Power Purchase Agreements for Variable Renewable Energy

May 2018
Power Purchase Agreements (PPA)

- Power purchase Agreements (PPA) is an important contract that governs the sale and purchase of power.
- Key to bankability of the project.
- Addresses uncertainty in demand and pricing.
- Provides reliable long-term clarity on roles, responsibilities, costs, revenues as well as probability and significance of associated risks for stakeholders.
PPA Design Details

Power Purchase Agreement

- Tenure
- Price
- Supply Comm.
- Others include price adjustment; currency risk; policy/regulatory risks; dispute settlement; ownership transfer

PPA design details vary (examples for wind projects)

<table>
<thead>
<tr>
<th></th>
<th>Brazil: 53.9</th>
<th>Chile: 45.3</th>
<th>Mexico: 35.8</th>
<th>Panama: 90.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price (USD/MWh)</td>
<td>Brazil: 20</td>
<td>Chile: 20</td>
<td>Mexico: 15</td>
<td>Panama: 15</td>
</tr>
<tr>
<td>Tenure (years)</td>
<td>Brazil: annual</td>
<td>Chile: 3 daily blocks</td>
<td>Mexico: annual</td>
<td>Panama: monthly, 24/7</td>
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<tr>
<td>Supply Commitment</td>
<td>Brazil: annual</td>
<td>Chile: 3 daily blocks</td>
<td>Mexico: annual</td>
<td>Panama: monthly, 24/7</td>
</tr>
</tbody>
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PPAs for Wind and Solar PV

Three unique generation characteristics of wind and solar PV

- Variability (how much generation and at what time)
- Uncertainty (how predictable the generation)
- Location-constraint (how to coordinate grid and generation)

→ Supply and purchase commitments
→ Curtailment clauses
→ Requirements for dispatch procedures
IRENA’s Project Facilitation Toolbox

Ensuring bankability and managing risk

PPA Assessment
PPA Work in Central America CEC

CECCA Technical Component

CECCA Regulatory Component

Assessing Investment Incentives through PPAs in Panama

- Market review: Jun-Sep 17
- Excel tool: Sep 17-Apr 18
- Best practice: Jan-Mar 18
- Dissemination: May 18
Assessing Investment Incentives through PPAs - Panama

- Assess current renewable energy PPAs
- Identify potential design improvements based on regional and international best practices
- Develop financial model to analyze PPAs
- Analyze financial implications of suggested rule change

Develop financial analysis to assess the impacts of different rule changes
IRENA – PPA Assessment Tool

• The assessment tool was developed to analyze the financial implications of design changes to PPAs

• Developed in Excel for greater flexibility and acceptance

• Designed from the ground up by IRENA with consultants COWI
Key Results

Key results

➢ Excel-based financial model developed to analyse different PPA designs
➢ Best RE PPA practices from the region and EU compiled and analysed
➢ Model applied in Panama – results are being finalized
➢ Contracts that accommodate the seasonality and daily cycles of RE production are key to enhancing investment incentive and reduce wholesale market interfaces (risk)
Way forward

➢ Validation and feedback from local stakeholders

➢ Further investigation on time block bidding and power curve bidding contracts

➢ Developing actionable recommendations for Panamanian policy makers on future PPA design

➢ Expanding the model to include other RE technologies
Muchas Gracias!