SUPPORTING ENERGY EFFICIENCY AND CLEAN ENERGY PARTNERSHIPS BETWEEN CALIFORNIA AND MEXICO

LEONARDO BELTRÁN
DEPUTY SECRETARY FOR PLANNING AND ENERGY TRANSITION
I. Overview of the Energy Sector

II. Mexico’s Energy Reform

III. Investment Opportunities

IV. Final Comments: Current Collaboration
### Overview of the Energy Sector

<table>
<thead>
<tr>
<th>Year</th>
<th>Population</th>
<th>Cities</th>
<th>Population Change</th>
<th>Vehicles Using Petrol and Diesel</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>119 million</td>
<td>406</td>
<td>75% of the total population is located in cities</td>
<td>30.7 million vehicles using petrol and diesel</td>
</tr>
<tr>
<td>2029</td>
<td>137 million</td>
<td>503</td>
<td>90% of the total population will be located in cities</td>
<td>39.8 million vehicles will use petrol and diesel</td>
</tr>
</tbody>
</table>
OVERVIEW OF THE ENERGY SECTOR

MEXICO: ENERGY PRODUCTION, CONSUMPTION AND ECONOMIC GROWTH (PETAJOULES)

2013: BEFORE ENERGY REFORM

- PRIMARY ENERGY PRODUCTION: AAGR: 1.32%
- ENERGY CONSUMPTION: AAGR: 2.25%

2015: AFTER ENERGY REFORM

- PRIMARY ENERGY PRODUCTION: AAGR: 3.19%
- ENERGY CONSUMPTION: AAGR: 4.14%

ENERGY DEFICIT

SOURCE: ENERGY INFORMATION SYSTEM, MINISTRY OF ENERGY
Mexico’s Energy Reform
Electricity Sector

New Legal Framework & Institutional Arrangement

Create a Wholesale Electricity Market

Increased Competition / Competitive Prices

Participation of Enterprises Under Equal Conditions

Incentives for Clean Energies
MAIN MANDATES

- Transition towards the sustainable use of energy
- Gradual increase of clean energy in the national energy grid,
- Reduction in the carbon footprint of the energy sector
- Aligning the mandate on climate change and the electrical industry

PLANNING INSTRUMENTS (ADVISORY COUNCIL)

- Transition strategy to promote the use of cleaner technologies and fuels
- Special program for the energy transition
- National program for sustainable use of energy.
AVERAGE DAILY IRRADIATION IN MEXICO IS ABOUT 5.5 KWH/M²/D, AND CAN REACH VALUES HIGHER THAN 8.5KWH/M².

**STUDIES TO CHARACTERIZE THE WIND RESOURCE IN REGIONS OF THE ISTHMUS OF TEHUANTEPEC, THE PENINSULAS OF YUCATAN AND BAJA CALIFORNIA, AND THE NORTHERN REGION OF THE GULF OF MEXICO.**

***GEOTHERMAL POTENTIAL BASED ON THE CENSUS OF MORE THAN 1,300 HOT SPOTS ESTIMATED BY THE FEDERAL ELECTRICITY COMMISSION.**

SOURCE: SENER, NATIONAL INVENTORY OF RENEWABLE ENERGIES
**Investment Opportunities**
Gradual penetration of renewables to the system

**Clean Power Generation: Geothermal**

- **Proven**: 286 MW
- **Probable**: 5,730 MW
- **Possible**: 7,422 MW

Total: 13.4 GW

- 15 Exploration’s Permits (508 MW)
- 2 Exploration’s Concessions (50 MW)
- 77 MW in addition to the 4 CFE’s field
- 11 Applications in process

**Countries**

- **U.S.A.**: 3,450 MW
- **Philippines**: 1,870 MW
- **Indonesia**: 1,340 MW
- **Nueva Zelanda**: 1,005 MW
- **Italy**: 916 MW
- **Mexico**: 899 MW
- **Mexico’s Outlook**: 1,534 MW

**Fuente:** Bertani, Ruggero, WGC, April 2015 / National Inventory of Renewable Energies
**Investment Opportunities**  
Gradual Penetration of Renewables to the System

## Clean Power Generation: Geothermal

<table>
<thead>
<tr>
<th><strong>Process for Investing</strong></th>
<th><strong>Drivers</strong></th>
</tr>
</thead>
</table>
| **Recognition**  
Registration for 8 months (SENER) |  
- New Legal Framework  
(Geothermal Energy Act) |
| **Exploration**  
3 Year Renewable Permit for Areas of Up to 150 km² |  
- Wholesale Electricity Market |
| **Exploitation**  
30 Year Renewable Concessions for Areas of Up to 150 km² |  
- Financial Risk Mitigation Mechanism |
|  |  
- Clean Energy Certificates |
### Investment Opportunities

#### Electricity Sector: 116 Billion Dollars

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Generation Additional Capacity</strong></td>
<td>60 GW (2015-2029)</td>
</tr>
<tr>
<td><strong>Wholesale Electricity Market</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Electricity Auctions</strong></td>
<td>(Clean energy certificates: 2018: 5%; 2019: 5.8%)</td>
</tr>
<tr>
<td><strong>Electric Interconnections with North America and Central America</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Interconnection of Baja California System-National System</strong></td>
<td></td>
</tr>
<tr>
<td><strong>New Transmission Lines</strong></td>
<td>24,600 km (2015-2029)</td>
</tr>
<tr>
<td><strong>Smart Grids and Distributed Generation</strong></td>
<td></td>
</tr>
</tbody>
</table>
The following systems began operations:

- Baja California: January 27th
- Sistema Nacional: January 29th
- Baja California Sur: March 23rd

Participation (397 average of daily offers):

- CFE / 183 permit holders represented by CFE
- Fenix Group
- Fisterra

Transparency and administrative flexibility:

- Greater transparency in generation costs
- Establishment of reference prices
- Simplification and administrative flexibility
INVESTMENT OPPORTUNITIES
LONG TERM ELECTRICITY AUCTION (LTEA)

1ST LTEA
RESULTS (MAR 29TH, 2016)

- 11 WINNING COMPANIES WILL ADD 2,085 MW OF GENERATING CAPACITY (81% SOLAR AND 19% WIND)
- CLEAN GENERATION WILL INCREASE 1.9%
- ESTIMATED INVESTMENT: 2.6 BILLION USD OVER THE NEXT 3 YEARS
- 7 STATES BENEFIT FROM INVESTMENT (AGS, BCS, COAH, GTO, JAL, TAMPS, & YUC.)
- AVERAGE PRICE: 47.78 USD FOR A PACKAGE OF 1 MWH AND 1 CLEAN ENERGY CERTIFICATE:
  - WIND: 55.39 USD
  - SOLAR: 45.15 USD

2ND LTEA

- TRANSPARENCY THROUGHOUT ALL PROCESS (HTTP://WWW.CENACE.GOB.MX)
- PROMOTE NEW INVESTMENTS IN CLEAN ENERGY GENERATION
- BEST PRACTICES FROM 1ST ELECTRICITY AUCTION
- CALL FOR TENDER: APRIL 29TH, 2016
- AWARDING: SEP. 30TH, 2016
1ST BID
WITH PRIVATE INVESTMENT

- ISTMO DE TEHUANTEPEC TO THE CENTER OF THE COUNTRY
- INVESTMENT: 1.2 BILLION USD
- HIGH-VOLTAGE DIRECT-CURRENT 600 LINEAR KM
- PRIVATE INVESTORS CAN COMPETE

2ND BID
INTERCONNECTION OF BAJA CALIFORNIA SYSTEM-NATIONAL SYSTEM

- INCLUSION OF THE PROJECT: PRODESEN 2016-2030
- ESTIMATED INVESTMENT: 1.2 BILLION OF USD
- CALL FOR TENDER AND AWARDING: 2017
- STARTING OF OPERATIONS: APRIL 2021
THE SENER AND THE STATE OF CALIFORNIA OF U.S.A. SIGNED A MOU FOR COOPERATION IN CLEAN ENERGIES (JULY 29TH, 2014)

UNIVERSITY OF CALIFORNIA AND SENER SIGNED A MOU (OCT. 30, 2014)
# Main Results

<table>
<thead>
<tr>
<th>Visits and Workshops</th>
<th>Academic Exchange &amp; Graduate Programs</th>
<th>Power Sector Transformation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Renewable Energy Symposium</strong></td>
<td><strong>Visits of professors, scientists and administrators</strong></td>
<td><strong>Carbon Market</strong></td>
</tr>
<tr>
<td><strong>Conferences Series: The Future of Energy</strong></td>
<td><strong>Academic Exchanges: Americas Institute UCSD</strong></td>
<td><strong>Technical Workshops:</strong></td>
</tr>
<tr>
<td><strong>Technical Workshops</strong></td>
<td><strong>MoU: Stanford University &amp; LBNL-Berkeley</strong></td>
<td><strong>Renewable Energy Technologies and Grid Integration</strong></td>
</tr>
<tr>
<td></td>
<td><strong>CCUS Postgraduate Program (LBNL-Berkeley)</strong></td>
<td><strong>Geothermal Energy and Grid Integration.</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Commercial Missions</strong></td>
</tr>
</tbody>
</table>