Getting to the Finish Line: Lessons on Solar PV Development

Tetchi C. Capellan
President & CEO
SunAsia Energy Inc

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The PV Solar Market

- The Philippine Renewable Energy Act of 2008 provided the policy framework for the development of Solar PV in the country. The law represents the commitment of government towards achieving a balanced generation mix.

- In 2013, the regulators passed the incentive scheme for solar energy and the feed-in tariff (FiT) was granted by the Energy Regulatory Commission (ERC) through a resolution.

- The 1st contracting round was set in motion and USD0.24/kwh feed-in tariff signaled the start of solar development. About six projects – with a combined capacity of 108Mw – were awarded supply contracts during this round.

- All PV solar projects in the 1st contracting round were fully financed by equity capital as the Department of Energy (DOE) introduced a Build-First policy – the Philippines was first and only country implementing this approach to RE development.

- The build-first policy was carried to the 2nd contracting round for the Solar FiT, with a digressed rate of Php0.18/kwh. The race ended in March 2016 – with 28 registered projects and a combined capacity of over 500MW.
PV Solar Installed

- Luzon
- Visayas
- Mindanao

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Luzon</td>
<td>266.7</td>
</tr>
<tr>
<td>2 Visayas</td>
<td>431.0</td>
</tr>
<tr>
<td>3 Mindanao</td>
<td>39.0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>736.7</td>
</tr>
</tbody>
</table>

Source: Philippine Solar Power Alliance

Installed PV Solar, 2016: Philippines
The Feed-In Tariff Program drove solar PV development in high gear. Installation jumped to 40Mw in 2013, then increased to 62Mw in 2014.

In the 2nd contracting round, solar installed in 2015 reached a high of 108Mw, and by the end of 2nd contracting round, three months ago, solar in the Philippines is very close to reaching the 1Gw mark.
Moving forward, solar PV growth in the Philippines is expected to reach 3Gw of utility solar in 2022. By the end of 2030, industry predicts a cumulative installation of 8.7Gw with solar rooftop constituting 35 percent of total installation.
Given the present electricity market, utility-scale solar makes economic sense for the Philippines as the technology of solar, as peaking plant, is well placed to capitalise on increasing fuel prices, whilst also showing a high level of resilience to falling oil prices.

**Cumulative solar build in Luzon (from 2016)**

When oil prices fall below $28 we start to see a pronounced decrease in solar, as it becomes displaced by new CCGT gas plant and an increase in generation at existing gas plant.

In the most bullish scenario, solar displaces around 16 TWh of gas generation between 2020-2025, rising to 40 TWh between 2026-2030.

Cumulative capacity build (MW)

- High Fuel 3
- High Fuel 2
- High Fuel 1
- Current Outlook
- Flat-Lining
- Low Fuel
• Solar costs globally have been on a clear downward trajectory for the last 8 years;
• Installed costs are expected to fall further, albeit at a more gradual rate;
• Solar cost will fall by 1.5% per annum until 2025;
• It will continue to be competitive, dropping further by 0.75% pa. thereafter

2015 costs (PSPA)
US $2,290 / kW (rooftop)
US $1,400 / KW (utility-scale)

2030 projected costs
US $1,925 / kW (rooftop)
US $1,177 / KW (utility-scale)
The cost of solar projects can further decline with better governance of the program. The soft cost needs to be addressed in order for solar to provide Philippine electricity market an alternative to high fuel prices.

### Challenges to Solar Growth: Low Project Turnover

<table>
<thead>
<tr>
<th>Year</th>
<th>Awarded Projects</th>
<th>Projects Completed</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>584</td>
<td>40</td>
<td>14.6</td>
</tr>
<tr>
<td>2014</td>
<td>1,216</td>
<td>62</td>
<td>19.6</td>
</tr>
<tr>
<td>2015</td>
<td>2,206</td>
<td>108</td>
<td>20.0</td>
</tr>
<tr>
<td>2016</td>
<td><strong>4,016</strong></td>
<td>674</td>
<td>5.9</td>
</tr>
</tbody>
</table>

Source: Philippine Solar Power Alliance
Challenges to Solar Growth:
Availability of Industrial Lands
## Challenges to Solar Growth:

### 134 Signatures for Permits

<table>
<thead>
<tr>
<th>Type of Permits</th>
<th>Issuing National Agency</th>
<th>Signatures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Solar Energy Service Contract</td>
<td>Department of Energy</td>
<td>9</td>
</tr>
<tr>
<td>2 Environmental Clearance Certificate</td>
<td>Department of Natural Resources</td>
<td>7</td>
</tr>
<tr>
<td>3 Non-Overlap Certificate</td>
<td>National Commission on Indigenous People</td>
<td>5</td>
</tr>
<tr>
<td>4 Certificate of Registration</td>
<td>Board of Investments</td>
<td>6</td>
</tr>
<tr>
<td>5 Mayor’s Permit</td>
<td>Local Government</td>
<td>10</td>
</tr>
<tr>
<td>6 Business Permit</td>
<td>Local Government</td>
<td>10</td>
</tr>
<tr>
<td>7 Locational Clearance</td>
<td>Local Government</td>
<td>5</td>
</tr>
<tr>
<td>8 Connection Agreement</td>
<td>National Grid Corporation of the Phils</td>
<td>8</td>
</tr>
<tr>
<td>9 Confirmation of Commerciality Certificate</td>
<td>Department of Energy</td>
<td>9</td>
</tr>
<tr>
<td>10 Certificate of Endorsement</td>
<td>Energy Regulatory Commission</td>
<td>5</td>
</tr>
<tr>
<td>11 Certificate of WESM Membership</td>
<td>Philippine Electricity Market Corporation</td>
<td>5</td>
</tr>
<tr>
<td>12 Certificate of Completion</td>
<td>Energy Regulatory Commission</td>
<td>5</td>
</tr>
<tr>
<td>13 Renewal Energy Purchase Agreement</td>
<td>TRANSCo</td>
<td>5</td>
</tr>
<tr>
<td>14 Renewable Energy Payment Agreement</td>
<td>TRANSCo</td>
<td>5</td>
</tr>
</tbody>
</table>
The Capacity of Transmission Lines limits power flow from one place to another. In Visayas, power are restricted to export excess to a low of 90Mw. Where land is available, the infrastructure is limited to 180Mw.

**2016 DAY PEAK with Renewable Energy and Base load Power Plants Running at Maximum Output**

** LUZON **

500 MW
13 % OL

440 MW

** Leyte/Samar **

Gen Con = 522 MW
Gen VRE = 79 MW
Dem = 215 MW

400 MW

North Cebu

Gen Con = 0 MW
Gen VRE = 0 MW
Dem = 610 MW

1,080 MW

South Cebu

Gen Con = 589 MW
Gen VRE = 48 MW
Dem = 329 MW

495 MW
175 % OL

**Negros**

Gen Con = 291 MW
Gen VRE = 252 MW
Dem = 291 MW

180 MW

245 MW
37 % OL

** Bohol **

Gen Con = 8 MW
Gen VRE = 0 MW
Dem = 75 MW

185 MW

90 MW

799 MW

Total Demand = 1,808 MW

** Panay **

Gen Con = 470 MW
Gen VRE = 65 MW
Dem = 288 MW

180 MW

Challenges to Solar Growth : Grid Conditions
• **Increase In Investments**: The government reported Php366.7billion of investments in 2015, of which 67 percent came from solar.

• More Jobs. At peak of construction, employment created reached about 100,000 people.

• Greater Energy Security. Solar Energy can provide economic alternative to the electricity market as well as deliver quick alternative power during severe climate changes such as El Nino periods.

• Reduced GHG Emissions. An equivalent 674million young trees were planted due to avoided emissions from power plants using fossil fuel.

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**Benefits of Solar PV**
Thank You.