CHAPTER 11

Energy

The growth of the Power sector is key to economic development as it facilitates development across various sectors of the economy. Electricity consumption has a very high correlation with the Human Development Index. The more is the electricity consumption the higher is the economic growth, economic and social development. Being the capital of India and the hub of the commercial activities in the Northern Region, coupled with the prosperity of population, the load requirement of Delhi has been growing at a much faster pace. Added to that, being the focus of socio-economic and political life of India, Delhi is assuming increasing eminence among the great cities of the world. Plus the vision-2021, aiming to make Delhi a global metro politic and world-class city demand greater infrastructure to enrich many services of infrastructure development. The per-capita consumption of the consumers in Delhi is more than 1561 units per annum as against the national average of 1122 units 2016-17.

- 2. Delhi has already achieved 100% electrification. Delhi, being an urban place with high load density, has seen the electricity consumption increasing from 25581 MUs in 2010-11 to 31874 MUs in 2017-18. Delhi has its unique load pattern and peak load problem due to a predominant share of domestic consumption and extreme weather conditions. Power sector of Delhi is different compared to other states, while other states have a power deficit, Delhi has tied up surplus power in order to cater to the increasing demand and peak load.
- 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).

4.1 **Power Generation**

Indraprastha Power Generation Company Limited (IPGCL) and Pragati Power Corporation Limited (PPCL) are managing the power plants in Delhi having a total installed generation capacity of 1983.2 MW. Two of its old power plants IP and Raj Ghat are not functional due to the pollution.

There is a jointly collaborated 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.

Statement 11.1

INSTALLED CAPACITY OF POWER GENERATION IN DELHI

			(As on 30 ^{°°} September 2018)
SI.	Companies/Station	Fuel	Units
No.			
1.	Indraprastha Power Generation Company	y Limitec	I (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 (PPC	CL)	
	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)
	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)

4.2 Plant Load Factor

In the electricity industry, the 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:

						(Perce	ntage)
SI.	Year	Indraprastha	Rajghat	Gas	Pragati-I	Pragati-III	Average
No.		Power Station	Power	Turbine	Power	Power	
			House	Plants	Station	Station	
1.	2010-11	Decommissione	66.05	57.85	80.80		68.23
		d on 31.12.2009	(75.98)	(81.91)	(86.32)		(81.40)
2.	2011-12		69.01	52.21	88.32	38.36	69.14
			(68.37)	(79.41)	(92.61)	(68.65)	(82.31)
3.	2012-13		67.04	55.28	86.77	30.24	54.15
			(66.94)	(84.22)	(90.50)	(88.04)	(85.71)
4.	2013-14		32.12	44.01	83.90	9.16	33.71
			(67.55)	(85.76)	(92.62)	(95.69)	(91.13)
5.	2014-15		35.82	39.59	63.91	18.60	29.49
			(56.50)	(68.80)	(85.62)	(92.32)	(91.52)
6.	2015-16		3.93 [#]	19.69	53.11	15.87	21.77
			(56.16) [#]	(74.81)	(90.25)	(64.55)	(72.88)
7.	2016-17		0.00	29.41	62.46	17.04	26.31
			(0.00)	(82.84)	(90.62)	(80.70)	(82.94)
8.	2017-18		0.00	24.48	67.63	24.60	31.79
			(0.00)	(83.07)	(92.64)	(74.11)	(78.25)
9.	2018-19*		0.00	31.49	64.57	31.23	36.85
			(0.00)	(73.17)	(84.10)	(68.70)	(71.72)

PLANT LOAD FACTOR / AVAILABILITY FACTOR OF POWER PLANTS IN DELHI-2010-18 .

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

* up to September 2018. # up to December 2015.

The average plant load factor of the power plant of Delhi during 2017-18 to 2018-19 (up to Sept'2018) is low due to fewer schedules by system control. The reason for the low plant load factor attributed to non-availability of sufficient domestic gas for Bawana power plant.

4.3 **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 the non-availability of gas.

4.4 **Power Distribution**

The total power purchase in Delhi has grown by 55.38% during the last ten years. The power purchased in Delhi has increased from 32744 MU in 2010-11 to 38510 MU in 2017-18. While 25.76% of total power purchase is sourced from own generation by Delhi Govt. Power Plants, 74.24% is purchased from Central Govt, and other sources.

Chart 11.1



POWER PURCHASE IN DELHI (in Million Unit)

Source: - Delhi Statistical Handbook, Power Department letter dated 16.10.2018 The supply of electricity in Delhi periphery increased from 32744 million units in 2010-11 to 38510 million units in 2017-18.

The distribution of electricity in Delhi to various categories of consumers increased from 19758 million units in 2010-11 to 26830 million units in 2017-18. Category wise consumption of electricity in Delhi during 2010-11 to 2017-18 is presented in Chart11.2.

Statement 11.3

						(i	n Million	Unit)
Year	2010-	2011-	2012-	2013-	2014-	2015-	2016-	2017-
	11	12	13	14	15	16	17	18
Domestic	9723	10396	10796	11609	12386	12560	14060	14627
Commercial	5074	6253	5569	6786	6814	6053	7257	6550
Industrial	3008	2989	2979	3064	3068	3135	3088	3243
PWW & Street Lighting	734	748	870	838	1007	1027	1098	1042
Others	1219	1314	1147	1484	1202	1262	1362	1368
Total	19758	21700	21361	23781	24477	24037	26865	26830
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PATTERN OF ELECTRICITY DISTRIBUTION OF ELECTRICITY IN DELHI

Source: - Delhi Statistical Handbook

Chart 11.2

DISTRIBUTION OF ELECTRICITY (in Million Unit)



Source: - Delhi Statistical Handbook

During the period 2010-11 to 2017-18, the number of consumers of electricity in Delhi increased from 40.47 lakh to 57.55 lakh. The information regarding a number of consumers of electricity in Delhi during 2010-18 is presented in Chart 11.3.





Source: - Delhi Statistical Handbook

The number of electricity consumers in Delhi has grown by 71.92% during the last ten years. The electricity consumers have increased 17.08 lakh consumers from 2010-11 to 2017-18. 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 the number of consumers of electricity in Delhi during 2017-18 is depicted in Chart11.4.

Chart 11.4

NUMBER OF CONSUMERS OF ELECTRICITY IN DELHI: 2017-18



4.5 Aggregate Technical and Commercial Losses (AT&C)

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 equipment, the absence of upgradation of old lines and equipment, low HT: LT Ratio, poor repair and maintenance of equipment, 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 the metering system, low accountability of employees, the absence of energy audit and accounting etc.

After reforms in the power sector the AT & C losses in Delhi reduced significantly from 52% in the pre-reform era to 9.41% in 2017-18. The information regarding AT&C losses in Delhi during 2010-18 is presented in Statement 11.4.

Statement 11.4

				(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
8.	2017-18			
	a. Target	13.33		
	b. Achievement	10.41	9.42	8.40

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

Sources:- DERC, Discoms and websites.

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. Its prime objective is for the strengthening of the subtransmission and distribution network in urban areas, metering of distribution /feeders/ transformers /consumers in urban areas and rooftop solar panels. The project proposal under IPDS is under submission to Govt. of India for the financing of distribution-related works during 2018-19.

4.6 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 distribution companies since FY 2010-11 is presented in Statement 11.5.

					(₹ in crore)
SI. 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
8.	2017-18	343.86	564.83	479.00	1387.69
	Total	1592.16	2580.38	2999.66	

Statement 11.5 INFRASTRUCTURE CREATED BY POWER COMPANIES IN DELHI

Sources: - DERC, Discoms.

4.7 Power Transmission

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. Its mission is to facilitate intra and interstate transfer of power in coordination with NRLDC (Northern

ECONOMIC SURVEY OF DELHI, 2018-19

Regional Load Despatch Centre) with Reliability, Security and Economy on sound commercial principles.

Delhi Transco Limited has established a power transmission network consisting of four number of 400 KV and thirty-six 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 2017-18 is presented in Statement 11.6.

Statement 11.6

NETWORK OF DELHI TRANSMISSION UTILITY: 2017-18

SI. No.	Details	400 KV Level	220 KV Level
1.	Number of Sub Stations	4	36
2.	Transformation Capacity (in MVA)	5410	12440
3.	Transmission Lines (Length in Ckt. Km.)	249.192	824.22
0	Della: Transport Limited (CLD)	\sim	

Source:- Delhi Transco Limited / SLDC.

The performance of the transmission utility during the last ten years, the system has improved mainly in system availability, reduction in transmission losses, a 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 2010-18

SI. No.	Details	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
1.	Peak Demand met (in MW)	4720	5028	5642	5653	5925	5846	6261	6526
2.	Load Growth (in %)	7.10	6.50	12.21	0.19	4.81	-1.33	7.10	4.06
3.	Energy Consumption (in MUs)	25581	25593	27235	28021	29035	29416	30797	31874
4.	Shedding (in MUs)	74	83	138	77	117	42	32	19
5.	Shedding as % of Energy Consumption	0.29	0.32	0.51	0.27	0.40	0.14	0.10	0.06
6.	Transmission Losses (in %)	1.28	1.20	1.17	0.95	0.69	0.85	0.98	0.79
7.	System Availability (in %)	98.58	98.38	97.17	97.43	98.60	99.03	98.01	99.37

Source:- Delhi Transco Limited / SLDC.

ECONOMIC SURVEY OF DELHI, 2018-19

It may be observed from Statement 11.7 that the peak demand increased from 4720 MW in 2010-11 to 6526 in 2017-18. Energy consumption recorded an average annual growth of approx. 3.66%, System availability is always 97% or more during the 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- 2010-18 (IN MUS)



Volume III of the 19th Electric Power Survey (EPS) of India Report covers the demand forecast of the 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 for electricity in Delhi to be 6764 MW by the end of March-2019. The forecast of energy requirement made in the report indicates that the total demand may go up to 7471 MW by 2021-22.

Statement 11.8

ENERGY REQUIREMENT AND PEAK LOAD FORECAST FOR NCR- 19TH EPS

	2018-19	2021-22
Energy Requirement (MU)	33391	36884
Peak Load (MW)	6764	7471

4.8 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 substations) at 400 KV level in the network are envisaged in Business Plan for the period up to 2022 for improving the reliability of power supply in Delhi.

4.9 Renewable Energy

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.

It is proposed to develop the New Delhi Municipal Council (NDMC) area as Solar City by installing SPV panels on the rooftop of Govt. buildings, Metro Stations, Bus Stops, etc. Govt. of India approved for installation of Grid Connected Rooftop Projects in NCT of Delhi. Solar installations are being promoted in housing societies. A new scheme, namely, "Mukhyamantri Agriculture-cum-Solar Farm Scheme" has been approved by the Delhi Cabinet on 24.07.2018 to promote and increase solar power generation.

Disposal of Municipal Solid Waste is a 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.

Statement 11.9

INSTALLED CAPACITY OF RENEWABLE ENERGY

Till 31.12.2018

Solar Generation	118.35 MW
Waste to Energy	52 MW { Timarpur-Okhla (16 MW), Ghazipur (12 MW), Narela-Bawana (24 MW)}
Total	170.35 MW

11.10 Government Investment in the Energy Sector

Investment in the 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, the energy sector in Delhi has a total budget share of ₹ 250.83 crore, which increased to ₹ 421 crore in 2018-19 (RE). The share of investment in the energy sector in Delhi from 2010-18 is presented in Statement 11.10.

Statement 11.10

				(₹ in crore)
S			Expenditure	
No.	Years	Total Plan Expenditure	Energy Sector	% of Energy Expr. to Total Plan Expr.
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	14401.00	221.85	1.54
9.	2018-19 (RE)	18200.00	421.00	2.31

GOVT. EXPENDITURE IN ENERGY SECTOR

Besides the above, the Government is also spending on subsidising electricity tariff for domestic consumers. The expenditure on power subsidy during the last 05 years was as under (₹ in crore) is presented in Statement 11.11.

Statement 11.11

EXPENDITURE ON POWER SUBSIDY

(₹ in crore)

Year	Amount
2014-15	291.94
2015-16	1442.76
2016-17	1577.94
2017-18 (RE)	1720.00
2018-19 (RE)	1700.00