CHAPTER 8

POWER SECTOR

Introduction

Electricity supply in Pondicherry is the responsibility of the Electricity Department (ED) of the Union Territory of Pondicherry. The Electricity Department purchases power from central sector generating stations, based on long-term contractual agreements, and from the neighbouring states of Tamil Nadu, Kerala and Andhra Pradesh, to meet any shortfall. Till the year 1999, the Union Territory had no generating capacity. In 1993, the Pondicherry Power Corporation Limited, an Undertaking of the Government of Pondicherry, was set up. This undertaking is a generating company and has established a 32.5 MW gas based power plant in the Karaikal region of the Union Territory . The entire funds for this undertaking have been provided by the Union Territory government in the form of share capital, received from the Planning Commission. Since 1999 this generating company has also started supplying power to the Karaikal and Pondicherry regions.

Pondicherry has historically had the reputation of offering a stable supply of electricity and at cheaper rates, especially compared to its neighbours Tamil Nadu and Andhra Pradesh. This has largely been possible due to the following reasons: the Union Territory has access to relatively cheaper power from the central sector power stations of National Thermal Power Corporation (NTPC), Neyveli Lignite Corporation (NLC), and Madras Atomic Power Project (MAPP); the smallness of the Union Territory avoids the need for an extensive network of Transmission and Distribution (T&D) lines and hence minimizes the technical line losses; the ED has a higher percentage of High Tension (HT) consumption (which has gone up from 45 per cent in the mid sixties to 65 per cent during the late nineties) and a smaller share of agricultural consumption (which has fallen from 34 per cent in 1965-66 to 8 per cent in 2000-01). Such a favourable scenario of quality electricity supply at cheaper rates combined with power tariff concessions for the first 5 years of operation and other tax concessions offered by the Union Territory government caused a significant growth of power intensive industries. The period from the late eighties to the late nineties particularly witnessed a spurt in HT industrial consumption

and there was a sizeable growth in the consumption by basic metal, chemical and non-metallic mineral industries.

There are indications, however, that this comfortable scenario is gradually changing for Pondicherry. Starting from 1995-96, the revenue expenses of the Electricity Department have been higher than the revenue receipts and this gap has widened from Rs.0.84 crore in 1995-96 to Rs.43.97 crore in 2001-02. The outstanding dues payable by the ED to the Central Power Sector units (which include the National Thermal Power Corporation (NTPC), Power Grid of India Ltd. (PGIL), Power Finance Corporation (PFC), Rural Electrification Corporation (REC) and others) stood at Rs.17.91 crore at the end of March 1999 and rose to Rs.36.31 crore by the end of March 2001 and came down to Rs.24.22 crore at the end of March 2002 (as indicated in the Ministry of Power's website). The greater emphasis being placed on fiscal discipline at the Centre means that the Union Territory will find it increasingly difficult to access the necessary government funds to make good its losses and pay its dues. Moreover, the restructuring efforts currently being undertaken in the country's power sector implies that the ED may have to pay higher prices for the power it purchases in the future.

Power is undeniably a crucial infrastructure input and the performance efficiencies in this sector would have a very significant bearing on the performance of the overall economy of the Union Territory . Hence, this chapter seeks to evaluate the strengths and weaknesses of this sector in Pondicherry and to visualize its role and direction for the next twenty years. It tries to identify the enabling factors and suggests broad policy directions towards that end.

Growth and Performance

Investments

The outlay on power by the Union Territory government has been basically to build/expand the transmission and distribution network for supply of power within the Union Territory . Table 8.1 gives details of the actual and percentage outlays on power. The table also shows capital expenses incurred to promote non-conventional sources of energy. The Union Territory , through its Electricity Department, has undertaken a Solar Pond Project as a joint venture with the Pondicherry Engineering College and with technical collaboration with the National Aerospace Laboratories. The main objective of

this project is to generate 360 KW of power per day from a 6,000 sq. m. salt gradient solar pond. About 50 per cent of the capital outlays on non-conventional energy sources have been towards this project.

Table 8.1
PLAN OUTLAYS ON ENERGY FROM 1970-71 TO1999-2000

Year	Total Plan Outlay (Rs.Crore)	Outlay on Power		Outlay on Non-Conv. Energy	
		Rs.Crore	%	Rs.Crore	%
1970-71	2.33	0.22	9.51		
1971-72	2.58	0.18	6.96		
1972-73	3.37	0.20	5.82		
1973-74	3.74	0.19	4.96		
1974-75	4.25	0.21	5.05		
1975-76	5.15	0.44	8.60		
1976-77	7.05	0.61	8.67		
1977-78	8.21	0.74	8.99		
1978-79	9.90	0.90	9.09		
1979-80	10.85	1.05	9.70		
1980-81	12.98	1.44	11.12		
1981-82	16.00	1.40	8.76		
1982-83	19.22	1.67	8.68		
1983-84	20.94	2.35	11.21		
1984-85	29.80	4.36	14.62		
1985-86	32.94	4.00	12.15	0.02	0.07
1986-87	38.89	2.83	7.27	0.05	0.14
1987-88	46.80	3.53	7.53	0.12	0.25
1988-89	54.37	5.62	10.34	0.17	0.31
1989-90	59.55	8.01	13.44	0.16	0.26
1990-91	65.56	11.58	17.63	0.17	0.26
1991-92	81.79	14.61	17.86	0.34	0.42
1992-93	90.00	15.22	16.91	0.04	0.04
1993-94	108.00	28.44	26.33	0.07	0.06
1994-95	134.46	33.35	24.80	0.17	0.13
1995-96	173.59	10.27	5.91	0.42	0.24
1996-97	195.25	43.36	22.21	0.80	0.41
1997-98	213.71	44.95	21.03	1.27	0.59
1998-99	259.32	46.66	17.99	1.30	0.50
1999-2000	312.00	21.33	6.84	0.72	0.23

Source: Government of Pondicherry, Annual Five Year Plan Statements, (1970-71 to 1999-2000).

Outlay on power, as a proportion of total Plan outlay for Pondicherry, was about 7.7 per cent during the seventies, 10.51 per cent during the eighties and 17.75 per cent during the nineties. In terms of the Five Year Plans, the share of power sector's outlay has grown from about 8 per cent during the 5th Plan to 19.23 per cent during the 8th Plan and 17.85 per cent during the 9th Plan.

Capacity

The ED of Pondicherry has about 142 MW of installed generating capacity available at its disposal from its allocated shares in central sector generating stations. The details of the allocation are as follows:

Neyveli Lignite Corporation	80 MW
National Thermal Power Corporation (Ramagundam)	50 MW
Madras Atomic Power Station	04 MW
Kaiga Atomic Power Station	08 MW
Total	**142 MW**

In addition a 32.5 MW Combined Cycle Gas Turbine power station set up at Karaikal by the Pondicherry Power Corporation sells its power to the Karaikal and Pondicherry regions. The Tenth Plan proposals for Pondicherry envisage increasing the capacity of this station by 110 MW.

In terms of the progress in its physical capacity, the length of transmission and distribution lines have grown from 293 Km of High Tension (HT) and 1,182 Km of Low Tension (LT) lines at the end of March 1968 to 917 Km of HT and 3,356 Km of LT lines at the end of March 1998 (Table 8.2). The installed transformer capacity has grown from 25.3 MVA to 203 MVA and the maximum demand has risen from 11.18 MW to 191.31 MW during the same period. Pondicherry has achieved 100 per cent electrification of all its villages and hamlets. The number of consumers has grown from 29,000 at the end of March 1968 to about 2,19,000 at the end of March 1998. About 51 per cent of the rural households in Pondicherry have been provided with electricity as of March 2001 compared to 44 per cent in Tamil Nadu.

Table 8.2

PROGRESS IN PHYSICAL CAPACITY

Sl. No.	**Item**	*1965-66*	*1966-67*	*1967-68*	*1968-69*	*1969-70*	*1970-71*	*1971-72*	*1972-73*	*1973-74*
A	T&D Network									
i	H.T.Lines (Km.)	300.40	321.96	340.14	349.22	363.42	386.92	414.94	420.20	437.65
ii	L.T. Lines (Km.)	1212.96	1280.35	1331.20	1370.60	1475.02	1578.92	1685.00	1763.09	1843.31
iii	Transformers (No.)	238.00	264.00	295.00	305.00	322.00	348.00	375.00	398.00	422.00
B	No. of Consumers									
i	Domstic & Comm.	16302	17950	19503	21282	23381	25659	27913	30050	32612
ii	Agriculture	3290	3578	3852	4177	4531	4932	5350	5726	6081
iii	Industries	538	618	697	775	879	978	1058	1138	1231
iv	Street Lights	12113	12254	12279	12558	12876	13683	14662	15334	15706
C	Max. Demand (Kw)	13754	13754	12840	17133	17855	20685	21097	24435	28896
D	Agri.Pumps Added									

Sl. No.	*Item*	*1974-75*	*1975-76*	*1976-77*	*1977-78*	*1978-79*	*1979-80*	*1980-81*	*1981-82*	*1982-83*
A	T&D Network									
i	H.T.Lines (Km.)	447.65	467.65	491.10	518.54	548.75	560.75	576.25	591.49	601.17
ii	L.T. Lines (Km.)	1902.51	1963.51	2029.38	2115.73	2186.72	2256.32	2324.63	2385.17	2436.17
iii	Transformers (No.)	449.00	484.00	509.00	539.00	569.00	596.00	622.00	644.00	674.00
B	No. of Consumers									
i	Domstic & Comm.	34902	37254	39582	42447	45424	48417	51719	53860	57944
ii	Agriculture	6409	6739	7073	7328	7553	7719	7836	7995	7598
iii	Industries	1292	1378	1422	1496	1631	1753	1855	1970	1954
iv	Street Lights	15923	16086	16351	16670	17275	17577	18038	18500	18946
C	Max. Demand (Kw)	28896	29327	27191	27482	34480	33691	42804	45102	44701
D	Agri.Pumps Added	328	330	334	255	225	250	117	159	150

Sl. No.	*Item*	*1983-84*	*1984-85*	*1985-86*	*1986-87*	*1987-88*	*1988-89*	*1989-90*	*1990-91*	*1991-92*
A	Physical Capacity									
i	H.T.Lines (Km.)	616.31	624.55	635.59	647.59	661.30	672.35	684.45	723.29	756.74
ii	L.T. Lines (Km.)	2501.16	2551.24	2594.65	2645.10	2700.20	2765.21	2820.20	2945.89	2981.42
iii	Transformers (No.)	699.00	724	742.00	767.00	796.00	823.00	851.00	904.00	946.00
B	No. of Consumers									
i	Domstic & Comm.	65457	72037	77557	83123	88411	95251	100791	111700	118207
ii	Agriculture	7766	7858	8678	8878	9078	9278	9449	9533	9603
iii	Industries	1980	2172	2495	2628	2782	2948	3079	3295	3422
iv	Street Lights	19248	19248	19929	20729	21529	22359	23099	24800	25528
C	Max. Demand (Kw)	56528	42058	61728	67591.3	70450	78280	85600	127350	130000
D	Agri.Pumps Added	168	200	165	200	200	200	171	84	100

Table 8.2
PROGRESS IN PHYSICAL CAPACITY

Sl.No.	*Item*	*1992-93*	*1993-94*	*1994-95*	*1995-96*	*1996-97*	*1997-98*
A	Physical Capacity						
i	H.T.Lines (Km.)	786.05	810.51	839.25	864.24	892.62	916.95
ii	L.T. Lines (Km.)	3028.46	3094.50	3160.81	3225.93	3295.74	3356.00
iii	Transformers (No.)	982.00	1017.00	1061.00	1116.00	1172.00	1220.00
B	No. of Consumers						
i	Domstic & Comm.	126073	135235	143728	153980	143449	173101
ii	Agriculture	9679	9743	9854	9972	10082	10158
iii	Industries	3554	3681	3850	4024	4189	4396
iv	Street Lights	26341	27136	28182	29229	30043	31057
C	Max. Demand (Kw)	140000	176242	169789	191911	161240	191310
D	Agri.Pumps Added	73	65	71	118	64	76

Source: Government of Pondicherry, Directorate of Economics and Statistics, "Abstract of Statistics", various issues.

Purchase And Supply

The progress in the electricity purchased and sold by the ED is presented in Table 8.3.

Table 8.3

PROGRESS IN ELECTRICITY CONSUMPTION - 1965-66 TO 2000-01

(Million Units)

Year	Tot.Purch	Tot.Sold	Domestic	Comm.	Ind LT	Ind. HT	Agriculture
1965-66	64.997	55.400	3.282	2.968	3.945	24.231	18.746
1966-67	60.273	51.659	3.565	2.977	3.900	24.978	14.443
1967-68	78.107	66.581	4.194	3.183	4.890	32.017	20.134
1968-69	90.007	76.515	4.631	3.564	5.363	34.170	26.995
1969-70	87.984	75.797	5.267	3.607	5.712	32.690	24.262
1970-71	96.359	82.787	5.694	4.018	6.162	37.641	25.033
1971-72	101.231	87.525	6.299	4.220	6.747	39.783	25.397
1972-73	103.236	89.078	7.014	4.211	6.832	37.648	28.297
1973-74	108.646	93.168	7.328	3.871	7.183	43.657	25.745
1974-75	128.332	108.920	8.796	4.509	7.844	42.572	39.457
1975-76	126.820	107.847	9.581	4.264	7.666	46.867	34.033
1976-77	135.391	117.118	11.428	5.099	9.354	50.143	35.422
1977-78	129.944	109.571	12.853	5.508	9.419	45.419	30.394
1978-79	142.063	120.910	14.678	5.885	10.254	58.111	25.725
1979-80	142.721	122.044	16.139	5.875	10.727	52.276	30.499

Table 8.3

PROGRESS IN ELECTRICITY CONSUMPTION - 1965-66 TO 2000-01

(Million Units)

Year	Tot.Purch	Tot.Sold	Domestic	Comm.	Ind LT	Ind. HT	Agriculture
1980-81	179.717	146.791	18.463	6.665	12.110	63.293	39.374
1981-82	180.243	149.582	20.236	6.865	11.446	67.317	36.300
1982-83	184.885	145.493	21.632	7.330	11.574	58.775	37.747
1983-84	166.288	133.856	25.627	8.809	11.800	46.367	33.195
1984-85	183.264	146.974	26.571	9.583	13.825	55.116	33.484
1985-86	164.313	162.939	24.552	10.556	15.295	63.006	40.496
1986-87	293.521	233.227	33.971	10.948	16.910	114.316	49.117
1987-88	368.216	293.776	38.157	12.334	18.250	153.538	57.360
1988-89	447.132	360.741	43.264	15.118	21.738	204.560	61.359
1990-91	668.020	551.370	56.740	19.730	29.250	374.270	67.740
1991-92	768.220	637.620	64.470	22.540	34.100	441.450	70.060
1992-93	883.460	738.480	73.640	25.750	39.560	520.710	73.210
1993-94	832.987	703.710	85.040	25.100	37.730	452.830	87.160
1994-95	976.118	829.502	102.177	27.640	39.802	556.582	91.946
1995-96	981.865	839.690	117.023	42.004	43.045	525.059	93.388
1996-97	983.170	845.410	126.520	43.850	48.710	510.830	94.400
1997-98	1087.963	937.890	144.530	48.210	52.780	573.330	95.140
1998-99	1222.118	1057.620	155.500	56.180	54.870	684.980	95.750
1999-2000	1429.880	1239.700	179.660	68.660	66.840	817.530	96.190
2000-01	1608.510	1413.380	204.830	78.280	76.200	932.060	109.630

Source: Government of Pondicherry, Directorate of Economics and Statistics, "Abstract of Statistics", various issues.

Bulk of the power purchases (around 75 per cent during the late nineties) is from the central sector generating companies – NLC, NTPC and MAPP. The rest of it is from its neighbouring states of Tamil Nadu, Andhra Pradesh and Kerala. Electricity consumption in Pondicherry grew at the (exponential) rate of 9.7 per cent between 1965-66 and 2000-01. In terms of sub-periods, the growth rate during the sixties was 9.4 per cent; this fell to only 5 per cent during the seventies, shot up to 14 per cent during the eighties and dropped down to about 8 per cent for the nineties. Consumption by the industrial category, which accounts for a sizeable share of the total consumption, (growing from 51 per cent in 1965-66 to 71 per cent in 2000-01) has led this growth pattern. Industrial consumption grew at an overall rate of 10.84 per cent. After growing at 9 per cent on an average during the sixties it fell to 5 per cent during the seventies, rose to 18 per cent during the eighties and fell to about 7.5 per cent during the nineties. Domestic consumption has been steadily growing at a rate of 12 per cent throughout. Commercial

consumption has been growing at an increasing rate. After registering a growth rate of 6 per cent and 5 per cent during the sixties and seventies respectively, it grew at 11 per cent during the eighties and 14 per cent during the nineties. Growth in agricultural consumption on the other hand has seen a slowing down: a growth of 9 per cent during the sixties was followed by a growth of only 2.7 per cent during the seventies which improved to 7.3 per cent during the eighties and fell again to 4 per cent during the nineties.

Table 8.4 gives an idea of the emerging trend in the shares of different categories of consumers in the total electricity consumption between 1965-66 and 2000-01. As indicated earlier, the share of industrial consumption has grown from 51 per cent in 1965-66 to 71 per cent in 2000-01. HT industries have accounted for bulk of the consumption by the industrial category, going up from 86 per cent to about 93 per cent. The share of the domestic category gradually rose from about 6 per cent in 1965-66, reached a high of about 19 per cent during 1983-84 and dropped to around 15 per cent by 2000-01. Commercial consumers have accounted for roughly 5 per cent of the consumption throughout whereas agricultural consumption has registered a significant fall in its share, going down from around 34 per cent in 1965-66 to 8 per cent during 2000-01.

Technical Efficiencies

In terms of the quality of supply, Pondicherry has not had to resort to major power cuts for lack of available generating capacity, as Tamil Nadu has had to. Part of the reason is the nature of its sources of supply. Pondicherry keeps drawing power from the central sector power stations and from neighbouring states. If supply exceeds anticipated levels it results in overdrawing, for which the ED pays up. Moreover, the magnitude of such over drawings is relatively small compared to the size of the loads in its neighbouring states and hence it does not penalize the system very significantly. However, lack of adequate capacity in its T&D network has created significant bottlenecks. This has caused considerable load shedding in recent years and has inordinately delayed some new connections. A few of the industries, including HT industries, that were sanctioned power, had to wait for some months before getting new or expanded supply from the Pondicherry grid. One of the big industrial units we surveyed had run its factory entirely on captive generation for two years after setting up,

before it could get connected to the grid. Many of the industrial units are also witnessing frequent and unannounced shutdowns that are significantly impinging on their productivity and profit margins.

Table 8.4
PERCENTAGE SHARES IN ELECTRICITY CONSUMPTION

Year	Total (mu)	Domestic	Commercial	Industry LT	Industry HT	Industry Total	Agriculture
1965-66	55.400	5.92	5.36	7.12	43.74	50.86	33.84
1966-67	51.659	6.90	5.76	7.55	48.35	55.90	27.96
1967-68	66.581	6.30	4.78	7.34	48.09	55.43	30.24
1968-69	76.515	6.05	4.66	7.01	44.66	51.67	35.28
1969-70	75.797	6.95	4.76	7.54	43.13	50.66	32.01
1970-71	82.787	6.88	4.85	7.44	45.47	52.91	30.24
1971-72	87.525	7.20	4.82	7.71	45.45	53.16	29.02
1972-73	89.078	7.87	4.73	7.67	42.26	49.93	31.77
1973-74	93.168	7.87	4.15	7.71	46.86	54.57	27.63
1974-75	108.920	8.08	4.14	7.20	39.09	46.29	36.23
1975-76	107.847	8.88	3.95	7.11	43.46	50.57	31.56
1976-77	117.118	9.76	4.35	7.99	42.81	50.80	30.24
1977-78	109.571	11.73	5.03	8.60	41.45	50.05	27.74
1978-79	120.910	12.14	4.87	8.48	48.06	56.54	21.28
1979-80	122.044	13.22	4.81	8.79	42.83	51.62	24.99
1980-81	146.791	12.58	4.54	8.25	43.12	51.37	26.82
1981-82	149.582	13.53	4.59	7.65	45.00	52.66	24.27
1982-83	145.493	14.87	5.04	7.96	40.40	48.35	25.94
1983-84	133.856	19.15	6.58	8.82	34.64	43.45	24.80
1984-85	146.974	18.08	6.52	9.41	37.50	46.91	22.78
1985-86	162.939	15.07	6.48	9.39	38.67	48.06	24.85
1986-87	233.227	14.57	4.69	7.25	49.01	56.27	21.06
1987-88	293.776	12.99	4.20	6.21	52.26	58.48	19.53
1988-89	360.741	11.99	4.19	6.03	56.71	62.73	17.01
1990-91	551.370	10.29	3.58	5.30	67.88	73.18	12.29
1991-92	637.620	10.11	3.54	5.35	69.23	74.58	10.99
1992-93	738.480	9.97	3.49	5.36	70.51	75.87	9.91
1993-94	703.710	12.08	3.57	5.36	64.35	69.71	12.39
1994-95	829.502	12.32	3.33	4.80	67.10	71.90	11.08
1995-96	839.690	13.94	5.00	5.13	62.53	67.66	11.12
1996-97	845.410	14.97	5.19	5.76	60.42	66.19	11.17
1997-98	937.890	15.41	5.14	5.63	61.13	66.76	10.14
1998-99	1057.620	14.70	5.31	5.19	64.77	69.95	9.05
1999-2000	1239.700	14.49	5.54	5.39	65.95	71.34	7.76
2000-01	1413.380	14.49	5.54	5.39	65.95	71.34	7.76

Source: Government of Pondicherry, Directorate of Economics and Statistics, "Abstract of Statistics", various issues.

The ED has reported T&D losses of around 13.5 per cent during 1998-99. These losses have come down from 19.32 per cent during 1988-89. For the same period Tamil Nadu reported T&D losses of 18.5 per cent during 1988-89 that fell to 16.9 per cent during 1998-99. The line losses reported in Pondicherry were higher than those reported in Tamil Nadu during the late eighties and now they have fallen below that of Tamil Nadu. However, given the smallness of the area of supply in Pondicherry and given that 65 per cent of the electricity consumption is by industries in the HT category, 13.5 per cent line losses still seems quite high.

The per capita consumption of electricity in Pondicherry is among the highest in the country. It had gone up from 517 units in 1988-89 to 1309 units in 1998-99. In comparison, the per capita consumption in Tamil Nadu was only 295 units during 1989-90 that went up to 452 units in 1998-99, while in Andhra Pradesh the per capita consumption during 1998-99 was 332 units. This abnormally high per capita consumption is due to the fact that about 70 per cent of the electricity consumption in Pondicherry is by the industries category compared to 40 per cent in Tamil Nadu, combined with the fact that Pondicherry has a relatively much smaller population size. If one considered only the domestic per capita consumption, it was 279 units in Pondicherry compared to 209 units in Tamil Nadu during 1998-99.

Costs and Tariffs

Power purchases accounted for about 86 per cent of the total revenue expenses of the ED during the nineties. Bulk of these purchases is from the central sector thermal/nuclear generating stations, based on long-term pricing agreements. Cost per unit of power generated in these stations have generally been lower than the overall cost of energy generated by other State Electricity Boards. Hence, the cost per unit of power available for supply in Pondicherry has been lower than that of Tamil Nadu. The cost per unit of power available in Pondicherry was Rs.1.04 in 1993-94 compared to Rs.1.59 of Tamil Nadu. This rose to Rs.1.82 during 2000-01 whereas in Tamil Nadu it was Rs.2.94 for the same year.

These lower costs for Pondicherry got translated into lower tariffs for different categories of consumers compared to those in its neighbouring states. For industrial and commercial consumers taking supply at the HT level, the demand charge rose from Rs.

50/KVA/month during the early nineties to Rs.85/KVA/month in 2000. The energy charge, which was 89 paise per unit (ppu) for all consumption in 1990, changed to an increasing slab rate of Rs.1.89 for the first lakh units and Rs.2.09 for all additional units during 2000. Government and non-commercial HT consumers paid slightly lower rates compared to industry. The LT consumers are also charged at an increasing block rate. Domestic consumption was charged at the rate of 55 ppu for the first 100 units per month with the rate going up to Rs.1.39 for consumption in excess of 400 units per month during 2000. LT industrial and commercial consumers also pay according to an increasing slab but at higher rates compared to the domestic category, with the commercial category paying the highest. Electricity consumption for irrigation pumps operated by small farmers is provided free of charge if the farmers' families are solely dependent on the income derived from their agricultural land holding. For this purpose a small farmer is defined to be someone holding not more than two-and-a half acres of wetland or not more than five acres of dryland. Irrigation pumps operated by other farmers have a fixed charge per annum based on the horsepower rating, but the consumers are also given an option of paying on the basis of energy consumed. In 2000 the fixed charge was Rs.75 per HP per annum plus a service charge of Rs.200 per service.

For information on financial performance, a summary of the revenue receipts and revenue expenses of the ED is provided in Table 8.5. (More detailed financial information was not available for this study).

Table 8.5
PONDICHERRY ELECTRICITY DEPARTMENT - REVENUE RECEIPTS AND EXPENSES
(1993-94 To 2002-03)

(Rs. Crore)

	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-2000	2000-01	2001-02
RECEIPTS									
Sale of power	87.82	106.21	113.38	117.57	135.57	165.94	207.21	250.33	303.64
Misc. revenue	0.84	1.70	1.94	1.56	1.60	0.54	0.87	1.30	1.50
Total	88.66	107.91	115.32	119.13	137.17	166.48	208.08	251.63	305.14
EXPENSES									
Power purchase	75.14	92.34	100.41	107.90	126.18	162.14	211.52	258.61	314.76
O&M expenses	7.49	7.79	10.39	11.52	13.03	17.04	16.95	18.73	18.15
Depreciation	3.83	4.45	5.36	10.85	12.13	13.00	13.90	14.98	16.20
Total	86.46	104.58	116.16	130.27	151.34	192.18	242.37	292.32	349.11
Net Revenue	2.20	3.33	-0.84	-11.14	-14.17	-25.70	-34.29	-40.69	-43.97

Source: Government of Pondicherry, Electricity Department

The table indicates the deteriorating financial health of the ED. The net revenue realized by the ED was Rs.3.33 crore in 1994-95. Since then the net revenue has been negative and decreasing. Estimates for 2001-02 indicate that the net revenue loss would be of the order of Rs. 44 crore. The net fixed assets of the ED was Rs.160.43 crore at the beginning of 1998-99 and the return on NFA for this year was (-)16per cent. From earning net revenue of 0.4 paise on every unit sold during 1994-95 the ED has gone to losing about 3 paise on every unit sold during 2000-01. The ED, as of now, does not incur any interest expenses on its source of funding for capital expenditure. The funds are made available through government allocations. Now if we take into account the opportunity cost of these funds also then the revenue losses would be higher.

Future Demand

The electricity requirement in the Union Territory over the next 20 years would depend on the growth of the various sub-sectors (manufacturing, agriculture and services) of the economy and the growth of its population. This relationship is two-way though because growth in these sectors would in turn depend on adequate availability of power. However, till recent years Pondicherry has not had significant problems of supply shortages. A brief analysis of the energy consumption pattern by some of the big industries, in the last five years, indicated that electricity supply from the ED formed the bulk of their consumption. Captive generation comprised only a negligible proportion. Also there were no cases of fuel substitution or shifting out of Pondicherry for lack of power availability. Agricultural consumers get their supply during non-peak hours and domestic consumers have not really had to deal much with power cuts. In the last couple of years this scenario has been changing, though the nature of supply constraints are in terms of frequent interruptions, load shedding and long waiting periods for new/additional connections. These are indications of an emerging supply constrained scenario. For this study, however, it seems reasonable to treat the demand for electricity as a derived demand in order to make projections for future requirements. The projections are made based on 1998-99 consumption levels. The projections for electricity requirement (in terms of million units of energy consumed) are made separately for the four major categories of consumers, industrial, commercial, agricultural and domestic.

Industrial

Since industrial consumption accounts for increasing shares of energy consumed, 67 per cent during 1997-98 and 71 per cent in 2000-01, the growth in the demand from this category would have a very significant impact on the overall demand for electricity. Hence, in this study much emphasis was given to a careful estimation of the elasticity of demand from this category. The results of the Annual Survey of Industries prepared by the Directorate of Economics and Statistics at Pondicherry were used for the analysis. Using panel data relating to 15 major industrial groups for the years 1981-82 to 1996-97, regression analysis was carried out.The details of the analysis and the regression results are provided in the appendix to this chapter.

The results indicate that the equations of electricity consumption with respect to total output of industry seem to have a better fit and seem more robust and reliable, compared to the ones with respect to value added. Results of equation (3) in the appendix seem to be the most appropriate. Based on this the elasticity of demand for electricity with respect to total output in industry is estimated to be 1.2. It was also seen that while electricity consumption by industries (based on the ED data) grew at the rate of 20 per cent between 1980-81 and 1995-96, the total output of all industries (as given by the Annual Survey of Industries figures) grew at the rate of about 17 per cent during the same period. This strengthens the estimate we have arrived at.

In this report, industry is anticipated to grow at an overall rate of 10 per cent in the next twenty years. This means that the demand for electricity from this category must grow at 12 per cent based on our elasticity estimates. The industrial consumption of electricity in 1998-99 was about 740 mus. Thus, if industry grows at 10 per cent, the demand for electricity from this category in 2020 is expected to be around 8,000 mus.

Agriculture

The share of agricultural consumption in the total has significantly come down and the growth rates are also dropping. All indications show that the decline in both the growth rate and the relative share of agricultural consumption is likely to continue. Table 8.6 gives information on the cropped and irrigated area from 1980-81 to 1996-97. It may be observed that the net sown area has been gradually decreasing and the gross cropped area has been more or less stagnant since the early eighties. There is also a

declining trend in the total irrigated area since the early eighties. The additional number of irrigation pumps that were energized each year has been falling continually. On an average about 300 new pumps were connected each year during the late seventies but by the late nineties this figure had come down to around 60 (Table 8.2). Agricultural output, measured in 1993-94 prices and based on the new series of the National Accounts, grew at about 1.5 per cent between 1981-82 and 1998-99 and as a proportion of the total GSDP of the Union Territory it fell from about 12 per cent during early eighties to about 2 per cent in the late nineties.

Table 8.6
AGRICULTURE - GROSS CROPPED AND IRRIGATED AREA

(in hectare)

Year	Tot.Geog.Area	Net Area sown	Net Area sown/Total %	Gross Cropped Area	Tot.Irr.area
1980-81	46822	29908	63.88	53981	42005
1981-82	46822	29612	63.24	50788	41813
1982-83	46822	28648	61.18	44984	38007
1983-84	46822	28922	61.77	43851	36952
1984-85	46822	29080	62.11	48707	41202
1985-86	48581	27909	57.45	45638	38058
1986-87	48581	27463	56.53	43414	36330
1987-88	48581	26243	54.02	39298	33198
1988-89	48581	26191	53.91	40989	34761
1989-90	48581	25333	52.15	41999	33019
1990-91	48581	27294	56.18	43738	33525
1991-92	48581	27836	57.30	45596	35522
1992-93	48581	27485	56.58	47415	36889
1993-94	48581	26655	54.87	44895	35495
1994-95	48842	26550	54.36	46420	36086
1995-96	48842	26041	53.32	44474	35180
1996-97	48842	25393	51.99	44653	34644

Source: Government of Pondicherry, Directorate of Economics and Statistics, Abstract of Statistics, various issues.

Regression analysis on agricultural consumption of electricity indicated that there was no systematic relationship existing with respect to agricultural output or with respect to total irrigated area. In fact the agricultural consumption failed to show a systematic relationship with any of the relevant variables that were analyzed. Moreover, while the

agricultural output measured in 1993-94 prices grew at 1.5 per cent between 1981-82 and 1998-99, electricity consumption by this category grew at 8 per cent between 1980-81 and 1995-96 indicating an output elasticity of about 5.33! The reason for this is possibly because agricultural consumption is not metered and supply for this category is basically free. The ED therefore does not have accurate information on the following three categories - T&D losses, thefts and agricultural consumption that jointly are responsible for all unaccounted energy. The agricultural consumption data given are hence 'guesstimates'.

Hence, in order to project the energy requirements of this sector we assume an output elasticity of 2. This is based on the assumption that when a lot of existing inefficiencies in the system are removed, when agricultural consumption is metered and priced and when illegal drawing of power is curtailed the elasticity would come down. It is probably still on the higher side but it is felt that if irrigation requirements become more intensive and ground water tables keep falling then irrigation might become more energy intensive. This study assumes a 2 per cent growth in the agriculture sector in the next 20 years. Hence this sector's consumption of electricity is likely to grow at 4 per cent. Agricultural consumption during 1998-99 was 96 mus (Million Units). The estimated requirement of this sector in 2020 is therefore about 220 mus.

Commercial

The services sector in the economy basically is responsible for the consumption that is captured under the commercial category of the ED. This category has consistently accounted for 5 per cent of total electricity consumption and its consumption has been growing at an increasing rate. The electricity consumption by commercial consumers grew at about 13 per cent between 1980-81 and 1995-96. We did not have information on the average price per unit consumed by this category. Hence, the output elasticity could not be estimated based on the data we had. Therefore, based on a thumb-rule approach, we assume the elasticity of growth in commercial electricity consumption with respect to the growth in the services sector of the economy to be 1.5. This study projects that the services sector would grow at 6 per cent for the next twenty years. To support this growth, electricity consumption by the commercial category should grow at 9 per cent.

Consumption during 1998-99 was about 56 mus. Thus, the projected requirement of this category for 2020 is 342 mus.

Domestic

Consumption by the domestic category has been growing at a steady rate of 12 per cent starting from the mid sixties. Growth in the consumption by this category depends largely on the growth in the population, the income levels and the price of electricity. Again for want of sufficient data accurate estimates of elasticities could not be worked out. The growth in domestic consumption between 1980-81 and 1995-96 was 14 per cent. We assume the same growth to continue for the next 20 years. The population growth rate is expected to decline over the next 20 years. On the other hand price of electricity and income levels are expected to go up. Given all these, the current growth rate may be expected to continue. Domestic consumption during 1998-99 was 156 mus. Based on this the projected requirements of this sector during 2020 would be 2,444 mus.

Power Requirement

The total requirement during 2019-20 of the four major categories considered above works out to around 11,000 mus. Allowing for about 200 mus towards any additional miscellaneous requirements and assuming that Pondicherry could bring down its T&D losses from the current 13 per cent to about 10 per cent the total electricity requirement works out to be around 12,300 mus. If we assume an 85 per cent load factor this means that Pondicherry should have at its disposal 1,652 MW of capacity to meet this demand. This is about 12 times the present capacity at its disposal. Pondicherry does not have enough natural resource potential of its own to meet this. It will either have to import the necessary primary fuels or it could contract with other generating stations to buy from them.

Vision for the Future

Institutional Reforms

We saw that while Pondicherry has had a fairly comfortable situation with regards to its power sector in the past decades this scenario has been coming under some strain in recent years. We have also estimated the magnitude of additional power requirements for the next 20 years, if Pondicherry's economy should grow at 6 per cent. Hence, if the

growing inefficiencies in this sector are not corrected then inadequacy of power could act as a major constraint to economic development in the Union Territory . The issue gains further urgency in light of the fact that the power sector in the country as a whole is witnessing severe imbalances. The central sector power utilities and the neighbouring state utilities that now supply power to Pondicherry are themselves having huge over-dues and/or are running heavy losses. This means that Pondicherry cannot expect to get a cushioning support from them if it gets into a crisis. There are also mounting pressures to improve the fiscal discipline of the central and state governments, which implies that the ED in Pondicherry will not have unlimited access to more resources from the government budget allocations to tide over its financial crises. In any case, depending on budgetary support to meet current or running expenses is at the most a temporary solution. Thus, if the power sector has to deliver and supply adequate quantities to promote higher economic growth then it is imperative that it has to become more efficient.

Restructuring efforts are already afoot to address the problem of gross inefficiencies in the Indian power sector. Keeping in view the broader context of reforms that are taking place in the country, we seek here to outline a reforms agenda and suggest a possible enabling institutional arrangement that could help promote efficiency in Pondicherry's power sector.

The present institutional arrangement in Pondicherry is such that the Electricity Department has the ownership, supply rights and regulatory responsibility relating to power supply. In order to reduce the potential either for 'government failure' or for 'market failure' in this sector, it is first important to separate the ownership/supply functions from the regulatory functions. The Central Electricity Regulatory Commissions (CERC) Act (1998) has already prepared the ground for this by *requiring* all the states and union territories to set up independent regulatory commissions in their respective jurisdictions. The regulatory authority on all issues relating to the power sector would vest with these commissions. Provisions have also been made in this Act to facilitate restructuring the existing institutional arrangement for supply. The Electricity Bill 2001 submitted to the Parliament, when passed, would extend these provisions. Moreover, there is sufficient flexibility in the options afforded so that different states and union territories can adapt the restructuring efforts they undertake to suit their specific situation.

Given this, we suggest here a possible approach to restructuring in Pondicherry, which, it is felt, would greatly help in improving efficiency, particularly in the emerging scenario for the Indian power sector. The basic idea is to design an institutional arrangement that would provide appropriate incentives to all relevant groups so that the decisions they are expected to make in society's interest are also in tune with their own self-interests. In other words the objective is to design incentive-compatible mechanisms. The suggestions offered are strongly based on the recognition that the alternative should be a viable and sustainable one and that the "transaction costs" of effecting *and* sustaining the transition are minimized.

Regulated Electricity Board

The ownership structure of the electricity supply sector in the Union Territory could be converted from that of a government Department to a fully autonomous Electricity Board. The Union Territory government and the private sector could jointly own the share capital of this Board, with the government holding a minority share. This Board should be given ***complete autonomy*** in making all short-term and long-term decisions relating to the Electricity Board (EB) and also be made ***accountable*** to the public and to the regulatory commission. An independent Regulatory Commission, established according to the guidelines given in the CERC Act 1998, should be responsible for regulating the performance of the EB. The basic responsibility of the EB would be to supply electricity to whoever requires it in the Union Territory , subject to the pricing and quality regulations of the Regulatory Commission. The EB should be allowed to run its operations on commercial lines with complete flexibility both in terms of deciding who it purchases electricity from and at what prices, and in terms of the prices it would like to charge the different categories of its consumers. The EB should however be required to meet all the regulatory requirements of the Commission.

Price-Cap Regulation

The Regulatory Commission could adopt a price-cap type of regulation as it is done in the United Kingdom. This approach requires that the Commission specify an overall price ceiling, which the EB cannot exceed. Within this overall ceiling the utility may be free to fix the tariff rates for its different categories of consumers. For the price-cap form of regulation, while working out the price ceiling for the first time would be an elaborate

exercise, any subsequent revisions allowed would simply depend on the rise in the retail price index (RPI). The utility would be allowed to raise the price ceiling by a percentage, which would be equal to the percentage rise in the RPI minus a certain percentage 'X'. This is so as to encourage the utility to increase its efficiency. It implies that the utility's prices can rise only slower than the general price rise. It is suggested that the Regulatory Commission could work out the price ceiling for the first time based on long run marginal costs of capacity expansion. The 'X' percentage that is disallowed from the rise in RPI, would have to be carefully worked out based on technically feasible efficiency increases in the sector. All the policy decisions of the Regulatory Commission should be transparent and subject to public hearings.

The advantages of the price-cap form of regulation would be that the Regulatory Commission needs minimum information to monitor and enforce regulatory standards of pricing and the information needed is clearly observable. The rate of return regulation on the other hand, which is a cost-plus form of regulation, requires that the Commission have information on the actual costs of supply, which is more difficult to accurately ascertain. Moreover, price-cap regulation provides incentives to the utility to minimize costs since all the benefits are retained by it. In the case of the cost-plus regulation any benefits realized through cost savings are passed on to the consumers and hence there is not enough incentive on the part of the utility to maximize efficiency. In the Indian context today, given the inefficiencies in the power sector, the price-cap regulation would hence be better.

Incentives

The managers and the other employees of the EB could be offered appropriate performance-linked incentives. The managers could probably be given equity shares in the utility, which may be non-transferable for a sufficient length of time so that the long-term interest of the utility is promoted. The other employers could be given bonus payments. Such an incentive system would align individual interests of income maximization with the utility's, and hence society's, interest of efficiency maximization.

Tariffs and Subsidies

The EB should be given the autonomy to fix tariff rates for all consumer categories as it sees fit. If, however, the government of the Union Territory desires to provide a subsidy

to any consumer, it could do so by paying a percentage of the consumer's bill. The government could pay a very high percentage (maybe 95 per cent or so) of the bill if the consumer is from a highly disadvantaged category, say the lowest income group or very small farmer. It could pay correspondingly smaller percentages for other consumers who are relatively in a better position. The key thing is however, that ***all consumption is metered*** and every consumer is required to pay at least a part of the bill, even if it is a small percentage. These measures would not only ensure better transparency but also encourage more judicious use of electricity. They would also avoid significant negative externalities like illegal power consumption, indiscriminate use of groundwater resulting in over-exploitation of the resource, illegal markets for water and so on.

Concluding Remarks

Pondicherry has an advantage in the context of power sector reforms because right now the ED is basically an electricity distribution entity that buys power from other sources and manages the supply within the Union Territory . It would not have to deal with the higher transaction costs associated with 'unbundling' that other vertically integrated utilities would have to. The smallness of its size, the share of industrial consumption being as high as seventy percent, the falling share of agricultural consumption and the fact that in the near future the cost of supplying electricity here would continue to be relatively lower compared to that of its neighbouring states are additional advantages.

APPENDIX

Regression Analysis for Industrial Consumption:

The variables used in the analysis are as follows:

Elec - Electricity consumption by the industry group

Out - Total Output of the group in constant (1993-94) prices

VA Net Value Added by the group in constant (1993-94) prices

EP - Electricity Price per kwhr for the industry group; it is got by dividing the total payment for electricity by the quantity of electricity consumed i.e. it is the average price paid per unit consumed

ID - Implicit Deflator, the price index for electricity for the year under consideration, divided by the base period price (1993-94 = 100)

EPI - Electricity Price Index based on 1993-94 = 100

Two sets of regression equations were estimated, one based on total output and the other on value added. The equations and results are as follows:

I. Elasticity of electricity consumption with respect to total output:

(1) $\text{Ln (Elec)} = \alpha + \beta \text{ Ln (Out)}$; the estimated values were

$\text{Ln (Elec)} = -6.40 + 1.17 \text{ Ln (Out)}$

$R^2 = 0.78$, and the coefficients were significant.

(2) $\text{Ln (Elec)} = \alpha + \beta \text{ Ln (Out)} + \gamma \text{ Ln (EP/ID)}$; the estimated values were

$\text{Ln (Elec)} = -5.70 + 1.14 \text{ Ln (Out)} - 1.32 \text{ Ln (EP/ID)}$

$R^2 = 0.79$ and the coefficients were significant.

(3) $\text{Ln (Elec)} = \alpha + \beta \text{ Ln (Out)} + \gamma \text{ Ln (EPI)}$; the estimates were

$\text{Ln (Elec)} = -5.26 + 1.24 \text{ Ln (Out)} - 0.49 \text{ Ln (EPI)}$

$R^2 = 0.78$, and the coefficients were significant.

II. Elasticity of electricity consumption with respect to value added:

(4) Ln (Elec) = α + Ln (VA); the estimated values were

Ln (Elec) = -2.30 + 0.98 Ln (VA)

R^2 = 0.64, and the coefficients were significant

(5) Ln (Elec) = α + Ln (VA) + γ Ln (EP/ID); the estimated values were

Ln (Elec) = -1.52 + 0.96 Ln (VA) – 1.82 Ln (EP/ID)

R^2 = 0.67 and the coefficients were significant

(6) Ln (Elec) = α + Ln (VA) + γ Ln (EPI); the estimated values were

Ln (Elec) = -2.98 + 0.95 Ln (VA) + 0.23 Ln (EPI)

R^2 = 0.64 and the coefficient for Ln (EPI) was not significant