Roof top Solar PV Systems

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Solar Energy Corporation of India

- A Government of India Enterprise under the administrative control of MNRE.
- Incorporated on 20th September 2011.
- “Not for profit” company.
- Authorised capital of Rs 2,000 Crores
- Paid up capital Rs. 21 crores.
Main Objects

- Plan and execute an integrated programme on development and deployment of solar energy technologies to achieve commercialization;
- Own, operate and manage, any type of power stations (both grid & off-grid);
- Promote research and development;
- Assisting the Ministry of New and Renewable Energy in executing the Mission objectives through appropriate mechanisms.
SECI Activities : Ongoing

Broad mandate : Implementation & Facilitate various activities of the JNNSM.

As part of the Mission activities SECI has taken up the following projects/activities.

- Solar Thermal installations for water/air heating.
- Pilot Solar Thermal Power Plants.
- Implementation of Solar Roof-Top scheme.
- Development and dissemination of low cost solar lanterns.
- Grid connected solar power plants.
- Solar Mini/Micro Grids.

3 June 2013
Growth of Solar Capacity (MW)

<table>
<thead>
<tr>
<th>State</th>
<th>MWp</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gujarat</td>
<td>857.9</td>
<td>50.96</td>
</tr>
<tr>
<td>Rajasthan</td>
<td>551.2</td>
<td>32.74</td>
</tr>
<tr>
<td>Maharashtra</td>
<td>100.0</td>
<td>5.94</td>
</tr>
<tr>
<td>Madhya Pradesh</td>
<td>37.3</td>
<td>2.22</td>
</tr>
<tr>
<td>Andhra Pradesh</td>
<td>23.2</td>
<td>1.38</td>
</tr>
<tr>
<td>Uttar Pradesh</td>
<td>17.4</td>
<td>1.03</td>
</tr>
<tr>
<td>Tamil Nadu</td>
<td>17.1</td>
<td>1.01</td>
</tr>
<tr>
<td>Jharkhand</td>
<td>16.0</td>
<td>0.95</td>
</tr>
<tr>
<td>Karnataka</td>
<td>14.0</td>
<td>0.83</td>
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<tr>
<td>Orissa</td>
<td>13.0</td>
<td>0.77</td>
</tr>
<tr>
<td>Punjab</td>
<td>9.3</td>
<td>0.55</td>
</tr>
<tr>
<td>Haryana</td>
<td>7.8</td>
<td>0.46</td>
</tr>
<tr>
<td>A &amp; N Island</td>
<td>5.1</td>
<td>0.30</td>
</tr>
<tr>
<td>Uttarakhand</td>
<td>5.1</td>
<td>0.30</td>
</tr>
<tr>
<td>Chhattisgarh</td>
<td>4.0</td>
<td>0.24</td>
</tr>
<tr>
<td>Delhi</td>
<td>2.6</td>
<td>0.15</td>
</tr>
<tr>
<td>West Bengal</td>
<td>2.1</td>
<td>0.12</td>
</tr>
<tr>
<td>Lakshadweep</td>
<td>0.8</td>
<td>0.04</td>
</tr>
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</table>
Residential sector continue to be the major part along with large scale utility power plants

Source: IEA, 2010
By 2017 roof top solar power cost will reach the grid parity.
Why roof top PV

• On national level, reduces requirement of land for addition of solar capacities.

• For consumers, it
  – Reduces the dependency on grid power.
  – Mitigates diesel generator dependency.
  – Long term reliable power source.

• For Discoms, it reduces
  – Demand
  – T&D and conversion losses as power is consumed at the point of generation.

• Most suitable for commercial establishments
  – Max generation during peak usage time.
  – Solar power cost is close to the commercial power cost.
Roof top PV potential

- According to the 2011 Census, India has:
  - 330 million houses.
  - 166 million electrified houses.
  - 76 million houses that use kerosene for lighting.
  - 1.08 million houses using solar for lighting.
  - 140 million houses with proper roofs (Concrete or Asbestos/metal sheet).
  - 130 million houses with more than 2 rooms.

- An average house can accommodate 1-3 kWp of solar PV systems.

- The large commercial roofs can accommodate larger capacities.

- As a conservative estimate, about 25,000 MW capacity can be accommodated on roofs of buildings with more than 2 rooms alone if we consider 20% of the roofs.
Main issues of implementation

- Connectivity norms
- Metering norms
- Business model – tariff & PPA etc.
- Performance
Gujarat

• Gujarat already initiated 5MW Rooftop Project in Gandhi Nagar in PPP model.
• Generated power is completely fed to the grid.
• As per their model, Roof owner gets paid lease rent (Rs.3.00 per unit) and the project developer gets feed-in-tariff (Rs.11.21) for 25 years.
• Recently announced a rooftop scheme for development of 25 MW in 5 other cities.
Kerala launched its 10,000 rooftop power plants program for 2012-2013.

With each applicant eligible to apply for 1 kW only, the total capacity target is 10 MW.

Due to the small per capita limit; the target audience will be only households and small cottage industries.

Apart from the MNRE’s 30% capital subsidy, the state is offering a discount of Rs. 39,000 per system.
West Bengal

- West Bengal has initiated a net-metering solar rooftop model promoting self consumption.
- Under the WBERC Regulations, grid-integrated rooftop PV is allowed only for institutional consumers like government departments, academic institutions, etc.
- The system size limited to 2-100 kW, Connectivity is allowed at Low Voltage or Medium Voltage, or 6 KV or 11 KV, of the distribution system of the licensee.
- Solar injection is permitted only up-to 90% of the annual electricity consumption, and the net energy supplied by the utility would be billed as per existing slab tariffs.
- Solar generation would first offset consumption in the highest tariff slab and then the lower slab.
- Policy targets 16 MW of rooftop and small PV installations by 2017.
Tamil Nadu Solar Policy 2012

• Targets 3000 MW by 2015, including 350 MW of rooftop capacity in three phases of 100, 125 and 125 MW (per year) during 2013-2015.

• 50 MW from domestic customers who will receive a GBI of Rs. 2/kWh for the first two years, Rs. 1/kWh for the next two and Rs. 0.5/kWh for the subsequent two years.

• 300 MW from government buildings and government schemes for rural and urban lighting.

• Mandates 6% SPO for HT consumers to achieve targets.

• TEDA designated single window agency.

• Connectivity :
  - < 10 kW - 240 V
  - < 100 kW – 415 V
  - > 100 kW - 100 kV
Andhra Pradesh

- AP Solar Policy 2012 also promoting roof top solar projects.
- Only for 3 phase service consumers can setup roof top PV systems.
- Net metering is allowed.
- Recently announced by a committee that Rs.3.50 per unit would be paid for exported power for 7 years.
- The consumer/SPV generator also has to set up a protection system on their premises with “Islanding” for events like grid failures.
- Any prevalent subsidy from Government of India can be availed.
Draft Model regulation for FoR

Draft prepared by Deloitte and IFC for discussion within FoR provides:

– Rooftop system need to be located in the consumer premises and shall be intended primarily to consume partially or completely the consumers electricity requirements.
– Distribution licensee shall offer the provision of net metering arrangement.
– Cumulative capacity allowed at a particular distribution transformer should not exceed 10% of its peak capacity.
– Maximum installed capacity shall not exceed 1 MW for one consumer.
– More than 90% of the consumption on annual basis will not be allowed to be injected into the distribution system.
– Maximum allowed CUF for solar plant is 22%.
– Distribution licensee would be eligible to get benefit of deemed RPO.
– Roof top projects shall be exempted from banking, wheeling and cross-subsidy surcharges.
– Bi-directional meters shall be installed along with Solar Check Meters (0.2s class accuracy). Solar Check Meters will not be mandatory for < 20 kW capacity.
Suggested Metering Scheme

- PV Solar Array
- Combiner box with Fuse
- DC Disconnect Switch (S1)
- Inverter (built in disconnect)
- 230 V / 415 V AC
- Main Consumer Panel
- AC Disconnect Switch (S2)
- Solar Meter
- SM
- Small Residential
- Small Commercial
- Distribution Network
- To Grid
- AC Disconnect Switch (S3)
- Utility Meter (Net Meter)
- Consumer Loads
MNRE Pilot Scheme

- MNRE launched pilot scheme for grid connected rooftop PV power projects.
- The scheme allows system size from 100 kW to 500 kW.
- Aggregation of capacity from smaller roofs is allowed.
- Systems are to be grid connected without battery back up.
- Solar power would be exported to grid, whenever in excess of the consumption of the building.
- SECI will implement the scheme through competitive bidding on the project cost.
- The selected bidders in each city will implement the projects.
- 30% of the cost would be provided as subsidy and 70% to be met by the consumer.
**Status of Implementation**

- **Phase-I** already started with the following allocations:
  - Chennai – 2 MW
  - Bangalore – 2 MW
  - Delhi – 1 MW
  - Gurgaon – 0.5 MW

- **Phase-II**: Bids invited for a capacity of 11.1 MW:
  - Jaipur – 3.1 MW
  - Bhubaneswar/Cuttack – 1 MW
  - Hyderabad – 2 MW
  - Gurgaon – 1.5 MW
  - NOIDA/Gr. NOIDA – 1.5 MW
  - Raipur – 2 MW
THANK YOU