

CHAPTER 11

ENERGY

Efficient and reliable power supply is of critical importance to the economic development. Power is a subject in concurrent list and it is the responsibility of both Union and State Government to develop the power sector to become efficient, robust and financially viable. The challenge before the Delhi Government in the energy sector is to meet the continuously increasing power demand to supply reliable and quality of power at a reasonable cost and to augment the infrastructure for transmission, generation and distribution of power. Distribution of power has been privatized in Delhi with effect from 1st July 2002 and both transmission and generation are with three Government owned companies, i.e. Delhi Transco Limited, Indraprastha Power Generation Company Limited (IPGCL) and Pragati Power Corporation Limited (PPCL). Power Sector Reforms has improved the power scenario of Delhi in terms of reduction of transmission and distribution losses, customer services, capacity addition of transmission and generation of power etc.

2 Power Generation

- 2.1 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 2118.2 MW. 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 500MW 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.

Statement 11.1 INSTALLED CAPACITY OF POWER GENERATION IN DELHI

(As on 30th September 2014)

S. No	Companies/Station	Fuel	Units
1.	Indraprastha Power Generation Company Limited (IPGCL)		
	a. Rajghat Power House	Coal	2 x 67.5 MW= 135 MW
	b. Gas Turbine Power Station (GTPS)	Gas	6 x 30 MW (GTs) + 3 x 34 MW (STGs) } = 282MW*
2.	Pragati Power Corporation Limited (PPCL)		
	c. Pragati-I Power Station	Gas	2 x 104 MW (GTs) + 1 x 122 MW (STGs) } = 330 MW
	d. Pragati-III Power Station, Bawana	Gas	4 x 216 MW (GTs) + 2 x 253.6 MW (STGs) } = 1371.2 MW
	Total	--	2118.2 MW**

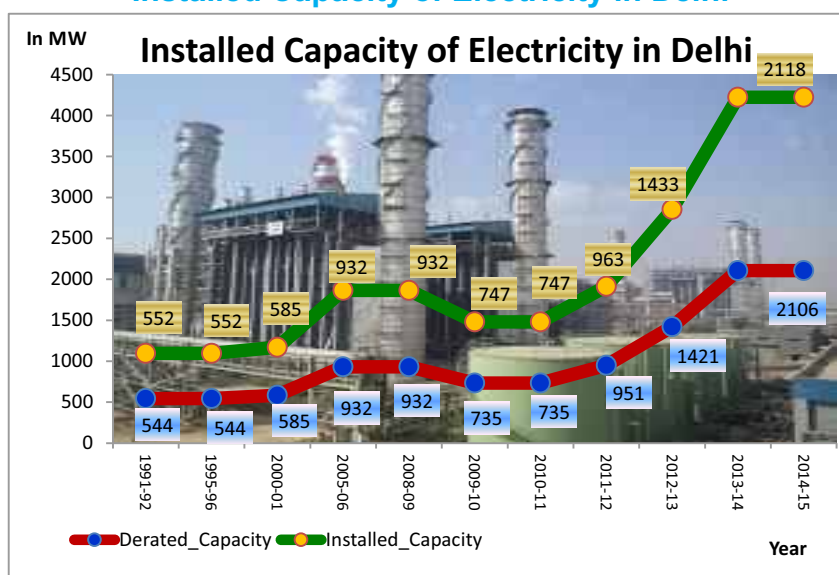
Source: Indraprastha Power Generation Company Limited and Pragati Power Corporation Limited.

* Derated to 270 MW

** Total Capacity 2106.2 MW (Derated)

2.2 The growth of installed capacity of electricity by own power plants of Government of Delhi is presented below:

Chart 11.1
Installed Capacity of Electricity in Delhi



Source: - PPCL & IPGCL

3 Plant Load Factor

3.1 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-2005-15

(Percentage)

Sl. No	Year	Indraprastha Power Station	Rajghat Power House	Gas Turbine Plants	Pragati-I Power Station	Pragati-III Power Station	Total
1.	2005-06	45.42	48.57	70.76	79.53		64.35
2.	2006-07	43.92	53.69	57.17	77.99		60.31
3.	2007-08	47.26	76.04	60.38	84.72		67.31
4.	2008-09	44.05	74.16	53.05	83.07		64.06
5.	2009-10	35.04 (64.09)	54.55 (54.64)	63.32 (73.28)	84.85 (85.50)		71.38 (75.34)
6.	2010-11	Decommissioned on 31.12.2009	66.05 (75.98)	57.85 (81.91)	80.80 (86.32)		68.23 (81.40)
7.	2011-12	--	69.01 (68.37)	52.21 (79.41)	88.32 (92.61)	38.36 (68.65)	69.14 (82.31)
8.	2012-13	--	67.04 (66.94)	55.28 (84.22)	86.77 (90.50)	30.24 (88.04)	54.15 (85.71)
9.	2013-14	--	32.12 (67.55)	44.01 (85.76)	83.90 (92.62)	9.16 (95.69)	33.71 (91.13)
10.	2014-15 (upto Sept.2014)	--	57.41 (65.82)	44.93 (61.21)	66.93 (69.93)	14.61 (95.86)	21.42 (88.56)

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

3.2 It may be inferred from Statement 11.2 that the average plant load factor of all power plants of Delhi during 2014-15 upto September 2014 was 21.42 per cent and availability factor at 88.56 per cent. The reason for low Plant Load Factor attributed to non availability of gas for Bawana plant.

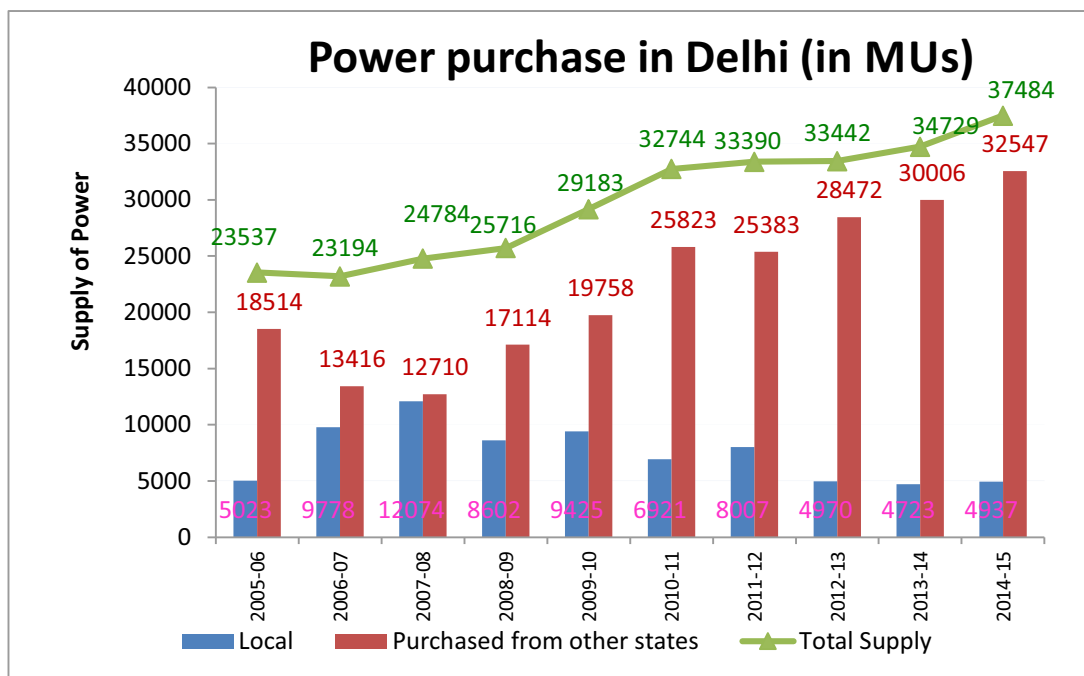
4 Capacity Addition Programme

A new 750 MW Gas Based Combined Cycle Gas Turbine (CCGT) 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.

5 Power Distribution

- 5.1 The total power purchase in Delhi has grown by 59.26% during the last ten years, that has increased from 23537 MU in 2005-06 to 37484 MU in 2014-15. While 13.17% of total power purchase is sourced from own generation by Delhi Govt. Power Plants, 86.83% is purchased from Central Govt. and other sources.

Chart 11.2
Power purchase in Delhi (in MUs)



Source: - Delhi Statistical Handbook, 2014, DERC for 2014-15

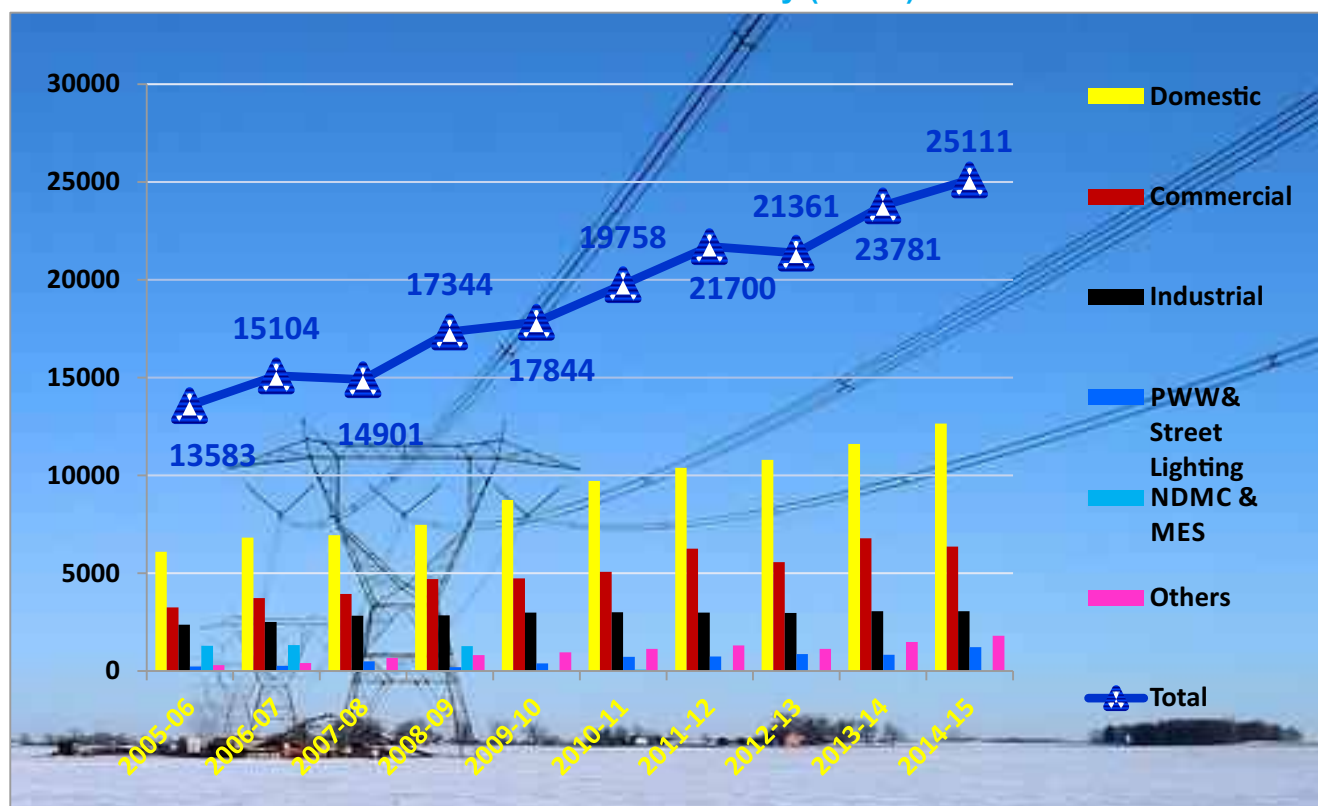
- 5.2 The supply of electricity in Delhi periphery increased from 23537 million units in 2005-06 to 37484 million units in 2014-15.
- 5.3 The distribution of electricity in Delhi to various categories of consumers increased from 13583 million units in 2005-06 to 25111 million units in 2014-15. Category wise consumption of electricity in Delhi during 2005-06 to 2014-15 is presented in Chart 11.3.

Statement 11.3
DISTRIBUTION OF ELECTRICITY IN DELHI

Year	Pattern of Electricity Distribution in Delhi (In Million Unit)									
	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15*
Domestic	6107	6825	6945	7481	8753	9723	10396	10796	11609	12649
Commercial	3251	3730	3944	4701	4741	5074	6253	5569	6786	6370
Industrial	2383	2518	2831	2851	2991	3008	2989	2979	3064	3062
PWW& Street Lighting	246	275	498	198	404	734	748	870	838	1219
NDMC & MES	1296	1339	--	1286	--	75	--	--	--	--
Others	300	417	683	827	955	1144	1314	1147	1484	1810
Total	13583	15104	14901	17344	17844	19758	21700	21361	23781	25111

Source: - Delhi Statistical Handbook 2014, DERC for 2014-15

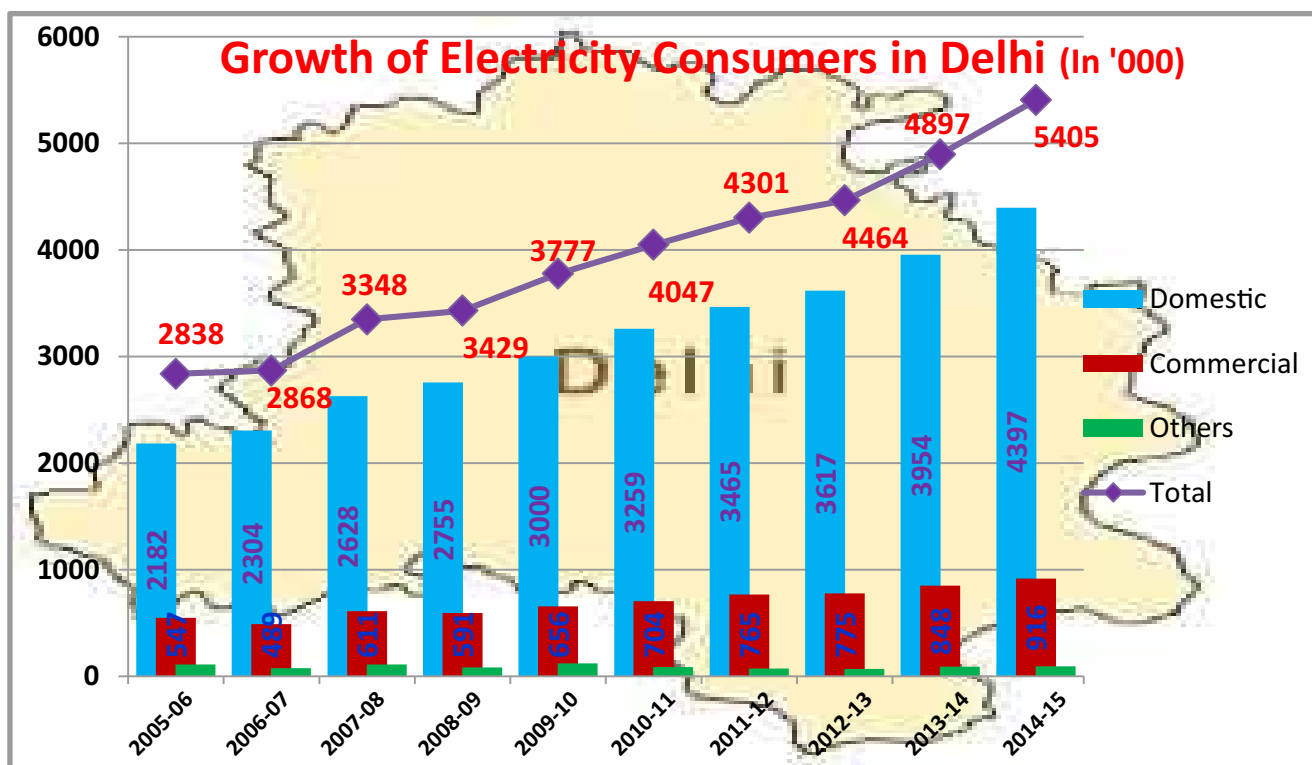
Chart 11.3
Distribution of Electricity (In MU)



Source: - Delhi Statistical Handbook 2014, DERC for 2014-15

5.4 During the period 2005-06 to 2014-15, the number of consumers of electricity in Delhi increased from 28.38 lakh to 54.05 lakh. The information regarding number of consumers of electricity in Delhi during 2005-15 is presented in Chart 11.4.

Chart 11.4
Growth of Electricity Consumers in Delhi (In '000)

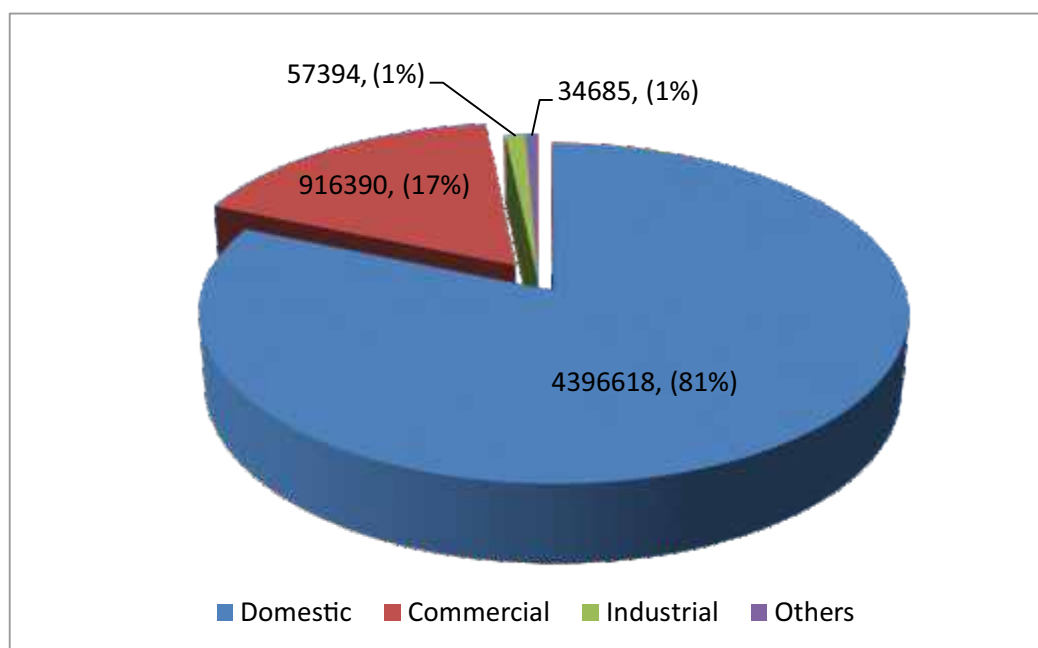


Source: - Delhi Statistical Handbook, 2014, DERC, Discoms website for 2014-15

5.5 It may be inferred from Chart 11.4 that the number of electricity consumers in Delhi has grown by 90.47% during the last ten years, that has increased 25.67 lakh consumers from 2005-06 to 2014-15. Number of consumers in domestic increased every year in the period covered under the study. While all other consumers mentioned in the table showed an up and down situation in the period covered. The information regarding number of consumers of electricity in Delhi during 2014-15 is depicted in Chart 11.5.

Chart 11.5

NUMBER OF CONSUMERS OF ELECTRICITY IN DELHI: 2014-15



6 Aggregate Technical and Commercial Losses (AT&C)

- 6.1 Aggregate Technical and Commercial Losses 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.
- 6.2 After reforms in power sector the AT & C losses in Delhi reduced significantly from 52% in the pre-reform era to 12.83% (T) in 2014-15. The information regarding AT&C losses in Delhi during 2002-15 is presented in Statement 11.4.

Statement 11.4

AT&C LOSSES IN DELHI – POST POWER SECTOR REFORMS PERIOD

(Percentage)

Sl. No.	Year	BYPL	BRPL	NDPL
1.	Opening Level of AT&C Losses	57.20	48.10	48.01
2.	2002-03			
	a. Target	56.45	47.55	47.60
	b. Achievement	61.88	47.40	47.79
3.	2003-04			
	a. Target	54.70	46.00	45.35
	b. Achievement	54.28	45.06	44.86
4.	2004-05			
	a. Target	50.70	42.70	40.85
	b. Achievement	50.12	40.64	33.79
5.	2005-06			
	a. Target	45.05	36.70	35.35
	b. Achievement	43.87	35.53	26.52
6.	2006-07			
	a. Target	39.95	31.10	31.10
	b. Achievement	39.03	29.92	23.73
7.	2007-08			
	a. Target	34.77	27.34	22.03
	b. Achievement	29.80	27.17	18.56
8.	2008-09			
	a. Target	30.52	23.46	20.35
	b. Achievement	24.02	20.59	16.74
9.	2009-10			
	a. Target	26.26	20.23	18.68
	b. Achievement	24.32	20.53	15.16
10.	2010-11			
	a. Target	22.00	17.00	17.00
	b. b. Achievement	21.95	18.82	14.15
11.	2011-12			
	a. Target	18.00	15.00	15.33
	b. b. Achievement	22.07	18.11	11.49
12.	2012-13			
	a. Target	16.82	14.16	12.50
	b. b. Achievement	21.14	17.12	10.73
13.	2013-14			
	a. Target	15.66	13.33	12.00
	b. b. Achievement	21.53	16.20 (P)	10.35
14.	2014-15			
	a. Target	14.50	12.50	11.50
	b. b. Achievement	NA	NA	NA

Sources:- DERC, Discoms and websites.

6.3 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 2015-16.

7 Capital Investment made by DISCOMs on infrastructure

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 companies since the introduction of reforms in power sector in Delhi is presented in Statement 11.5.

Statement 11.5

INFRASTRUCTURE CREATED BY POWER COMPANIES IN DELHI

(₹ in crore)

Sl. No.	Year	BYPL	BRPL	NDPL	Total
1.	2010-11	178.78	301.84	465.53	946.15
2.	2011-12	98.87	206.51	365.89	671.27
3.	2012-13	133.23	267.06	292.97	693.26
4.	2013-14	230.00	269.50	326.46	825.96
5.	2014-15	230.00	300.00	264.22	794.22
	Total	870.88	1344.91	1715.07	3930.86

Sources: - DERC, Discoms websites.

8 Power Transmission

8.1 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 department was part of O&M Department of Delhi Transco Ltd / Delhi Vidyut Board. SLDC Delhi started its function on the First of January 2004. SLDC is responsible for the real time Load Despatch function, O&M of SCADA System and Energy Accounting. It's mission is to facilitate intra and inter state transfer of power with Reliability, Security and Economy on sound commercial principles.

- 8.2 Delhi Transco Limited has power transmission network consisting of four number of 400 KV and thirty three 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 up to the year 2014-15 is presented in Statement 11.6.

Statement 11.6

NETWORK OF DELHI TRANSMISSION UTILITY: 2014-15

Sl. No.	Details	400 KV Level	220 KV Level
1.	Number of Sub Stations	4	33
2.	Transformation Capacity (in MVA)	5040	10530
3.	Transmission Lines (Length in Ckt. Km.)	249.064	716.46

Source:- Delhi Transco Limited / SLDC.

- 8.3 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 during the last ten years is presented in Statement 11.7.

Statement 11.7

PERFORMANCE OF DELHI TRANSCO LIMITED 2005-15

Sl. No	Details	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
1.	Peak Demand met in MW	3626	3736	4030	4034	4408	4720	5028	5642	5653	5925
2.	Load Growth (%)	3.9	3.0	7.9	0.10	9.30	7.10	6.50	12.21	0.19	4.81
3.	Energy Consumption in MUs	21184	21977	22372	21768	23349	25581	25593	27235	28021	29035
4.	Shedding in MUs	322	411	136	128	185	74	83	138	77	117
5.	Shedding as % of Energy Consumption	1.50	1.87	0.61	0.61	0.80	0.29	0.32	0.51	0.27	0.40
6.	Transmission Losses (%)	0.72	0.95	1.42	1.59	1.38	1.28	1.20	1.17	0.95	0.69*
7.	System Availability (%)	97.71	98.87	98.50	98.78	98.39	98.58	98.38	97.17	97.43	98.6*

* figure upto Jan-15

Source:- Delhi Transco Limited / SLDC.

8.4 It may be observed from Statement 11.7 that the peak demand increased from 3626 MW in 2005-06 to 5925 in 2014-15. Like-wise energy consumption recorded an average annual growth of 3.63%, System availability is always 98% or more. The information regarding peak demand met in MW and energy consumption in MUs are depicted in Charts 11.6 and 11.7 respectively.

Chart 11.6
PEAK DEMAND MET (MW) IN DELHI

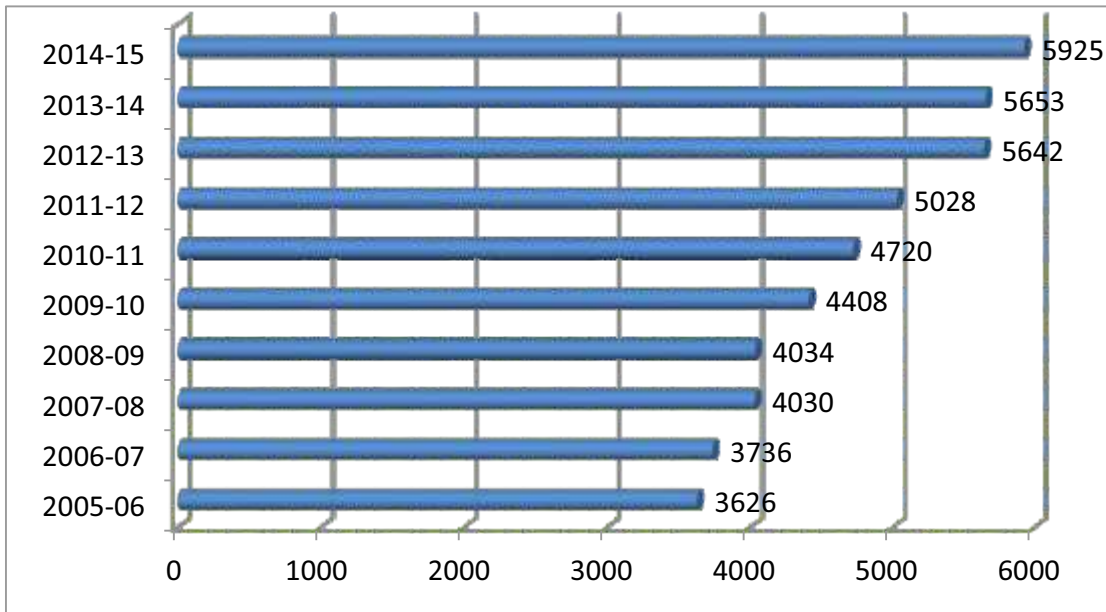
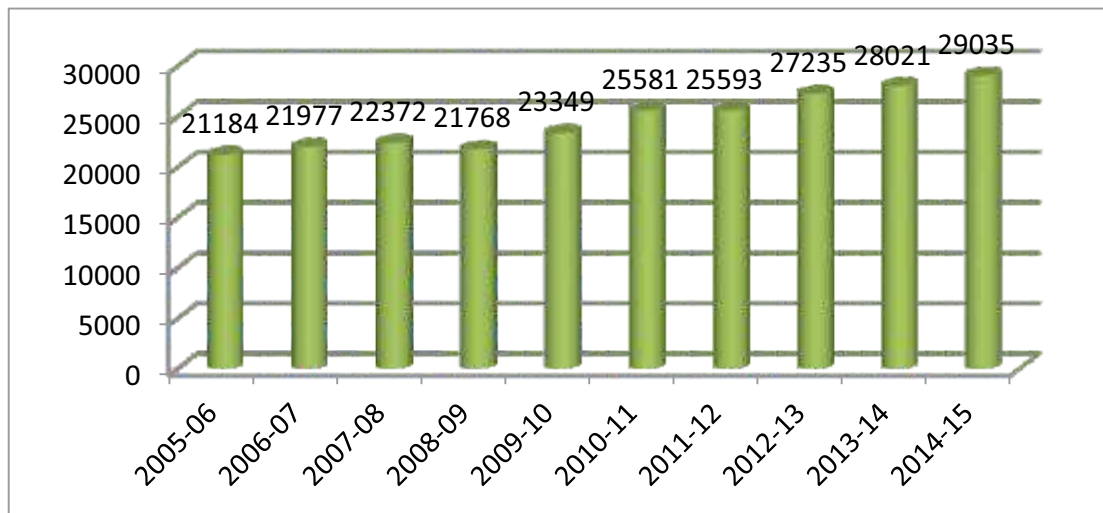


Chart 11.7
ENERGY CONSUMPTION IN DELHI- 2005-15 (IN MUS)



8.5 Volume III of 18th 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 18th Electric Power Survey has projected maximum

demand of electricity in Delhi to be 6398 MW by the end of 12th Five Year Plan (March-2017). The forecast of energy requirement made in the report indicates that the total demand may go-up to 9024 MW by 2021-22.

ENERGY REQUIREMENT AND PEAK LOAD FORECAST FOR NCR- 18TH EPS

	2016-17	2021-22
Energy Requirement (MU)	37529	52930
Peak Load (MW)	6398	9024

9 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 load requirement of power in Delhi, 33 Nos. of various Transmission Network Projects (400/220 KV) costing ₹1676 crore are to be taken up in 2015-16 for increasing and strengthening the reliability of power supply.

10 Renewable Energy

Solar Photo Voltaic (SPV) Power Plant of 2.14 MWp at Indira Gandhi International Airport has been successfully installed and commissioned. 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. All the grid connected projects have contributed to nearly 7 MW of power in Delhi till November 2014 generating around 2.34 MUs in 2014-15. A 16 MW Waste-to-Energy plant utilizing Municipal Solid Waste to generate electricity is operational since 2012 at Old NDMC Compost Plant, New Delhi. Setting up of some more 'Waste-to-Energy' plants is under progress at Connaught Place and Bawana.

11 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 2005-06, energy sector in Delhi has a total budget share of ₹271 crore, i.e. 6% of the total expenditure, which increased to ₹581 crore in 2014-15, i.e. 4% of the total expenditure. The share of investment in energy sector in Delhi during the last ten years is presented in Statement 11.8.

Statement 11.8
GOVT. EXPENDITURE IN ENERGY SECTOR

(₹ in crore)

Sl. No	Years	Expenditure		
		Total Plan Expenditure	Energy Sector	% of Energy Expr. to Total Plan Expr.
1.	2005-06	4280.87	271.47	6.34
2.	2006-07	5083.70	257.24	5.06
3.	2007-08	8745.32	1256.75	14.37
4.	2008-09	9619.32	567.08	5.90
5.	2009-10	11048.14	461.00	4.17
6.	2010-11	10490.81	250.83	2.39
7.	2011-12	13642.54	1833.26	13.44
8.	2012-13	13237.53	1271.61	9.61
9.	2013-14	13963.63	326.00	2.33
10.	2014-15	13371.78*	581.26	4.35

* Provisional expenditure