Target	13.33	11.67	9.80
	b. Achievement	15.66	12.08	8.88
7.	2016-17			
	a. Target	--	--	10.50
	b. Achievement	12.70	10.69	8.59

Sources:- DERC, Discoms and websites.

8.3 A new scheme namely "Integrated Power Development Scheme (IPDS)" has been launched (earlier known as Restructured Accelerated Power Development and Reforms Programme (R-APDRP)) by Government of India with an objective to reduce Aggregate Technical and Commercial (AT & C) losses, to establish IT-enabled energy accounting/ auditing and to improve collective efficiency. It's prime objective is for strengthening of the sub-transmission and distribution network in urban areas, metering of distribution / feeders/ transformers /consumers in urban areas and roof top solar panels. The project proposal under IPDS is under submission to Govt. of India for financing of distribution related works during 2017-18.

9 Capital Investment made by DISCOMs on infrastructure

9.1 As the demand for power increases, the demand for improved infrastructure for power also increases. For improving the power conditions in Delhi, all the three companies are augmenting infrastructure like power transformers, EHV cables, installation and 11 KV feeders, shunt capacitors, etc. The capital investment made by the three distribution companies since FY 2010-11 is presented in Statement 11.5.

Statement 11.5

Infrastructure Created by Power Companies in Delhi

(₹ in crore)

S. No.	Year	BYPL	BRPL	TPDDL	Total
1.	2010-11	178.78	283.00	465.53	**927.31**
2.	2011-12	99.96	119.00	365.89	**584.85**
3.	2012-13	133.23	301.00	292.97	**727.20**
4.	2013-14	172.75	287.55	326.46	**786.76**
5.	2014-15	184.87	308.00	264.22	**757.09**
6.	2015-16	231.68	346.00	350.49	**928.17**
7.	2016-17	247.03	371.00	455.10	**1073.13**
	Total	**1248.30**	**2015.55**	**2520.66**	

Sources: - DERC, Discoms.

10 Power Transmission

10.1 Delhi Transco Limited is the State Transmission Utility of the National Capital Territory of Delhi. It is responsible for transmission of power at 220KV and 400KV level, besides up gradation operation and maintenance of EHV Network as per system requirements. After the enactment of Electricity Act 2003, a new department: State Load Despatch Centre (SLDC) under Delhi Transco Limited was created, as an Apex body to ensure integrated operation of the power system in Delhi. Earlier the SLDC was part of O&M Department of Delhi Transco Ltd / Delhi Vidyut Board. SLDC Delhi started its function on the 1st of January 2004. SLDC is responsible for the real time Load Despatch function, SCADA System and Energy Accounting. It's mission is to facilitate intra and inter state transfer of power in coordination with NRLDC (Northern Regional Load Despatch Centre) with Reliability, Security and Economy on sound commercial principles.

10.2 Delhi Transco Limited has established power transmission network consisting of four number of 400 KV and thirty five 220 KV substations and associated with transmission lines. The existing network consists of 400 KV ring around the periphery of Delhi interlinked with the 220 KV network spread all over Delhi. The network of Delhi Transmission Utility upto the year 2016-17 is presented in Statement 11.6.

Statement 11.6

Network of Delhi Transmission Utility: 2016-17

S. No.	Details	400 KV Level	220 KV Level
1.	Number of Sub Stations	4	35
2.	Transformation Capacity (in MVA)	5410	11720
3.	Transmission Lines (Length in Ckt. Km.)	249.192	823.815

Source:- Delhi Transco Limited / SLDC.

10.3 The performance of the transmission utility during the last ten years, system has improved mainly in system availability, reduction in transmission losses, significant reduction of load shedding etc. The performance of Delhi Transco Limited is presented in Statement 11.7.

Statement 11.7

Performance of Delhi Transco Limited 2010-17

S. No	Details	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
1.	Peak Demand met (in MW)	4720	5028	5642	5653	5925	5846	6261
2.	Load Growth (in %)	7.10	6.50	12.21	0.19	4.81	-1.33	7.10
3.	Energy Consumption (in MUs)	25581	25593	27235	28021	29035	29416	30797
4.	Shedding (in MUs)	74	83	138	77	117	42	32
5.	Shedding as % of Energy Consumption	0.29	0.32	0.51	0.27	0.40	0.14	0.10
6.	Transmission Losses (in %)	1.28	1.20	1.17	0.95	0.69	0.85	0.98
7.	System Availability (in %)	98.58	98.38	97.17	97.43	98.60	99.03	98.01

Source:- Delhi Transco Limited / SLDC.

10.4 It may be observed from Statement 11.7 that the peak demand increased from 4720 MW in 2010-11 to 6261 in 2016-17. Energy consumption recorded an average annual growth of approx. 3.51%, System availability is always 98% or more during last ten years. The information regarding peak demand met in MW and energy consumption in MUs are depicted in Charts 11.5 and 11.6 respectively.

Chart 11.5

Peak Demand Met (MW) in Delhi

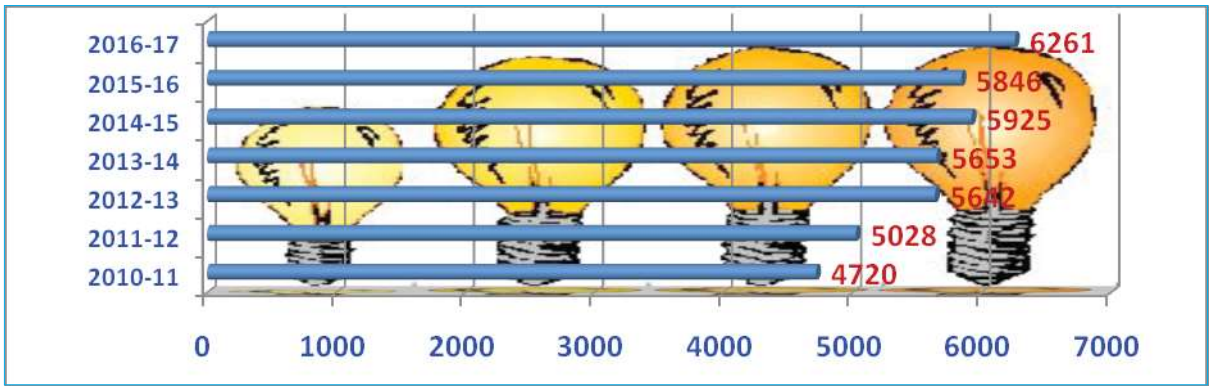
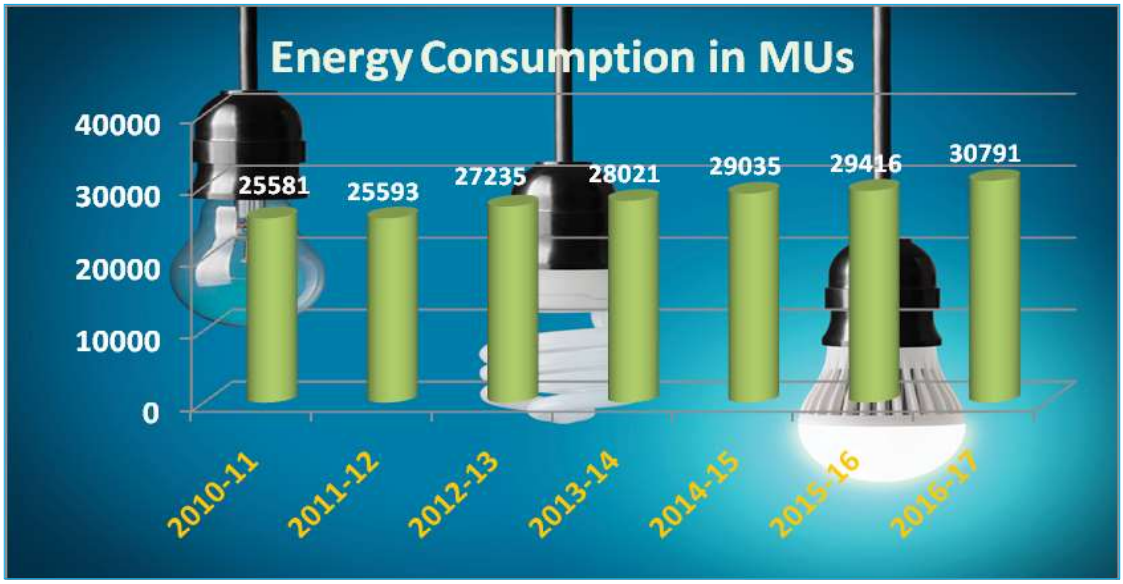


Chart 11.6

Energy Consumption in Delhi- 2010-17 (in MUs)



10.5 Volume III of 19th Electric Power Survey (EPS) of India Report covers the demand forecast of National Capital Region (NCR). Central Electricity Authority, Ministry of Energy, Government of India, in the report of 19th Electric Power Survey has projected maximum demand of electricity in Delhi to be 6541 MW by the end of March-2018. The forecast of energy requirement made in the report indicates that the total demand may go-up to 7471 MW by 2021-22.

Energy Requirement and Peak Load Forecast for NCR- 19th EPS

	2017-18	2021-22
Energy Requirement (MU)	31937	37778
Peak Load (MW)	6541	7471

11 Major Transmission Projects

To facilitate constant access to real-time data of the entire network, Supervisory Control and Data Acquisition (SCADA) system has been implemented. In order to meet the future requirement of power in Delhi, various new and augmentation transmission network projects (400/220 KV) costing approx. ₹ 4600 crore for adding 7680 MVA transformation capacity at 220 KV level and 6815 MVA (including 4000 MVA of ISTS sub stations) at 400 KV level in the network are envisaged in Business Plan for the period upto 2022 for improving the reliability of power supply in Delhi.

12 Renewable Energy

12.1 For mass scale adoption of solar energy as green power in Delhi, a Policy named as "Delhi Solar Policy-2016" has been notified on 27.09.2016. Delhi Govt. formed Energy Efficiency and Renewal Energy Management Centre (EE&REMC) to work as 'State Designated Agency (SDA)' to coordinate, regulate and enforce Energy Conservation Act, 2001 in Delhi in association with Bureau of Energy Efficiency (BEE). The Centre, as 'State Nodal Agency (SNA)', has to implement new and renewable energy projects in the city of Delhi in association with Ministry of New & Renewable Energy (MNRE), Govt. of India.

12.2 It is proposed to develop New Delhi Municipal Council (NDMC) area as Solar City by installing SPV panels on rooftop of Govt. buildings, Metro Stations, Bus Stops, etc. Govt. of India approved for installation of Grid Connected Rooftop Projects in NCT of Delhi. Presently, the number of net metered consumers in Delhi is 1143. Execution 74 MW of solar capacity in Delhi is in progress in various Govt. Departments, domestic and social sector. Solar installations are being promoted in housing societies.

12.3 Disposal of Municipal Solid Waste is very challenging issue. In order to overcome this problem 'Waste-to-Energy' Plants are being set-up at various locations in Delhi to generate electricity. In this line, setting up of two more 'Waste-to-Energy' plants at Bhalswa (20 MW) and Tehkhand (25 MW) are proposed.

	Installed Capacity of Renewable Energy	
Solar Generation	77.34 MW	Till 31.01.2018
Waste to Energy	52 MW	Till 31.01.2018 WTE Plants at Timarpur-Okhla (16 MW) Ghazipur (12 MW) Narela-Bawana (24 MW)
TOTAL	**129.34 MW**	

13 Government Investment in Energy Sector

Investment in energy sector by the Govt. of Delhi is only for augmentation of transmission and transformation capacity and power generation. Investment by the government in this sector during the last five year showed an up and downward trend. During the year 2010-11, energy sector in Delhi has a total budget share of ₹ 250.83 crore, which increased to ₹

295 crore in 2017-18 (BE). The share of investment in energy sector in Delhi from 2010-17 is presented in Statement 11.8.

Statement 11.8

Govt. Expenditure in Energy Sector

(₹ in crore)

S. No	Years	Expenditure		
		Total Plan Expenditure	Energy Sector	%age of Energy Exp. to Total Plan Exp.
1.	2010-11	10490.81	250.83	2.39
2.	2011-12	13642.54	1833.26	13.44
3.	2012-13	13237.51	1271.61	9.61
4.	2013-14	13964.28	326.00	2.33
5.	2014-15	13979.68	581.26	4.16
6.	2015-16	14960.54	235.52	1.57
7.	2016-17	14355.03	187.77	1.31
8.	2017-18	18500.00*	295.00*	1.59

* BE Amount