Latin America Outlook for PV

Investment Opportunities for Solar Energy in post COVID-19 Scenarios

July 2020
The Association of Renewable Energy of Colombia is a non-profit organization that currently represents 69 companies interested in develop non-conventional renewable energy projects within the country.

**Our Main Objective:** is to promote a diversified and competitive electrical matrix, contributing to the regulatory development, in terms of technical, environmental and commercial matters, that encourage the inclusion of Non-Conventional Renewable Energy Sources.

**Objectives:**

- Represent the interests of their members before government entities, associations, chambers and private organizations, either national or international.

- Encourage a more competitive, efficient and autonomous electricity market.

- Promote the development of the electric power generation industry with non-conventional renewable energy sources (FNCER), being a forum for discussion and proposition of the topics that revolve around it.

- Contribute to the development of a regulatory framework that equitably promotes different technologies.
Agenda

Top-down approach. From general to specific

- General Context
- Registered Projects
- Legal Framework
- Large Scale: auctions and prospects
- Small Scale: Challenges
- Other future prospects
Legal Framework

Two milestones

- Promotion of FNCER as a public policy objective
- Tax incentives for project development (income reduction, exclusion and exemption from VAT and tariffs, accelerated depreciation)
- Regulatory integration and promotion schemes

- Promotion of long-term contracts
- New specific policy objectives:
  - Climate Resilience
  - Competition
  - Complementarity
  - Energy security (within regions)
  - Emissions Reduction
Registered Projects

386 Total
Registered Projects

12,742 MW Total
Capacity MW

186 Total
Approved Connection Concept

8359 MW Total
Capacity MW


Large-scale milestones: reliability charge and long-term contract auctions

Reliability Charge Auction
- REN have limited participation because of their low reliability contribution compared with thermal and large hydro
- Income in USD over a 20-year period

Long-term contracts Auction
- Mechanism designed to bring financial closure to REN projects
- 15-year financial energy contracts, in Colombian pesos
### Auction Awarding - 2019

#### Long-term Contracts Auction - CLPE:
**Awarded: 1.366 MW**

<table>
<thead>
<tr>
<th>SPV</th>
<th>Developer</th>
<th>Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trina Solar</td>
<td>Trina Solar</td>
<td>El Campano</td>
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<td>Trina Solar</td>
<td>Cartago</td>
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<td>Trina Solar</td>
<td>Trina Solar</td>
<td>San Felipe</td>
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<td>Jemeiwaa Ka’i</td>
<td>Jemeiwaa Ka’i</td>
<td>Apotolorru</td>
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<td>Jemeiwaa Ka’i</td>
<td>Jemeiwaa Ka’i</td>
<td>Casa Eléctrica</td>
</tr>
<tr>
<td>Vientos del Norte</td>
<td>Renovatio</td>
<td>Alpha</td>
</tr>
<tr>
<td>Eolos Energía</td>
<td>Renovatio</td>
<td>Beta</td>
</tr>
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<td>Celsia</td>
<td>Renovatio</td>
<td>Camelas</td>
</tr>
<tr>
<td>Celsia</td>
<td>Renovatio</td>
<td>Acacia 2</td>
</tr>
</tbody>
</table>

#### Reliability Charge Auction:
**Awarded: 772 MW**

<table>
<thead>
<tr>
<th>Owner</th>
<th>Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enel Green Power Colombia</td>
<td>El Paso Solar</td>
</tr>
<tr>
<td>Enel Green Power Colombia</td>
<td>Chemesky</td>
</tr>
<tr>
<td>Enel Green Power Colombia</td>
<td>La Loma Solar</td>
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<td>Enel Green Power Colombia</td>
<td>Tumawind</td>
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<tr>
<td>Enel Green Power Colombia</td>
<td>Windpeshi</td>
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</table>

**Awarded in both Auctions**
Long-term contract Auction - [Balance]

**Envelope 1**
- Offer: 24 bidders
- 56 projects
- 4.773 MW
- Demand: 26 bidders

**Guarantees**
- Offer: 17 bidders
- 38 projects
- 3.414 MW
- Demand: 23 bidders

**Envelope 2**
- Offer: 12 bidders
- 25 projects
- 2.787 MW
- Demand: 23 bidders

**Awarding**
- Offer: 4 awarded
- 8 + 1 projects
- 1.291 + 75 MW
- Demand: 22 + 18 awarded
Future prospects relevant to large-scale projects

- **Mandatory 10% of renewable purchases**
- **Possibility of new auctions sponsored by the government**
- **New energy trading mechanisms: private auctions**
- **New LTC Auctions?**
Small-scale milestones and challenges (<1MW, self and distributed generators)

Res. CREG 030 de 2018:

- Simplified connection procedures
- Regime of sale of surplus with benefits
  - Prices with incentives
  - Purchase obligation

Challenges:

- Uncertainty about Network Backup Contracts
- Technical requirements can increase costs and hinder financial viability
- Complex connection processes with Dx
# Project Finance – Barriers or Opportunities

<table>
<thead>
<tr>
<th>Bankable PPA</th>
<th>Guarantee</th>
<th>Colombian Electric Market Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Contract that cover income during the debt period.</td>
<td>• For the financial closure it is required signing the contractors (EPC, O&amp;M, etc.) with penal clauses in case of default and collecting the guarantees. In case the plant stop production, guarantees hedge the payments ahead.</td>
<td>• <strong>Challenges:</strong> financial institutions see as a great risk when the Cx goes into default. It is important to let banks understand the operation of the electricity market. When a default occur, seek other contract is totally feasible.</td>
</tr>
<tr>
<td>• Challenges: Exposure to the Spot Market and uncertainties in the hourly settlement.</td>
<td>• Challenges: (i) Risk assessment in each scenario and, (ii) the lack of knowledge of financial institutions leads to the collection of guarantees and hedging outside of an international standard.</td>
<td></td>
</tr>
</tbody>
</table>
Prospects

- Energy transformation mission
  - Intraday markets and ancillary services
  - Nodal Prices
  - DERs Promotion
  - Vertical and Horizontal Disintegration
- Review of existing connection regulation
  - Access to the grid rules and loss of connection point to the grid
  - New and better regulated procedures
Ramiro Arellano Price

Chairman of the Board

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Back Up
Regulatory – Small-scale


Res. UPME 0281 / 2015 “By which the maximum power limit of small-scale self-generation is defined”.

Res. CREG 030 de 2018 “Operational and commercial rules for the integration of Self Generation and Distributed Generation – Below 100 kW, Between 100 kW and 1MW, Between 1MW and 5MW”

✓ Methodology for small producers: self-generate and sell energy in the interconnected system.
  o Connection.
  o Measurement.
  o Billing.
  o Surplus Delivery.

✓ Distributed generation <100 kW, helps reduce system losses (SDL) by generating lower current flows to meet demand.

✓ Final users procedure to become energy sellers.

Res. CREG 015 de 2018 “Defines the methodology for calculating the backup charge”

Res CREG 038 de 2018 “Regulates Self-generation and Distributed Generation in non-interconnected areas”.

Res. CREG 038 de 2018 “Regulates Self-generation and Distributed Generation in non-interconnected areas”.
Regulación – Pequeña Escala

MinEnergía – Política Pública – Decreto 2469 de 2014 y Decreto 570 de 2018

Res. CREG 024 de 2015 “Regula la actividad de autogeneración a gran escala en el sistema interconectado nacional (SIN)”.

Decreto 1543 de 2017 “Reglamentación del Fondo de Energías No Convencionales y Gestión Eficiente de la Energía, FENOGE”.

Res. CREG 167 de 2017 “Metodología para determinar la energía firme de plantas eólicas”.

Res. CREG 201 de 2017 “Metodología para determinar la energía firme para Cargo por Confiabilidad, ENFICC, de plantas fotovoltaicas”. – Modificación de resolución CREG 243 de 2016.

Res. CREG 114 de 2018 “Mecanismos de comercialización de los agentes”.

Res. CREG 060 de 2019 “Se hacen modificaciones y adiciones transitorias al Reglamento de Operación para permitir la conexión y operación de plantas solares fotovoltaicas y eólicas en el SIN”.

Res CREG 096 de 2019 “Opción de acceso al despacho central, a plantas menores a 20 MW conectadas al Sistema Interconectado Nacional”.

Project Location Map

Córdoba
1 Solar PV

Cesar
2 Solar PV

Valle del Cauca
1 Solar PV

La Guajira
9 Wind

Tolima
1 Solar PV

RC Auction: 772 MW
LTC Auction: 1366 MW
Total: 2138 MW
## Long-term contract Auction - [Projects]

<table>
<thead>
<tr>
<th>Project</th>
<th>Tech</th>
<th>Capacity [MW]</th>
<th>Location</th>
<th>Connection to the grid</th>
</tr>
</thead>
<tbody>
<tr>
<td>El Campano</td>
<td>Solar PV</td>
<td>99,9</td>
<td>Córdoba</td>
<td>Chinú 220 kV</td>
</tr>
<tr>
<td>Cartago</td>
<td>Solar PV</td>
<td>99</td>
<td>Valle del Cauca</td>
<td>Cartago 230 kV</td>
</tr>
<tr>
<td>San Felipe</td>
<td>Solar PV</td>
<td>90</td>
<td>Tolima</td>
<td>San Felipe 230 kV</td>
</tr>
<tr>
<td>Apotolorru</td>
<td>Wind</td>
<td>75</td>
<td>La Guajira</td>
<td>Colectora I 500 kV</td>
</tr>
<tr>
<td>Casa Eléctrica</td>
<td>Wind</td>
<td>180</td>
<td>La Guajira</td>
<td>Colectora I 500 kV</td>
</tr>
<tr>
<td>Alpha</td>
<td>Wind</td>
<td>212</td>
<td>La Guajira</td>
<td>Cuestecitas 500 kV</td>
</tr>
<tr>
<td>Beta</td>
<td>Wind</td>
<td>280</td>
<td>La Guajira</td>
<td>Cuestecitas 500 kV</td>
</tr>
<tr>
<td>Camellias</td>
<td>Wind</td>
<td>250</td>
<td>La Guajira</td>
<td>Cuestecitas 500 kV</td>
</tr>
<tr>
<td>Acacia 2</td>
<td>Wind</td>
<td>80</td>
<td>La Guajira</td>
<td>Cuestecitas 110 kV</td>
</tr>
</tbody>
</table>

Tx works on going:
- Substation Colectora I 500 kV
- Extension Cuestecitas 110 kV
- New T-lines 500 kV 360 km