Current International Perspectives on Recent Market Developments in Mexico

Opportunities and Challenges

Presented to: NARUC 2019
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Development in Mexico
Drivers in the First Year of the AMLO Administration, Who Is Involved

- For CFE, development closely linked to the growth of natural gas fired resources and avoidance of retirements to retain wholesale market share.
- For the private sector, renewable energy resources remain the focus which likely ultimately will require larger amount of variable resources to be integrated.

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Title/Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>SENER</td>
<td>Ministry of Energy</td>
</tr>
<tr>
<td>SHCP</td>
<td>Ministry of the Treasury</td>
</tr>
<tr>
<td>SE</td>
<td>Ministry of the Economy</td>
</tr>
<tr>
<td>SFP</td>
<td>Ministry of the Controller</td>
</tr>
<tr>
<td>CFE</td>
<td>Modernization, Distribution, Customer Services, Operations</td>
</tr>
<tr>
<td>CENACE</td>
<td>ISO, including Planning, Transmission, Generation</td>
</tr>
<tr>
<td>CRE</td>
<td>Regulatory Commission</td>
</tr>
<tr>
<td>CONUEE</td>
<td>Energy Efficiency Commission</td>
</tr>
<tr>
<td>PROFECO</td>
<td>Consumer Protection Agency</td>
</tr>
<tr>
<td>NOM</td>
<td>Standards Organization</td>
</tr>
</tbody>
</table>

Source: Que Advisors
Retail electricity prices in Mexico varied widely between different consumer classes and regionally.

Agriculture and Residential consumers had the lowest tariffs, with agriculture clients paying less than a third of the second least expensive group.

Medium and large enterprises paid roughly the same tariffs as industrial and residential clients.

Customers in the services and commercial sectors paid the highest retail tariffs.

Source: CFE, CRE, SENER, Que Advisors
Mexico Electricity Sector Reform
Initial Timeline

- **Draft Market Rules issued February 24, 2015**
- **End of 2015: Publication of Draft rules and market operations manual**
- **Late 2015: Restructuring of CFE**
- **January 1st 2016: Wholesale market begins operation**
- **2016 – 2018: Full market implementation**

**Market**
- CENACE’s Creation
- Contract Creation
- Power Market Operation
- First Market Rules

**Transmission and Distribution**
- Regulates Rates
- National Electric System Development Program

**Power Industry**
- Regulations of the PI
- Restructuring of the CFE
- Terms of Separation of CFE

**Clean Energy**
- Guidelines on Clean Energy
- Clean Energy Requirements
- Auctions for Basic Supplies
- Requests for Interconnection
- Geothermal Round 0
- Geothermal Round 1

**Source:** CFE, CRE, SENER, Que Advisors
Mexico Wholesale Production Costs
Sample Region

Source: CFE, CRE, Que Advisors

<table>
<thead>
<tr>
<th>Feb-Nov</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min</td>
<td>$17.25</td>
<td>$19.06</td>
<td>$7.34</td>
</tr>
<tr>
<td>1%</td>
<td>$22.14</td>
<td>$24.16</td>
<td>$16.14</td>
</tr>
<tr>
<td>5%</td>
<td>$26.69</td>
<td>$29.88</td>
<td>$26.75</td>
</tr>
<tr>
<td>10%</td>
<td>$29.45</td>
<td>$35.12</td>
<td>$31.25</td>
</tr>
<tr>
<td>50%</td>
<td>$44.58</td>
<td>$65.78</td>
<td>$83.48</td>
</tr>
<tr>
<td>90%</td>
<td>$68.68</td>
<td>$100.70</td>
<td>$141.87</td>
</tr>
<tr>
<td>95%</td>
<td>$75.26</td>
<td>$130.93</td>
<td>$168.14</td>
</tr>
<tr>
<td>99%</td>
<td>$126.68</td>
<td>$210.39</td>
<td>$253.44</td>
</tr>
<tr>
<td>Max</td>
<td>$340.95</td>
<td>$376.08</td>
<td>$449.51</td>
</tr>
<tr>
<td>Average</td>
<td>$48.85</td>
<td>$69.29</td>
<td>$88.06</td>
</tr>
</tbody>
</table>

Source: CFE, CRE, Que Advisors
ELECTRICITY AND NATURAL GAS OVERVIEW

Investors During the Transition
Observations From the First Year of the AMLO Administration

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional CFE RFP’s</td>
<td>Power generation and gas pipelines.</td>
<td>Limited in 1H2019.</td>
</tr>
<tr>
<td>“Special Situations”</td>
<td>Border Gen/Transmission assets</td>
<td>Continue interest in 1H2019.</td>
</tr>
</tbody>
</table>

- 4Q2018 suspension of auctions have shifted focus to bilateral transactions for PPAs.
- Situation still challenging but some projects are moving ahead independent of CFE.
- Difficult to structure PPAs; few credit worthy marketing entities both QS and Aggregators. Project finance structures challenging; bias for larger amounts of equity; favors corporates.
- SENER indicates possibility exists for new auctions in “special situations”.
- Overall, investment depends in part on market design specifics that CENACE, CENAGAS, and stakeholders develop as well as forthcoming policy vehicles.
- International investors have questions/concerns about CFE gas pipeline renegotiation process.
- Recent revisions to the role of CFE would benefit from greater industry consensus.

Source: Que Advisors
Mexico Electricity Sector Reform
Observations About the First Year of the AMLO Administration

Milestones Reached

– Independent system operators CENACE and CENAGAS established and functioning.
– Initial market design largely implemented.
– System expansion plans continue to be presented (PRODESEN).
– Initial CFE separation completed.
– Spot Market operations and reliability management continuing.
– Three auctions for long term energy and CEL contracts completed; currently suspended.

Next Steps

– Need consensus for revised market design and enhancements; long term auction process and revisions not clear; centralized institutions not fully implemented or not operational.
– System expansion plans presented; questions remain among industry participants as to quantitative results; lack of consensus about operating reserve margin.
– Revisions to CFE separation lack industry consensus.
– Revisions to the role of CELs and long term commitments to CEL process and Paris accords not clear; recent pilot for managing greenhouse gases under review by industry participants.
– Need process for future transmission additions; not currently clear.

Source: SENER, Que Advisors
ELECTRICITY AND NATURAL GAS OVERVIEW

CFE View of Smart Grid
Traditional Components, Changing Rules, Implication for Implementation

Source: CFE
# ELECTRICITY AND NATURAL GAS OVERVIEW

## Smart Grid Drivers

**Vary Globally**

<table>
<thead>
<tr>
<th></th>
<th>CFE</th>
<th>Latin America/Caribbean</th>
<th>Europe/Eurasia</th>
<th>Middle East/Africa</th>
<th>Asia/Oceania</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lowering power losses in the national system</td>
<td>Reliability Improvements</td>
<td>Integration with Renewable Energy</td>
<td>Optimizing Energy Consumption</td>
<td>Reliability Improvements</td>
</tr>
<tr>
<td>2</td>
<td>Enterprise Architecture for IT</td>
<td>Power Quality Improvements</td>
<td>Demand Response and Management</td>
<td>Reducing Operating and Maintenance Costs</td>
<td>Power Restoration Improvements</td>
</tr>
<tr>
<td>3</td>
<td>Strengthening customer communication systems</td>
<td>Improving revenue collection and assurance; reduction of commercial losses</td>
<td>Reducing Operating and Maintenance Costs</td>
<td>Reducing Losses</td>
<td>Optimizing Energy Consumption</td>
</tr>
<tr>
<td>4</td>
<td>Asset Management Systems</td>
<td>Power System Restoration Improvements</td>
<td>Integration of Distributed Energy Resources</td>
<td>New and Improved Services for the Customer</td>
<td>Reduce Operating and Maintenance Cost</td>
</tr>
<tr>
<td>5</td>
<td>Institutional system of GIS</td>
<td>Energy Efficiency</td>
<td>Power Quality Improvements</td>
<td>Improved Revenue Collection and Assurance</td>
<td>Power Quality Improvements</td>
</tr>
</tbody>
</table>

### Additional Mexico-Specific Issues:
- Retail Customer Classes, Retail Subsidies
- Energy Poverty, Unmet Demand
- CEL Credits, Capacity Market Participation

*Source: ESTA international survey of International Smart Grid Drivers, Que Advisors*