Thailand’s Solar Power Status
the 50th Task 1 Meeting

7-9th April 2018
Pullman Hotels and Resorts Kuching
Sarawak, Malaysia
Thailand Integrated Energy Blueprint (2015-2036)

Alternative Energy Development Plan

Solar Power Status in Thailand
### Alternative Energy Consumption

<table>
<thead>
<tr>
<th>Energy</th>
<th>Percent in 2014</th>
<th>Percent in 2079</th>
<th>Demand (ktoe)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power sector : Electricity</td>
<td>9</td>
<td>15-20</td>
<td>27,789</td>
</tr>
<tr>
<td>Heat Sector : heat</td>
<td>17</td>
<td>30-35</td>
<td>68,413</td>
</tr>
<tr>
<td>Biofuel Sector : Biofuel</td>
<td>7</td>
<td>20-25</td>
<td>34,798</td>
</tr>
<tr>
<td>Alternative Energy: final energy consumption</td>
<td>12</td>
<td>30</td>
<td>131,000</td>
</tr>
</tbody>
</table>

*source: AEDP และ EEP 2015*
Alternative Energy Development Plan
Alternative Energy Development Plan

Foundation: Commitment to the development of a low-carbon society

Facilitator: Private-led investment

Strategy: Alternative Energy Development Plan 2015-2036

Facilitator: Government funded R&D

Goal: Target 30% renewables in Total Energy Consumption by 2036

Bio-Energy
- Biomass: 5,570 MW, 22,100 ktoe
- Biogas: 1,280 MW, 1,283 ktoe
- MSW: 550 MW, 495 ktoe
Total: 7,400 MW Power | 23,878 ktoe Heat

Bio-Fuel
- Ethanol: 11.3 ML/Day
- Biodiesel: 14.53 ML/Day
- Others: 4,810 TPD

Solar
- 6,000 MW
- 1,200 ktoe
Total: 9,002 MW Power | 1,200 Ktoe Heat

Wind
- 3,002 MW

Hydro
- Small
- Large
Total: 3,282.4 MW

New-Energy
- Oil from used tire
- Geothermal
- 10 ktoe
Target and current RE status: Power

RE proportion in power sector: 20%

Target: 19,684.40 MW / 5,588.44 ktoe
(10,237.93 MW / 2,440 ktoe)

- Biomass: 5,570 MW (3,157.28 MW)
  - Community waste: 500 MW (191.47 MW)
  - Industrial waste: 50 MW (- MW)
  - Biogas from waste water: 600 MW (475.42 MW)
- Wind: 3,002 MW (627.82 MW)
- Small Hydro: 376 MW (182.28 MW)
- Biogas from energy plant: 680 MW (- MW)
- Large Hydro: 2,906.40 MW (2,906.40 MW)
- Solar: 6,000 MW (2,697.26 MW)

Note: Dec. 2017
Solar Power Status in Thailand
Summary of Solar PV Policy

1993-present

- Solar Off-grid program for rural non-electrified areas for village, school, health care clinic, water pumping, the royal project and military and police at the border area.
- 100% Government support with regular maintenance. 30 MWp in total

2007

- Introducing of “Adder (Feed-in Premium)” policy for the VSPP and SPP for all RE generation up to 90 MWp
- Solar PV target: 500 MWp, Adder: 8 baht/kWh or 23 UScent/kWh for 10 years

2010

- Since there were huge applications for Solar PV
- Solar PV target: 2,000 MWp, Adder: decreased to 6.5 baht/kWh or 18.6 UScent/kWh for 10 years and stop taking application since June 2010

2013

- Solar PV target: increased to 3,000 MWp
  - Solar farm: 2,000 MWp-with Adder for 10 years
  - Solar Rooftop: 200 MWp-with FiT 6 - 6.84 baht/kWh for 25 years
  - Solar for Community 800 MWp-with decreasing FiT for 25 years

2014

- Solar PV target: increased to 3,800 MWp
  - Solar farm: 1,800 MWp-with Adder for 10 years
  - Solar farm: 1,000 MWp- applied before June 2010-changed from Adder for 10 years to FiT 5.66 baht/kWh for 25 years
  - Solar Rooftop: 200 MWp-with FiT 6-6.84 baht/kWh for 25 years
  - Solar for Community 800 MWp-changed to Solar for Governmental Agency and Agricultural Cooperative -with FiT 5.66 baht/kWh for 25 years

2015

- Phase 1: Solar for Governmental Agency and Agricultural Cooperative

2016-2017

- Pilot project for Solar PV rooftop (for self consumption) 100 MWp
- Phase 2: Solar for Governmental Agency and Agricultural Cooperative
Incentives Scheme

- **1993**: Continuous Subsidy 100% for Off-Grid
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- **2007**: Adder
  - **8 THB/kWh** On-Grid
  - **(0.23 USD/kWh)**

- **2010**: Adder
  - **6.50 THB/kWh** On-Grid
  - **(0.186 USD/kWh)**

- **2013 - 2015**: FiT
  - **5.66-6.85 THB/kWh** On-Grid
  - **(0.12 USD/kWh)**

- **2013 - 2015**: FiT
  - **4.12 THB/kWh** On-Grid
  - **(0.12 USD/kWh)**

- **2016 - 2017**: Self-Consumption
  - **(0.16 - 0.20 USD/kWh)**

* Exchange rate 1 USD = 35 THB
New FiT Rate for Solar PV 2016

NEPC approved new FiT, September 26, 2016

<table>
<thead>
<tr>
<th>Installed Capacity</th>
<th>FiT Rate</th>
<th>Supporting Period (Years)</th>
<th>FiT Premium** (THB/kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar PV (VSPP)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 10 MWp</td>
<td>4.12 (0.11 USD)*</td>
<td>25</td>
<td>0.50</td>
</tr>
</tbody>
</table>

* Exchange rate 1 USD = 35 THB

** Project in Yala, Pattani, and four districts in Songkhla (Chana, Saba Yoi Na Thawi and Tepa)

This FiT rates used for the installations of the solar ground mount systems for the Governmental Agency and Agricultural Cooperatives for the next round.
Solar Power Plants Developer applied for a power generation license

<table>
<thead>
<tr>
<th>Project</th>
<th>No.</th>
<th>MWp</th>
<th>% MWp</th>
<th>Rate of scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Solar Farm- Adder</td>
<td>183</td>
<td>1,570</td>
<td>48.9%</td>
<td>8.00-6.50 baht/kWh</td>
</tr>
<tr>
<td>2 Solar Farm-FiT (Adder change to FiT)</td>
<td>165</td>
<td>969</td>
<td>30.2%</td>
<td>5.66 baht/kWh</td>
</tr>
<tr>
<td>3 Solar Farm-FiT (Agricultural Co.. 2015)</td>
<td>59</td>
<td>255</td>
<td>7.9%</td>
<td>5.66 baht/kWh</td>
</tr>
<tr>
<td>4 Solar Farm-FiT (Gov. Agency and Agri Co.. 2017)</td>
<td>-</td>
<td>219</td>
<td>6.8%</td>
<td>4.12 baht/kWh</td>
</tr>
<tr>
<td>5 Rooftop Solar PV-FiT</td>
<td>6,284</td>
<td>131</td>
<td>4.1%</td>
<td>6.16-6.96 baht/kWh</td>
</tr>
<tr>
<td>6 Solar Farm -self consumption</td>
<td>6</td>
<td>11</td>
<td>0.3%</td>
<td></td>
</tr>
<tr>
<td>7 Rooftop Solar PV -self consumption</td>
<td>184</td>
<td>51</td>
<td>1.6%</td>
<td></td>
</tr>
<tr>
<td>8 Rooftop Solar PV-Pilot Proj..59</td>
<td>184</td>
<td>6</td>
<td>0.2%</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>7,065</strong></td>
<td><strong>3,211</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Gap from Target about 2,800 MWp
Solar PV Programme for Governmental Agency and Agricultural Cooperative

Programme Description

• VSPP program with max. size at 5 MWp
• Total target: 800 MWp separated in 2 phases
• FiT : 5.66 Baht/kWh for 25 years
• Installation in areas announced by ERC

Phase 1

• Application acceptance period: November 2015
• FiT : 5.66 Baht/kWh for 25 years
• COD within 31 DEC. 2016
• COD already 55 Projects 232.87 MWp

Phase 2

• Target **219 MW** (Government 100 MW, Agricultural Cooperative 119 MW)
• Selected Projects for making PPA are **35 Projects for 154.52 MWp**
• FiT 4.12 Baht/kWh for 25 years
• SCOD within 31 DEC. 2018
Quick Win Project (ข้อเสนอโครงการปฏิรูปเร็ว)

The project need to promoted the installation of solar rooftop freely: Self Consumption (for household and commercial).

Proposed by the National Energy Regulatory Commission on January 5, 2015.

The Pilot Project of Solar PV Rooftop (Self Consumption) (Announcement : 11 Aug 2016)

Free Solar Roof Project (Expansion period)

People produce electricity themselves and sell the rest.

<table>
<thead>
<tr>
<th>Area</th>
<th>Household (not more than 10 kWp)</th>
<th>Commercial (not more than 1,000 kWp)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEA</td>
<td>10</td>
<td>40</td>
<td>50</td>
</tr>
<tr>
<td>PEA</td>
<td>10</td>
<td>40</td>
<td>50</td>
</tr>
</tbody>
</table>
Target 100 MW

Number of applicants which candidates selected 358 project with 32.75 MW

Status of Solar Rooftop COD to Distribution Grid

<table>
<thead>
<tr>
<th>Type</th>
<th>MEA No.</th>
<th>MEA Capacity (MW)</th>
<th>PEA No.</th>
<th>PEA Capacity (MW)</th>
<th>TOTAL No.</th>
<th>TOTAL Capacity (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household</td>
<td>100</td>
<td>0.39</td>
<td>20</td>
<td>1.61</td>
<td>120</td>
<td>2</td>
</tr>
<tr>
<td>Commercial</td>
<td>53</td>
<td>3.54</td>
<td>7</td>
<td>0.09</td>
<td>60</td>
<td>3.63</td>
</tr>
<tr>
<td>Total</td>
<td>153</td>
<td>3.93</td>
<td>27</td>
<td>1.70</td>
<td>180</td>
<td>5.63</td>
</tr>
</tbody>
</table>

Source: MEA and PEA as of 31 August, 2017
The Net Billing support model based on a monthly billing. The advantage which can be purchased with some priced from excess electricity. Easy Electric Account Management Reflector if the meter is rotating, it must be converted to digital. The bill clearly shows the value of the purchase of electricity as usual, and the excess electricity sales.

- **excess electricity sales → the value can set**
- The value of electricity within the monthly billing cycle.
- Electronic meter (2 data records)
The excess electricity purchase price is lower than the average wholesale electricity price. Divided into 3 groups:

1) Household
2) Buildings / Factory Installed Size < 1 MWp
3) Buildings / Factory Installed Size ≥ 1 MWp

Target and volume purchase:

- Set the target follow AEDP 2015 and new update the policy of the renewable energy.
- The rate will reviewed with continually period.

Net Billing - 2017 (not yet approved)
Thank you for your kind attention

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