

## 11.2 NON- CONVENTIONAL SOURCES OF ENERGY

The demand for power has been growing rapidly in view of the galloping economic activity and population increase. The burnt fuels result in the release of CO<sub>2</sub> and other gases into the atmosphere causing environmental damage. It has, therefore, become imperative that to supplement / substitute the conventional energy sources by non conventional or renewable energy sources in as much as they offer clean energy, and are pollution free and are limitless and inexhaustible. They rely on Sun, Wind, Bio-mass, Bio-gas, etc. The NCES is the only alternative/ available best option in the State in view of the potential for additional hydel and thermal power generation getting exhausted. The ever-growing power demand in the sphere of industrial, agricultural and domestic has to be met.

The importance of renewable energy was recognized in the country in the early 1970s. India has today one of the largest programmes for renewable energy. The Ministry of Non-conventional Energy Sources (MNES) created in 1992 is the nodal agency of the Government of India for all matters relating to new and renewable energies. The national programme covers the entire gamut of technologies, including improved chulhas, biogas plants, short rotation fuelwood tree species, biomass gasifiers, solar thermal and solar photovoltaic systems, wind farms, wind mills, biomass based cogeneration, small and micro hydel systems, energy recovery from urban, municipal and industrial wastes, hydrogen energy, ocean energy, fuel-cells, electravans and gasohol, etc. In each of these areas, there are programmes of resource assessment, R & D, prototype development and technology commercialisation.

In Tamil Nadu, the Tamil Nadu Energy Development Agency (TEDA) since its inception in 1985 has been serving as a promotional agency for developing renewable energy sources. TEDA is also functioning as the State's Nodal Agency to the Ministry of Non Conventional Energy Sources (MNES), Government of India for implementing Centrally funded/ sponsored State plan schemes. During the last 17 years, TEDA had conducted sustained public awareness campaigns to promote/ harness renewable energy sources in the State with the active support from the MNES, Government of India and State Government.

The salient achievements of TEDA are as follows:

- The total installed capacity under Renewable Energy Sources (excluding Hydro) in Tamil Nadu State has reached 1648 MW (Total grid capacity of EB is 10950 Mw) which is 15% of the total TNEB grid capacity, while the All India average is only 4.5%.
- The harnessing of Wind Energy is the highest in Tamil Nadu with an installed capacity of 1361 MW (as on 31.03.2004) as against the total installed capacity at all India level of 2473 Mw (as on 31.03.2004), which is 55% of the total installed capacity in India. The gross available potential of Wind Power in the State is of the order of 4160 MW.
- So far, three small wind generators called Aerogenerator have been set up/ installed (upto 10 KW) in industries, local bodies/ institutions, farm houses, etc. located in windy sites for demonstration purposes.
- Under biomass based power generation, Tamilnadu stands first in the country with an installed capacity of 12 MW as against the total available potential of 695 MW. 6 projects are under implementation with a total capacity of 64.5 MW. The Bio-mass assessment studies

have been completed in all the districts. The number of new projects recommended is 37 with a capacity of 249 MW.

- Again, under Bagasse based power generation, Tamilnadu stands first in the country. The achievement had been made possible mainly due to private sector investment / policy initiatives of the Government.
- Electrification of remote habitations (phase I): A project proposal of TEDA which was approved by the State Government under phase-I during 2003-2004 for electrification of 152 remote habitations in 11 districts in Tamil Nadu was approved and sanctioned by Ministry of Non-Conventional Energy Sources (MNES) with 90% Central Financial Assistance.
- 3503 numbers of domestic Solar Water Heating Systems and 355 numbers for industries/ institutions have been installed so far in Tamil Nadu.
- TEDA is also promoting R & D activities by formulating / implementing various plan programmes/schemes using Wind, Solar, Bio-energy etc., under various subsidy schemes with the assistance of MNES, Government of India/State Government.

The important physical achievements of Tamil Nadu Energy Development Agency (TEDA) are as shown in the following tables:

**Total Installed capacity under N.C.E.S. - Tamil Nadu State**

Source	1990	1995	2000	2004
Grid Power (MW)	5473	6693	7758	10950
Renewable Power (MW)	4	285	939	1648

Source: TEDA

**Wind Power Potential in Tamil Nadu State**

Ø No. of sites surveyed	68
Ø Potential sites identified	41
Ø Micro surveys conducted	21
Ø Sites exploited	20

Location	Gross Potential MW	Technical Potential MW	Exploited MW
*Aralvaimozhi Pass (Muppandal) Kanyakumari, Tirunelveli	1000	1000	748
* Sengottah (Kayathar) Tirunelveli, Thoothukudi	1000	500	171
*Palghat Pass (Kethanur) Coimbatore, Erode	2160	880	442
Total	4160	2380	1361

Source: TEDA

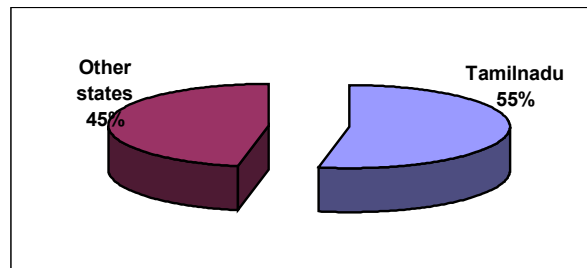
**Growth of Wind Mills-Tamil Nadu**

<i>Period</i>	<i>Wind Monitoring Stations installed (Nos.)</i>	<i>Demo Wind Farms Installed (MW)</i>	<i>Micro survey carried out. (Nos.)</i>	<i>Total installed capacity (MW)</i>
1985 - 90	15	4	--	4
1990 - 95	19	15	--	266
1995 - 00	27	--	--	501
2000 - 04	7	--	21	590
Total	68	19	21	1361

Source: TEDA

**Wind Power Harnessed - Tamil Nadu vs. India**

<b>Wind Power</b>	<b>As on 31.03.2004</b>	<b>Addition 2003-04</b>
Total installed capacity (All India)	2473 MW	613 MW
Share of Tamil Nadu	1361 MW	371 MW

**Wind Energy - Tamil Nadu Vs other States****Biomass Power Potential**

	<b>All India</b>	<b>Tamil Nadu</b>
Total Potential	10,000 MW	695 MW
Installed capacity	234 MW	12 MW
Projects under implementation	300 MW	6 Nos. (64.5 MW)
Biomass assessment studies		All districts
Target proposed in 10 <sup>th</sup> Five Year Plan (2002-2007)		250 MW
New projects recommended		37 Nos./ 249 MW

**Biomass Power Potential in Tamil Nadu  
(Districtwise)**

No.	District	Tentative Potential	Power Plant Capacity allotted	No.	District	Tentative Potential	Power Plant Capacity allotted
1	Chennai	0	0	16	Pudukkottai	16	0
2	Kancheepuram	9	18	17	Thanjavur	10	7.5
3	Thiruvallur	12	18.5	18	Thiruvarur	2	0
4.	Cuddalore	29	5	19	Nagapattinam	4	6
5.	Villupuram	51	24.5	20	Madurai	-10	2.5
6	Vellore	17	1.5	21	Theni	9	4.5
7	Thiruvannamalai	176	13.5	22	Dindigul	13	15
8	Salem	27	20	23	Ramanathapuram	27	16
9	Namakkal	22	7.5	24	Virudhunagar	32	18
10	Dharmapuri	40	14	25	Sivagangai	46	27
11	Coimbatore	-17	7.5	26	Thirunelveli	28	15
12	Erode	30	17	27	Thoothukudi	48	14.5
13	Tiruchirapalli	11	6	28	The Nilgiris	-16	0
14	Karur	0	0	29	Kanniyakumari	23	0
15	Perambalur	5	0		<b>Total</b>	<b>644</b>	<b>279</b>

Source: TEDA

**Biomass - Cogeneration  
Achievement under Cogeneration  
(As on 31.3.2004)**

	India	Tamil Nadu
Total Potential	3500 MW	450 MW
Commissioned capacity (Surplus)	380 MW	164 MW (installed capacity 274.6 MW)
Target proposed in 10 <sup>th</sup> Five Year Plan (2002- 2007) - 300 MW		

Source: TEDA

**I) Non Conventional Energy Sources( NCES)**

The (Part I) Ongoing Programmes/ Schemes of TEDA are as described below:

**Wind Energy**

**Wind Power Generation**

Wind monitoring studies were conducted to identify places having wind speed of more than 18 Kmph. Based on the study, Demonstration Windfarms for a total capacity of 19 MW were set up in Tamil Nadu for the first time in the country. Consequently, the first private sector wind farm in the country was established in Tamil Nadu during 1990. Further, as per the study report, 40 stations were declared as suitable for wind power projects, of which 17 sites have been developed mostly through private sector investment with an installed capacity of 990 MW as on 31.3.2003. In the last two years alone, about 180 MW has been added compared to a total of 256 MW during the entire period of previous five years. The investors who generate electricity from these wind farms can sell the power so produced to TNEB at Rs.2.70 per unit or use the same for captive consumption in their industries for which TNEB levies 5% as wheeling charges towards transmission losses.

### **Wind Mill Water Pumping**

Small windmills are installed in places with wind speed of less than 18 Kmph and used for lifting water from open wells/ borewells. 875 Windmills have been installed so far with financial assistance from State Government and Government of India. For installing new wind mill water pumping system of 1 HP capacity, central assistance is available up to 30% of the cost in the form of subsidy.

### **Aero-generators**

As a pilot project, aero-generators have been installed in 3 places in Kancheepuram, Tirunelveli and Kanyakumari districts with Central subsidy. For those who come forward to instal new systems, subsidy is being provided from Government of India @ 50 to 75%, subject to eligibility.

### **Solar Energy**

There are two ways in which solar energy is being harnessed in the State. Firstly, by producing electricity for lighting/ other electrical requirements and secondly, for hot water requirements/drying agricultural produce using solar thermal energy.

### **Solar Photovoltaic System**

#### **SPV lighting devices**

Solar lighting devices of various types have been developed and are used in the State to meet the needs of home lighting, street lighting office lighting etc. 12398 solar lanterns, 1470 Home lights and 1578 street lights have been installed upto 31.3.2003 with financial assistance from Government of India and State Government, of which, 4500 solar lanterns, 1400 home lights, and 350 street lights were provided in the last two years alone. Government of India provides subsidy upto 50% ranging from Rs.3000 to Rs.11000/- for the devices depending upon the capacity and type. Action is also being taken by TEDA to provide solar street lights in rural local bodies and reduce the current consumption charges.

#### **SPV Water pumps**

Electricity is produced from solar energy to run motor pumps. In Tamil Nadu, 195 pumps have so far been installed with subsidy from Government of Tamil Nadu and the Government of India. Further, water pumps have been installed under private arrangement also taking the total number to 750 SPV pumps. The cost of installing these pumps is Rs.2.24 lakhs for 1 HP with a Central subsidy of 44%. The Government of Tamil Nadu has decided to allot Rs.1.95 lakhs towards additional subsidy for this scheme during 2003-04. This will also enable the beneficiaries to get higher subsidy from Government of India.

### **Solar Thermal Energy**

#### **Solar Water Heating System**

The scheme for installation of Solar Water Heating System using Solar thermal energy for purposes of bathing in houses, lodges and hospitals and washing of utensils/ equipment has been implemented in Tamil Nadu, with 3522 domestic Solar water heating systems, 345 systems in lodges and institutions and 26 systems in Government buildings. The Government of Tamil Nadu has decided to extend subsidy for large Solar water heating systems in Government buildings and private industries / institutions.

### **Solar Air Heating System / Solar Cooker**

A new technology for using solar thermal energy for drying grains, tea, fruits, leather, etc., was first developed and used in Tamil Nadu. To encourage its use further, the Government of Tamil Nadu have decided to provide subsidy. Box and Dish type Solar cookers have been developed using Solar thermal energy and 402 solar cookers have been distributed so far.

### **Biomass and other Bio Energy Systems**

The scheme of producing gas and electricity from Biomass and other bio wastes to meet the energy requirements is also being implemented in recent years as detailed below:

#### **Co-generation**

The scheme of producing steam from bagasse in sugar mills and generating electricity using the same and sale of surplus power to TNEB has been successfully implemented in Tamil Nadu. With a total installed capacity of 274.6 MW as on 31.3.2004, Tamil Nadu is leading in the country. It represents about 40% of total installed capacity in the country. The capacity addition of 80.5 MW during last two years is impressive as compared to 74 MW added during the previous five years.

#### **Biomass Power generation**

The Government of Tamil Nadu is encouraging the scheme for generation of power from wood and other agro wastes and residues. A power plant of 12 MW capacity is in operation at Pazhayaseevaram in Kancheepuram district. In addition, TNEB has issued consent for six new biomass based power plants for a total capacity of 64.5 MW.

#### **Gasifier**

The Central Government has introduced a scheme for installation of Gasifier systems to produce thermal and electrical power required for the industries. Action is being taken to motivate industries to instal gasifier systems taking advantage of the scheme. Besides the 7 projects already sanctioned by Government of India, efforts are being taken to develop new projects and expand this scheme further. The Government of India provides subsidy from 10 to 50% of the cost of gasifiers depending upon the type of systems.

#### **Nightsoil based biogas plant**

Biogas plants have been installed in large numbers in Tamil Nadu and the scheme continues to be implemented in various districts. Based on the pilot schemes implemented in Kolathur (Salem), Perundurai (Erode) and Periyakulam (Theni), a scheme to assist Government and private institutions for installing one Nightsoil based biogas plant in each district has been proposed. The Government of Tamil Nadu has allotted Rs.43.5 lakhs for grant of subsidy for this scheme for the year 2003 - 2004. The gas produced thus can be used for cooking in canteens, hostels and for producing electricity for lighting, etc.

#### **Other Schemes**

##### **Power Generation-Waste to Energy**

The schemes for producing gas and electricity from sago industry liquid effluent , poultry litter and vegetable wastes are under implementation in Tamil Nadu. The project for producing gas and electricity from Sago industry liquid effluent in Pappireddipatty (Dharmapuri district) has been completed and taken on trial. The scheme for power generation from poultry waste in Namakkal district is under

implementation. Further, the Government of India has agreed to extend financial assistance for the project to generate electricity from the vegetable wastes available in Koyambedu wholesale vegetable market (Chennai) which will be taken up for implementation in the current year. Action is also being taken to get financial assistance from Government of India for the scheme to produce gas from the sago industry liquid effluent in small sago industries.

### **Battery Operated Vehicles**

For eligible institutions/ organisations using transport vehicles running on batteries which prevent pollution caused by obnoxious emissions from the petrol and diesel vehicles, subsidy is provided by Government of India up to 33% of the cost of vehicles. These vehicles can be used in wild life sanctuaries, tourist centres, hospitals, etc., to avoid pollution.

### **Ethanol as transport fuel**

The rectified spirit obtained from the molasses produced in sugar mills can be converted as ethanol and blended with petrol upto 5% and used as fuel in transport vehicles. The Government of India has decided to implement the scheme in 9 States including Tamil Nadu. Efforts are being taken to implement the scheme in Tamil Nadu so as to reduce pollution and improve the financial position of the Sugar mills.

For the programmes / schemes under NCES, an outlay of 204.32 lakhs has been proposed for the year 2004-2005 which is inclusive of TEDA staff cost, modified IREP scheme cost, maintenance of Wind Monitoring Stations, State contribution for maintenance of Wind Monitoring Stations, publicity and advertisements etc.

## **II) Hill Area Development Programme**

### **Assistance to Rural Energy Conservation Scheme in HADP**

For the Rural Energy Conservation scheme in Hill Area Development Programme, the Budget Estimate 2003-04 was Rs.10.50 lakhs. Against this, the expenditure anticipated for 2003-04 is Rs.34.12 lakhs.

An outlay of Rs.34.13 lakhs has been proposed for this scheme for the year 2004-05.

### **Assistance to Non-conventional Energy Sector under HADP**

The Budget Estimate 2003-2004 for the scheme of giving assistance to non-conventional energy sector under HADP was Rs.222.67 lakhs. Against this, the expenditure anticipated for the year 2003-2004 is 246.35 lakhs. A sum of Rs.270.00 lakhs has been proposed for continuing the scheme under HADP for the year 2004-05.

In all, a sum of Rs.304.13 lakhs has been proposed for the above two schemes for the year 2004-2005.

### **Annual Plan 2004-05 - Outlay**

The details of proposed outlay for Part-I (Ongoing schemes) and Part-II (New Schemes) for the year 2004-05 are shown below:

#### **New Schemes**

The list of Part-II (New Schemes) for the year 2004-05 is as follows:

Name of the Scheme	Total (Rs. in lakhs)
<b>Non-Plan</b>	
Purchase of Computers & Xerox Machine	2.00
<b>Plan Schemes</b>	
20 KW Biomass Gasifier for Power Generation for water pumping / street light (14 nos.)	12.00
Biomass gasifier (20 KW) for Noon Meal Centres Schools with more than 800 students.	7.50
State Level Energy Park at Chennai	25.00
Solar Water Heating System in Government / Quasi Government Institutions and Other Institutions.	15.00
Supply of Solar Educational Kits to Government Higher Secondary Schools	7.00
Wind monitoring station and Micro Surveys	9.50
Night Soil based biogas plants	20.00
Preparation of Detailed Project Report for sustainable Energy Security System by Anna University.	4.00
Provision of conference hall with necessary facilities in the Office of Tamil Nadu Energy Development Agency	2.00
<b>Total</b>	<b>104.00</b>

### I) Energy Department

1. Purchase of computers and xerox machines (Non-Plan)- ( Rs.2.00 lakhs).

It is proposed to purchase computers and xerox machine for Energy Department at Secretariat at a cost of Rs.2.00 lakhs during 2004-05. (Non-Plan).

### II) TEDA

- 2) 20 KW Biomass Gasifier for Power Generation for water pumping/ Street light (14 Nos.) - (Rs.12.00 lakhs)

It is proposed to instal 20 Kw gasifier electrical with 100% producer gas engine for weaker Local Bodies for water pumping/ street lights at Rs.1,00,000 - ( 6 Nos.) and Rs.75,000/- (8 Nos.) for other institutions at a total cost of Rs.12.00 lakhs subject to MNES, G.O.I. also providing subsidy during 2004-05.

- 3) Biomass Gasifier (20 Kw) for Noon Meal Centres schools with more than 800 students :- (Rs.7.50 lakhs).

It is proposed to instal 20 Kw Biomass gasifier in Noon Meal Centres Schools with more than 800 students (free of cost of the MNES subsidy at Rs.1.50 lakhs - 3 Nos. and Rs.75,000 - 4 Nos. to other institutions).

4. State Level Energy Park at Chennai (Civil works cost: Rs.25 lakhs)

Ministry of Non-conventional Energy Sources (MNES), G.O.I. provides financial assistance for setting up Energy Parks in Universities, Engineering Colleges etc., for creation of awareness on the uses of renewable energy devices. MNES also provides special financial assistance upto Rs.100.00 lakhs to the State Nodal Agency towards cost of equipments for State Level Energy Park. TEDA has proposed to set up a State Level Energy Park in co-ordination with Tamil Nadu S & T, Kotturpuram, Chennai. The total estimated cost of the park is Rs.1.50 crores of which Rs.1.00 crore will be provided by MNES and the balance cost of Rs.50.00 lakhs towards the cost of civil works for installing the various devices will be borne by the State Government. The works will be completed in two years. Hence, an outlay of Rs.25 lakhs has been proposed for the year 2004-05 towards the cost of civil

works for first year. The balance of Rs.25 lakhs may be provided next year (2005 - '06).

- 5) Solar Water Heating System in Government. Quasi Government Institutions and other institutions - (Rs.15 lakhs).

It has been proposed to instal SWHS in (a) Government Institutions at full cost (6 × 1000 LPD or 12 × 500 LPD); and (b) Institutions/ subsidy and other charges at 25,000/- per unit. The outlay (Rs.15 lakhs) sought for is towards sanction of cost of SWHS for Government institutions and subsidy towards part of the cost for other than Government institutions.

- 6) Supply of Solar Educational Kits to Government Higher Secondary Schools (Rs. Lakhs)

It is proposed to supply Solar Educational Kits to Government Higher Secondary Schools (50%) subsidy @ Rs.3000/- for 230 numbers during 2004-05. This scheme is proposed to be implemented through the Directorate of School Education.

- 7) Wind Monitoring Stations and Micro Surveys - (Rs.9.50 lakhs)

A sum of Rs.9.50 lakhs has been proposed for conducting Micro Survey studies in 3 wind monitoring stations and for installing 3 New Wind Monitoring Stations in the State.

- 8) Nightsoil based biogas plants - (Rs.20 lakhs)

TEDA had already installed 3 Numbers of Nightsoil based biogas plants in 3 institutions in Theni, Salem and Erode districts under MNES subsidy programme. MNES subsidy has since been discontinued. The State Government has approved continuance of the scheme during 2004-05. A sum of Rs.20 lakhs is proposed for, for this scheme.

- 9) Preparation of DPR for sustainable Energy Security System by Anna University - (Rs.4 lakhs)

At the instance of MNES, GOI, the SPC has requested TEDA to prepare a DPR for providing sustainable energy security in Tamil Nadu for taking pilot projects in Salem city and Coimbatore district. An outlay of Rs.4 lakhs has been preposed for the preparation of DPR through suitable institutions, such as Anna University.

- 10) Provision of Conference Hall with necessary facilities in the Office of the TEDA - (Rs.2 lakhs)

A sum of Rs.2 lakhs is for the provision of Conference Hall with necessary facilities in the office of the TEDA during 2004 - '05.

### Non-Conventional Energy Sources - Annual Plan 2004-05

#### Abstract

(Rs. in lakhs)

Head of Development / Schemes	Actual Exp. 2002-03	B.E. 2003-04	Anticipated Expenditure 2003-04	Proposed outlay for 2004-05
I. N.C.E.S.	67.51	197.51	173.51	204.32
II. H.A.D.P.				
a) Assistance to Rural Energy Conservation Scheme in HADP	10.00	10.50	34.13	34.13
b) Assistance to Non-conventional Energy Sector - HADP	212.07	222.67	246.35	270.00
Sub- Total	222.07	233.17	280.48	304.13
<b>Total N.C.E.S.</b>	<b>289.58</b>	<b>430.68</b>	<b>453.99</b>	<b>508.45</b>

