Natural Group

Driving Green Value

SOLAR ENERGY TECHNOLOGY FORUM
JULY, 2013

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Understanding the implications of the 'Tamil Nadu Solar Energy Policy' to devise cost-effective and profitable strategies

About Us

A Safer, Better and Healthier Planet

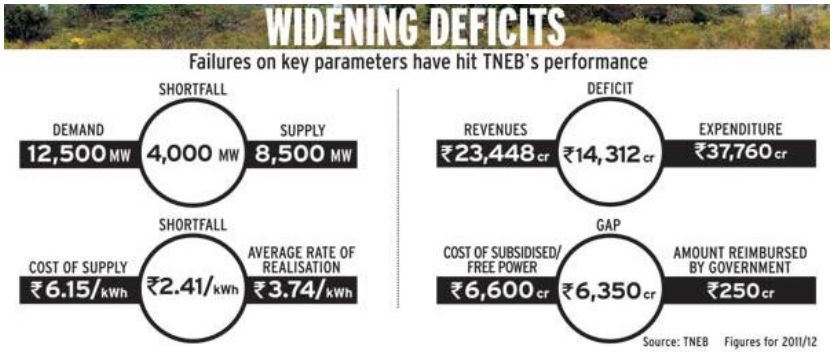
Delivering Green Value

Innovative, Sustainable, Enhanced

- India focused Renewable Energy Advisory
- NG sustainable value added business models - Solar, Biomass, Green projects
- Concept to Commissioning – Advisory, Consulting, Project Management, PPA Sourcing / Structuring, EPC, Finance….
- Largest India focused renewable and solar energy forums on LinkedIn
  - Renewable Energy and Cleantech – India
  - Solar Energy Professionals – India
- Published across varied global Industry leading journals, websites and magazines – Energy Next, Solar Business Focus, Renewable Energy Magazine, Infraline…….
- www.natgrp.org - most read blog on Solar and Renewable Energy in India

Tamil Nadu - Today

- Generation inefficiencies with high AT&C Losses
- Power demand held at 12GW due to generation inadequacy
- Power tariffs held at artificial low, with a widening gap of almost Rs. 2.5 per unit, due to subsidies and freebies
- Grid availability poor and infrastructure in need of upgrade
- Industry plagued by unreliable power and high costs of running Diesel Gensets
- TNEB cumulative losses at 50,000 Crores and counting
- Restriction and Control (R&C) measures in the evening for HT Industries
- Wind power nameplate capacity at 35% but generates just 12%
- Wind power inconsistent and expensive to the state
- Almost 10 GW thermal in pipeline but none have begun implementation with 2.4 GW dependent on imported type coal
- Nuclear to add just 450MW, Growing Demand Gap ~2GW = ~7GW Solar
- Grid too expensive for low density locations coupled with growing rural needs and lifestyle
- Poor Discom infrastructure and health unable to support the growing needs of the state
- RECs future is hazy without enforcement and 2nd Amendment has no value
- Proposed 690 MW+ grid based projects (~200 MW Conventional) at Rs. 6.48 per KWhr with 5% escalation upto 10th year
- Rooftop Subsidies – No MNRE disbursements since Feb 2013, No State Clarity



Current Power Scenario

	Sector	Thermal			Total		Hydro	RES **	
		Coal	Gas	Diesel	Thermal	Nuclear	Renewable	(MNRE)	
Tamil Nadu	State	4170.00	523.20	0.00	4693.20	0.00	2137.20	118.55	6948.95
	Private	400.00	503.10	411.66	1314.76	0.00	0.00	7338.99	8653.75
	Central	3306.23	0.00	0.00	3306.23	524.00	0.00	0.00	3830.23
	Sub-Total	7876.23	1026.30	411.66	9314.19	524.00	2137.20	7457.54	19432.93*

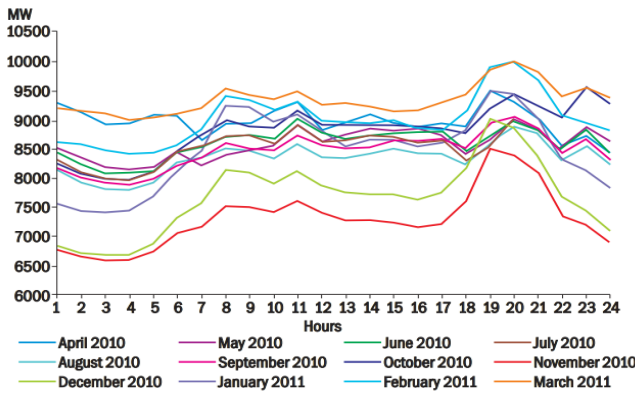
*TANGEDCO claims 17540MW

	April, 2013			
	Peak Demand	Peak Met	Surplus / Deficit (-)	
	(MW)	(MW)	(MW)	(%)
Andhra Pradesh	14,072	11,410	-2,662	-18.9
Karnataka	9,934	8,103	-1,831	-18.4
Kerala	3,510	3,053	-457	-13.0
Tamil Nadu	13,380	11,388	-1,992	-14.9
Puducherry	321	321	0	0.0
Lakshadweep	9	9	0	0
Southern Region	39,015	32,507	-6,508	-16.7

Source: CEA

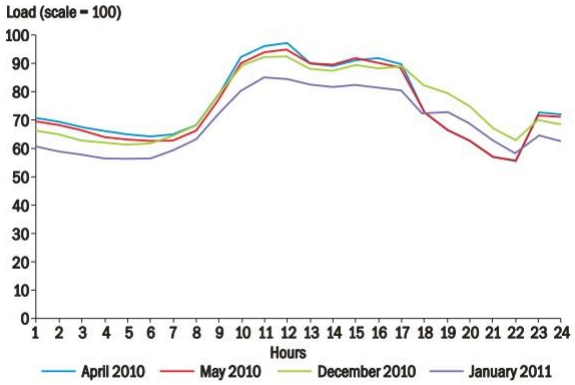
The Need for Solar

Monthly average load curves for FY 2010-11



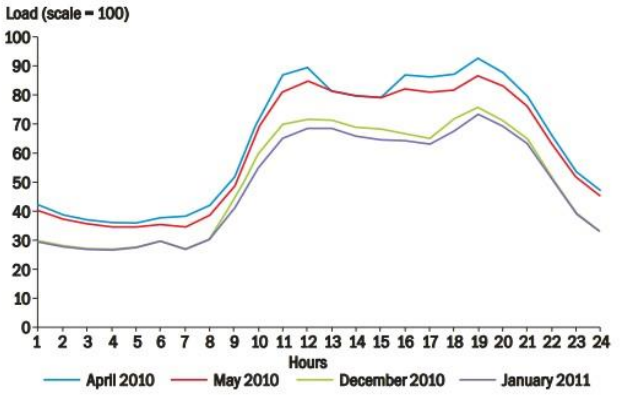
Source: TERI analysis

Pattern of load demand for industrial category



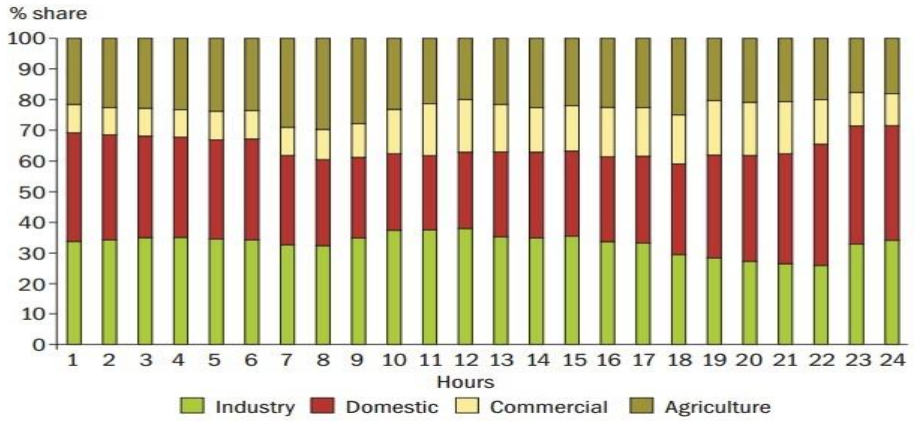
Source: TERI analysis

Pattern of load demand for commercial category



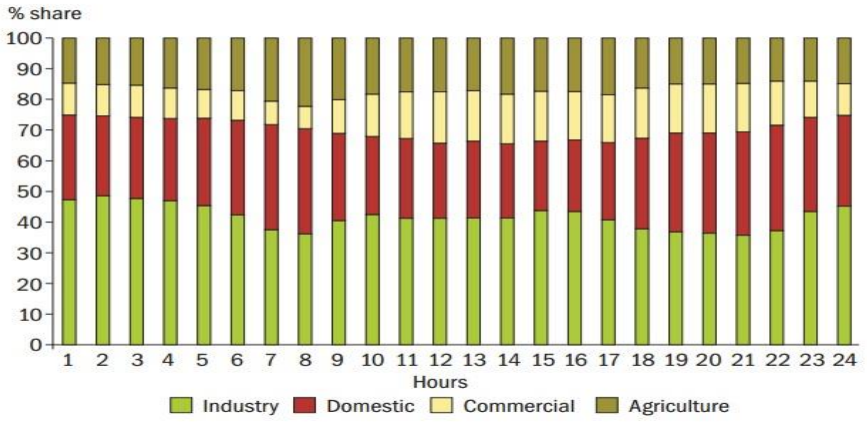
Source: TERI analysis

Indicative share of different consumer categories on aggregated hourly demand for summer months (Average of April and May 2010)



Source: TERI analysis

Indicative share of different consumer categories on aggregated hourly demand for winter months (Average of December 2010 and January 2011)



Source: TERI analysis

Solar – PV, CSP

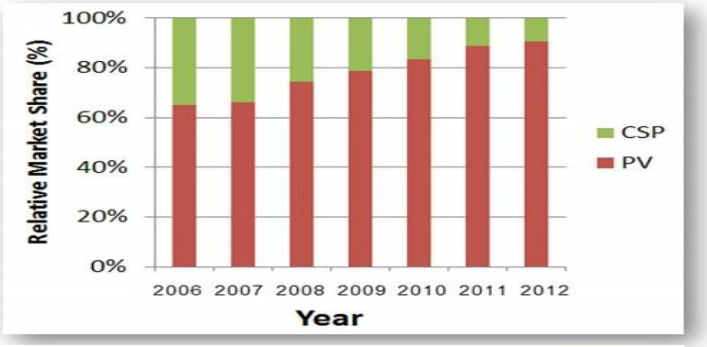
Solar Photovoltaic

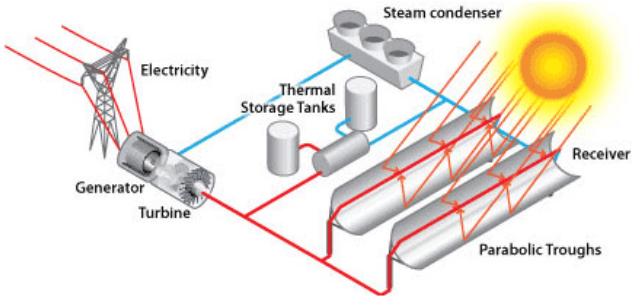
- Uses the light of the sun to generate electricity
- Plant can be commissioned with 3-6 months
- Low CUFs and functional during days between 9am-5pm
- Types – PV, CPV, TF
- Storage – Indirect – Hydro, Grid, Compressed Air
- Use – Small to large scale Grid, Rooftops, Residential, Off-grid, Small installations
- Advantages – Easy to deploy, short installation time, low skill requirements, easily maintainable, Lower costs, Minute installations, Ubiquitous and long life
- Cons – Low efficiencies, Expensive direct storage, non-dispatchable power, Unviable for residential power

Concentrated Solar Power

- Focuses the heat of the sun to generate heat and uses liquids to transfer heat to turbines to generate electricity
- Plant commissioning anywhere from 6-36 months
- Types – Fresnel, Parabolic Trough, Sterling, Tower
- Storage – Direct – Molten Salt, Oil, Steam
- Use – Hybrids, Large Scale Grid, Industrial Processes, Cooking, CHP
- Advantages – Dispatchable Power, Improve efficiencies of existing systems, interoperable with thermal systems
- Cons – Significant water requirement for cooling and cleaning, Needs vast tracts of contiguous land, High DNI requirement, Specialized skills, High raw material usage, Lengthly Installations for large scale projects

Relative Market Share of Photovoltaic (PV) & Concentrating Solar Power (CSP) 2006-2011





Tamil Nadu Solar Policy – Highlights

- Generation only during peak hours 3000 MW Installed by 2015, with a GW per year
- Mandatory 6% Solar Purchase Obligation SPO with 3% upto Dec 2013 and 6% thereon
  - Applicable to SEZs, Industries, IT Parks, Telecom Towers, Educational Institutes, Structures with 20,000 sq m of Built up area
- SPO will be administered by TANGEDCO
- Captive Generation permitted for SPO using separate meters
- Domestic Rooftop GBI per KWh generated of Rs. 2 for initial 2 years, Rs. 1 for the next 2 years and 0.5% for the remaining 2 years for those installed before 31st March, 2014
- All government / local bodies mandated to use solar power
- Solar Water Heating mandated for entire state (A Boon for Solar Thermal Manufacturers), as well as for industries using hot / steam boilers
- Solar Park developments promoted under the policy of upto 650MW, with a minimum of 50MW per district
- Competitive bidding for public sectors
- RECs and CDM can be availed in addition to GBI
- Single Window Clearance
- Indigenous products and panels will be promoted
- Supporting organizations will be created for a balanced ecosystem
- Preference in SEZs and Exclusive Manufacturing SEZs to be promoted
- Reduction of T&D by installing solar plants at site recommended for Industries
- Net Metering allowed at multiple voltage levels for rooftops
- Exemption from electricity charges for initial 5 years as well as no demand cuts for captive / self use

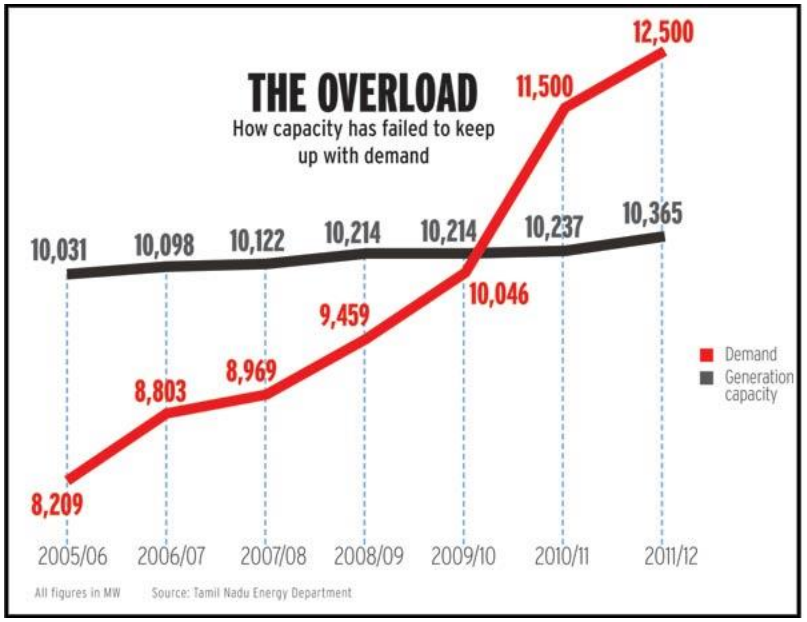
Proposed Roadmap - Solar

	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

6% SPO Mandation for HT & LT Commercial Consumers with 3% till December 2013 & 6% from January 2014 - Applicable to SEZs, Industries, IT Parks, Telecom Towers, Educational Institutes, Structures with 20,000 sq m of Built up area

Obligated consumers can choose to:

- Set up captive solar plants (utility scale or rooftop)
- Purchase solar power from IPPs within the State
- Purchase Solar RECs from IPPs within the State (Not Possible)
- Purchase from TANGEDCO at Solar Tariff



SPO – Need and its Implications

- Is a necessity where the government has failed to provide energy security
- Everyone has to contribute if TN has to be an energy surplus state
- Industry and Commercial will gain in the long term provided they don't eye windfall gains
- Has to be a win-win with the developer, state and consumer
- Power cost to rise for Commercial and Industrial Use but will result in more reliable power
- Land cost jumped to 3-4 lakhs per acre
- Reduced CO2 emissions and healthier environment reducing pollution related diseases
- Distributed Generation with local transformers not given to load shedding
- Reduced Power requirement on using Solar Thermal Solutions for industries and residential heating
- Increased Discom efficiencies with reduced Transmission losses
- Reduced load shedding during the day with Solar power availability between 9-5pm
- Cheaper Land availability closer to consumption areas i.e. semi-urban, rural
- Increased Local Economic Activities with every unit of power multiplying the output for industry and commerce
- Improved lifestyle with employment opportunities and local entrepreneurship development
- Reduced load on grid during 9-5pm especially during summers
- Net metering with battery to provide power

Solar – Commercial Structure's

Type	On Grid / Open Access	Commercial / Industrial	Residential / Habitat	Off Grid / Mini Grid
Size	1MWp+	250KWp+	0.3 – 5 KWp	10 KWp+
PPA	Rs. 6.48 + 5% escalation to 10th year	Rs. 8 + Fixed	Net Metering / FIT Rs. 6 +	Dist. Access ~Rs.8 - 14
Tenure	20+ Yrs	15+ Yrs	10+ Yrs / Variable	Monthly / Yearly / Variable
Escalation	Fixed / Escalated with Discom + BOOT	Fixed / Escalated with Discom + BOOT	Escalated with Discom + BOOT	Fixed
Incentive	AD / REC	AD / REC / Subsidy	Capital + Interest Subsidy	Capital + Interest Subsidy
Probability	High – 500 MW	High – 50 MW	Low – 1 MW	Medium – 5 MW
Backup	Hydro / Grid	NA, DG Sync,	Battery	Battery
Audience	Factory, IT Parks, SEZs, Industries, State Discom	Colleges, Education Institutes, Malls, Factories, Commercial Buildings,	Residential, Small Shops,	Telecom Tower, Villages,

Residential and Off-grid

- Residential / Agricultural capital costs with storage subsidized up to 80% of the cost especially for solar pumps
- Hybrid, Smart grids and normalization in a cluster
- Delivery system to be privatized
- Private prepaid style delivery i.e. Simpa
- Mix of technology and delivery
- Government funding for such private programs (entrepreneurs)
- Innovative Solar based devices with higher subsidies i.e. Solar Cookers (<Rs. 1500), Dryers, Pumps)
- No Discom expensive infra required

End State

- Energy Security
- Solar as a mainstay for the next stage of growth
- Grid losses reduced to manageable levels
- Better living conditions and stronger economy
- Lower subsidies on fossil fuel
- Lower impact of grid failures
- Higher grid availability
- Reduced load on the grid
- More efficient technologies given preference
- Increased commercial activity resulting in high standards of living
- Local employment generation
- Rural progress

Contact

Thank You

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