

## SOLAR ROADMAP WORKSHOP FOR POLICY MAKERS

**Date:** 1 - 5 Aug 2016  
**Venue:** Level 1, Ballroom 1  
 Pan Pacific Hotel, Singapore  
 7 Raffles Boulevard, Marina Square, Singapore 039595

1 Aug 2016	Programme Day 1 - Setting the scene
08:30 – 09:00	<b>Registration</b>
09:00 – 09:20	<b>Welcome remarks</b> <ul style="list-style-type: none"> <li>1. Sustainable Energy Association of Singapore (SEAS)</li> <li>2. Asian Development Bank</li> </ul>
09:20 – 09:40	<b>Introduction to training programme</b> <ul style="list-style-type: none"> <li>- Introduction to the Sustainable Energy Centre of Excellence (SECOE)</li> </ul>
09:40 – 10:00	<b>Introduction to the Solar Workshop: overview and objectives</b> <ul style="list-style-type: none"> <li>- Getting the most out of the workshop</li> </ul>
10:00 – 10:30	<b>Overview of climate change and the need for clean energy</b>
10:30 – 11:00	<b>Coffee break</b>
11:00 – 12:30	<b>Speed networking with participants</b> <ul style="list-style-type: none"> <li>- This session allows participants to know each other and to provide an information baseline on Solar and finance issues/needs in each country</li> <li>- Self-introductions to the group by all participants (max. 30 seconds each)</li> <li>- Country introductions – “5 Minutes of Fame”. A designated representative from each country will BRIEFLY present the current situation in 3 slides with the following topics:  <b>Slide 1:</b> Solar overview in your country  <b>Slide 2:</b> Regulatory environment for Solar  <b>Slide 3:</b> Solar financing gaps and challenges            (max. 5 minutes each and NOT MORE THAN 3 Power Point slides)</li> </ul>
12:30 – 13:30	<b>Lunch</b>
13:30 – 14:15	<b>The economic case for solar</b> <ul style="list-style-type: none"> <li>- Market segmentation</li> <li>- What is grid parity?</li> <li>- PV's economic impact on the grid</li> </ul>

<b>14:15 – 15:00</b>	<p><b>Power wheeling and virtual RE electricity contracts</b> In urban settings many rooftop PV plants can generate more than their buildings consume. On the other hand, many aspiring green electricity consumers do not have sufficient roof space, or perhaps are only tenants instead of their own landlords. Unconventional business models allow market makers to satisfy both sides' requirements, by wheeling surplus power from one building to one or more remote consumers.</p>
<b>15:00 – 15:45</b>	<p><b>Tea break</b></p>
<b>15:45 – 16:30</b>	<p><b>Case study - Micro-grids</b> Micro-grids are defined as grids in which any single generator or load is capable of disrupting the grid. Since many remote island or micro-grids run primarily on diesel power, PV has a significant role in reducing costs by offsetting diesel fuel consumption. Such systems require careful planning and construction to ensure stable and cost-effective operation.</p>
<b>16:30 – 17:00</b>	<p><b>Wrap up</b></p>
	<p><b>End of day</b></p>

<b>2 Aug 2016</b>	<b>Programme Day 2 - Grid context</b>
<b>08:30 – 09:00</b>	<b>Registration</b>
<b>09:00 – 09:45</b>	<b>Case study - Singapore's Solarnova programme</b> <ul style="list-style-type: none"> <li>- Singapore's unsubsidised government stimulus for PV adoption</li> </ul>
<b>09:45 – 10:30</b>	<b>Grid management overview</b> <ul style="list-style-type: none"> <li>- Balancing supply &amp; demand – bids and offtake commitments</li> <li>- Regulations &amp; spinning reserves</li> </ul>
<b>10:30 – 11:15</b>	<b>Case study - grid management in Singapore</b> Unlike European or North American grids, Singapore cannot rely on wide geographic interconnectivity, yet Singapore has one of the world's most reliable and stable electricity grids. What key policies ensure this stability?
<b>11:15 – 11:45</b>	<b>Coffee break</b>
<b>11:45 – 12:30</b>	<b>Demand Response and Time of Use (ToU) metering</b> ToU metering prices electricity according to supply and demand, giving market signals to consumers to manage their loads. Demand Response takes this further by encouraging consumers to reduce or shift their power usage in exchange for payments during times of peak demand or forced outages of power generation plants. Demand Response helps to stabilise the electricity grid during such abnormal events. Adopting Demand Response reduces the need to construct new peaking power plants and improves capacity utilisation factors of existing power plants.
<b>12:30 – 14:00</b>	<b>Lunch</b>
<b>14:00 – 14:45</b>	<b>Case study - solar energy in Thailand's rural grids</b> While tropical urban grids have peak demand during daylight hours, which corresponds to PV production, rural grids typically face peak demand after sundown. Rural grids also have less capacity to accommodate feed in from large solar farms. Thailand recently experienced very strong growth in solar farms, resulting in unanticipated strains on grid in more rural regions, and corresponding price distortion. Thailand's experience yields lessons for other rural grids looking to manage the integration of solar electricity.
<b>14:45 – 15:30</b>	<b>Solar energy integration into the urban grid</b> Solar energy is an intermittent renewable energy source available during the sunlight hours of the day – coinciding with peak demand in the urban tropics. PV output varies according to the time of day and the extent of cloud cover experienced throughout the day. Weather forecasting and mapping tools help grid operators to manage the resulting intermittent PV electricity supply.

<b>15:30 – 16:00</b>	<b>Tea break</b>
<b>16:00 – 16:20</b>	<p><b>Site visit overview – SportsHub design and performance metrics</b></p> <p>The National Stadium at Singapore SportsHub includes a 707kWp PV system on the RC roof around the stadium perimeter. The system generates enough electricity to supply the bowl cooling system during events. Configured under a leasing scheme, the PV system belongs to a third-party investor who sells the PV electricity to SportsHub at a fixed tariff for 21 years.</p>
<b>16:20 – 17:00</b>	<p><b>Introduction to taskforce topics</b></p> <ul style="list-style-type: none"> <li>- Presentation template</li> <li>- Key outcomes</li> <li>- Brainstorming process</li> </ul>
<b>17:00 – 17:30</b>	<b>Summary and discussion</b>
	<b>End of day</b>

<b>3 Aug 2016</b>	<b>Programme Day 3 - Site visits, taskforces &amp; solar economics</b>
<b>08:30 – 09:00</b>	<b>Meet at hotel to catch bus for site visit</b> Dress code: casual (long trousers, closed shoes, comfortable shirt, sun cap)
<b>09:00 – 10.00</b>	<b>Site visit (SportsHub)</b>
<b>10.00 – 10.15</b>	<b>Return to hotel</b>
<b>10:15 – 11.00</b>	<b>Coffee break &amp; freshen up</b>
<b>11:00 - 11:45</b>	<b>Taskforce – part 1, brainstorming and structuring ideas</b> <ul style="list-style-type: none"> <li>- Current situation</li> <li>- Desired targets</li> <li>- Barriers and strategies</li> <li>- Prioritise your goals</li> <li>- Quantify your budget and resource requirements</li> </ul>
<b>11:45 - 12:30</b>	<b>Financing solar projects</b> <ul style="list-style-type: none"> <li>- Equity financed</li> <li>- Leasing models</li> <li>- Raising debt</li> </ul>
<b>12:30 – 14:00</b>	<b>Lunch</b>
<b>14:00 – 14:30</b>	<b>LCOE (Lifecycle Cost of Electricity)</b> PV plant cost structure is almost entirely front-loaded capex (construction cost), with very low opex (maintenance). Fossil fuel generators have comparatively low capex but higher and more variable opex (fuel and maintenance costs). To properly compare the two we need to calculate the life cycle cost of electricity in \$/kWh. This depends on several variables and underlying assumptions.
<b>14:30 – 15:30</b>	<b>Group work &amp; wrap up</b>
<b>15:30</b>	<b>Tea break</b>
	<b>End of day</b>

<b>4 Aug 2016</b>		<b>Programme Day 4 - Solar ecosystem and policy models</b>	
<b>08:30 – 09:00</b>	<b>Registration</b>		
<b>09:00 – 09:45</b>	<b>Solar system design and quality – part 1</b>	<ul style="list-style-type: none"> <li>- Relevant ISO and IEC standards</li> <li>- Financial &amp; technical due diligence on key component suppliers</li> </ul>	
<b>09:45 – 10:30</b>	<b>Solar system design and quality – part 2</b>	<p>Establishing competent local EPCs in new PV markets</p> <p>Project investors and financial lenders (banks) require experienced EPC contractors to build solar projects. These typically team up with local construction contractors in an offshore/onshore contractual relationship.</p>	
<b>10:30 – 11:00</b>	<b>Coffee break</b>		
<b>11:00 – 11:45</b>	<b>Policies, incentives, and how they must evolve</b>	<p>Examples from Germany, Singapore, Australia, US, Thailand</p> <p>When designing or reviewing national PV policies, there is no “one-size-fits-all”. We can examine the reasons for what worked well and what failed in other countries, and apply the lessons to new national policies.</p>	
<b>11:45 – 12:30</b>	<b>Financing large PV projects in new markets</b>	<p>PV projects in new and developing markets are often harder to finance. Development banks like the ADB have programmes to co-finance both the equity and debt portions of such projects, subject to certain conditions</p>	
<b>12:30 – 14:00</b>	<b>Lunch</b>		
<b>14:00 – 14:45</b>	<b>Capability development</b>	<ul style="list-style-type: none"> <li>- Training &amp; certification</li> <li>- Facilitating knowledge transfer</li> </ul>	
<b>14:45 – 15:15</b>	<b>Wrap up</b>		
<b>15:15 – 15:45</b>	<b>Tea break</b>		
<b>15:45 – 17:15</b>	<b>Taskforce – part 3, refining your group presentation slides</b>	<ul style="list-style-type: none"> <li>- Incorporate today's lessons</li> <li>- How can you apply some of the lessons from the workshop in your country?</li> <li>- What are the key things you have learned during the week?</li> <li>- What are some key strategies to develop Solar in your country in the future?</li> <li>- Identify priority list for public and private sector action in your country to support a successful solar ecosystem.</li> <li>- Prepare a coherent story &amp; explain it clearly</li> </ul>	

<b>5 Aug 2016</b>	<b>Programme Day 5 – Presenting the roadmaps</b>
<b>08:00 - 08:30</b>	<b>Registration</b>
<b>08:30 – 10:00</b>	<b>Presentation by Country Representatives – round 1</b>
<b>10:00 – 10:30</b>	<b>Coffee break</b>
<b>10:30 – 12:00</b>	<b>Presentation by Country Representatives – round 2</b>
<b>12:00 – 12:30</b>	<b>Summary and wrap up discussion</b>
<b>12:30 – 13:30</b>	<b>Closing ceremony &amp; presentation of certificates (SEAS &amp; ADB)</b>
<b>13:30 – 14:30</b>	<b>Lunch</b>
	<b>End of programme</b>