Commercial and Industrial Rooftop Solar PV: Vietnam Market Overview and Update

17 April 2019
Clean Energy Investment Accelerator (CEIA) is an innovative public-private partnership focused on improving opportunities for corporate clean energy purchasing.

The CEIA is co-led by:

- World Resources Institute (WRI),
- Allotrope Partners
- U.S. National Renewable Energy Laboratory (NREL)

We work across emerging markets, including Mexico, Colombia, Vietnam, Indonesia, and the Philippines.

The CEIA is funded and supported by key partners, including:
CEIA Approach and Activities

Dialogue and engagement with market participants, i.e. RE Buyers Working Group

Supporting policy and regulatory development, i.e. DPPA and RTS

Direct technical and transaction support to corporate buyers through RE project feasibility assessments and procurement/RFP assistance

Technical assistance to other market stakeholders, i.e. banks

CEIA aims to improve and increase opportunities for corporate procurement and usage of clean energy in Vietnam.
Agenda

Corporate Rooftop Solar PV:
A. Market Activity and Updates – Evan Scandling, CEIA
B. Policy and Regulatory – Dr. Quynh Chi Trinh, CEIA

Q&A – 15 minutes

Direct Power Purchase Agreement:
A. DPPA Pilot Program Overview and Next Steps – Gary Zieff, USAID V-LEEP

Q&A – 15 minutes
## Vietnam Power Sector Transition

<table>
<thead>
<tr>
<th>6-7% GDP growth</th>
<th>55-60% electricity demand from C&amp;I segments</th>
<th>3.7, 10 and 12 billion kWh projected supply shortage (2021-2023)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-10% Electricity annual demand growth</td>
<td>50 GW → 130 GW installed capacity by 2030</td>
<td>$150 billion investment by 2030</td>
</tr>
</tbody>
</table>

**Electricity Market Liberalization**
Vietnam Solar PV Market Potential & Targets

Current installed and connected to the grid (Source: NLDC 3/2019)

- 3/2019: 290 MW
- 6/2019: 4244 MW

Targeted solar power development (according to the revised Power Development Plan VII)

- 2020: 850 MW
- 2025: 4,000 MW
- 2030: 12,000 MW

Expected COD (Source: NLDC 3/2019)

- 6/2019: 4244 MW
## Rooftop Solar Market Growth

<table>
<thead>
<tr>
<th></th>
<th>2017-2018</th>
<th>Jan-June 2019</th>
<th>July 1 (&quot;FIT 2&quot;)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support Mechanism</td>
<td>Net-metering, COD by 30/6/19</td>
<td>Net-billing, COD by 30/6/19</td>
<td>4 models, effective 1/7/2019</td>
</tr>
<tr>
<td>FIT Level</td>
<td>9.35 US/kWh</td>
<td>9.35 US/kWh</td>
<td>Zonal FITs (4 zones)</td>
</tr>
<tr>
<td>Capacity Limit</td>
<td>1 MW</td>
<td>1 MW</td>
<td>1 MW</td>
</tr>
<tr>
<td>National RTS Installed Capacity</td>
<td>17.5 MW</td>
<td>&gt; 30 MW - 50 MW</td>
<td></td>
</tr>
<tr>
<td>Number of RTS Consumers</td>
<td>1,510</td>
<td>1,800</td>
<td></td>
</tr>
<tr>
<td>Main Market Segment</td>
<td>Households</td>
<td>Commercial &amp; Industrial</td>
<td>Commercial &amp; Industrial</td>
</tr>
<tr>
<td>Third-Party Financing</td>
<td>Unclear</td>
<td>Unclear</td>
<td>Possible</td>
</tr>
<tr>
<td>Primary Contract Models</td>
<td>Leasing, CAPEX</td>
<td>Leasing, CAPEX</td>
<td>Leasing, CAPEX, PPA</td>
</tr>
<tr>
<td>Excess PV Payment</td>
<td>Stuck due to tax issues</td>
<td>2 separated flows and taxed</td>
<td>2 separated flows and taxed</td>
</tr>
</tbody>
</table>

**EVN Retail Tariff Increase on 1_{st} April 2019:** ~ 7% increase for industrial energy users during daylight hours
Solar Policy: In Transition

Decision 11/2017/QD-TTg
Support mechanism for solar power
Circular 16/2017/TT-BTC
Regulation on solar project development

Decision 02/2019/QD-TTg
Amending and supplementing some articles on RTS of Decision 11/2017/QD-TTg

1st Draft Decision
On support mechanism after Decision 11/2017/QD-TTg

2nd Draft Decision
On support mechanism after Decision 11/2017/QD-TTg

Circular 05/2019/TT-BCT
Amending Circular 16/2017/TT-BTC and SPPA for RTS projects

Doc 1532/EVN-KD
Implementation guidelines of EVN for RTS projects

1.5 years
6 months
Available C&I Rooftop PV Contract Models

Commercial or Industrial Electricity User

- Turnkey Asset Purchase (CAPEX)
  - Corporate Loan via Domestic Bank
- Solar Rental / Lease (OPEX)
  - Build-Own-Operate (BOO)
  - Build-Own-Operate-Transfer (BOOT)
- EVN
  - Power Purchase Agreement (PPA)
  - Direct Wire (On-Site)
  - DPPA (Off-Site)
C&I Rooftop Solar Contract Features

- In lieu of PPA availability, long-term leases are prevalent
- Long-term leases, i.e. 15-25 years
- “Lease-to-own” / “BOOT” options oftentimes available at the end of the contract
- Operating leases and financial leases, depending on customers and investor
- VND or USD
- “Meet or beat” current EVN prices for “industrial” ratepayers
- Strong business cases for “commercial” ratepayers
## Snapshot: Factory Rooftop Solar – Long An

<table>
<thead>
<tr>
<th>Customer</th>
<th>Dinsen (apparel manufacturer)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Adidas supplier</td>
</tr>
<tr>
<td>Capacity</td>
<td>999 kWp</td>
</tr>
<tr>
<td><strong>Usage</strong></td>
<td>Self-consumption;</td>
</tr>
<tr>
<td></td>
<td>Excess sold to EVN at $9.35 US cents/kWh</td>
</tr>
<tr>
<td><strong>Contract Type</strong></td>
<td>20-Year Operating Lease (BOOT)</td>
</tr>
<tr>
<td>Developer</td>
<td>Indefol Engineering</td>
</tr>
<tr>
<td>Equity Investor</td>
<td>Skylight Power</td>
</tr>
<tr>
<td>Lender</td>
<td>HD Bank</td>
</tr>
<tr>
<td>CO2 Reduction</td>
<td>25,000 tons of CO2 during 25 year lifetime</td>
</tr>
</tbody>
</table>
### Snapshot: European MNC Manufacturing – HCMC

<table>
<thead>
<tr>
<th>Customer</th>
<th>European MNC “SMART” Factory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>422 kWp</td>
</tr>
<tr>
<td><strong>Annual Production</strong></td>
<td>538 MWh</td>
</tr>
<tr>
<td><strong>(Estimated)</strong></td>
<td></td>
</tr>
<tr>
<td>Usage</td>
<td>Self-consumption</td>
</tr>
<tr>
<td>Contract Type</td>
<td>15-Year Lease</td>
</tr>
<tr>
<td>Developer / Investor</td>
<td>Cleantech Solar</td>
</tr>
<tr>
<td><strong>CO2 Reduction</strong></td>
<td>6,700 tons across contracted period</td>
</tr>
</tbody>
</table>
A market in transition – Overcoming barriers

**Legal and Regulatory**
1. Limited communication and dissemination on solar power development
2. EVN and PCs cannot sign the PPA with consumers due to the lack of official guidelines on electricity settlement
3. EVN is the sole buyer
4. Permitting and licensing requirement for over 1MW RTS projects

**Financial Incentives**
1. Lack of rooftop solutions, investment models
2. Lack of regulations for investors (third party) to invest in solar power facilities
3. Cost of solar power facility is high and does not encourage consumers in investment

**Technical**
1. Lack of national technical standards on solar power equipment and facilities
2. Lack of regulation on construction, roof structure load for rooftop installations
3. Lack of regulation on construction, roof structure load for rooftop installations
   - Lack of information on product quality, installation agency, operational mode, equipment warranty
Solar Policy: In Transition

**Decision 11/2017/QD-TTg**
- Support mechanism for solar power

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- Regulation on solar project development

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**Doc 1532/EVN-KD**
- Implementation guidelines of EVN for RTS projects

- 1.5 years
- 6 months
Draft Decision: Main Features for Rooftop Solar

Four (4) zones to determine feed-in-tariff / net billing

<table>
<thead>
<tr>
<th>Anticipated Net Billing Payment Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>(in U.S. Dollar Cents)</td>
</tr>
<tr>
<td>------------------------</td>
</tr>
<tr>
<td>Starting July 2019</td>
</tr>
</tbody>
</table>

- Payment levels highest for lower quality solar resource regions
- Designed to drive deployment in those areas where solar is less competitive
- More RTS business models, open for activeness of various stakeholders
Possible C&I Rooftop PV Contract Models

- Commercial or Industrial Electricity User
  - Turnkey Asset Purchase (CAPEX)
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E VN
Possible RTS models for Corporate Buyers

Corporate or Industrial Renewable Energy Buyer

Lease payment and/or power (kWh)

EPC contract or leasing contract

Invest or develop

RTS Investor/Developer

Self-consume

Invest or lease

Roof

RTS system

Buy-all
Sell-all
Sell excess to the grid

Payment at FIT

National Grid

E VN
To expect...

RTS for C&I buyers

Direct PPA without EVN grid usage (Industrial zones)

More RTS investment up-North

Dinsen Long An Project

Source: Blue Oak Energy
Takeaways

- RTS market showing strong growth in late-2018 and 2019
- RTS is a strategic focal point of GVN and EVN to satisfy increasing power demand and combat supply shortages with limited transmission and distribution capacity
- July 1st 2019 to be significant milestone in RTS market transition
- Moving toward more attractive project financials and procurement/contract options