

10. ENERGY

Energy, an essential requirement for all facets of life is recognised as a basic human need on which socio-economic development of the country depends, is a critical infrastructure. Electricity is the primary source of supply of energy. Hence, supply of electricity at reasonable rates and making available reliable and quality power is vital. The demand for power is a function of population and economic growth, which reflects the growth process-taking place in primary, secondary and tertiary sectors. Recognising that electricity is one of the key drivers for rapid economic growth and poverty alleviation, the nation has set itself the target of providing access to electricity to all households in the next five years. As per 2001 Census, about 44 per cent of the households at the national level and 22 per cent at the State level do not have electricity. Hence, meeting the target of providing universal access is a daunting task, requiring significant addition to generation capacity and expansion of Transmission and Distribution network.

State Profile : 2005-06:

On the power front, the State was able to supply additional power in 2005-06 compared to 2004-05. The total installed capacity has crossed 10000 MW mark and gross availability increased to 56000 mu. The per capita consumption of power, an ultimate indicator, rose by 5.5 per cent.

The installed capacity `at the command of TNEB' rose by 5.25 per cent from 9512 MW in 2004-05 to 10011.84 MW in 2005-06. In the process of synchronisation of generation from own sources and purchases, the latter played a dominant role (12.3%) than the former which had a marginal increase of 1.8 per cent during 2005-06. However, the overall power availability of the State increased (7.0 %) in 2005-06 over and above the increase of 6.7 per cent in 2003-04 and 5.8 per cent in 2004-05. The total consumption of the State had also moved from 40840 mu in 2004-05 to 42825 mu in 2005-06, registering an increase of 4.8 per cent. The per capita power consumption, a pointer to the overall economic development of the State stood at 860 kwh / units in the reference year, recording an increase of 5.5 per cent over the 815 kwh/units in 2004-05. The details are furnished in Table- 1.

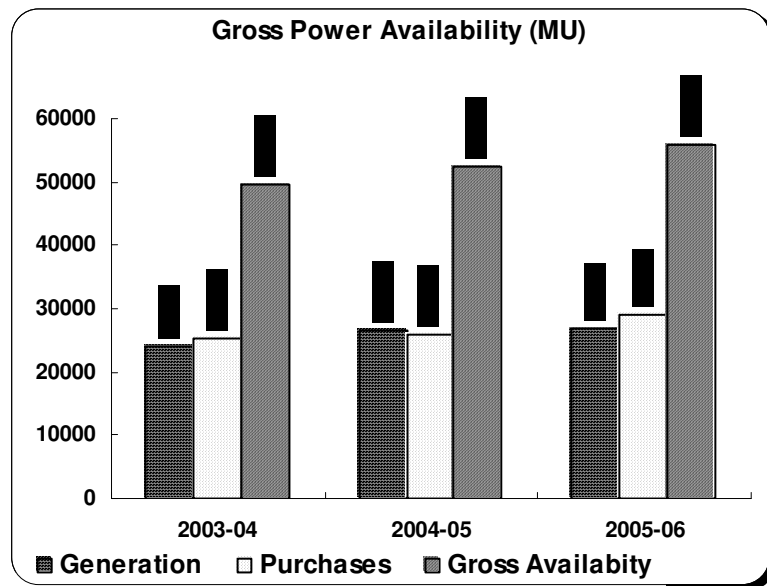


Table - 1 : Power Sector : An Overview

Sl. No	Details	2003-04	% Change	2004-05	% change	2005-06	% change
1.	Installed Capacity (MW)	9318.70	12.7	9512.00	2.1	10011.84	5.25
2.	Power Generation (mu)	24110	(-)3.3	26450	9.7	26915	1.8
3.	Power Purchases (mu)	25384	18.3	25895	2.0	29091	12.3
4.	Gross Power Availability (mu)	49498	6.7	52345	5.8	56006	7.0
5.	Total power consumption(mu)	38374	6.4	40848	5.0	42825	4.8
6.	Per Capita Consumption (Kwh/Unit)	780	5.4	815	4.5	860	5.5

Source: Statistics at a Glance, 2005-06, TNEB.

Tamil Nadu Vis-a-vis All India:

The performance of Power sector at the all-India level was also satisfactory during 2005-06. The installed capacity of utilities rose from 112.7 thousand mega watts in 2003-04 to 118.4 in 2004-05 and touched 124.8 thousand mega watts in 2005-06. Towards this achievement, the State had contributed about 8.0 per cent since 2002-03. Similarly in achieving an overall generation of 608.6 billion units during 2004-05, the share of Tamil Nadu was 8.6 per cent. The performance of the State thermal power stations could be rated to be relatively more efficient than that of National power stations as the Plant Load Factors (PLF) of the former was ahead of the latter during this period.

Table - 2 : Power Sector : State's Share to All- India

	2002-03		2003-04		2004-05		2005-06	
	Tamil Nadu	All India*	Tamil Nadu	All India*	Tamil Nadu	All India*	Tamil Nadu	All India*
Installed Capacity '000' MW	8.27 (7.7)	107.9	9.32 (8.3)	112.7	9.51 (8.0)	118.4	10.01 (8.0)	124.8
Gross Power Availability (Billion units)	46.39 (8.7)	532.7	49.5 (8.8)	565.1	52.35 (8.6)	608.6	56.01	NA
PLF of Thermal Stations (%)	81.02	72.2	78.3	72.7	76.9	69.6	72.24	NA

(State's share in All India is given in paranthesis) *Utilities only.

Source: Statistics at a Glance, 2005-06, TNEB.

Public Expenditure:

Power projects having a high Incremental Capital Output Ratio (ICOR) involves huge initial investments, long gestation period and high risk and low rate of return. Realising this, the Governments both at the Centre and State allocate a considerable portion of the Plan outlay to this sector. Over the Plan periods, power sector had a fluctuating share in the overall budget allocation depending upon the prioritisation of various economic and social activities. The sanctioned outlay for power sector in the State had increased from Rs.30.28 crores in the First Five Year Plan period to Rs.8029.65 crores in the X Plan. However, its relative share in the total plan outlay had come down from 37.67 per cent in the First Plan to 20.07 per cent in the Tenth Plan.

Table – 3 : Power Sector Allocation : Plan-wise

(Rs. crores)

Plan Period	Total Plan Outlay	Power Sector Allotment	% share to total
I	80.39	30.28	37.67
II	187.76	79.15	42.15
III	347.15	119.20	34.34
IV	558.96	210.05	37.58
V	833.61	259.82	31.17
VI	3644.63	967.57	26.55
VII	6316.07	1770.81	28.04
VIII	14016.80	3115.95	22.23
IX	24916.71	4560.62	18.30
X	40000.00	8029.65	20.07

Source: Budget Link, Government of Tamil Nadu.

Influence of Power Demand on State Income:

Energy generated and utilised is an indicator of the economic achievement in any country. There is a remarkable correlation not only between per capita consumption of energy and the per capita income of the State / Nation but also between the peak demand for power and GSDP / GDP.

Table – 4: State / Per Capita Income and Demand for Power

Year	GSDP (Current Prices) (Rs. lakhs)	Peak Demand (MW)	Per Capita Income (Rs) (Current Prices)	Per Capita Consumption (Units/kwh)
1993-94	5754902	3948	8955	380
1994-95	6866579	4360	10503	390
1995-96	7820534	4424	11819	410
1996-97	8923735	4874	13269	420
1997-98	10355034	4918	15388	430
1998-99	11820918	5196	17383	452
1999-00	12631300	5580	18359	480
2000-01	14109983	6290	20361	510
2001-02	14355542	6687	20315	708
2002-03	15509925	6957	21433	740
2003-04	16845717	7228	23476	780
2004-05	18892107	7473	25713	815

Source: Computed by DEAR

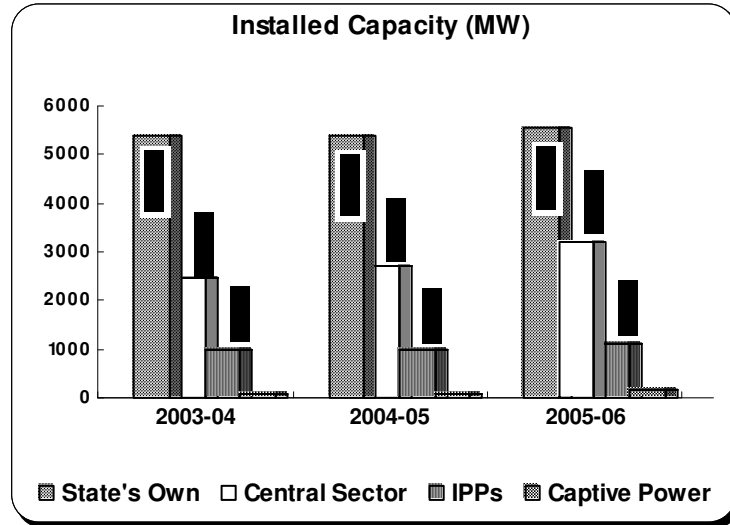
It is observed that between 1993-94 and 2004-05 the elasticity of demand for energy in the State with respect to GSDP was 0.57. Like-wise the per capita power consumption to per capita income was 0.76. This high elasticity nature proves that power is an important ingredient as well as an Index of the economic development.

Performance during 2005-06:

In the above backdrop, the performance of State's power sector during 2005-06 is studied and presented in the following sections.

Installed Capacity:

The installed capacity in the State had increased from 9531.70 MW in 2004-05 to 10031.20 MW in 2005-06, registering an overall increase of 5.2 per cent. For this additional capacity of 499.5 MW, all the four sources viz. State's own projects (29.9%), Central Sector Projects (27.3%), IPPs (22.7%) and Captive Power Plants (20.2%) have contributed.



This is a positive feature compared to previous few years when entire addition came from the Central sector projects.

Table - 5: Installed Capacity :Tamil Nadu

Sources	(MW)					
	2003-04		2004-05		2005-06	
	Abso- lute	Net Addition	Abso- lute	Net Addition	Absolute	Net Addition
1. State's own projects	5401.04	92.9	5401.04	Nil	5550.00	148.96
% share to total	58.0	8.3	56.7		55.3	29.9
2. Central Sector Projects	2852.00*	949.00	3065.00*	213.00	3201.00*	136.0
% share to total	30.6	90.4	32.2	100.0	31.9	27.3
3. Independent Power Projects	988.16	Nil	988.16	Nil	1101.16	113.0
% share to total	10.6		10.4		11.0	22.7
4. Captive Power Plants	77.50	8.0	77.50	Nil	178.0	100.5
% share to total	0.8	0.8	0.8		1.8	20.2
Total capacity	9318.70	1049.9	9531.70	213.00	10031.20	499.50

* includes 360 MW from the External assistance.

State's Own Projects:

The aggregate capacity of the State's own projects which remained constant in 2004-05 over the previous year's level of 5401.04 MW rose to 5551.04 MW in 2005-06. An addition of 150 MW of hydel capacity during the year is a notable achievement. In that sense 3 x 50 MW capacity at Pykara ultimate stage is a breakthrough since 2000 when 30 MW at Parsons Valley was commissioned. After exploitation of almost all the hydel resources smaller additions were made possible only by the contribution of small/mini/ micro projects. The relative share of hydro capacity to total State's own capacity as on 31st March 2006 was 38.5 per cent (25.0% at National) which is very close to the desired level of 40 per cent

Table - 6: State's Own Projects : Capacity

Source	(MW)		
	2003-04	2004-05	2005-06
1. Hydro	1987.40	1987.40	2137.40
2. Thermal	2970.00	2970.00	2970.00
3. Gas	424.28	424.28	424.28
4. Wind	19.36	19.36	19.36
Total	5401.04	5401.04	5551.04

Source :TNEB.

The hydel capacity of the State rose from 1987.40 MW during 2003-04 to 2137.4 MW by the end of 2005-06. The Pykara Ultimate Stage with 150 MW had helped to improve the overall capacity of the hydel sources. In Tamil Nadu Ennore, Tuticorin, Mettur and North Chennai are the four thermal power projects having an aggregate capacity of 2970 MW since 1995-96. However, the efficiency of these projects is maintained by periodical overhauling. Besides these Gas Turbines with 424.28 MW and Wind Mills (as demonstration units for encouraging private participation) are also functioning.

Central Sector Projects:

The projects established and maintained by the Central Sector also provide share to the Southern States depending upon the place of origin and the need . Neyveli Thermal Station I and its expansion having a total capacity of 1020 MW offer a share of 740 MW being 72.5 per cent to the State, while Neyveli TS II extend 30.0 per cent of its 441MW capacity. National Thermal Power Corporation, Ramagundam with a total capacity of 2600 MW contributes about 23 per cent (588 MW) to the State's utility. Likewise, Talcher Stage II contributes 27 per cent (541 MW)of the total capacity to the State grid.

Table - 7: Installed Capacity: Share from Central Sector

Project	Total Capacity	(MW)					
		2003-04	(%)	2004-05	(%)	2005-06	(%)
Neyveli TS-I	600	500	(83.3)	500	(83.3)	500	(83.3)
Neyveli TS-I Ext.	420	240	(57.1)	240	(57.1)	240	(57.1)
Neyveli TS-II	1470	441	(30.0)	441	(30.0)	441	(30.0)
MAPP	470	294	(62.5)	294	(62.5)	294	(62.5)
NTPC	2600	470	(18.1)	588	(22.6)	588	(22.6)
Kaiga	440	237	(53.9)	237	(53.9)	237	(53.9)
Talcher Stage II	2000	270	(13.5)	405	(20.2)	541	(27.1)
Total	8000	2452	(28.7)	2705	(33.8)	2841	(35.5)

Figures in brackets indicate percentage share to project's total capacity.

Source: Statistics at a Glance, 2005-06, TNEB.

The generating capacity of Central Sector Projects are strengthened regularly either by adding new projects or expanding the capacity of existing ones. The third and fourth units with 500 MW each at Talcher Super Thermal Power Project, Stage II commissioned on November 2004 and August 2005 increased the total capacity of Talcher Project to 2000 MW during 2005-06. Likewise, the VII unit of the project with 500 MW capacity commissioned in March 2005 rose the NTPC's capacity to 2600 MW.

Atomic energy is sourced from two projects viz. Madras Atomic Power Project (MAPP) and Kaiga Atomic Power Project which together have a capacity of 30 MW contributes 294 MW and 237 MW respectively to State's utility. Eventually, all the six projects together contributed 2841 MW by the end of 2005-06 or 35.5 per cent to the State against 33.8 per cent in 2004-05.

Box -1
Central Sector Projects : Percentage Share of Allocation

State	NLC TS-I & Exp.	NLS TS-II	MAPS	Talcher	Kaiga	NTPC
Andhra Pradesh	-	18.8	7.9	21.25	-	27.9
Karnataka	-	13.5	6.2	19.80	24.5	16.6
Kerala	-	10.4	5.4	14.0	8.6	11.8
Tamil Nadu	88.1	30.0	75.4	27.1	53.9	22.6
Pondicherry	-	5.4	1.3	3.0	1.8	2.4
Unallocated	11.9	15.0*	3.8	15.0	11.2	18.6\$
Total capacity (MW)	740	1470	390	2000	440	2600

*6.9% allotted to NLC, \$ 3.8% goes to Goa.

Source: Statistics at a Glance, 2005-06, TNEB

Independent Power Projects (IPPs):

Private sector IPPs came into vogue in the 1990s. GMR Vasavi in 1991 commissioned at the Basin Bridge DEPP, with 4 x 49 MW capacity in December 1998 and January 1999. Since then, more projects were launched and as on 31st March 2006 the following projects were added to IPP.

Private Sector IPPs	No. of units x MW	Total capacity (MW)	Commissioned on
Samalpatti DEPP	7 x 15.09	105.66	Jan. 2001
Pillaiperumal Nallur GTPP	1 x 330.5	330.5	April 2001
Samayanallur DEPP	7 x 15.143	106.0	Sept. 2001
Neyveli Zero Unit	1 x 250	250.0	Dec. 2002
Abian Power Co. Ltd. near Courtalam	1 x 113	113.0	Aug. 2005

Thus, with an addition of 113 MW in 2005-06, a total quantum of 1101.16 MW from the Independent Power Project was added to the State's grid. The additions piled up at the IPPs would definitely reduce the State's burden.

Captive Power Plants:

The provision in the Electricity Act 2003 in respect of setting up of captive power plants has been made with a view not only to securing reliable, quality and cost effective power, but also facilitating creation of employment opportunities through speedy and efficient growth of industry. The provision relating to captive plants to be set up by

group of consumers is primarily aimed at enabling small and medium industries or other consumers who may not individually be in a position to set up plant of optimal size in a cost effective manner. Grid inter-connections for captive generators was facilitated as per Section 30 of the Act. In 2005-06 a total capacity of 178 MW was also grouped under State's capacity. This apart, a quantum of 360 MW from the external assistance from Eastern Region is also added as the output is calculated as purchases.

Power Generation:

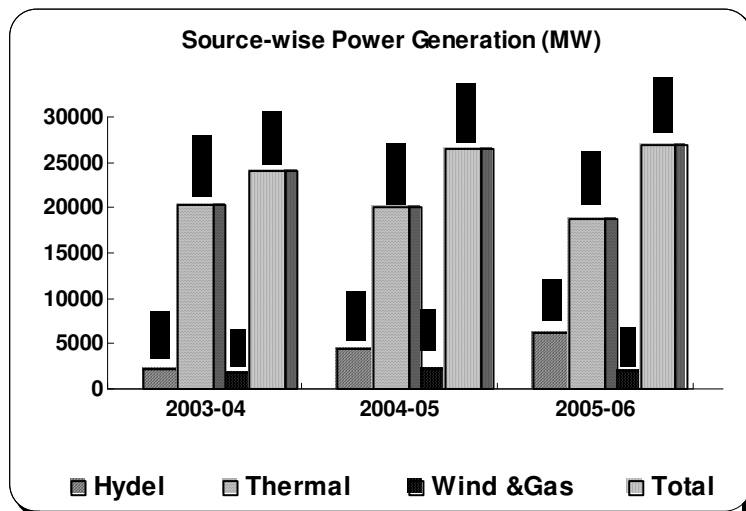
Power generation from State's own power projects at 26915 mu in 2005-06 rose from 26450 mu in 2004-05, by 1.8 per cent. Supply side constraints in coal supply due to flooding of coal pits, had pulled down the thermal generation by 6.0 per cent during 2005-06. In the normal process of synchronisation of hydel and thermal sources, the former had a dominant role as it had a comfortable storage level. In the overall analysis, generation from State's own power project which registered an increase of 9.7 per cent during 2004-05 slowed down to 1.8 per cent during 2005-06.

Table - 8 : State's Own Projects : Source-wise Generation

Source	(mu)					
	2003-04	% change	2004-05	% change	2005-06	% change
Hydel	2067	(-)24.1	4426	114.1	6141	38.7
Thermal	20430	(-)3.1	20004	(-)2.1	18795	(-)6.0
Gas	1593	43.9	2003	25.7	1964	(-)1.9
Wind	24	33.3	17	(-)29.2	15	(-)11.8
Total Generation	24114	(-)3.3	26450	9.7	26915	1.8

Source: Statistics at a Glance, 2005-06, TNEB.

The State's limited hydel potential is estimated to be of the order of 3737.6 MW. Commissioning of major projects with more than 100 MW capacity has become a rare phenomenon after the exploitation of all the possibilities. Succession of Lower Mettur Barrage (120 MW) commissioned on October 1988 was possible by Pykara Ultimate Stage with 150 MW on September 2005, after a gap of nearly two decades. This break through coupled with a comfortable storage position due to record rainfall had resulted in an overall increase in the hydel generation. The quantum of generation from the hydel sources had reached an all-time high level of 6141 mu in 2005-06.



Box -2 : Success Story of Hydel Projects

Details	2003-04	2004-05	2005-06
Installed Capacity (MW)	1987.40	1987.40	2137.40
Inflow (mu)	3032	3419	5644
Storage Peak Level (mu)	851 (Dec. 03)	1938 (Dec. 04)	2027 (Oct. 05)
Power Generation (mu)	2067	4426	6141
PLF (%)	12.0	25.0	33

All 33 hydro projects put together had created several new records in 2005-06. Apart from notable addition of 150 MW in the installed capacity, the hydro projects were blessed with bountiful rainfall resulted in record inflows in the reservoirs. Total inflow in 23 reservoirs (excluding Mettur) had precipitated an energy equivalent of 5644 mu in 2005-06 against the earlier record of 4536 mu in 1997-98. The storage equivalent during the reference year was 2027 mu realised in October 2005 against 1938 mu witnessed in December 2004. The energy generation from these sources had an all-time high level of 6141 mu, the previous peak was 5847 mu in 1994-95. The performance of hydel projects is highlighted by the yardstick of 'quantum of output' - 17 years out of two decades had a comfortable stay by exerting more than 3300 mu to the State grid. The Plant Load Factor (PLF), the single reliable indicator, also places the hydel projects at the supreme state. The hydel PLF was recorded at 33 per cent in 2005-06 against 25.0 per cent in 2004-05.

The hydel output depends not only on the efficiency of the project but also the water availability which is unpredictable. All hydel projects put together had generated 2.87 mu per MW, on an average, during 2005-06 against 2.22 in 2004-05 and 1.04 in 2003-04. The plant-wise generation potential could be assessed through 'Output per one MW'. Going by this indicator, the following hydro plants could be rated as 'better performers'.

Table - 9 : Energy Output per MW Hydel Capacity

Projects*	2003-04	2004-05	2005-06
Kundah II	2.92	4.11	4.04
Mettur Tunnel	1.17	2.17	3.02
Kadampari	6.88	1.81	2.75
Kundah III	2.08	2.93	2.44
Periyar	3.61	3.46	2.08
Lower Bhavani	1.63	1.80	1.61
Kundah I	1.24	1.73	1.54
Sholayar I	2.51	1.90	1.44
Pykara	2.41	1.49	1.21
State Total Hydel	1.04	2.22	2.7

* Ranked by the last column. Source: Statistics at a Glance, 2005-06, TNEB.

Functioning of four thermal power projects viz., Ennore, Tuticorin, Mettur and North Chennai are made to work in tandem with hydel projects, giving priority to the latter, to optimally utilise the fast depleting scarce fuel and cheap resource. During 2004-05 and 2005-06 also, similar incidents of co-ordinations took place as the State was blessed with copious inflows in the reservoirs. The aggregate generation from these sources at 18795 mu. in 2005-06 was against 20004 mu in 2004-05 and 20430 mu in 2003-04. Consequently, the PLF of thermal power stations was pulled down from 81.02% in 2002-03 to 76.89% in 2004-05 and further to 72.24% in 2005-06.

Table - 10 : Thermal Generation : Source-wise

Source	(mu)					
	2003-04	% change	2004-05	% change	2005-06	% change
1. Ennore -	1264	(-) 27.4	1223	(-) 3.2	601	(-) 50.9
2. Tuticorin	8083	(-) 1.3	8178	1.2	7674	(-) 6.2
3. Mettur	6735	(-) 0.1	6685	(-) 0.7	6519	(-) 2.5
4. North Chennai	4348	(-) 1.3	3918	(-) 9.9	4001	2.0
Total	20430	(-) 3.1	20004	(-) 2.1	18795	(-) 6.0
PLF (%)	78.31		76.89		72.24	

Source: Statistics at a Glance, 2005-06, TNEB.

The gap between coal 'linkages' given and actual quantum 'received' determines the severity of the input scarcity. In the recent three year period ending with 2005-06, coal shortages existed in all the years. However, the quantum of shortage reduced from 39.2 per cent in 2003-04 to 4.3 per cent in 2005-06.

Table - 11 : Coal Linkage and Supply

Year	Coal Linkage	Coal Received	% of shortage
	(Million Tonnes)		
2003-04	23.70	14.42	39.2
2004-05	16.38	14.04	14.3
2005-06	14.92	14.28	4.3

Source: Statistics at a Glance, 2005-06, TNEB.

The thermal projects, on an average could generate 0.7 kwh/units of electricity per one kg. of coal. While all the three except Ennore were maintaining similar scale, the Ennore Plant was able to give out 1 kwh/unit. The project-wise performance and PLF are furnished below for pointing out the efficiency of each of the project.

Table - 12 : Coal Consumption and Generation

Source	Coal (million tonnes)		Generation (mu)		PLF (%)	
	2004-05	2005-06	2004-05	2005-06	2004-05	2005-06
1. Tuticorin	5.56	5.69	8178	7674	88.9	83.4
2. Ennore	1.16	0.58	1223	601	31.0	15.23
3. Mettur	4.90	4.18	6685	6519	90.9	88.6
4. North Chennai	2.84	2.53	3918	4001	71.0	72.5
Total	14.46	12.98	20004	18795	76.9	72.2

Source: Statistics at a Glance, 2005-06, TNEB.

The gas turbines and wind mills under the State's fold had pushed 1979 mu of electricity in 2005-06 against 2020 mu. in 2004-05. As the wind farms are kept as demonstration units insufficient generation could only be anticipated.

**Table – 13 : Power Generation by Gas Turbines and Wind Mills
Under State's fold**

(mu)			
Year	Gas	Wind	Total
2003-04	1593	24	1617
2004-05	2003	17	2020
2005-06	1964	15	1979

Source: Statistics at a Glance, 2005-06, TNEB.

Power Purchases:

The quantum of power purchases from the Central Sector projects and Independent power projects are on the increase year after year. The total purchases at 10999 mu. during 1997-98 had steadily moved up after the introduction of Independent Power Projects (IPPs), to reach 29091 mu in 2005-06. As per the Power Purchase Agreement (PPA) signed in 1991, the State has to pay the fixed charges even in non-withdrawal period and during withdrawal the fixed plus variable cost.

From the assigned share of Central Sector Projects, 18611 mu of energy was purchased for 2005-06 against 16543 mu in 2004-05, an increase of 12.5 per cent. The nuclear sources offer a major share than that of thermal. The NTPC was the major provider among the thermal projects.

Table - 14 : Power Purchases : Central Sector Projects

Source	2003-04		2004-05		2005-06	
	Abso- lute	% change	Abso- lute	% change	Abso- lute	% change
1. Neyveli I & Ep.	4584	25.3	5059	10.4	4658	(-)-7.9
2. Neyveli II	2842	0.4	2629	(-)-7.5	2661	1.2
3. NTPC	3816	(-)-14.1	4010	5.1	4814	20.0
4. MAPP	965	140.0	913	(-)-5.4	1173	28.5
5. Kaiga	1518	3.8	1419	(-)-6.5	1386	(-)-2.3
6. Talcher Stage II	1085	-	2513	131.6	3919	55.9
Total	14810	15.7	16543	11.7	18611	12.5

Source: Statistics at a Glance, 2005-06, TNEB.

Private sector participation in the power sector was a welcome feature. in the sense that it eased the financial burden of the State. The energy realised from this source has slided down from 10788 mu in 2003-04 to 9352 mu. in 2004-05 and then moved up to 11201 mu. in 2005-06.

Table - 15 : Power Purchases : Independent Power Projects

(mu)			
	2003-04	2004-05	2005-06
1. Samalpatti	468	356	333
2. Pillaiperumalnallur	1342	464	428
3. Samayanallur	468	342	328
4. GMR Vasavi	1007	763	745
5. Neyveli Zero Unit	1529	1248	1348
6. Aban Power Company	-	5	668
7. Private Wind Farms	1690	2426	3430
8. Manali & Others	4284	3748	3921
Total	10788	9352	11201

Source: Chief Engineer (Planning), TNEB.

Gross Power Availability:

The output from the State's own projects and power purchases made from the Central Sector projects and IPPS together accounted for gross power availability of the State. This consolidation which stood at 49498 mu in 2003-04 had increased to 52345 mu. in 2004-05 and to 56006 mu. in 2005-06. The generation and purchases mix has moved in favour of purchases (from 48.7 : 51.3 in 2003-04 to 48.1 : 51.9 in 2005-06).

Table - 16 : Gross Power Availability

	(mu)		
	2003-04	2004-05	2005-06
Generation	24114 (48.7)	26450 (50.5)	26915 (48.1)
Purchases	25384 (51.3)	25895 (49.5)	29091 (51.9)
Gross Availability	49498	52345	56006

Figures in brackets indicate percentage share to total.

Net Power Availability:

The net power availability is the resultant of gross availability minus deductions from the auxiliary consumption (including Kadamparai pumping), Line Losses and Sales to other States. This apparent measure accounted for 23.3 per cent (against 22.0% in 2004-05) of the gross availability. Considerable decline in the auxiliary consumption indicates the reduced fuel consumption which clearly cite the increasing efficiency of the projects. The Line losses as a percentage to gross (minus auxiliary consumption) at 18.0 per cent during 2005-06 were maintained at the same level since 2002-03. The State's effort to reduce this loss by strengthening the distribution network is under consideration.

Table - 17 : Gross and Net Power Availability

	(mu)		
Details	2003-04	2004-05	2005-06
1. Auxiliary Consumption	1838	1869	1802
2. Kadampari Pumping	468	232	592
3. Line Loss	8495	9044	9613
4. Sales to other States	323	352	970
Total Deductions	11124	11497	12977
Gross Power Availability	49498 (6.7)	52345 (5.8)	55802* (6.6)
Total Deductions	11124 (7.9)	11497 (3.4)	12977 (12.9)
Net Power Availability	38374 (6.4)	40448 (6.4)	42825 (4.8)

** includes external assistance.*

(figures in brackets indicate percentage change over the previous year).

Net Power Availability thus gained is being distributed to various categories of consumers. At the end of 2005-06, State consumption was 42825 mu against 41848 mu in 2004-05, registering an increase of 4.8 per cent.

Power Consumption:

The net availability of power reaches the ultimate consumers through a net work of transformers and power lines as illustrated in Table-18..

Table - 18 : Distribution Net Work

Details	2003-04	2004-05	2005-06
1. No.of Transformers (lakhs)	1.54	1.61	1.67
2. Total capacity (MVA)	19080	20287	21207
3. Total Length of lines (lakh km)	6.12	6.24	6.36
4. Length of HT lines (lakh km.)	1.44	1.47	1.49
5. Lenth of LT lines (lakh km.)	4.68	4.77	4.87
6. No.of consumers (lakh No.s)	163.38	170.34	178.03
7. Connected load (mw)	29406	31556	33702

The State caters to the needs of various categories of consumers (both High Tension and Low Tension) through a network of transformers and power lines. About 1.67 lakh transformers with a total capacity of 21207 MVA as at the end of 2005-06 are spread throughout the State for linking the consumers with the State grid. From the transformers a total length of 6.36 lakh km.power lines comprising of 1.49-lakh km. of EHT/ HT and 4.87-lakh km. of LT Lengths are linking about 178.03 lakh consumers as on 31st March 2006. The connected load of all the consumers during 2005-06 was 33702 MW against 31556 MW in 2004-05.

The day-to -day increasing order of electricity demand is met in an uninterrupted manner by the State without any restrictions since July 1998,wherein the power cut was lifted completely. During 2005-06, the maximum demand rose to 8209 MW against 7473 MW in 2004-05, an increase of 9.8 per cent.

Consumption of Power : By Category of Consumers:

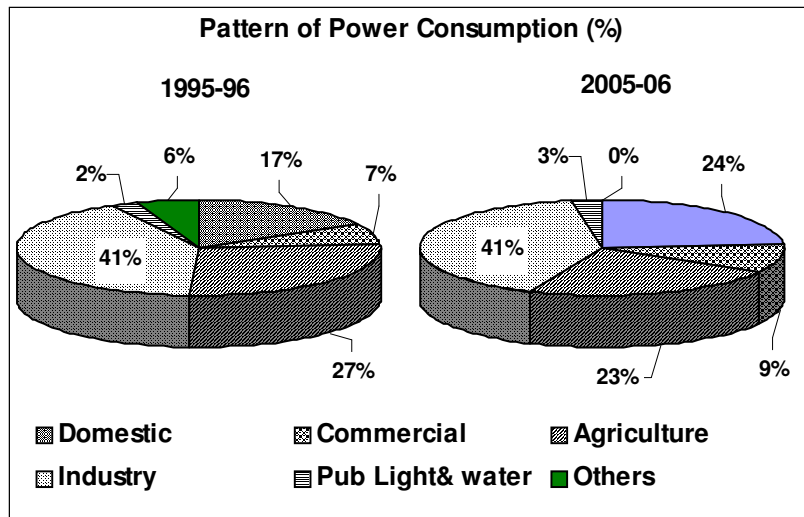
The State feeds different categories of consumers with various connected loads. The number of consumers in the State are increasing at an average rate of about 5.6 per cent annually. Efforts are being made by the Government not only to feed the new consumers but also the increasing demand. During 2005-06, the pattern of power consumption along with the number of consumers of each category is presented below.

Table - 19 : Pattern of Power Consumption

Category	2004-05		2005-06		Per Consumer Consumption	
	Consumers (in Lakhs)	Consumption (mu)	Consumers (in Lakhs)	Consumption (mu)	2004-05	2005-06
Domestic	114.60	9675	119.74	10257	844	857
Commercial	19.93	3794	21.23	3997	1904	1883
Agriculture	17.37	9764	17.68	9926	5621	5614
Industry						
HT (Nos.)	0.05		0.06			
LT	4.06	15349	4.30	16253	37345	37278
Public Lighting & Water supply	2.92	1134	3.21	1179	3884	3673
Others	11.41	1132	11.81	1213	992	1027
Sales within State	170.34	40848	178.03	42825	2398	2405

Source :TNEB.

Total number of consumers at 170.34 lakhs during 2004-05 had increased at an annual rate of 4.5 per cent to reach 178.03 lakhs. in 2005-06. The quantum of consumption by these consumers also increased more or less at an equal pace (4.8%). Of all the categories, commercial category had increased at a much



of the categories, commercial category had increased at a much faster rate (6.5%) followed by industrial (LT) category (5.9%) and domestic segment (4.5%). The four segments viz. domestic, commercial, agricultural and industrial together utilise about 95 per cent of the total power sold in the State. Per consumer annual per capita consumption of electricity indicates that agricultural consumers consumed 5614 units, commercial category 1883 units and domestic category 857 units during 2005-06.

Rural Electrification:

The rural electrification programme implemented in the State is vital for the socio-economic development of rural areas. The objective of the programme is to trigger economic development and generate employment by providing electricity as an input for productive uses in agriculture and rural industries besides improving the quality of life of rural people.

As per 2001 Census, a total number of 439 towns and 14621 villages in the State were electrified accounting for cent per cent and 95 per cent of the total respectively. The definition of rural electrification has been revised. A village is deemed to be 'electrified' if electricity is used in the inhabited locality within the revenue boundary of the village for any purpose whatsoever. The status of rural electrification as at the end of 2005-06 is given below.

Table - 20 : Rural Electrification Status

Item	Total existing	Electrified as on	
		31.3.05	31.3.06
1. Towns	439	439	439
2. Villages*	16317	14621	14621
3. Hamlets	48452	48116	48117
4. AD colonies	-	26764	26764
5. Agricultural pumpsets (lakh nos.)	-	17.37	17.68
6. Huts (lakh nos.)	-	9.82	10.21

*Number as per 2001 Census; 917 are uninhabited; of the villages electrified 40 were by Solar Photo Voltaic cells.

As per the new definition of village electrification (with effect from 2004-05) number of unelectrified villages is estimated to be around 1.25 lakhs at the National level. Government of India has formulated a time bound plan Bharat Nirman in which Rural Electrification is a component. in partnership with State Governments and Panchayat Raj

Institutions. Rural Electrification Corporation will be the nodal agency for implementing this plan. Under this action plan every village is to be provided electricity by 2009. Stand alone grid set up in partnership with Ministry of Non-Conventional Energy sources with generation where grid supply is not feasible. As per the plan, a village will be deemed to be electrified when the following conditions are met.

- basic infrastructure such as distribution transformer and distribution lines are provided in each habitation of every village.
- electricity is provided to all public places like schools, panchayat offices, community centres etc.
- number of households electrified should at least be 10 per cent of the total households in the village.

Under the scheme, 90 per cent subsidy on capital cost of the project will be provided. Electrification of unelectrified below poverty line households will be financed by 100 per cent capital subsidy at Rs.1500 per connection in all rural habitations. Others have to pay at the prescribed charges without subsidy. During the process, priority will be given to unelectrified villages and preference to Dalit Bastis, Tribal settlements and habitations of weaker sections.

Power Tariff:

The latest revision recommended by Tamil Nadu Electricity Regulatory Commission during March 2003 is as follows:

Table-21 : Power Tariff

(paise per kwh)		
Category	As on 16.3.2003	Current Rate of Tariff *
High Tension - Industrial	350	350
Low Tension		
Domestic bi monthly		
- Upto 50 units	110	75
- 51 - 100 units	130	85
- 101 - 200 units	260	150
- 201 - 600 units	350	220
- Above 600 units	475	305
Commercial bimonthly		
- Upto 200 units	530	530
- Above 200 units	580	580
Agriculture		
- Small & other farmers	20	Free**
Industrial		
- Upto 1500 units	400	400
- Above 1500 units	470	475

*with effect from 16.06.2004 for domestic services

**with effect from 1.4.04 & for Self Finance Scheme from 1.4.06

Determination of Electricity Tariffs is an issue that is rooted firmly in the realm of political economy the world over. The State Electricity Boards (SEBs) in our country are beset with the poor operational efficiencies due to financial distress. SEBs responsible for providing electricity to consumers are unable to earn a minimum rate of return of 3 per cent on their net fixed assets. To become financially viable, the SEBs are required to undertake structural reforms besides addressing the issue of rational tariff fixation. With this end in view, the Government of India has passed the Electricity Regulatory

Commission Act, 1998 for setting up of Independent Regulatory bodies at Central and State levels. The main function of Central Electricity Regulatory Commission constituted in 1998 is to regulate the tariff of power projects owned and controlled by Central Government and those of other projects which sell electricity to more than one State. The State Electricity Regulatory Commissions would be to determine the tariff for electricity at the wholesale bulk, grid or retail level with the State. Based on these principals, Tamil Nadu Electricity Regulatory Commission (TNERC) was constituted in 1999 (vide G.O.Ms.No.58, Energy (A1) Department) and is functional. In general, revision of tariffs has enormous implications both for the health of the SEB and the Budget as well.

As per Section 172 (a) of Electricity Act, 2003, the State Electricity Boards shall be deemed to be a State Transmission Utility (STU) and a Licensee for a period of one year from 10.06.2003. The Act also states that the State Government may, by notification authorise the State Electricity Board to continue to function as the State Utility or a licensee for such further period beyond the said period of one year as may be mutually decided by the Central Government and the State Government. As per the Act, Transmission company having functions of Transmission Utility and that of State Load Dispatch Centre (SLDC) has to be formed and the rest of TNEB can continue to function with generation, distribution and trading functions. TNEB has been permitted to continue to function as a State Transmission Utility and a Licensee upto 9.6.2007.

Energy Security:

Energy security is one of the key issues that warrants attention at all the levels of Government. Energy security both in terms of reliable supply and at reasonable rates is the dominant concern for the next decade. There is an imperative need to secure reliable supply of energy in terms of access, affordability and distribution. Alternative strategies have to be crafted to secure this objective. International Energy Agency forecast 60 per cent more oil consumption by 2020. Energy security has implications for the growth trajectory for it impacts all sectors of the economy. The energy intensity of production and its impact on productivity has implications for State like Tamil Nadu, which is striving for higher and faster growth rate.

Concerns about Energy Security has generated great debate on the strategy to reduce the dependence on fossil fuels and search for alternative sources of fuels like Bio-fuels and renewable energy sources.

Box -3 : Renewable and other alternative Sources Energy Security At Village Level

Integrated Rural Energy Programme (IREP) aims to help to secure energy security in cluster of villages. This Scheme implemented earlier in 21 Blocks has been revamped by the Ministry of Non-Conventional Energy Sources, Government of India and extended to all the districts. In the State, it has implemented in 14 districts during 2005-06 and all the 29 districts will be covered from 2006-07 onwards. The Government of Tamil Nadu has sanctioned Rs.4.00 lakhs and is awaiting for a detailed project report from the Anna University to which the work for a proposed security system in Salem and Coimbatore districts was entrusted.

Source: Policy Note on Demand No.14, Energy Department, Government of Tamil Nadu, 2006.

X Plan Mid-term Appraisal : Power Sector:

While formulating the proposals for the 10th Five Year Plan, emphasis has been laid on 'Reforms Oriented Plan' apart from focusing on 'measurable outputs along with Employment Generation' and promoting sustainable energy system at economical costs. So, the objective of the Plan was designed for ensuring financial viability of the Electricity Board and providing reliable and quality service to the customers. To achieve these objectives the following strategies were planned.

- Completing spill over State's own project
- Effective policy changes for the projects assigned to the private sector
- Bringing down the line losses from 16.5 per cent to 12 per cent
- Concentrating on demand side management and focusing on energy auditing / accounting
- Achieving cent per cent electrification of households in urban and rural areas
- Increasing the PLF of thermal and hydel stations.

Table - 21 : Anticipated Demand and Achievement

(MW)

	Peak demand estimated	Actual peak met	Installed Capacity		Deficit / Surplus	
			Estimated	Actual	Estimated	Actual
2002-03	7723	6957	7411	8268	-312	+1311
2003-04	8187	7228	7959	9319	-228	+2091
2004-05	8678	7473	8154	9531	-524	+2058
2005-06	9199	8209	8594	10031	-605	+1822
2006-07	9751	NA	8854	NA	-897	

Source: X Plan Document, State Planning Commission. Statistics at a Glance, TNEB.

The network expansion programme for the Plan period (2002-07) was designed in tune with forecast on energy and demand requirements. It was planned to consider alternative options like updating and renovation and modernisation works of old Power Stations, IPPs, Captive Power Plants, co-generation, renewable energy sources, due to the constraints faced in the capacity addition in State Sector. The capacity additions to the tune of 436 MW were commissioned as planned. By the end of the fourth year of X Plan 346 out of 436 MW were implemented and the remaining 90 MW (3 x 30 MW) are anticipated to come into picture in the terminal year of the plan period 2006-07. The strategies proposed were followed as planned in addition to the flow from Central sector projects. Tamil Nadu anticipated 1210 MW power generating capacity from the Central Sector for the Plan period which also has been added as envisaged leaving 325 MW from the NLC TS-II Expansion Stage II to offer in 2006-07. Efforts were converged and resulted in a fairly comfortable power situation of the State during the X Plan period. However, there are a few areas that require attention like reduction of T&D losses, improving PLF and augmentation of power generation capacity.

Under the renewable sources of energy it was proposed to add 250 MW wind power through private sector during the X Plan period against which about 1050MW were realised upto 2005-06. By these additions the national goal of meeting 10 per cent of grid capacity from renewable sources by 2010 has been achieved by the State (12.5%) even by the end of 2002.

The Power Sector Reforms have been underway for over a decade. Some of the important changes it has effected as per the, Tenth Five year Plan Mid-Term Appraisal, Government of India are:

- Nine States viz., Haryana, Andhra Pradesh, Uttar Pradesh, Karnataka, Rajasthan, Madhya Pradesh, Gujarat and Delhi have enacted their State Electricity Reforms Act which provide for unbundling/ corporatisation of SEBs, setting up of State Electricity Reforms Commissions (SERC) etc.
- Twenty States have either constituted or notified the constitution of SERC and eighteen SERCs have issued tariff orders. With the Electricity Act 2003, having come into force the setting up of SERCs has become mandatory. The States where the SERCs are not in existence have been advised to take necessary actions for setting up of the same.
- The SEBs of Orissa, Haryana, Andhra Pradesh, Karnataka, Uttar Pradesh, Utranchal, Rajasthan, Delhi, Madhya Pradesh, Gujarat and Assam have been unbundled
- Distribution has been privatised in Orissa and Delhi while Uttar Pradesh is in process of doing so.

Box -4 : Tariff Subsidy - Budget 2006-07

- Free power supply was extended to Agricultural consumers under Self Financing Schemes also from April 2006.
- Handloom weavers with own work shed and engaged in weaving using upto 100 units (bi-monthly) are given free supply of power since August 2006.
- Power loom weavers, running own power looms and using upto 500 units (bimonthly) could enjoy the free power from August 2006.

Source: TNEB Website.

Renewable Energy Sources:

Non-conventional sources of energy being the most environment friendly, there is an urgent need to promote generation of electricity based on such sources of energy. Efforts are being made to reduce the capital cost of projects based on non-conventional and renewable sources of energy. The Electricity Act 2003 provides that co-generation and generation of electricity from non-conventional sources would be promoted by State Electricity Regulatory Committees by providing suitable measures for connectivity with grid and sale of electricity to any person.

In the State, Tamil Nadu Energy Development Agency (TEDA) was set up in 1985 to encourage using of alternative sources of energy and to promote renewable energy sources in Tamil Nadu. The renewable energy is from an energy resource that is replaced by a natural process at a rate that is equal to or faster than the rate at which that resource is consumed. Of the various sources of renewable energy viz. wind, solar, bio-mass and other forms of bio-energy, tidal energy, fuel cell, ocean - thermal energy and geothermal, wind solar and bio-energy are being harnessed in a big way.

The State which stands first in harnessing these sources has a total installed capacity power of 3201 MW as on 31.3.2006. The State's capacity of renewable sources of energy accounts for 40 per cent of the total installed capacity of the country and 22 per cent of the State grid. This is against 5.5 per cent of all-India average.

Wind Energy:

The kinetic energy, formed out of uneven heating of earth, is used to run wind turbines, capable of producing 5 MW of power. The power output is a function of the cube of the wind speed, the turbines require wind at a rate of 20 Km/h. So, wind assessment studies were conducted to identify places having wind speed of more than 18 Kw/h. Demonstration farms with a total capacity of 19 MW were established in the State from the 41 identified places. Following that a large number of private sector farms are being set up since 1990.

Out of 41 suitable stations declared for wind power projects 22 have been developed entirely through private sector. Following the 19 MW demonstration farms, private sector had invested on a total capacity of 2898 MW by the end of March 2006, accounting for 58 per cent of the capacity in the country. The State purchases the generation from these wind mills at the unit cost of Rs.2.70 and allows wheeling and banking for captive power at the concessional rate of 5 per cent each. The Tamil Nadu Electricity Regulatory Commission (TNERC) reviews the tariff and other cost related matters periodically. In August 2005 TNERC issued orders for third party sale of power subject to a few conditions.

Apart from these large scale generators connected to the grid, a number of stand alone generators upto 30 KW available in the State are used to pump water directly both for drinking and irrigation. Subsidies are made available for establishing these type of power generators.

Solar Energy:

The energy directly collected from sunlight can be harnessed either by producing electricity meant for lighting and operating certain electrical applications or making hot water / drying agricultural produces / processing industrial products and cooking.

As the sun does not provide constant energy to any spot on the earth, the uninterrupted use requires a means for energy storage. Grid connected solar system feeds energy to the grid during day time and draw energy at night. The advantages from solar energy sources include the inexhaustible supply of energy and zero emissions of green house gas and air pollutants.

The usage of solar energy has disadvantages also. This source of energy has only intermittent availability. Solar panels are in many applications considerably more expensive than alternatives. The current generated is only of DC, which has to be converted if transmission over the grid is needed.

Solar Photovoltaic System:

Photo Voltaic devices are being used for the needs of home lighting, office lighting and street lighting. This mode of lighting is promoted in the State through a subsidy of 50 per cent of the cost from the Ministry of Non-conventional Energy Sources. Current consumption charges at the Local Bodies are being reduced by the use of SPV

Street Lights. In Tamil Nadu for Group Houses constructed by Rural Development Department and 5565 street lights including 3000 in village panchayats were installed under the subsidy scheme. For the year 2004-05, MNES has allotted 1200 Home Lights and 400 street lights for installation in Rural areas.

For the urban areas (six Corporations and 10 major Municipalities) MNES has sanctioned solar street lights (500 nos.), Solar Control System for street lights (200 nos.), Solar illuminated hoardings (55 nos.), Solar road studs (1000 nos.), Solar blinkers (150 nos.) and solar traffic signals (50 nos.).

Solar Thermal Energy:

Installation of solar water heating systems in houses, lodges and hospitals for the purposes of bathing and washing is on the anvil, receiving subsidy from Government of India. In the State as at the end of March 2006, there are 3522 domestic and 403 industrial solar heating systems installed under various State and Central Government's subsidy schemes, excluding 59 in Government buildings established with 100 per cent State fund.

Solar air heating technology used for drying grains, tea, fruits, leather etc. was developed initially in Tamil Nadu. For further encouragement, Government has sanctioned Rs.10.81 lakhs for a total capacity of 840 m² during 2003-04 and 2005-06. MNES gives assistance to the tune of 50 per cent of the cost for institutions and 35 per cent for commercial / industrial users.

This apart, the usage of Box type solar cooker for indoor cooking are encouraged through soft loanee schemes of Banks, MNES, GOI also provides 30 per cent subsidy of the cost for the solar cookers.

Bio-mass and other Bio-energy Systems:

The energy requirements of industries could be realised by effective usage of producer gas and electricity from bio-mass and other bio-wastes through co-generation, bio-mass based generation, gasifiers and toilet linked biogas plants.

As on 31st March 2006, the State has three bio-mass power units with a total installed capacity of 37.5 MW, by utilising fire wood, agricultural wastes and unused vegetables and other perishables. These projects spread in various parts of the State promote employment opportunities in rural areas. TEDA encourage industries at present using diesel, furnace oil or LPG as primary fuels to install bio-mass gasifiers for thermal and electrical energy requirements by providing 10 per cent subsidy for thermal and 50 per cent subsidy for electrical applications. Upto March 2006, a total number of 26 such thermal gasifiers with 3050 KW and 15 electrical gasifiers with 1823 KW capacities are functioning in the State.

Usage of toilet linked biogas plants in the State are also being promoted by the State which provided Rs.63.40 lakhs during 2003-04 for this purpose. Eventually, 82 such units including 39 in Integrated Women Sanitation Complexes were established and the gas generated is used for pumping and supplying water for the respective complexes.