Electricity trading in regional markets

October 24, 2019

Tashkent
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- Markets Models and Agreements
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- Results and lessons learned
- Q&A
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Central America

Six countries
- Guatemala
- El Salvador
- Honduras
- Nicaragua
- Costa Rica
- Panamá

Guatemala is connected to Mexico

Regional Resources
- Hydro
- Geothermal
- RES
- No oil-gas-coal reserves or production

Source: System Operators and National Markets
The SIEPAC project

This project involves a 230 LV double circuit network with length of around 1440 miles that will reinforce the interconnection of the six Central American countries.

230 kV lines

<table>
<thead>
<tr>
<th>PAÍS</th>
<th>LONG (km)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>GUATEMALA</td>
<td>242</td>
<td>13.4</td>
</tr>
<tr>
<td>EL SALVADOR</td>
<td>260</td>
<td>14.6</td>
</tr>
<tr>
<td>HONDURAS</td>
<td>366</td>
<td>20.3</td>
</tr>
<tr>
<td>NICARAGUA</td>
<td>254</td>
<td>15.8</td>
</tr>
<tr>
<td>COSTA RICA</td>
<td>515</td>
<td>28.5</td>
</tr>
<tr>
<td>PANAMA</td>
<td>135</td>
<td>7.5</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1,802</td>
<td>100.0</td>
</tr>
</tbody>
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The six countries participate in the regional market.

The main successes of this regional market has been to allow working with countries with very different organizations of their electricity sectors, with minor harmonization measures.

<table>
<thead>
<tr>
<th></th>
<th>Reforms</th>
<th>Wholesale Market</th>
</tr>
</thead>
<tbody>
<tr>
<td>Costa Rica</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>El Salvador</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Guatemala</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Honduras</td>
<td>Partial</td>
<td>No</td>
</tr>
<tr>
<td>Nicaragua</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Panama</td>
<td>Yes</td>
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</tr>
</tbody>
</table>
Electricity Sector Organization

Regional Market / EOR

- GU Market
- ES Market
- HO System
- NI Market
- PA Market
- CR System

Interface GU-MER
Interface ES-MER
Interface HO-MER
Interface NI-MER
Interface CR-MER
Interface PA-MER
Objectives of the MER

• Optimization of operation, reduction of variable costs and improvement of service quality, taking into consideration:
  – Reluctance of the countries to change their market models,
  – But aware of the benefits of trading
  – Hydrological diversity
  – Load peaks not simultaneous
• Allow firm contracts between agents of different countries
• And also, as long term objective
  – Development of regional scale generation projects (LNG, hydro,gas,..)
  – Optimization of primary resources
  – Sharing of reserves
Main Aspects of the Regional Market

• Market
  – Bilateral contracts (firm contracts with firm rights have dispatch priority)
  – Spot
    • Day Ahead
    • Real time balance
  – Nodal prices
• Regional grid (RTR): SIEPAC + existing connections between countries + national lines allocated to regional operation + regional expansions
• Expansion of the regional grid: planned and market based
• Market bids are used for the allocation of scarce transmission capacity. In the definitive design, firm and financial congestion rights are auctioned.
• Mutual support in emergencies
Day Ahead Market Functioning

- National SO&MO dispatch national markets
- After national dispatches, agents present bids to the MER,
- EOR clears the MER, and informs national SO&MO,
- National SO&MO adjust national dispatches to include regional transactions
- National SO&MO takes responsibility to maintain the schedules flows in the interconnectors
- Deviations are settled by the EOR
Firm Contracts

- **Firm Contracts (FC)** are bilateral contracts between agents who belong to different countries of the Central American market. The seller commits to sell firm energy to the buyer at the withdrawal node of the Regional Transmission Network (RTR).

- The energy committed in a regional FC cannot be committed in a national market and should be considered as firm energy in the country where the withdrawal node is located.

- One of the sides of the contract has to hold the ownership of the transmission rights in the direction from the injection to the withdrawal node. This is needed to validate the Firm Contract.

- In the commercial program of the regional pre-dispatch, the Selling Party in a Firm Contract is obliged to present an offer to the Regional Opportunity Market (MOR) of a quantity equal or greater than the energy object of the contract.
Scheduling of firm contracts

Planification process of Firm Contracts (CF)

- Seller Agent
- Contract issuance
- Buyer Agent
- CRIE
- Nat. Regulator

Daily contract offer

Daily process of offers reception

Review of requirements and inconsistencies

Pre-dispatch process

Technical and commercial verification

Publication of the daily program of regional energy

Regulatory reviews

Regulatory validations
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History

• 1996-1998: The SIEPAC (Interconnection System for Central América) treaty was signed in 1996 and ratified in 1998. It foresees:
  - Development of the regional network (the SIEPAC project), connecting the 6 countries, with a new 230 kV grid
  - Creation of the electricity regional market (MER)
• 2000: General design of the regional market is completed
• 2001: The regional regulatory agency CRIE starts functioning
• 2002: CRIE approved the temporary code for operation of the MER
• 2002: Transitory regional SO starts functioning
• 2002: Starts operation of MER, with temporary rules
• 2002-2004: development of definitive market and transmission codes, and organization of CRIE and regional SO (EOR)
• 2004-2019: progressive implementation of the designed market, presently fully operational
Governance of the Regional Market

• The MER constitutes the seventh market, superposed with the existent markets in the six countries.

• Agents (Market participants) of the six countries are allowed to participate of the MER

• Regional institutions
  – CRIE (regulatory)
  – EOR (SO&MO)

• Countries can preserve local regulations, with the changes necessary for compatibility with regional codes.

• Regional firm contracts are the basis for trading and expansion

• Spot market provides opportunities for short term optimization and balancing
Network Owner Company (EPR)

Made up of shares of the six countries of Central America, ENDESA and ISA Colombia, who add capital for the development of the SIEPAC project.
Organization of EPR

• EPR is the company that built, and presently maintains and owns SIEPAC transmission facilities. EPR owns the assets but do not operate them. Operation is in charge of the EOR.

• Shareholders of EPR are:
  – National transmission companies of CA countries
  – ENDESA of Spain.

• Individual shareholders are not allowed to own more than 15% of shares.

• Concession contract for building, operation and maintenance of SIEPAC facilities.

• Regulated revenues based on efficient cost of service (price cap).
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Challenges of MER

• Compatibilization of six different regulatory codes and organizations of electricity sectors in the six countries.
• Regional institutions: CRIE and EOR.
• Create conditions to encourage development of regional scale generation projects.
• Firm contracts: trust of regulatory agencies in regional contracts.
• Transmission tolls.
• Expansion of regional transmission is a prerequisite to increase trade.
Actual and forecasted dispatch
Net transactions
Exports and Imports by Country
Marginal Cost by Country

Figura 45. Costo marginal promedio mensual para los países del MER.
Lessons learned

- **Political and regulatory issues.** Due to the fact that each country faces different political challenges the effort required to harmonize local regulations is different in each country. The approval of the associated regulatory changes use to present delays.

- **Generation and Transmission needs.** The obsolescence of generation and transmission assets may create critical situations in the regional market. Both are key to foster the commercial relationship within the regional market.

- **Coincidence of interests and needs.** Due to the interaction between political factors and investments it is crucial to generate commitments and to match investor interests and political willingness to benefit the region.
Q&A