Grid Scale Renewable Energy Community of Practice

Online Session 5: Renewable Energy Auctions

Date: October 31, 2018

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AGENDA

5 min	Welcome and Opening remarks	Carishma Gokhale-Welch, LEDS GP EWG, NREL
20 min	Round robin: country participant introductions	All
25 min	Renewable Energy Auctions: context and emerging trends in Asia	Thanawat Keereepart, USAID Clean Power Asia
25 min	Renewable Energy Auctions: basics and key considerations	Barbara O'Neill, NREL
40 min	Open discussion	All
5 min	Closing and next steps	Carishma Gokhale-Welch, LEDS GP EWG, NREL

USAID
FROM THE AMERICAN PEOPLE

USAID CLEAN POWER ASIA

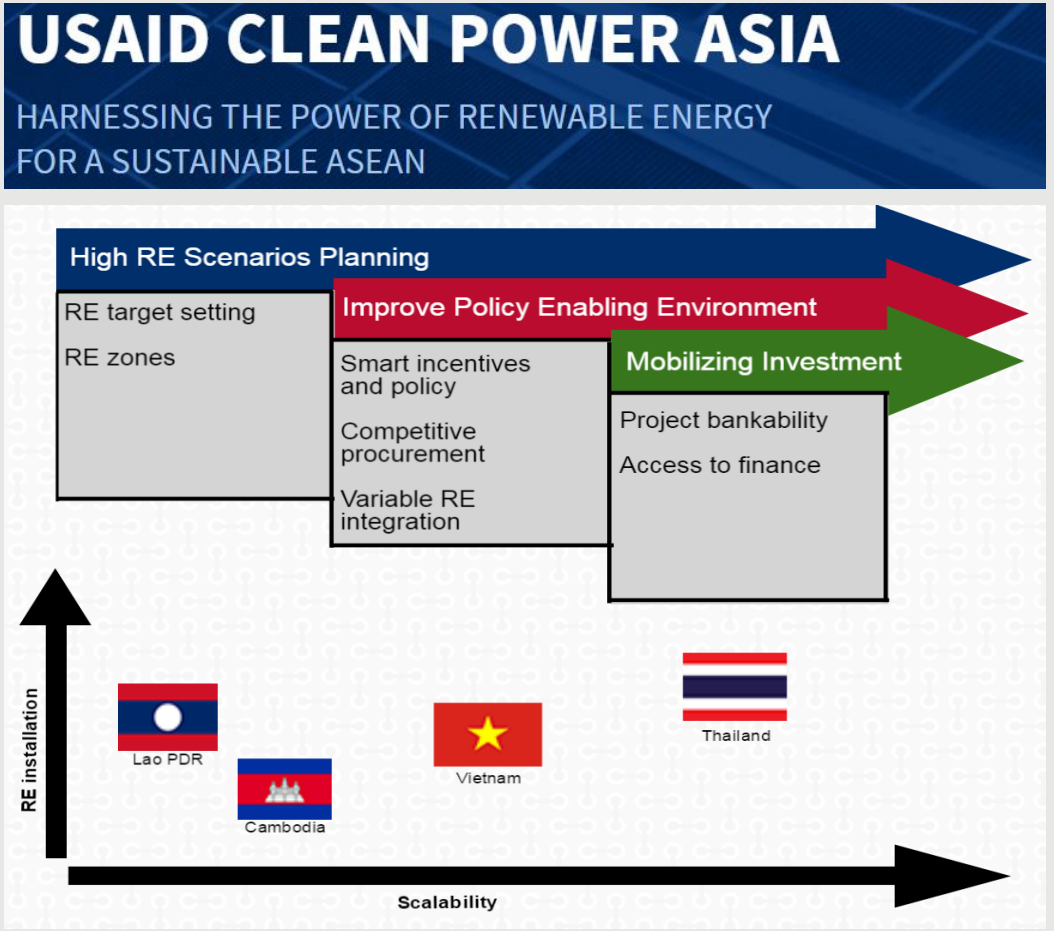
Trends of Renewable Energy Auctions in Southeast Asia

Thanawat Keereepart, Renewable Energy Policy Expert
USAID Clean Power Asia
October 26, 2018

Prepared for presentation at AMCHAM's Energy Committee

About USAID Clean Power Asia program

- 5 years: June 2016 – June 2021
- Aims to increase deployment in 'grid-connected' renewable energy in Asia
- Focus on LM Countries (Cambodia, Lao PDR, Thailand, and Vietnam) and ASEAN member states (Philippines)
- Goals:
  - 15 laws/policies/regulations
  - $750 M USD investment mobilization
  - 500 MW of installed RE
  - 3.5 M tCO2e reduction
- Implemented by Abt Associates and partners
- Funded by United States Agency for International Development (USAID)



Our website link: http://www.usaidcleanpowerasia.org/

Agenda

- Highlights of renewable energy trends
  - Policies supporting renewable energy
  - Factors influencing auction price
- Recent renewable energy auctions in Asia
- Renewable energy in Southeast Asia
- Recent renewable energy auctions in Southeast Asia
  - Indonesia
  - Malaysia
  - Thailand
- Auctions under development in Southeast Asia

Highlights of renewable energy trends

"Electricity from renewables will soon be consistently cheaper than from fossil fuels. ***Falling renewable power costs signal a real paradigm shift*** *in the competitiveness of different power generation options."*

(IRENA, 2018)

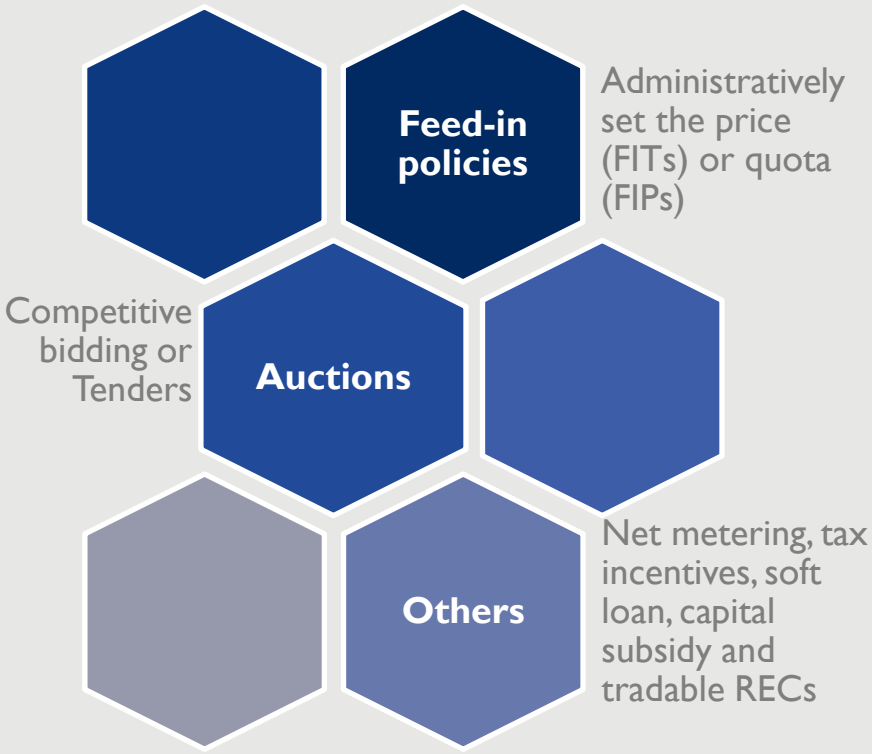
"Across Asia ***competitive bidding is making the difference****, accelerating a renewables boom sparked by already tumbling prices for solar panels and wind turbines. The* ***transition to an auction system*** *is a way for governments to put a lid on what's become a hard-to-control boom in clean-energy installations stimulated by government subsidies."*

(Bloomberg News, 2017)

"In order to solve the intermittency issue that RE has, there are different methods currently being used/developed in order ***to 'firm' the energy supply from RE*** *sources. These include large utility scale* ***battery storage, or hybrid facilities*** *(e.g., solar and gas/diesel hybrid power plants)."*

(PwC, 2018)

Policies supporting renewable energy

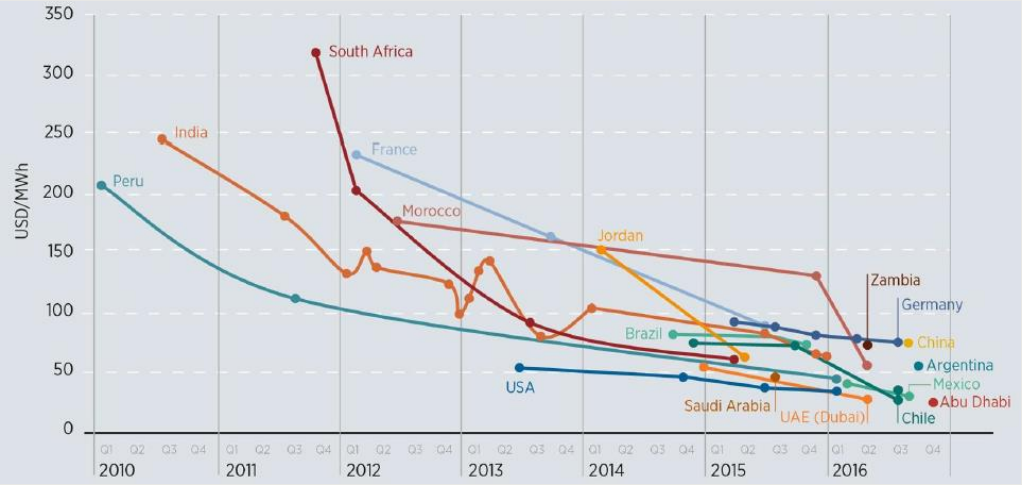


- At least 126 countries have promoted RE in the power sector through policy support
- **Feed-in policies** remain in force by most countries (83 countries in 2016), but declining rate of adoption by new countries.
- **Auctions** have been adopted by an increasing number of countries (67 countries in 2016), becoming a preferred policy tool with remarkable rate of adoption (34 countries issued new tenders in 2016)
- Others: net metering (55 countries)

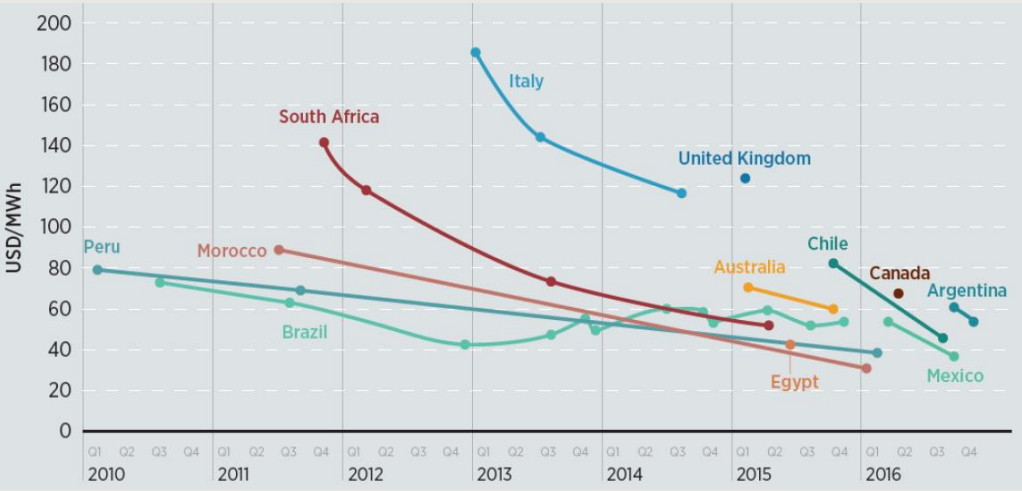
Source: REN21 database

Factors influencing the auction price

Price trends – solar PV auctions



Price trends – onshore wind auctions



Source: IRENA (2017). Renewable Energy Auctions

Country-specific conditions

- Cost of finance, cost of labor and land, resource ability
- Ease of doing business

Investor confidence and learning curve

- Credibility of off-taker and guarantees
- Lessens learned from past auction

Policies and measures for RE development

- National targets and plan
- Tax credits, exemption
- Socio-economic benefits

Auction design

- Ensuring project delivery and price
- Fulfill development goals
- Encourage new players

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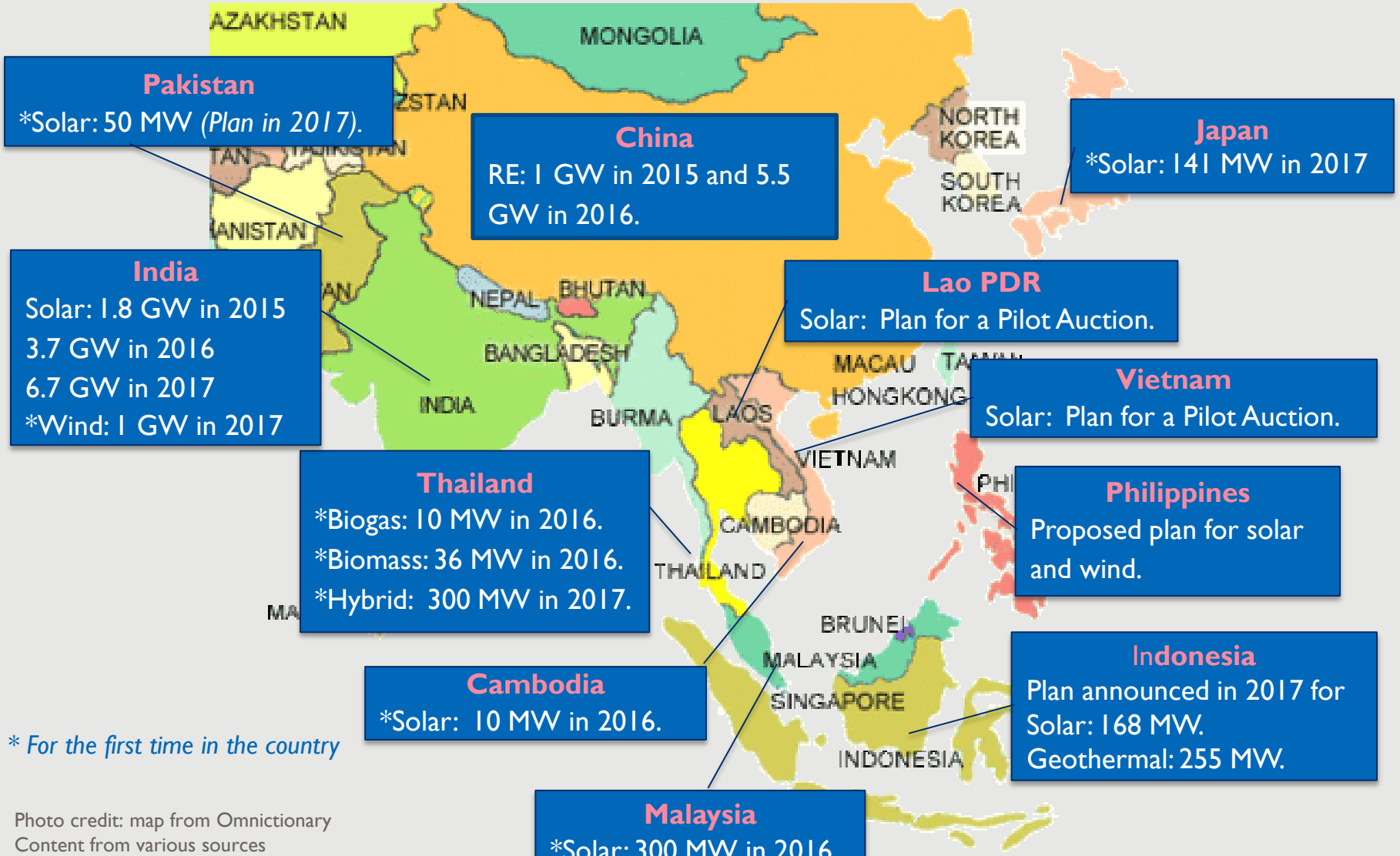
Recent renewable energy auctions in Asia



Pakistan
*Solar: 50 MW *(Plan in 2017).*

China
RE: 1 GW in 2015 and 5.5 GW in 2016.

Japan
*Solar: 141 MW in 2017

India
Solar: 1.8 GW in 2015
3.7 GW in 2016
6.7 GW in 2017
*Wind: 1 GW in 2017

Lao PDR
Solar: Plan for a Pilot Auction.

Vietnam
Solar: Plan for a Pilot Auction.

Thailand
*Biogas: 10 MW in 2016.
*Biomass: 36 MW in 2016.
*Hybrid: 300 MW in 2017.

Philippines
Proposed plan for solar and wind.

Cambodia
*Solar: 10 MW in 2016.

Indonesia
Plan announced in 2017 for
Solar: 168 MW.
Geothermal: 255 MW.

Malaysia
*Solar: 300 MW in 2016 and 563 MW in 2017.

** For the first time in the country*

Photo credit: map from Omnictionary
Content from various sources

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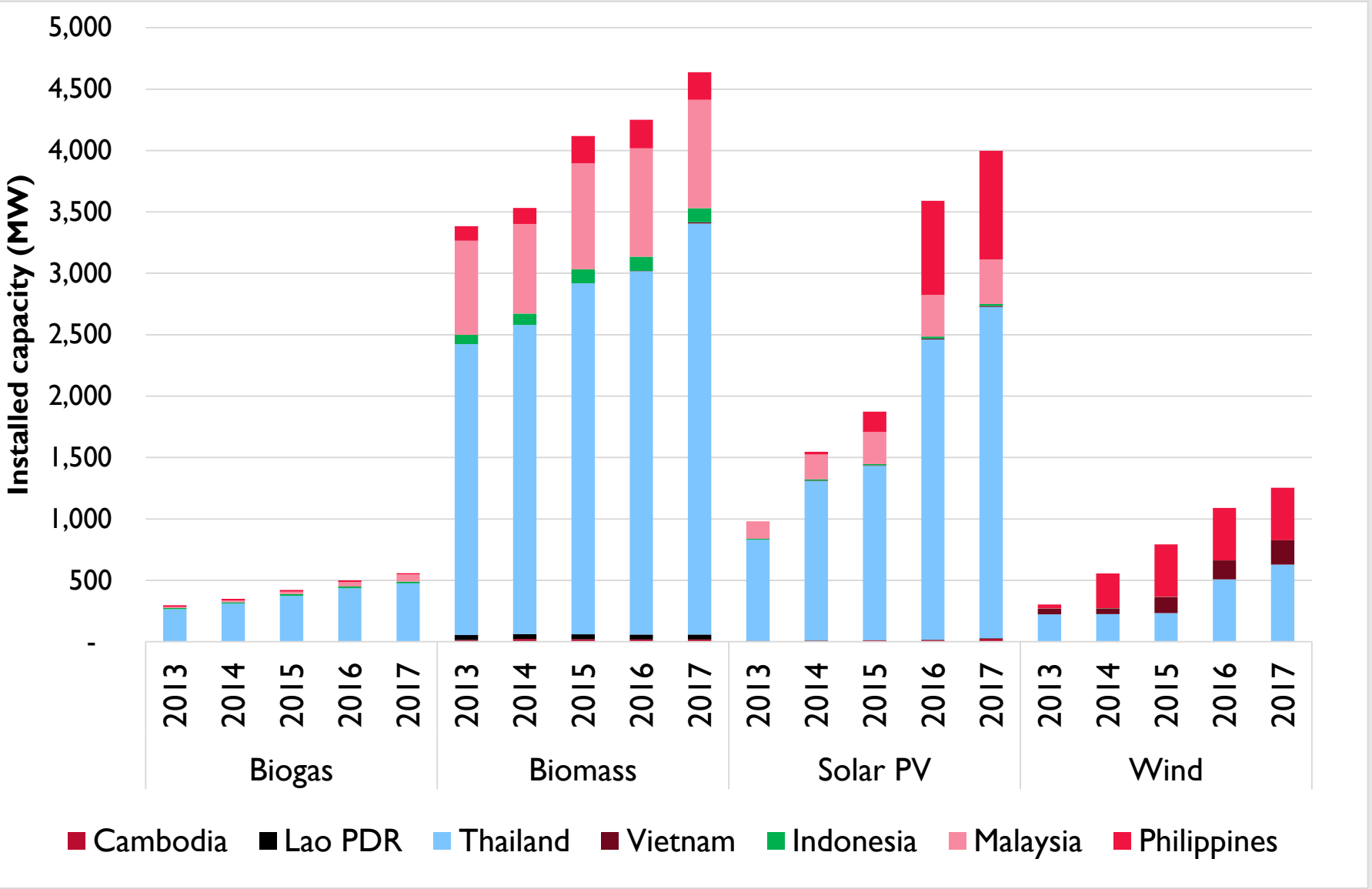
Grid-connected renewable energy in Southeast Asia



Availability of RE targets, incentives, and auctions in ASEAN

ASEAN countries		RE Targets	FIT	Self-consumption scheme	Competitive Bidding (or Auction)	Tax incentive	Soft loan	Capital subsidy	Tradable RECs
BRUNEI		✓							
INDONESIA		✓	✓	✓	✓	✓	✓		
MALAYSIA		✓	✓	✓	✓	✓	✓		
MYANMAR		✓				✓			
PHILIPPINES		✓	✓	✓		✓			✓
SINGAPORE		✓			✓	✓			
LM Countries	CAMBODIA				✓	✓			
	LAO PDR	✓				✓			
	THAILAND	✓	✓	✓	✓	✓	✓	✓	
	VIETNAM	✓	✓	✓		✓			

Note: ✓ means the RE targets or incentives or auction has been implemented in the country.

Source: USAID Clean Power Asia data collection

Source: USAID Clean Power Asia (2017). DESIGNING RENEWABLE ENERGY INCENTIVES AND AUCTIONS: LESSONS FOR ASEAN

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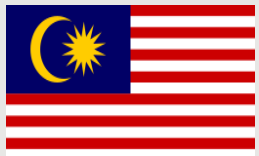
Recent auctions in Southeast Asia: Indonesia

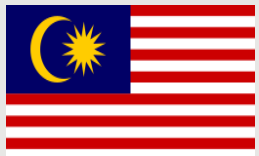
- Initiated a competitive tender in June 2017
- Target to add 168 megawatts (MW) of solar power capacity in Sumatra
- Attracted more than 100 interested parties
- Ceiling tariff set at 85% of local generation cost
  - Net prices ranged from $0.06 to $0.10 USD/kWh
- Bids were expected to be selected by late 2017, but have not yet been announced



Recent auctions in Southeast Asia: Malaysia

- Held first solar auction in 2016 and second solar auction in 2017
- Both auctions were heavily oversubscribed
- First auction target was 300 MW, winning bids represented 450 MW of total capacity
- Second auction target was 460 MW, winning bids represented 563 MW of total capacity

Photo credit: New Straits Times



Malaysia's 2017 auction: Policy and results

- Two competitive tenders conducted under the Large-Scale Solar (LSS) Program for Peninsular Malaysia, Sabah and Lubuan
- New Energy Minister committed to increase RE capacity to 20% of all power generation capacity by 2025
- Energy Commission announced 19 winning bids in December 2017
  - 563 MW of total capacity, compared to 460 MW planned
- Net prices ranged from $0.08 to $0.12 USD/kWh
- Winning projects required to be operational between 2019 and 2020

Recent auctions in Southeast Asia: Thailand

- Held biomass and biogas auctions in 2016, first technology-neutral hybrid-firm auction in 2017
- 2017 hybrid-firm auction
  - Target to add 300 MW of hybrid RE power
  - Bids were selected in December 2017 and power purchase agreements (PPA) will be signed by December 2019
- Recent government announcement signaled uncertainty or potential delays related to future RE procurement

Photo credit: Nikkei Asian Review

Thailand's 2017 auction: Policy and regulations

- Policy objectives
  - To increase the security of power system
  - To reduce the variation of intermittent energy sources
  - To reduce the dependency on a single RE technology

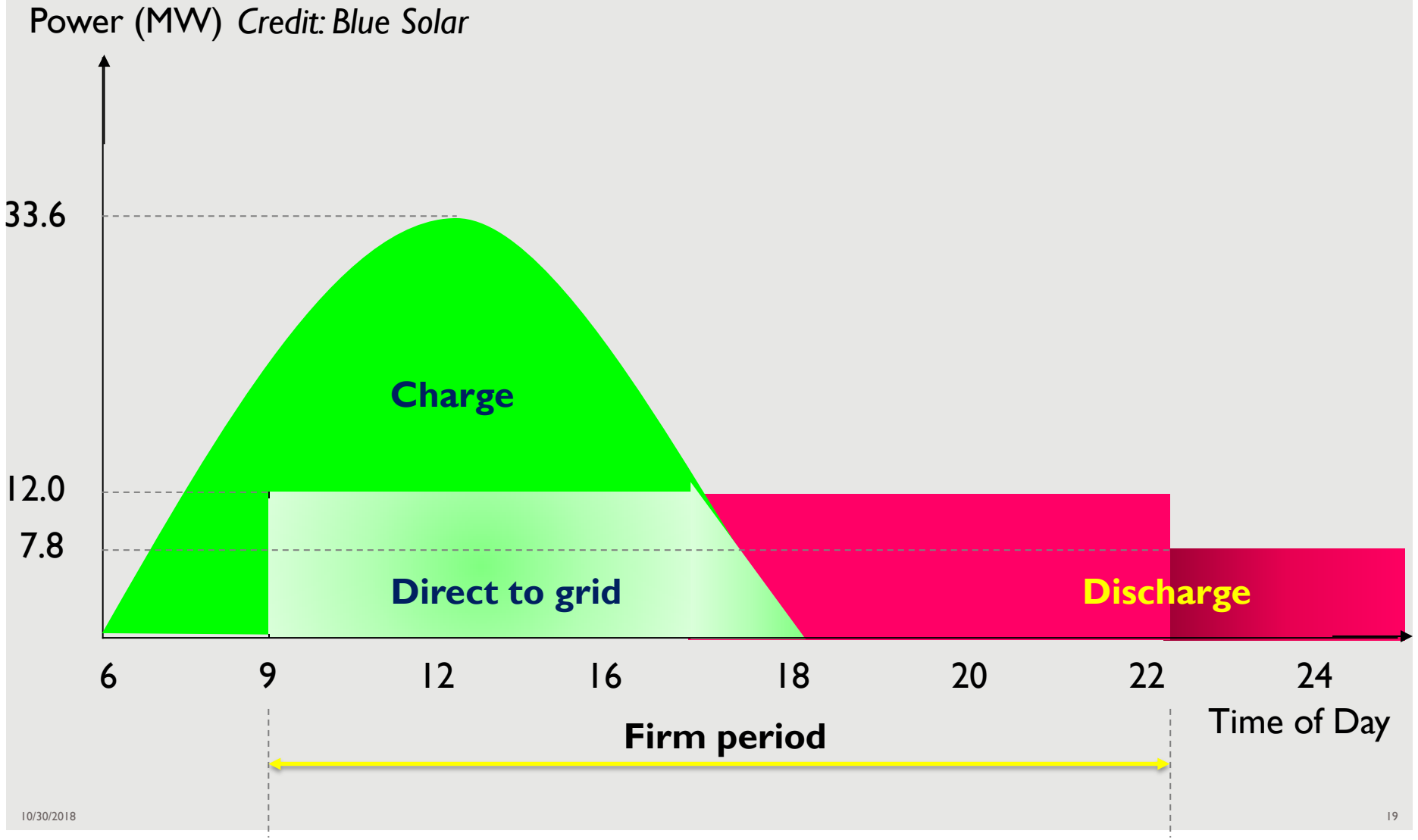
- Small Power Producers (SPP) Hybrid Program
  - First competitive bidding program in Asia to require "firm" power generation
  - First in Asia to allow hybrid power projects to participate in an auction

- Requires producers to commit to firm power generation by combining RE technologies to supply a defined amount of power during specified hours:
  - Peak hours (9:00-22:00 Monday through Friday), generation capacity must be at least100% of total capacity
  - Off-peak hours and public holidays, generation capacity limited to 65% of total sale capacity

Thailand's 2017 auction: Results

- 17 winning bids announced in December 2017 involving nine groups of companies
  - 14 biomass projects: 259 MW
  - 1 biogas + solar project: 16 MW
  - 1 biomass + solar project: 13.3 MW
  - 1 solar + energy storage project: 12 MW
- Net prices ranged from $0.06 to $0.11 USD/KWh
- Winning projects expected to be constructed and operational by 2021

Solar + energy storage "firm" bidding



Further consideration: Policy objectives

1. **To enhance power system security:**
   - A firm power requirement should not be viewed as the only solution since it does not address all the challenges that occur with increasing RE penetrations.
   - Additional measures to enhance power system security such as stronger interconnection between balancing areas, increasing existing plants' ramping capacity, etc. should also be considered and planned for

Further consideration: Policy objectives

2. To reduce the variation of intermittent energy sources:

Firm power requirements help reduce variability at individual points of interconnection. Is this approach cost-effective compared to other options?

- Reducing variability by combining several RE plants over a wide geographic area, taking advantage of complementary nature of wind-solar
- Increasing the flexibility of other components in the power system to manage variability
  - Increase ramp-up time
  - Reduce minimum running load

Further consideration: Policy objectives

3. **To reduce dependency on specific RE technologies**
   - The winning bids for firm/hybrid power were mostly from biomass plants due to lack of competitiveness of solar+storage and wind+storage or other options, compared to biomass from existing sugar mill factories.

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Other auctions under development in Southeast Asia

- Cambodia
  - ADB provided support to Ministry of Mines and Energy for solar auction
- Vietnam
  - World Bank is currently supporting Ministry of Industry and Trade for solar auctions
  - Current FIT program to expire June 2019 and new incentives are under consideration
- Lao PDR
  - USAID Clean Power Asia supporting Ministry of Energy and Mines to implement solar pilot auction
    - Complementing generation from hydro
    - Reduce energy imports from neighboring countries

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Auction Design

Barbara O'Neill
Grid Integration Manager
US DOE National Renewable Energy Laboratory

Presented to Asia LEDS Partnership Community of Practice
31 October 2018

National Renewable Energy Laboratory

Barbara O'Neill

- Grid Integration Manager
- 13+ years experience in renewable energy
- Former renewable energy contract negotiator for largest utility wind buyer in the US
- MS in international energy management
- BS in electrical engineering

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

- Focus on operational and policy changes to support high levels of RE
- Frequent speaker and presenter at industry conferences
- Recent projects in Colombia, Bangladesh, Pakistan, Mexico, Kazakhstan, USVI
- Clients: governments, USAID, DOE, State

Presentation Outline

Considerations

Bidder participation, project realization, cost efficiency, project financial viability, competition

Auction schedule

Frequency, lag for responses

Counterparty

Financial flows, off-taker arrangements

Auction volume

Demand and supply rounds

Auction design

Pay as bid, auction clearing price, descending clock

Auction “bands”

Technology, timing, locations

Qualitative criteria

Local content, environmental, work force, transmission congestion, resource diversity

Qualification requirements

Material, financial, bid bonds, varied system size qualifications

Bid Bonds/Deposits

How to price, exclusion of actors

Contract length

Short-term or life of equipment

Contract terms

Conditions precedent, commercial operation date, performance guarantees, security for performance, insurance, subordinated mortgage, step-in rights, grid services, output forecasting, SCADA and telemetry

Investor risks

Creditworthiness of counterparty, currency risk, regulatory risk, political risk, curtailment risk

So, you want to hold an auction…..

Considerations

What are the main objectives? Priorities? Values?

For example: bidder participation, project realization, cost efficiency, project financial viability, competition

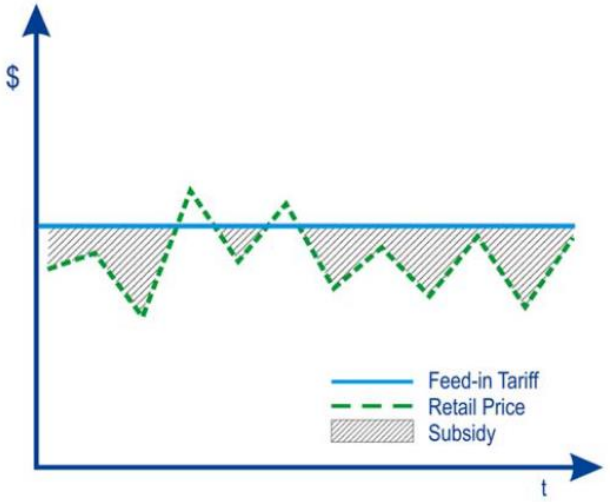
Get the conversation started!

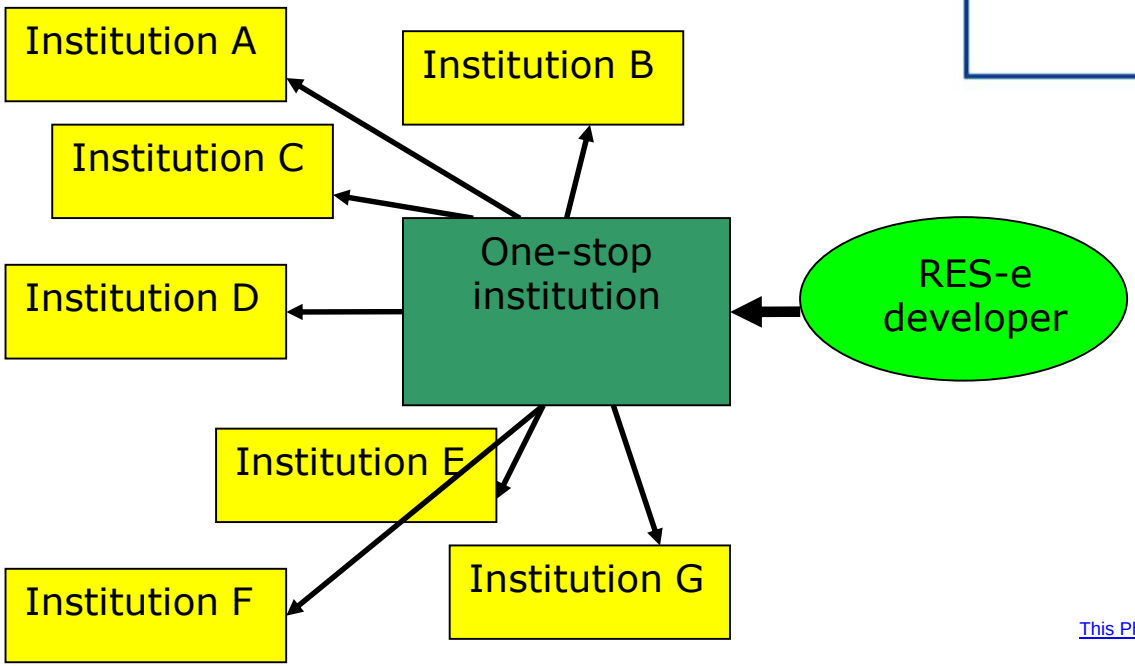
Auction Schedule and Frequency

- Generate local investment through certainty with a *schedule* of multiple auctions
- Price reductions based on frequency
    1. Technology learning (price reductions)
    2. Streamlining of processes/Maturity of market (“One GW Threshold”)
    3. Increased competition (depends on pre-qualification requirements)
- Allow enough time for responses

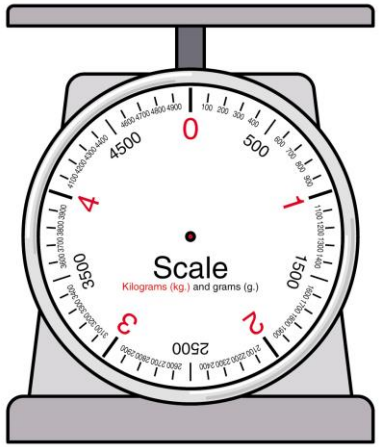
Counterparty

- Option 1: Individualized Mapping
- Option 2: Contracts Against the Pool
- Option 3: Contracts Against the Pool plus Premium Payment
- Option 4: Off-taker of Last Resort

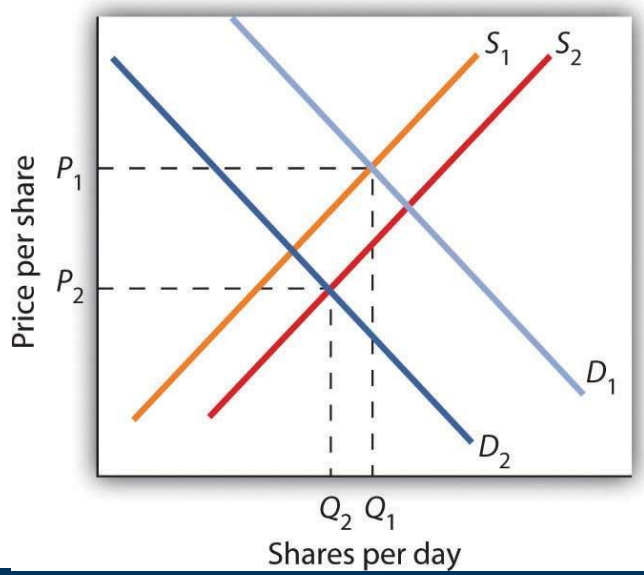




Auction Volume



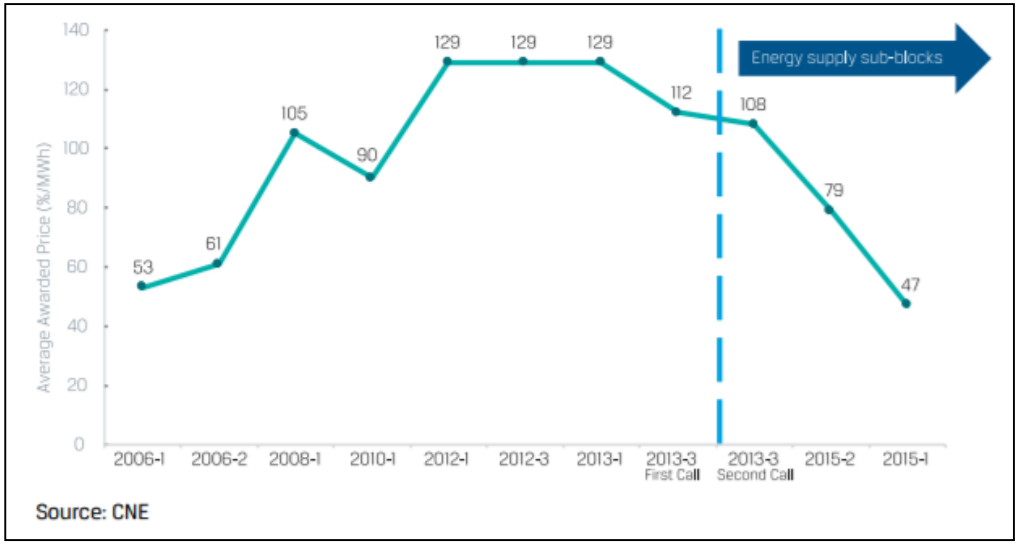
- Who gets to decide?
  - Regulator
  - Ministry of Energy or Planning Authority
  - Distribution companies nominate and aggregate
- MW or MWh?
- Demand auction in parallel with supply
- What minimum demand can participate?



Auction Design

- Take or Pay, P50/P90, Time Blocks, Nominated, Firm
- Pay-as-bid or clearing price?
- Volume announced or silent?
- Multiple rounds?
- Descending clock

In 2014, CNE modified their auction mechanism to include energy supply sub-blocks comprising *specific hour segments within the day* (in additional to standard 24-hour contracts).



Source: CNE

Auction Bands

- Technology
  - Neutral (To all? To all RE?) or specific?
  - Certain resource mix desired?
  - Build local supply chain?
  - If neutral to all, other ways to tilt to RE

- Timing

» Typical lead times for RE technologies:
  - » Wind: 1-3 years
  - » Solar PV: 0.5-1.5 years
  - » Biomass: 2-3 years
  - » Hydro: 1-10 years

» Consultation process with developers recommended

» Lead times depend on the pre-qualification requirements of achieved development

- Location
  - Were transmission upgrades included in valuation of LCOE?
  - Was transmission congestion considered?
  - Make available best substations from system operator's perspective
  - Location-based quotas or location incentives
  - Offer *ex-ante* incentives for location (and/or for time of production)

Source: NREL

Qualitative Criteria

- Binding Qualifications
  - Low material qualification -> high bid bonds
  - No material qualifications -> speculation (then need timing requirements)
  - Trade-off between level of competition and “serious bids”
- Location-specific
  - Grid impact stud
  - Approved grid connection
  - Environmental impact assessment
  - Securitization of land
  - Local permits
- Legal
  - Registration, documentation
  - Disclosure of bidding consortia
- Technological
  - Equipment specifications
  - Project size limitations
  - Manufacturer (local content?)
- Financial strength/health
  - Revenues/profits
  - Credit rating
  - Project finance track record
- Assessment Criteria
  - Social impact
  - Realization
  - System improvement

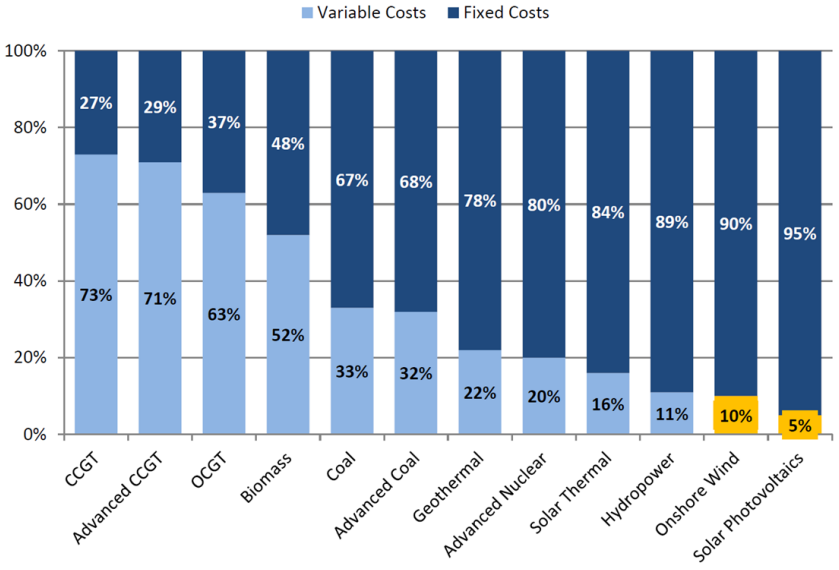
Bid Bonds

- **Reasoning for bid bonds**
  - Developer needs to put down a certain amount of money in order to participate in bidding round
  - Money will be lost of project is not executed as promised
  - Only serious bidders participate!
- **Disadvantage:**
  - Transaction costs
  - Exclusion of small-scale actors?
- **How to structure bid bonds**
  - Payment per kW (e.g. 5 US$ per kW)
  - Percentage of the estimated project cost (e.g. 5-10%)
  - Bid bonds step-down with milestones
- **Or completion bonds**
  - Projects awarded a contract will have to pay a completion bond
- **Form of bond**
  - Cash
  - Letter of credit
  - Parent guaranty
- **Payback of bonds**
  - When PPA is signed
  - When power is produced
  - Partial payback for achieving milestones

Contract Length

- For best price, align contract duration with economic life of power plant, e.g., 20 years
- Longer payment duration are sometimes offered for hydropower and solar PV
- Shorter payment durations are sometimes offered for higher O&M/fuel costs (e.g. biomass and waste-to-energy)
- Long-term contracts also provide incentive to maintain long-term performance
- Contract length decision impacted by liquidity and projections for wholesale power markets post contract term

- A 10-year contract does not have twice as high prices as a 20-year contract because near-term cash flows are valued more
- Advantage of long-term contracts is to lock in relatively low prices for a long period, despite risk that prices will fall further



Contract Terms

- Dispatch
- Curtailment risk
- Interconnection and transmission
- Conditions precedent
- Commercial operation date
- Performance guarantees
- Security for performance
- Insurance
- Subordinated mortgage

- Step-in rights
- Grid services
- SCADA
- Output forecasting

Source: NREL

The Investor Perspective: Primary Concerns

- Creditworthiness of counterparty
  - Good credit rating, or backing by State
- Currency risk
- Regulatory risk
  - Investors do not want to see frequent changes to the rules of the game
  - Hyper-transparency is key!
    - Standard rules/process
    - Contract terms
- Curtailment or congestion risk (unless compensated)
- Political risk

Thank you very much.

We will be taking questions during the discussion session of the agenda.

Please write them in the Questions box.

Barbara O'Neill

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Next Steps

- Survey to assess country needs and priorities; feedback on most impactful activities
- Activities:
- Access to tools and resources
- Continued engagement through facilitated online sessions
- Learning resources development – case study, good practice
- Country-to-country peer learning opportunities
- Access to no-cost technical assistance

Thank you!

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