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# Singapore's Experience in Rooftop Solar PV

By:



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# Agenda

- Singapore Overview
- Rooftop PV Business Models
- Permitting and Licensing
- Technical Considerations
- Conclusions
- Q&A

# Overview of Singapore Rooftop PV Market

- Rooftop PV good fit for Singapore due to its location and size
- Current capacity: 125 MWp rooftop PV in operation
- Target: 350 MWp by 2020
- Total Generation Capacity: 13,045 MW
- Liberalized electricity market
- Carbon tax to be implemented from 2019
- Renewable Energy Certificates (RECs)



# Rooftop PV Business Models

- Power Purchase Agreements (PPAs) for Government Tenders
  - Aggregated demand across governmental agencies and public housing
- PPAs with commercial customers
  - Directly with commercial & industrial power consumers
- Exported tariffs
  - Excess electricity not consumed can be sold to the grid
- Financing from commercial and development banks
- Off-takers with good credit quality
- Voluntary RECs improve project economics

# Permitting and Licensing

- Electrical Installation License
- Wholesaler (Generation) License required for PV systems over 1 MWp
- PV system owners (not necessarily building owners/tenants) can apply and obtain the license
- B2B PPA, Leasing and ESCO business models are available

# Technical Considerations

- Quality of roof and building
  - Roof material (metal, concrete, tile, asbestos)
- High technical installation standards
- Regulations for safe operation when connected to the grid
  - Anti-Islanding test conducted during commissioning of the system
- Grid stability
  - Solar energy constitutes less than 2% of Singapore's total power generation capacity
  - Systems that export to the grid required to provide per minute data reporting to Energy Market Company (EMC)

## Conclusion

- What could work in Singapore may be more difficult to implement in Cambodia
- Grid stability needs to be considered in Cambodia
- Could help attract additional FDI or lower RGC costs
- Enabling PPA / Build-Own-Operate type business models is important

# Q&A



Thank You.

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