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Electricity Reform Overview

9th Annual RENEWABLE ENERGY & WATER SUMMIT

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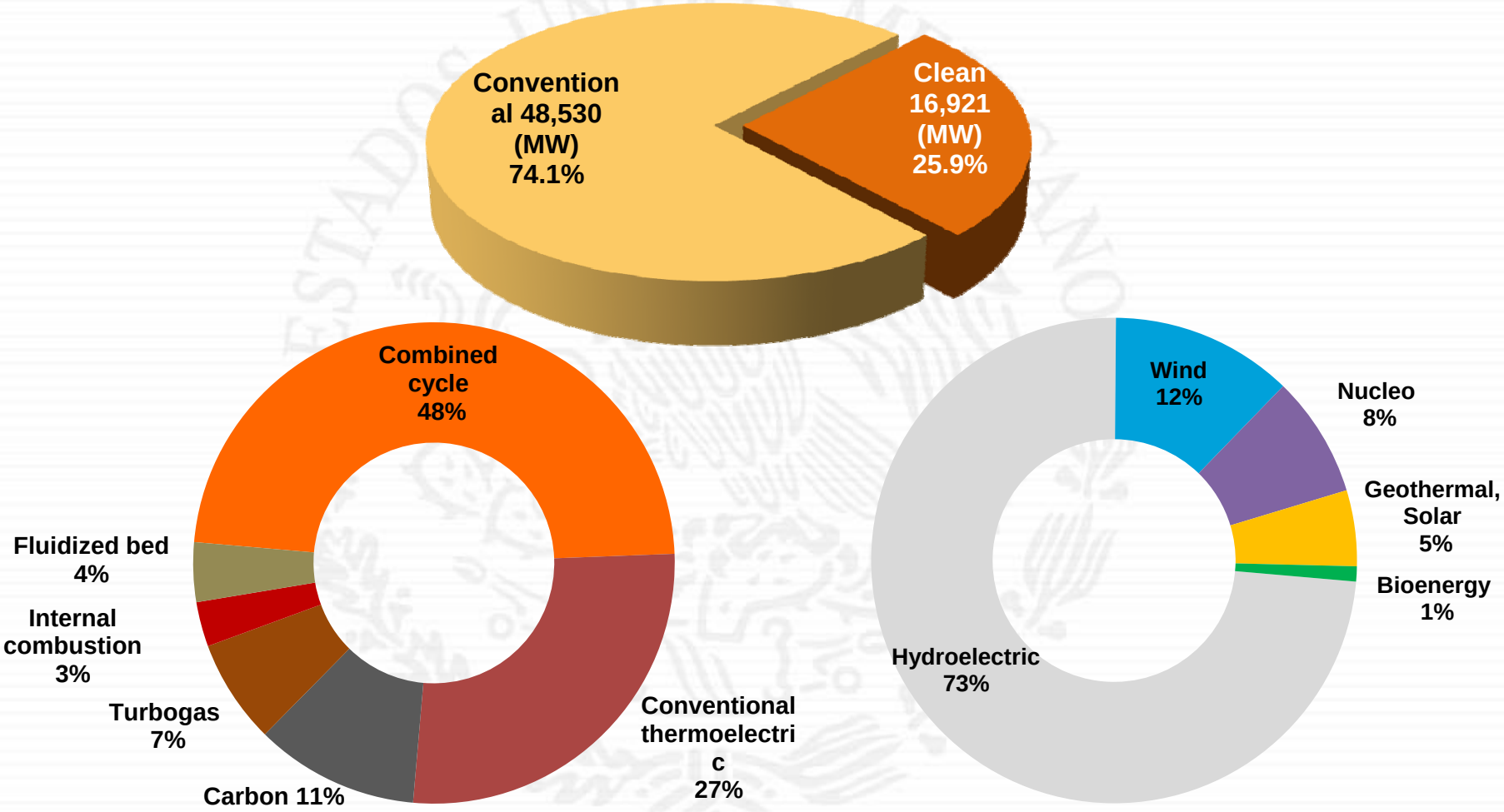
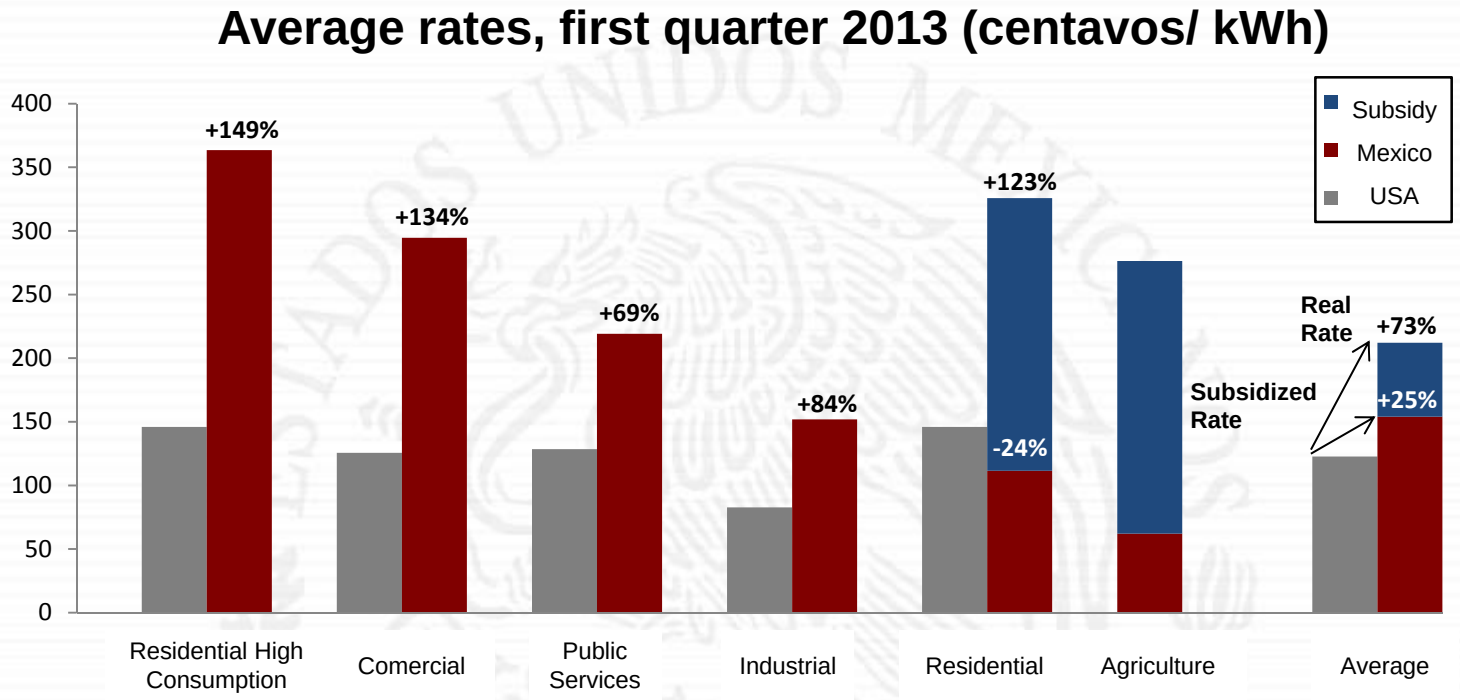
Minister for Energy Affairs
Embassy of Mexico

March 10, 2016

Generating Capacity (2014)



Electric Rates Pre-Reform



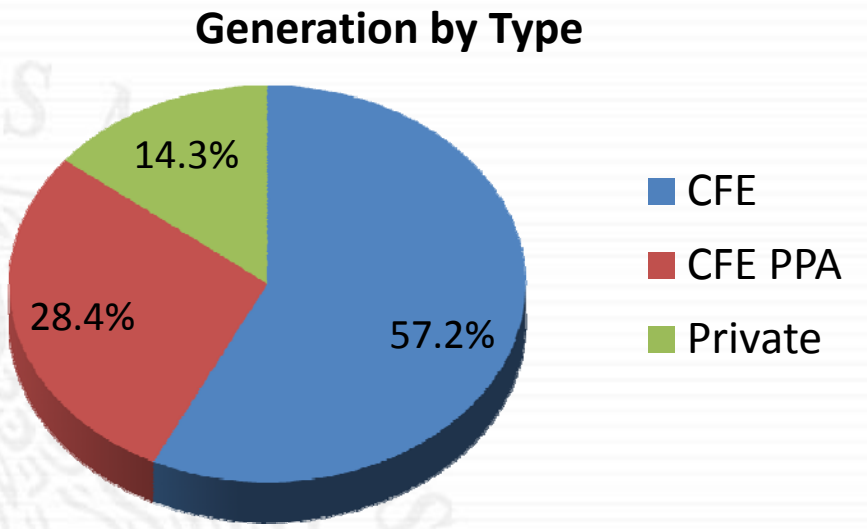
- Average rates: **25% higher than in the US**
- Without subsidies: **difference would be 73%**
- Subsidies equal to **0.75% of GDP**

Sources: Sistema de Información Energética (Mexico), Energy Information Administration (USA)

Background: Mexican Electric System

	Generation Capacity (MW)	
Conventional 48,530 MW	Combined Cycle	23,309
	Steam (Fuel Oil and Gas)	12,959
	Coal	5,958
	Simple Cycle	3,419
	Internal Combustion	1,312
	Multiple	1,573
Clean 16,921 MW	Hydro	12,429
	Wind	2,036
	Geothermal	813
	Solar	56
	Nuclear	1,400
	Biomass	180
	Other	7
	Total	65,452

Networks (km-c)	
400 kV	23,641
230 kV	27,543
Subtransmission (≥ 69 kV)	56,851
Distribution	683,226



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Objectives and Policies

Reform Objectives

- Reduce costs and rates
- More clean energy
- Spread the benefits

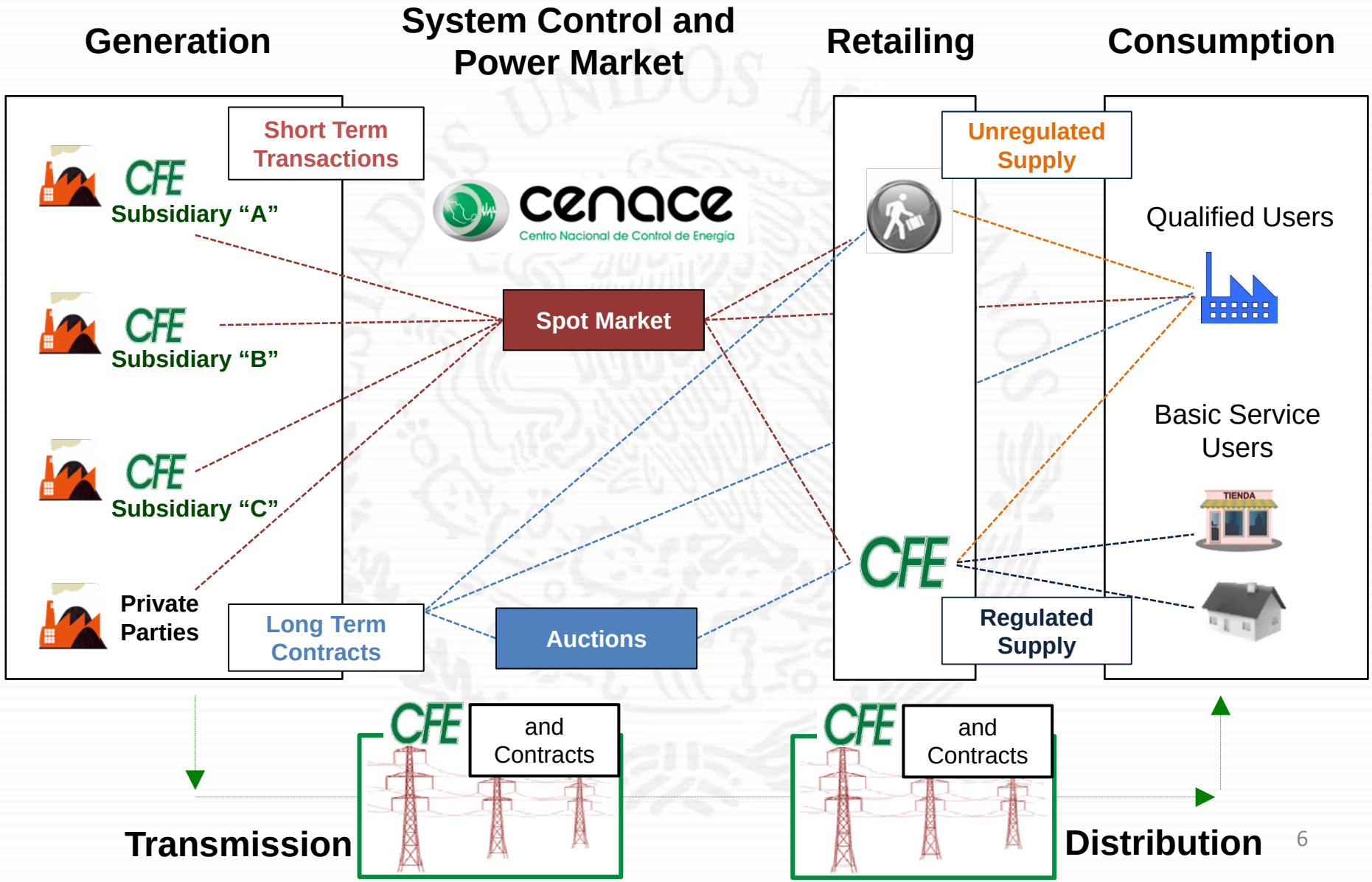
Reform Elements

- Industry Restructuring
- Competitive Market
- Clean Portfolio Standard
- Independent Planning

Reform Principles

- Incentives for value creation and efficient operation
- Decisions through competitive processes
- Open access and non-discrimination
- Transparency

New Industry Structure



Market Features

Market	Periodicity	Market Type
Energy and Ancillary Services	Daily, Hourly	Cost Based
Capacity	Yearly	Administered
Clean Energy Certificates	Yearly	Unrestricted offers
Financial Transmission Rights	Yearly / Monthly	Unrestricted offers

Auctions and Long Term Contracts

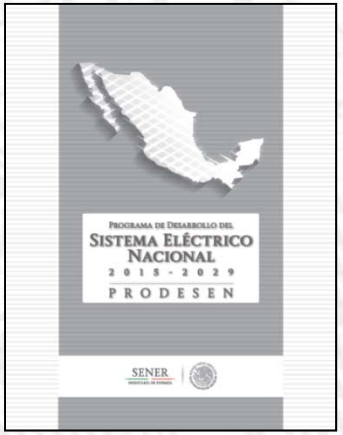
- CRE will set requirements for retailers to contract forward energy and associated products.
- Basic Service Retailers may only contract forward through auctions operated by CENACE.

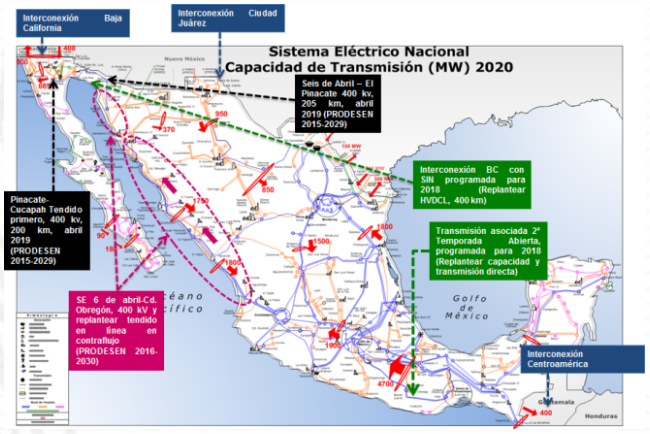
Transmission Planning and Investment

New mechanism:

1. SENER develops the Indicative Generation Expansion Plan
2. CENACE proposes the Transmission Expansion Plan
3. SENER publishes the System Development Program (PRODESEN)
4. SENER decides if new projects are built by CFE or in PPPs

First PRODESEN: 30 June 2015

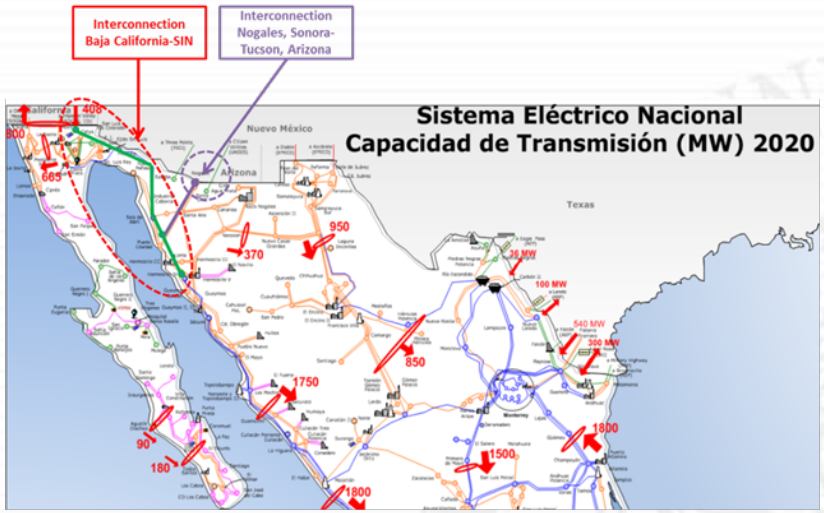




The new plan includes transmission projects worth **13.4 billion USD**

Planned Expansion 2015-2029		
Transmission	24,599	km-c
Transformation	64,352	MVA
Compensation	12,090	MVAr

Interconnections in PRODESEN 2016-2030

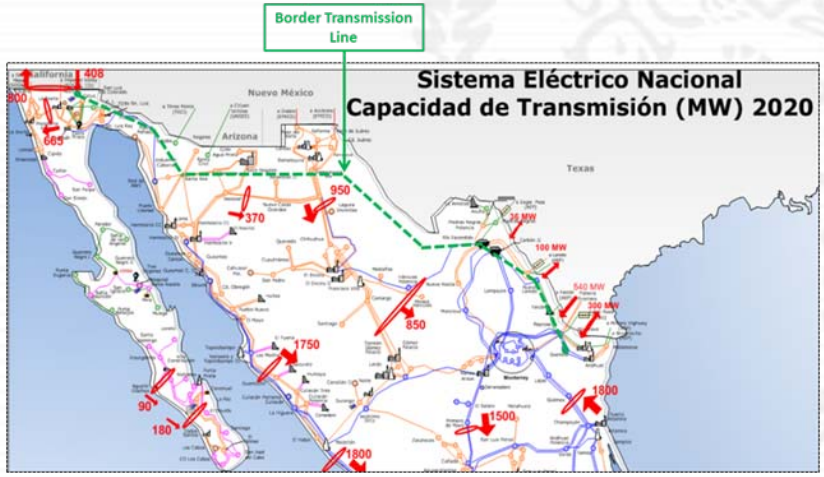


Interconnection Baja California-SIN :

- Back-to-Back link located in USA
- Estimated operation date Dec. 2018.

Interconnection Nogales-Tucson :

- Back-to-Back link located in Mexico.
- Estimated operation date 2021.

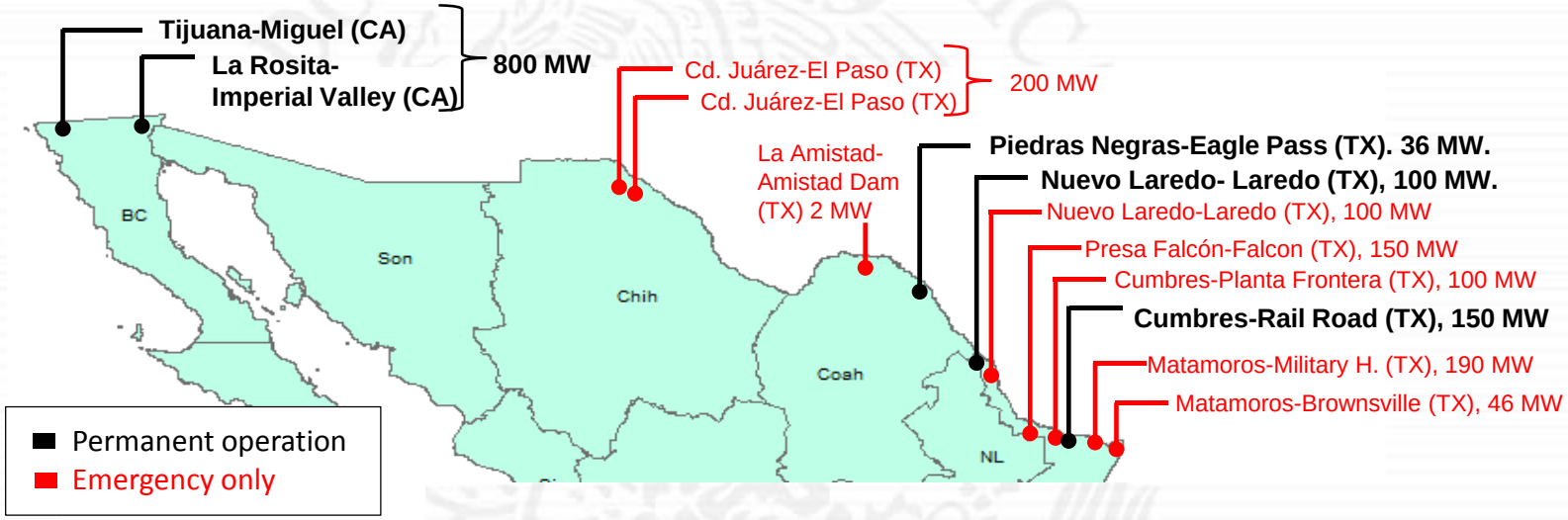


Border Transmission Line (under study):

- Direct Current (DC) transmission line, between 1,763 and 1,964 km long, depending on the path selected.
- This transmission line would allow Mexico to provide transmission services to the electricity system of the USA.

Cross-Border Interconnections

- Current Mexico-US interconnections:
  - 5 interconnections (1086 MW) in permanent operation.
  - 8 interconnections (788 MW) for emergency backup.

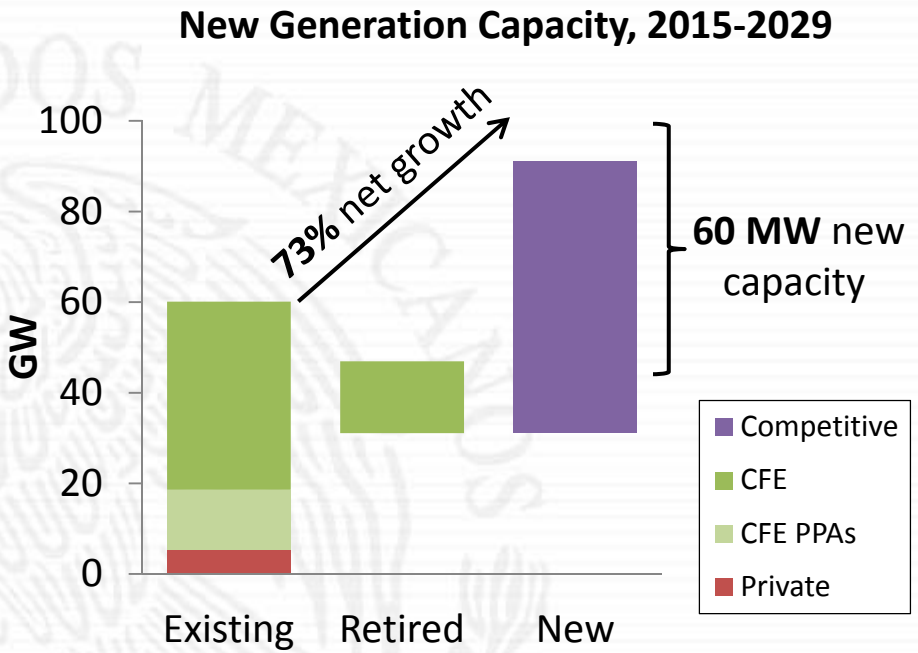


- 2014 statistics (system to system):

	Exports from Mexico	Imports to Mexico
CAISO	472,230 MWh	75,310 MWh
Total US	481,838 MWh	487,444 MWh

Generation Investment

Mexico will require 60 Gigawatts of new capacity (99 Billion USD) in the next 15 years.



Competitive modalities for generation investment:

- Auctions for contracts with the Basic Service Supplier
- Bilateral contracts with Qualified Users and Suppliers
- Merchant (short term contracts and spot sales)

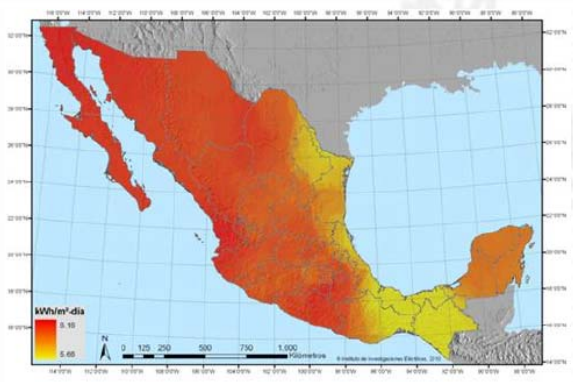
Clean Energy Potential in Mexico

Clean Energy Goals:

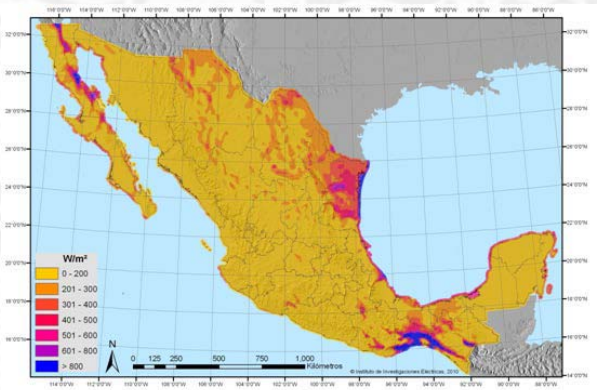
35% in 2024, 40% in 2035 and 50% in 2050

	Installed Capacity 2° semester 2014 (MW)	Renewable Energy Potential			
		Actual Generation Year 2013 (% of total GWh)	Actual Generation + Proven Resources	Actual Generation + Proven Resources +Probable Resource	Actual Generation + Proven Resources +Probable Resources +Possible Resource
Wind	1,900	1.4%	5.3%	5.3%	34.8%
Geothermal	823	2.0%	2.2%	22.5%	40.0%
Solar	64	0.01%	0.6%	0.6%	2,189.4%
Mini Hydro	419	0.5%	1.7%	9.5%	24.4%
Total	**3,206**	**4.0%**	**9.9%**	**37.9%**	**2,288.6%**

Solar Resources

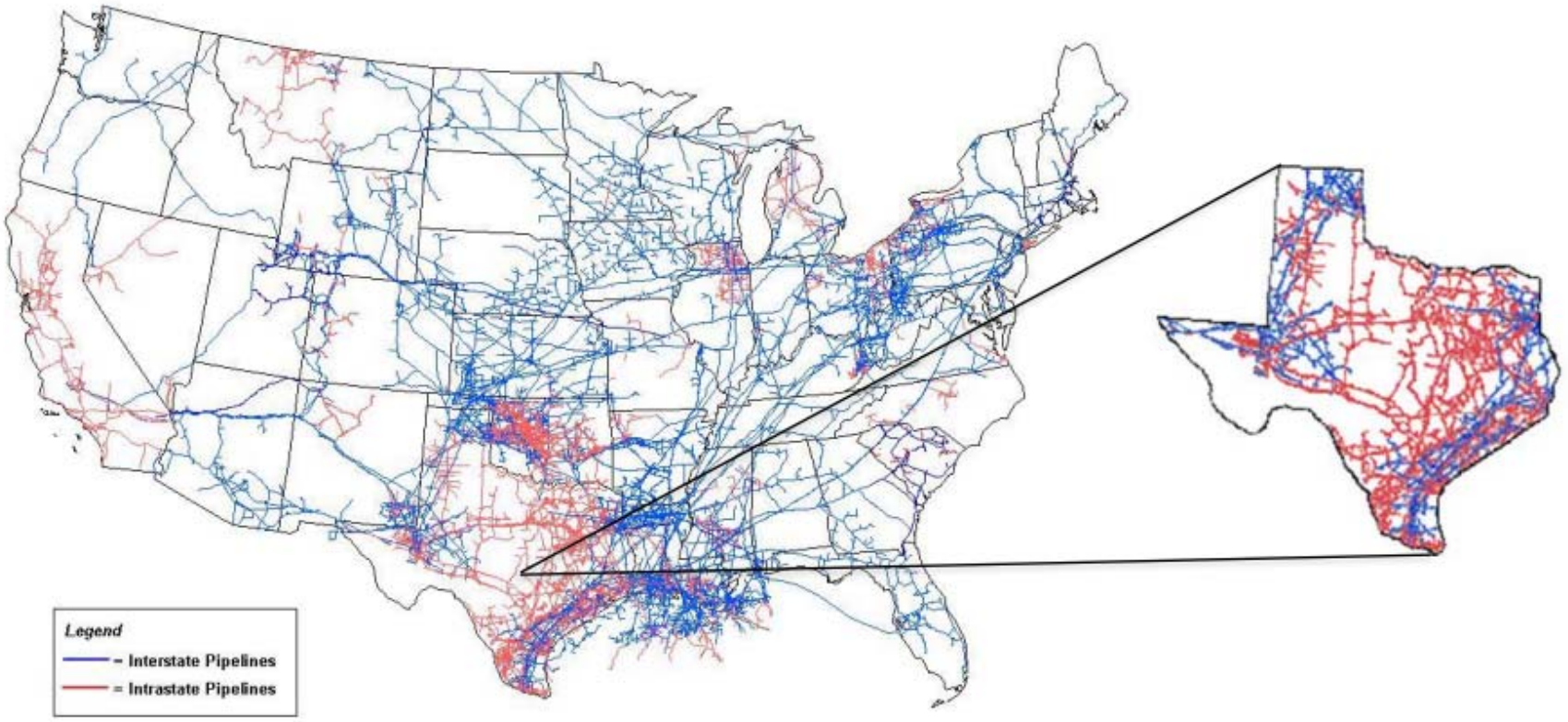


Wind Resources



Geothermal resources

The U.S. Natural Gas Pipeline Network has a length of cover 492,000 kilometers, which is 43 times longer than the Mexican National Gas pipeline System.



United States of America	
Natural Gas Pipelines	**Length (km)**
Intrastate	349,720
Interstate	142,665
Total	**492,385**

Texas	
Natural Gas Pipelines	**Length (km)**
Intrastate	72,420
Interstate	21,887
Total	**94,307**

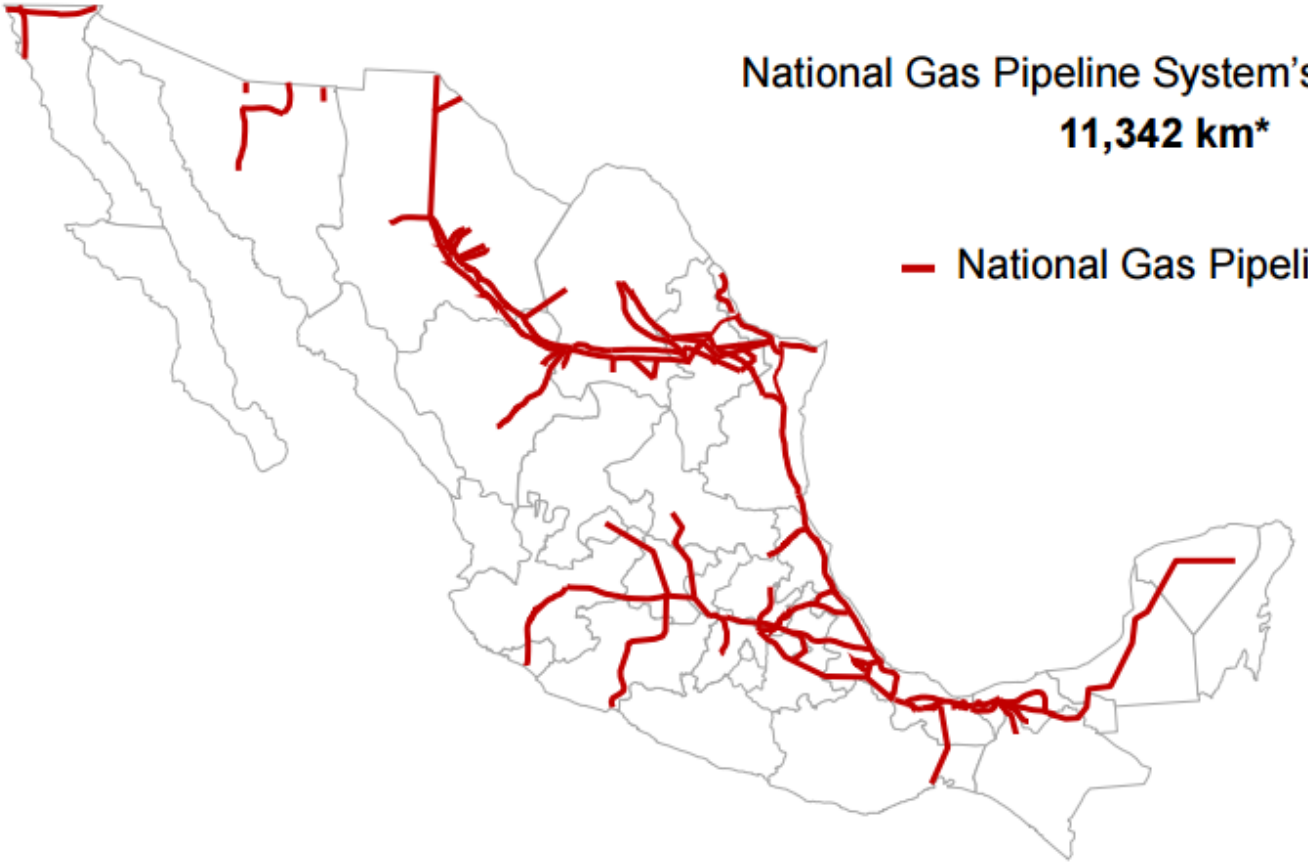
Mexico	
Natural Gas Pipelines	**Length (km)**
Existing network in 2013	11,342
Integral Strategy 2013*	3,818
Announced pipelines 2014	1,217
Total	**16,377**

NOTE: Intrastate Pipelines.- are natural gas pipelines that only operate in one state.
Interstate Pipelines.- are natural gas pipelines that operate in more than one state.
* The 2013 Natural Gas Integral Strategy considers projects promoted by Petróleos Mexicanos and the Comisión Federal de Electricidad. It includes 11 gas pipelines to be built in Mexico (3,818 km) and 2 in the United States (297 km).
Source: Energy Information Administration, Oil and Gas Office, Natural Gas Division, Natural Gas Transportation Information System, 2014.

Mexico does not have sufficient infrastructure to satisfy the country´s growing demand for natural gas. However, the National Infrastructure Program establishes mechanisms to cover the requirement infrastructure investments

The National Gas Pipeline System faces important challenges:

- Limited transport capacity.
- Limited redundancy.
- It does not reach all States.



National Gas Pipeline System's length (2013):

11,342 km*

— National Gas Pipeline Network

*This length includes Petróleos Mexicanos (Pemex) and private pipelines. It includes the 222 km pipeline from Pemex Gas y Petroquímica Básica's Jáltipan – Salina Cruz pipeline (rehabilitated in 2013). This length does not consider 383 km from the Chihuahua Pipeline, because it is part of the 2013 Integral Strategy.

Source: Natural Gas and LP Gas Prospective, 2013-2027, Ministry of Energy, 2013.

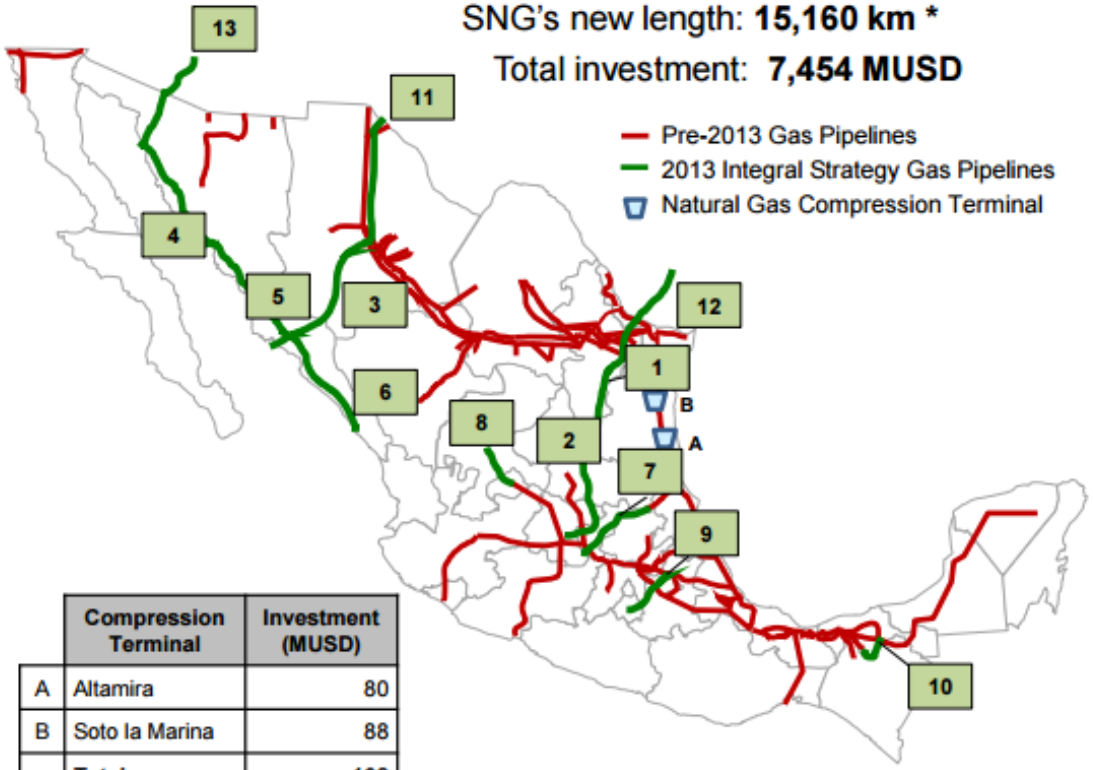
The Mexican State currently promotes the construction of projects equivalent to 34% of the National Gas Pipeline System (SNG).

- The CFE will continue to develop new routes to advance the redundancy and reliability of the natural gas transportation system.

SNG's length (2013): **11,342 km**

SNG's new length: **15,160 km ***

Total investment: **7,454 MUSD**



	Compression Terminal	Investment (MUSD)
A	Altamira	80
B	Soto la Marina	88
	Total	**168**

2013 Integral Strategy

	National gas pipelines	Length (km)	Investment (MUSD)
	Los Ramones	**842**	**2,535**
1	Ramones Fase I**	114	688
2	Ramones Fase II***	728	1,847
	North West	**1,944**	**2,411**
3	El Encino (Chih.) - Topolobampo (Sin.)	574	1,008
4	Sásabe - Guaymas	544	569
5	Guaymas - El Oro	364	429
6	El Oro - Mazatlán	462	405
	Other pipelines	**1,032**	**1,304**
7	Tamazunchale	229	468
8	Zacatecas	172	70
9	Morelos	172	246
10	Mayakán	76	125
11	Chihuahua****	383	395
	Total	**3,818**	**6,250**

	International Gas Pipelines	Length (km)	Investment (MUSD)
12	Agua Dulce -Frontera	200	828
13	Tucson - Sásabe	97	208
	Total	**297**	**1,036**

* It includes the projects from the Integral Strategy, as well as the 222 km from the rehabilitated Jáltipan-Salina Cruz pipeline.
** Los Ramones I project considers Los Ramones Compression Terminal.
*** The Chihuahua Pipeline started to operate in July 2013.
Source: 2013 Integral Natural Gas Supply Strategy, Ministry of Energy, 2013. MUSD: Million United States Dollars

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Achievements to Date

	Date	Content
Constitution	December 2013	• Competition in generation and retail; contracts and PPP • Vertical and horizontal separation
Secondary Laws	August 2014	• Wholesale Electricity Market • Independence of Regulators
CENACE	**August 2014**	• **Creation Decree**
Universal Serv.	Sept. 2014	• Creation of the Electrification Fund
Bylaws	October 2014	• Permit requirements, system planning process
Clean Energy	October 2014	• Guidelines for granting CEC and establishing requirements
Clean Energy	March 2015	• Clean Energy Certificate Requirements
Interconnection	June 2015	• Interconnection Criteria
Planning	August 2015	• System Expansion Program
Associations	August 2015	• Designation of transmission projects for PPP
Market Rules	**Sept. 2015**	• **Electric Power Market Bases**
Spot Market	**Jan. 2016**	• **Beginning of Short Term Market Operations**

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Next Steps

- The Wholesale Electric Market will continue to implement new functions during the next two and a half years.

Milestone	Date
Adjudication of the First Long-Term Auction	March 2016
Tender for Second Long-Term Auction	April 2016
Medium-Term Auctions for Energy and Capacity	October 2016
Auctions for Financial Transmission Rights	November 2016
Complete Implementation of the Short Term Market	January 2017
Capacity Balancing Market	February 2017
Clean Energy Certificate Market	2018

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Results of the Electric Reform

Transparency

- The public can verify the efficient dispatch of CENACE, using published models
- The market monitor evaluates the behavior of CENACE and market participants
- Confidence is gained; the level playing field is evident

Price Signals

- Prices reflect the true value of each product, considering the time and place of delivery
- The complete market history is public information
- Generators can make informed decisions about the location an technology of new plants

Simplification

- Self-supply societies and other processes from the old regime are no longer required
- All generators and marketers can buy and sell freely in the market
- The elimination of barriers promotes competition

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Thank you!

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