

**TAMIL NADU SOLAR ENERGY
POLICY 2012**

GOVERNMENT OF TAMIL NADU
TAMIL NADU SOLAR ENERGY POLICY

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SOLAR ENERGY POLICY - 2012

**Government of Tamil Nadu
Energy Department**

1. PREAMBLE

Conventional energy sources like coal, oil, natural gas, etc., are limited in quantity, and if these continue to be depleted at the present rate, these will be exhausted in the coming decades. Energy demand is resulting in the creation of fossil fuel based power plants leading to substantial green house gas emissions having an adverse impact on global warming and climate change.

Solar energy offers a clean, climate-friendly, abundant and inexhaustible energy resource to mankind. The costs of solar energy have been falling rapidly and are entering new areas of competitiveness. Solar Thermal Electricity (STE) and Solar Photo Voltaic Electricity (SPV) are becoming competitive against conventional electricity generation in tropical countries. Rooftop SPV in tropical countries can compete with high retail electricity prices. Solar Power installations worldwide are growing rapidly with nearly 18-20 Giga Watt (GW) expected to be installed in 2012.

Tamil Nadu has reasonably high solar insolation (5.6-6.0 kWh/sq. m) with around 300 clear sunny days in a year.

Southern Tamil Nadu is considered to be one of the most suitable regions in the country for the development of solar power projects. With substantial solar insolation in the State, the strong commitment of the State Government and rapidly declining Solar Power costs, there are remarkable opportunities in the solar energy domain. This will enhance energy security, making Tamil Nadu the global reference in the solar energy sector.

As on 30.9.2012, India has a total installed capacity of 2,07,876 MW, out of which 20,162 MW is derived from Renewable Energy sources viz., Wind, Biomass, Solar etc.

Knowing the importance of promoting solar power, the Government of India has launched the Jawaharlal Nehru National Solar Mission (JNNSM) under the National Action Plan for Climate Change (NAPCC). The goal of the Mission is to provide tariff subsidies to increase scale and drive down costs to grid parity for achieving a target of 22,000 MW by 2022 in a phased manner. India has also fixed a self imposed renewable energy obligation with a separate solar energy obligation.

2. VISION OF THE GOVERNMENT OF TAMILNADU

The Honourable Chief Minister Selvi J Jayalalithaa has a vision of developing Tamil Nadu as a world leader in Solar Energy by establishing 3000 MW by 2015.

Tamil Nadu is committed to leading the country by generating 3000 MW of Solar Power by 2015 through a policy conducive to promoting solar energy in the State. This Government headed by the Hon'ble Chief Minister Selvi J Jayalalithaa, intends to make Solar Energy a people's movement just as it did earlier in the case of Rain Water Harvesting.

3. TITLE AND ENFORCEMENT

This policy will be known as the "Tamil Nadu Solar Energy Policy - 2012". The Government of Tamil Nadu will undertake a review of this Policy as and when required in view of any technological breakthrough or any changes taking place in the policy at the National level.

4. OBJECTIVES

- To achieve energy security.
- To reduce carbon emissions.
- To project Tamil Nadu as a Solar Hub.
- To generate 3000 MW of Solar Energy by 2015.
- To achieve grid parity by 2015.
- To encourage indigenous solar manufacturing facilities in the State.

- To promote Research and Development in the solar energy sector and hybrid systems.
- To create skilled man power and employment in a new industry.

5. TARGET FOR PROMOTION OF SOLAR ENERGY IN THE STATE

It is proposed to generate 3000 MW of Solar Energy by 2015.

6. SHORTAGES AND CONSTRAINTS IN FOSSIL FUEL

Out of the Nation's installed capacity of 2,07,876 MW, the contribution of Thermal (coal/oil/gas) based power is around 67% causing huge emission of Green House Gases, thus making renewable sources of energy one of the critical sources of power in the future.

- Coal production in India is falling short of projection and there is a need to import a quantity much larger than what was planned for earlier. Further, the price of imported coal has been hiked by 1.5 times over the last couple of years, causing concern with regard to the viability of operation of many thermal power stations. The major supplier Coal India Limited is already facing massive problems in providing coal for the existing plants.
- 55% of India's Coal Supplies to thermal power plants have been affected due to the recent regulatory changes made in Indonesia and Australia.

In order to bridge the gap between demand and supply, taking into account the availability of fossil fuels, it is necessary to concentrate on renewable energy such as solar energy.

7. RENEWABLE ENERGY INSTALLATIONS IN TAMIL NADU

Tamil Nadu leads the country in terms of renewable energy installations. Tamil Nadu is the pioneer State in harnessing wind energy and remains at the No.1 position in the country. At present 40% of the country's installed wind energy capacity is contributed by Tamil Nadu. The erection of wind electric generators started during 1986 and gained momentum during the early 90's and again achieved huge growth

during the years 2001-2006, during the tenure of the All India Anna Dravida Munnetra Kazhagam Government headed by Selvi J Jayalalithaa.

As on 31.3.2012, the installed capacity of wind power has grown to 6,970 MW and an addition of 6000 MW is anticipated during the 12th Five Year Plan (2012-2017). This is due to the availability of high wind potential in Tamil Nadu as well as the conducive policies of the State Government. The contribution of energy from wind alone to the State grid during 2011-2012 is 9763 MU, which is around 12.6% of the total energy consumed by the State. Similarly, Tamil Nadu is a pioneer in establishing projects in the following Renewable Energy sectors also:

1. Bagasse based co-generation in sugar mills
2. Biomass based power projects
3. Biomass based gasification projects
4. Bio-methanation projects from Industrial / Poultry / Sago waste.

Biomass is limited by the availability of feedstock. While wind energy is seasonal and also variable on a daily basis, solar energy has better predictability and follows the sunrise to sunset pattern on a daily basis. The generation profile of solar energy can complement the Wind energy profile and help stabilize the grid. Solar energy will play a vital role in the years to come since the cost of installation is coming down drastically and grid parity is anticipated before 2015.

8. EXPERIENCE OF SOLAR ENERGY IN INDIA

India has high solar insolation. India being a tropical country receives adequate solar radiation for 300 days, amounting to 3,000 hours of sunshine equivalent to over 5,000 trillion kWh. Almost all the regions receive 4-7 kWh of solar radiation per sq. metre with about 2,300–3,200 sunshine hours/year, depending upon the location.

In July 2009, the Government of India unveiled a plan to produce 22 GW of solar power by 2020 under the Jawaharlal Nehru National Solar Mission (JNNSM).

Solar Energy is undergoing a silent revolution in India. The falling prices of Solar panels are on the verge of coincidence with the growing cost of grid power in India.

8.1 Global Solar Scenario

The Global solar market is expected to have an installed capacity of 227 Gigawatts (GW) by 2016. Global solar installations, meanwhile, are expected to reach 46.8 GW per annum in 2016, up from 19.8 GW in 2011, with a Compounded Annual Growth Rate (CAGR) of 18.7 percent during the same period.

9. TECHNOLOGY COST

The installed capacity of solar power has grown at a rate of 40 percent per year over the last decade. As the industry has grown, the prices have seen cost reductions of 22 percent for each doubling of cumulative capacity over the last few decades.

10. ADVANTAGES OF SOLAR POWER

Solar Energy provides the best viable solution to ensure long term energy sustainability with the following advantages:

- Abundant, constant and perennial source, predictable
- Solar resource is much more evenly distributed across the State
- Low gestation period
- Available during the day time, helping in peak demand
- Can be generated at the point of consumption
- Reduced Transmission & Distribution losses
- No fuel cost
- Clean & green power i.e., no emission of CO₂, Sox, Nox etc.,
- Much firmer and complements Wind Energy.

In case of Solar Photo Voltaic (SPV) technology, the plant can be established from few kW to 100s of MW and it is also easily scalable.

If SPV plants are established very near to Industrial Estates, the power produced can well be utilized at the same location drastically reducing T&D losses. Huge investment needed for transmission infrastructure could also be prevented.

Solar Thermal Power Generation has an additional advantage of storing of heat energy, which can be used to produce electricity during non sunny hours.

11. SOLAR TECHNOLOGIES

11.1 Solar Photovoltaic



Solar photovoltaic (SPV) cells convert solar radiation (sunlight) into electricity. A solar cell is a semi-conducting device made of Silicon materials, which, when exposed to sunlight, generates electricity. Solar cells are connected in series and parallel combinations to form modules that provide the required power. PV modules are manufactured by assembling the solar cells after stringing, tabbing and providing other interconnections.

Types of SPV Technologies

Cell Type	Efficiency of Cell	Land per MW
Mono crystalline Silicon	Around 18%-24%.	3-4 Acres
Poly/ Multi crystalline Silicon	Around 14-18%	4-5 Acres
Thin film (Different Types)	Amorphous silicon 6-10%. Cadmium Telluride 10-11% Copper Indium Gallium Diselenide 12-14%	7.5 to 9 Acres

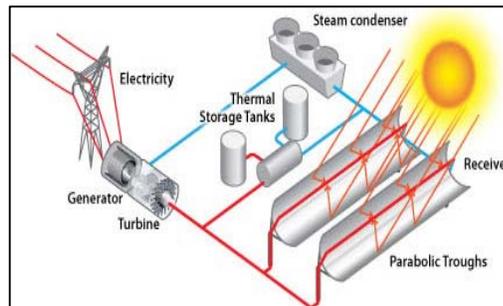
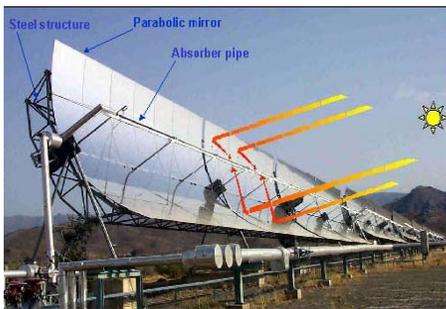
11.2 Concentrated Solar Power (CSP) based Solar Thermal Power Plant

Solar Thermal Power systems, also known as Concentrating Solar Power systems, use concentrated solar radiation as a high temperature energy source to produce electricity using the thermal route.

CSP requires 7.5 acres to 10 acres / MW.

High temperature solar energy collectors are basically of three types:

11.2.1 Parabolic Trough Systems



Trough solar systems use parabolic curved/ trough shaped reflectors that focus the sun's energy onto a receiver pipe running at the focus of the reflector. The concentrated energy heats a heat transfer fluid (HTF), usually oil, flowing through the pipe. This fluid is then used to generate steam which

powers a turbine. In a parabolic trough system, the receiver can reach 400° C and produce steam for generating electricity.

11.2.2 Power Tower Systems

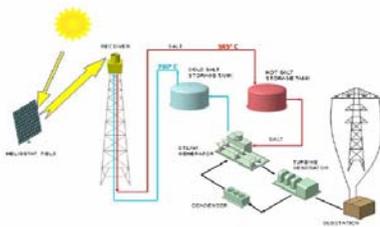


Figure 2. Solar TRES flow schematic



The solar power tower plant comprises an array of heliostats (mirrors) which concentrates the sun's rays on the top of the high tower where the solar receiver is located. The receiver collects the concentrated sun radiation and transfers the energy to generate steam. (The reflected rays of the sun are always aimed at the receiver, where temperatures well above 1000° C can be reached.) The steam drives the turbo generator thereby producing electricity.

11.2.3 Parabolic Dish Systems



The solar dish generates electricity by focusing the sun's rays onto a receiver, which transmits the heat energy to an engine. The engine is a sealed system filled with hydrogen, and as the gas heats and cools, its pressure rises and falls. The change in pressure drives the pistons inside the engine, producing mechanical power. The mechanical power in turn drives a generator and produces electricity. The solar dish sterling system could be well deployed for decentralised power generation. Parabolic dish systems can reach 1000° C at the receiver, and achieve the highest efficiencies for converting solar energy to electricity.

11.2.4 Thermal Storage Systems

A major advantage in a Solar Thermal Plant compared to SPV/other renewable energy is the thermal storage system, i.e., before using the heat to generate steam, a part of the heat can be stored for later use/ during peak hours. Solar thermal energy can be stored at high temperatures using molten salts/other materials. A part of the heat energy is stored as heat and the rest is used for generating steam to run the steam turbine. The stored heat can be used later to generate power. The collector field can be sized according to the need. Thus, thermal Energy storage systems can extend the operational time of Solar Thermal Power plants by 6-12 hours.

Storing heat energy is cheaper than storing energy in any other form. By building a sufficiently large heat storage system, it is possible to generate power even when the sun is not shining.

12.DEVELOPMENT OF SOLAR POWER IN TAMIL NADU

PHASE (2013-2015)	Target (MW)
2013	1000
2014	1000
2015	1000
Total (By 2015)	3000

With average solar incidence of 5.5 - 6 kWh/m²/day, Tamil Nadu is amongst the States with the highest solar insolation in India. To retain its leadership position, Tamil Nadu will promote setting up of solar power projects to the extent of 3000 MW over a period of 3 years, as furnished above.

Tamil Nadu will actively promote the solar energy sector by prescribing a certain percentage of electricity consumption through solar energy as mandatory. This will be progressively increased.

13. SOLAR PURCHASE OBLIGATION (SPO)

The State will mandate **6% SPO** (starting with 3% till December 2013 & 6% from January 2014) for the following category of consumers:

a. HT Consumers (HT Tariff I to V)

This category will cover all HT consumers including:

1. Special Economic Zones (SEZs)
2. Industries guaranteed with 24/7 power supply
3. IT Parks, Telecom Towers
4. All Colleges & Residential Schools
5. Buildings with a built up area of 20,000 sq.m. or more

b. LT Commercial (LT Tariff V)

The following categories of consumers will be exempted from SPO:

1. Domestic consumers
2. Huts
3. Cottage and Tiny Industries
4. Powerlooms
5. LT Industrial consumers
6. Agricultural consumers

The SPO will be administered by TANGEDCO.

The above obligated consumers may fulfill their SPO by:

- a. Generating captive Solar Power in Tamil Nadu equivalent to or more than their SPO
- b. Buying equivalent to or more than their SPO from other third party developers of Solar Power projects in Tamil Nadu
- c. Buying RECs generated by Solar Power projects in Tamil Nadu equivalent to or more than their SPO.
- d. Purchasing power from TANGEDCO at Solar Tariff

Consumers desirous of availing SPO exemption by captive solar generation shall necessarily install separate meters to measure captive generation.

This mechanism will require generation of **1000 MW** by 2015.

14. MECHANISM TO GENERATE 3000 MW BY 2015

The 3000 MW of Solar Power will be achieved through Utility Scale Projects, Rooftops, and under REC mechanism as follows:

	Utility Scale (MW)	Solar Roof Tops (MW)	REC (MW)	Total (MW)
	(a)	(b)	(c)	(a) + (b) + (c)
2013	750	100	150	1000
2014	550	125	325	1000
2015	200	125	675	1000
Total	1500	350	1150	3000

In utility scale out of 1500 MW, 1000 MW will be funded through SPO and balance 500 MW through Generation Based Incentive (GBI) provided by the Government.

15. PROMOTING SOLAR ROOF TOP SYSTEMS

The Government of Tamil Nadu will promote Solar Rooftops through the following measures:

i. Domestic Rooftop GBI

All domestic consumers will be encouraged to put up roof-top solar installations. A generation based incentive (GBI) of Rs 2 per unit for first two years, Re 1 per unit for next two years, and Re 0.5 per unit for subsequent 2 years will be provided for all solar or solar-wind hybrid rooftops being installed before 31 March, 2014. A capacity addition of 50 MW is targeted under this scheme.

Consumers desirous of availing GBI shall necessarily install separate meters to measure rooftop generation.

ii. Promoting Rooftops in Government

- a. Solar Home Lighting is being installed in 3 lakh houses under the Chief Minister's Solar Powered Green House Scheme (CMSPGHS) and will be completed by 2015-2016
- b. Energisation of Street Lights with Solar energy. The State will be energizing 1 lakh street lights through solar energy by 2015-2016.
- c. All new Government/Local Body buildings shall necessarily install solar rooftops.
- d. Existing Government/Local Body buildings will be provided with solar rooftops in a phased manner.
- e. All Street Lights and Water Supply installations in local bodies will be energized through solar power in a phased manner.

16. PROMOTION OF SOLAR WATER HEATING SYSTEMS

i. Public Buildings

The Government of Tamil Nadu has issued amendments to the Building Rules through the following Government Orders, making the use of solar water heating systems mandatory for all designated new Houses /buildings/ Marriage halls / hotels etc.,

- G.O. Ms. No. 112, Municipal Administration and Water Supply (MA1) Dept. dated 16.8.2002.
- G.O. Ms. No. 277, Housing and Urban Development (UD 1) Dept. dated 14.11.2002.

The State will promote Solar Water Heating systems by suitably amending the relevant Acts of Municipalities/Corporations.

ii. Industries

Installation of Solar water heating systems will be made mandatory for industries having hot water boiler/ steam boiler using fossil fuel.

17. DEVELOPMENT OF SOLAR PARKS.

Utility scale solar parks may comprise 250 MW in sizes of 1 to 5 MW, 600 MW in sizes of 5 to 10 MW and 650 MW of sizes above 10 MW. Solar Power projects will be developed through competitive/reverse bidding. Solar Parks with a capacity of about 50 MW each will be targeted in 24 districts.

18. PROCUREMENT POLICY OF SOLAR POWER**18.1 Tariff based competitive Bidding.**

As solar power is expensive compared to conventional/other renewable energy, a cost effective methodology needs to be evolved to promote solar power generation systems.

Tamil Nadu will select developers through Tariff based reverse/competitive bidding. The recent experiences of Germany and Spain also prove that competitive bidding is the best way for adoption by Governments. The Government of India through NTPC Vidyut Vyapar Nigam Ltd (NVVN) also follows the competitive bidding process.

Investments through Joint Ventures by State Public Sector Undertakings will also be encouraged at competitive tariffs.

18.2 Renewable Energy Certificate and Carbon Credits.

Renewable Energy Certificate (REC) mechanism promotes trading of solar power to meet solar purchase obligations (SPO). All the obligated entities committed to meet SPO will necessarily have to either produce solar power (captive) or buy solar power from TANGEDCO or purchase Solar RE Certificates for an equivalent quantity through the Power Exchange from the Promoters who have tradable RE Certificates.

Under this mechanism Solar power promoters are eligible to possess one tradable RE Certificate per every 1000 units of energy (1 MWh) wheeled to the Distribution utility or to any other licensee.

The promoter can trade the Certificates to the SPO consumers within the regulated price band as dictated by the market forces from time to time.

All solar power producers are eligible to avail of the Clean Development Mechanism (CDM) benefits to enhance the viability of the projects.

19. SINGLE WINDOW AGENCY (TEDA)

Various statutory clearances that are essential for the development and commissioning of Solar Energy Projects will be handled by TEDA in co-ordination with the concerned departments/agencies. Guaranteed single window clearance will be provided through TEDA in 30 days so that the plants can be commissioned in less than 12 months.

20. SOLAR MANUFACTURING FACILITIES

The Government of Tamil Nadu will promote integrated solar generation and manufacturing parks which will house the entire ecosystem for solar manufacturing including wafer, cell and module making, and Balance of System (BOS) component manufacturing. Local solar manufacturing industry (around 1000 MW/annum) will result in substantial direct and indirect job creation in the supporting sectors. Manufacturing of Solar Thermal components will also be encouraged.

The Government will encourage indigenous manufacturing of solar panels and other related equipment.

20.1 Incentives to Manufacturers

Appropriate tax incentives as per the Tamil Nadu Industrial Policy will be provided to attract investors from India and abroad.

Tamil Nadu will actively support the growth of local manufacturing of solar components and ancillaries. A solar manufacturing ecosystem will be created that include solar research centres, test facilities, resource assessment facilities, educational institutions, training centres, etc.

20.2 Global industry leaders in solar energy value chain

Global majors will be invited to invest in the creation of manufacturing facilities in Tamil Nadu, with appropriate incentives as detailed above. Tamil Nadu will position itself as the regional hub for integrated solar manufacturing and technology development.

20.3 Exclusive Solar Manufacturing Parks

Lands will be identified for development of exclusive solar manufacturing parks. The State will promote setting up of solar manufacturing industries in these exclusive solar manufacturing parks to be established in the State.

20.4 Requirements for Poly Silicon Manufacturing

A Poly Silicon capacity of 10,000 MT would be required to yield silicon wafers sufficient to produce 1000 MW.

20.5 Preference in Industrial Parks

Preference will be given for establishing Solar manufacturing industries in the SEZs /Industrial estates /Parks viz., SIPCOT, SIDCO and similar Government organizations.

21. ESTABLISHMENT OF SOLAR POWER PLANTS IN INDUSTRIAL ESTATES

In order to reduce the Transmission & Distribution losses, Aggregate Technical & Commercial (AT&C) losses and other infrastructure expenditure, Solar Power Plants will be set up in all industrial estates subject to availability of land at reasonable cost.

22. POLICY INITIATIVES

22.1 Net Metering

Net metering will be allowed (at multiple voltage levels) to promote rooftop penetration.

Net metering facility will be extended to Solar power systems installed in commercial establishments and individual homes connected to the electrical grid to feed excess power back to the grid with “power credits” accruing to the Photovoltaic energy producer.

Projects to evacuate power at suitable voltages as suggested below:

Solar PV System Size	Grid Connected
<10kWp	240V
10kWp to <15kWp	240V / 415V
15kWp to <50KWp	415V
50kWp to <100kWp	415V
> 100kWp	11Kv

22.2 Wheeling and Banking Charges

The wheeling and banking charges for wheeling of power generated from the Solar Power Projects, to the desired locations for captive use/third party sale within the State will be as per the orders of the Tamil Nadu Electricity Regulatory Commission.

22.3 Exemption from payment of Electricity Tax

Exemption from payment of electricity tax to the extent of 100% on electricity generated from Solar power projects used for self-consumption/sale to utility will be allowed for 5 years.

22.4 Tax Concessions

Tax concessions as per the Tamil Nadu Industrial Policy will be provided.

22.5 Exemption from Demand Cut

Exemption from demand cut to the extent of 100% of the installed capacity assigned for captive use purpose will be allowed.

22.6 Facilitation by the Nodal Agency

TEDA shall endeavour to facilitate the development of the projects in the following areas: -

- * All statutory clearances from Govt. Departments / Agencies
- * Evacuation approval from State Transmission Utility
- * Connectivity to the substation of State Transmission Utility
- * Common clearances from TNPCB etc., whenever feasible for providing plug and play facility to Solar Developers

23. PLANT AND MACHINERY

Only new plant and machinery are encouraged as per international standards. Such machineries/ components will be approved either by the Ministry of New and Renewable Energy, Government of India, or by approved test centers in India/International test houses. Only plants/machineries which give Plant Load Factor (PLF) as per the latest standards will be permitted.

24. FORMATION OF EMPOWERED COMMITTEE

An Empowered Committee under the Chairmanship of the Honourable Minister for Electricity with the following members will accord project clearances for the establishment of solar power projects to be bid out in the State:

- Chief Secretary

- Finance Secretary
- Energy Secretary
- CMD/TANGEDCO
- CMD TEDA – Member Secretary
- One Technical Officer from TANGEDCO

25. RESEARCH AND DEVELOPMENT AND CAPACITY BUILDING

Research and Development on solar technologies / solar thermal storage systems, testing facilities towards the development of solar technologies will be encouraged. Technology Demonstrations on innovative projects in association with reputed institutions will also be encouraged.

To effectively implement this policy and to achieve the intended objectives, the Tamil Nadu Energy Development Agency (TEDA) will promote capacity building in the area of Solar Energy.
