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SECRETARÍA DE ENERGÍA

Regional Address to the CAISO Stakeholder Symposium

Electricity Reform in Mexico

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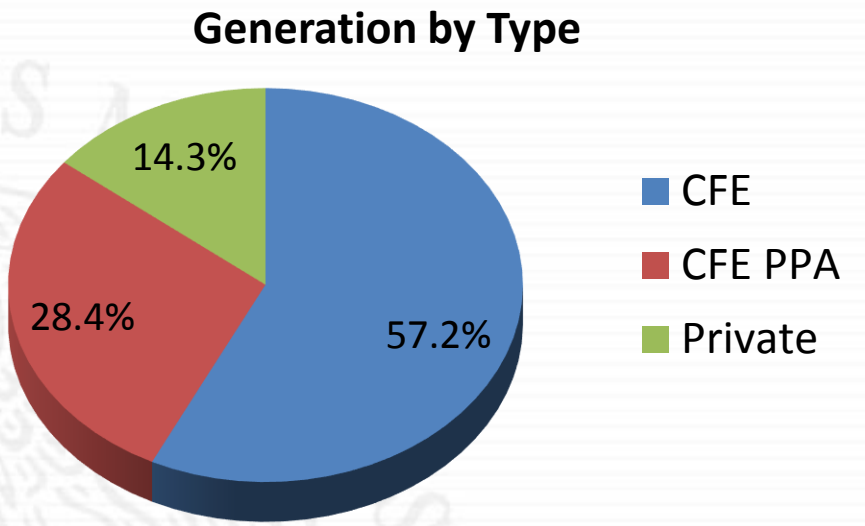
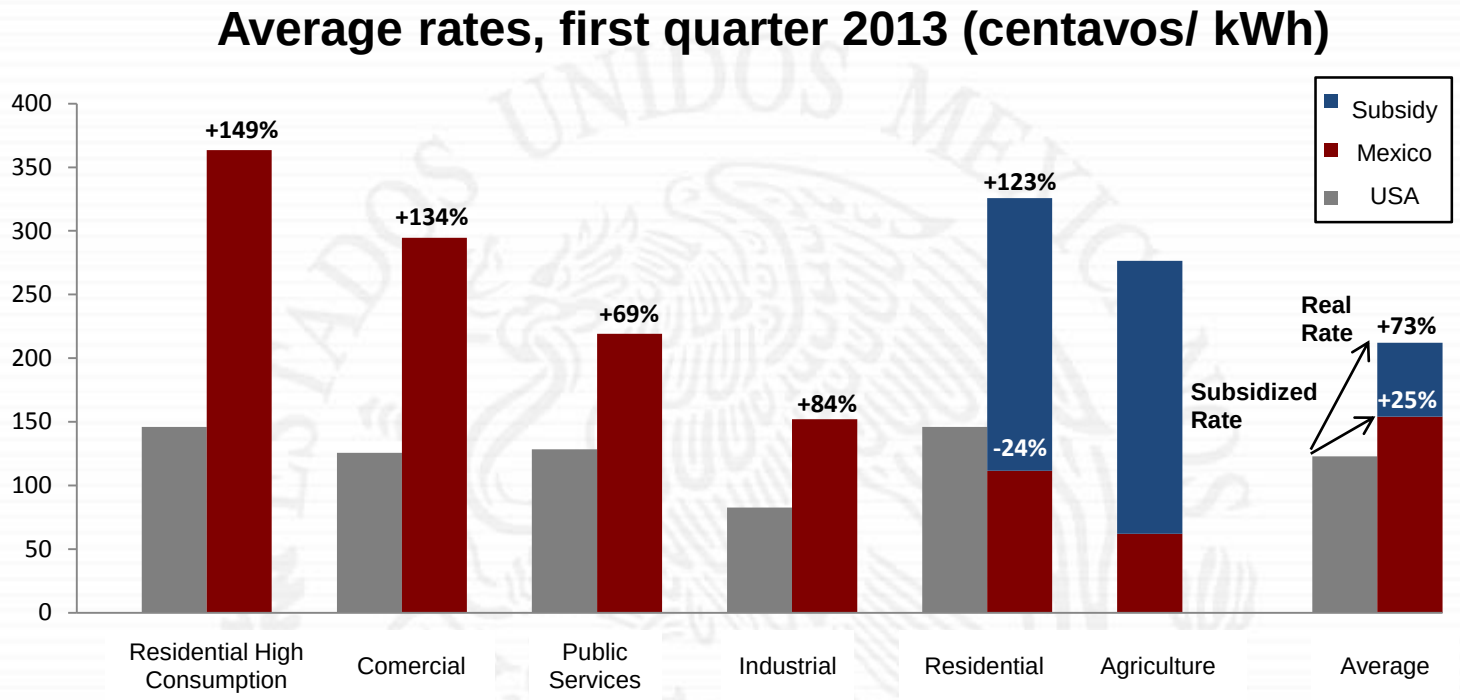
Background: Mexican Electric System

	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



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)

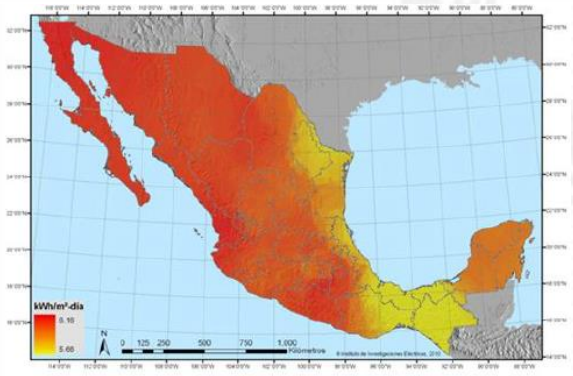
Clean Energy Potential in Mexico

Clean Energy Goals:

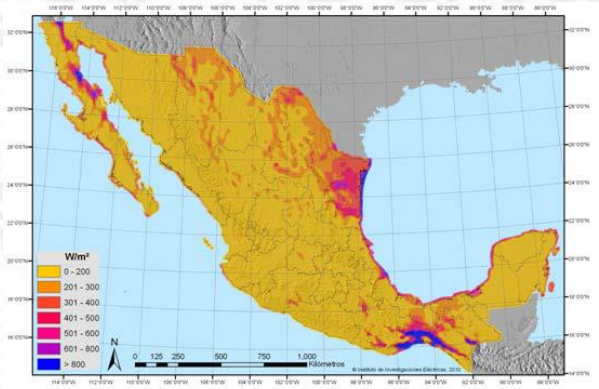
35% in 2024, 40% in 2035 and 50% in 2050

	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

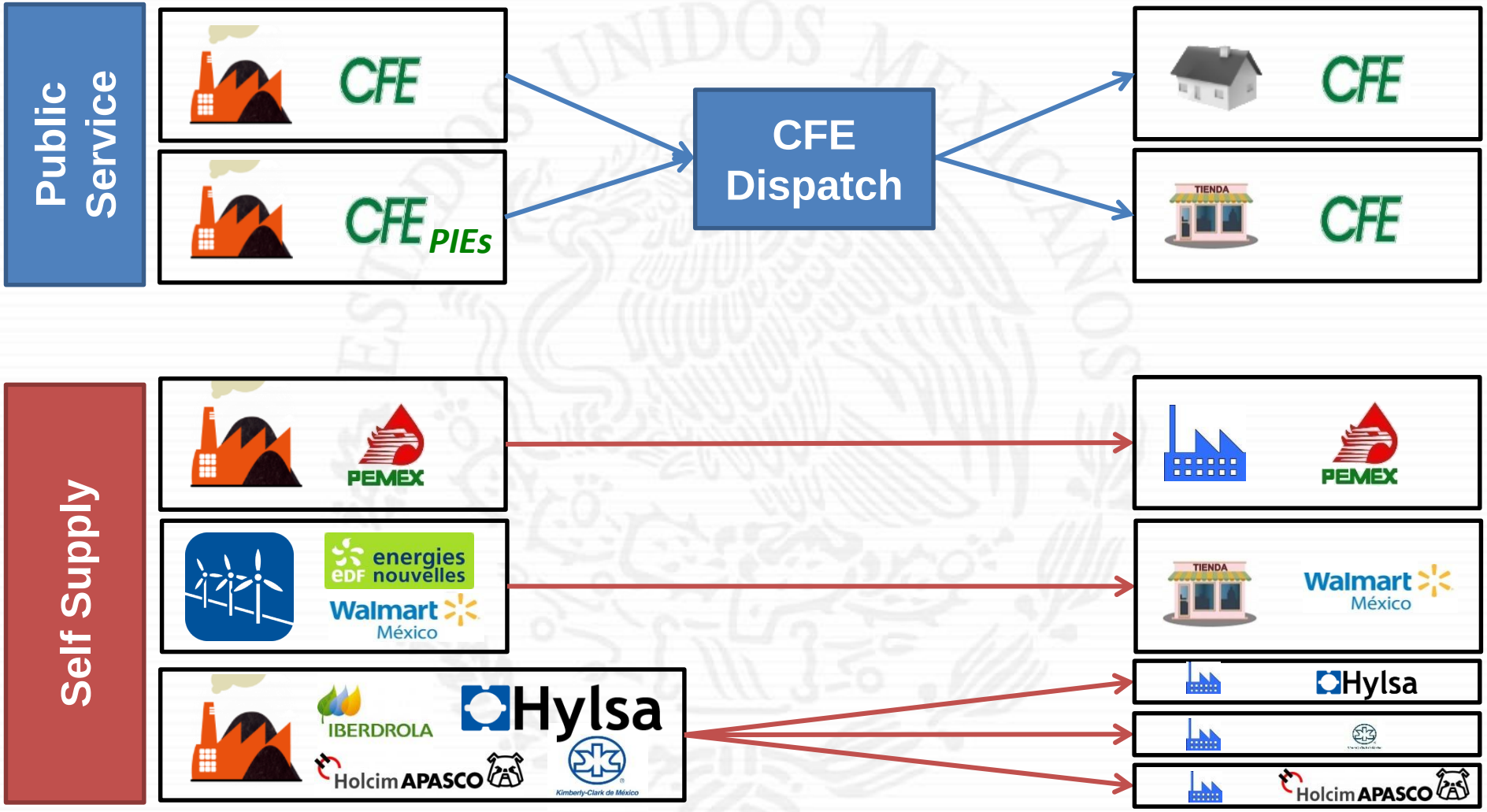


Wind Resources



Geothermal resources

Industry Structure Pre-Reform



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Objectives of the Reform

Reform Objectives

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

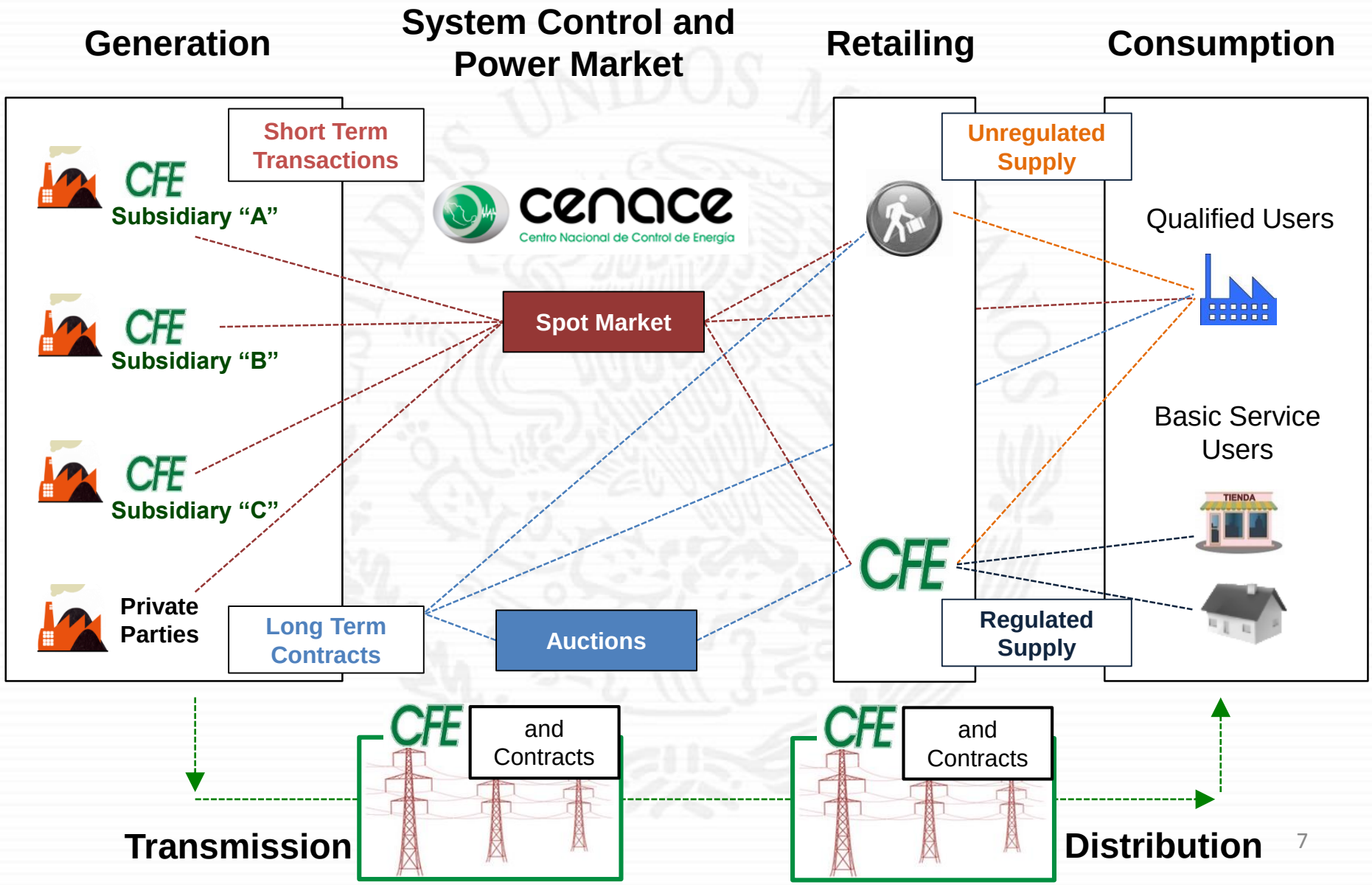
Reform Elements

- 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.

Short Term Market: General Characteristics

Objectives

- Efficient and reliable dispatch of the National Electric System.
- Correct signals for the location of new electric plants and the use of controllable demand.

Features

- Two-Settlement (Day Ahead and Real Time).
- Nodal prices (approximately 2000 nodes).
- Three part offers.
- Co-optimization of energy and ancillary services.
- Economic unit commitment by system operator.
- Cost based offers and market monitoring.
- Initial market based on existing CENACE software.

Cross-Border Transactions in the Power Market

Source	Sink	CRE Permits	Market Participation
SEN or Foreign System	Foreign System or SEN	No specific permit	• In any modality • Transactions in competitive market
Standalone Foreign Plant	SEN	Authorization only	• As Generator • Dispatch as any other plant.
SEN	Standalone Foreign Load	Authorization only	• In any modality • Transactions in competitive market
Foreign System	Standalone Mexican Load	Authorization only	• Market participation not required.
Standalone Mexican Plant	Foreign System	Generation Permit	• Market participation not required.

Market Stages

FIRST Stage Market	SECOND Stage Market
▪ Two Settlement Market: DA and RT	▪ Three Settlement Market: DA, HA and RT
▪ 15 minute dispatch intervals	▪ 5 minute dispatch intervals
▪ No virtual offers are permitted	▪ Virtual offers are allowed
▪ Demand Response is not dispatched by CENACE	▪ CENACE will dispatch demand in the DA and RT Markets.
▪ Simplified RSG calculation	▪ Separate RSG calculation per startup and for out of merit dispatch
▪ Scarcity pricing only applies when there is true scarcity; prices are capped at the highest cost generator	▪ Gradual scarcity pricing is implemented as a complement to the capacity market.

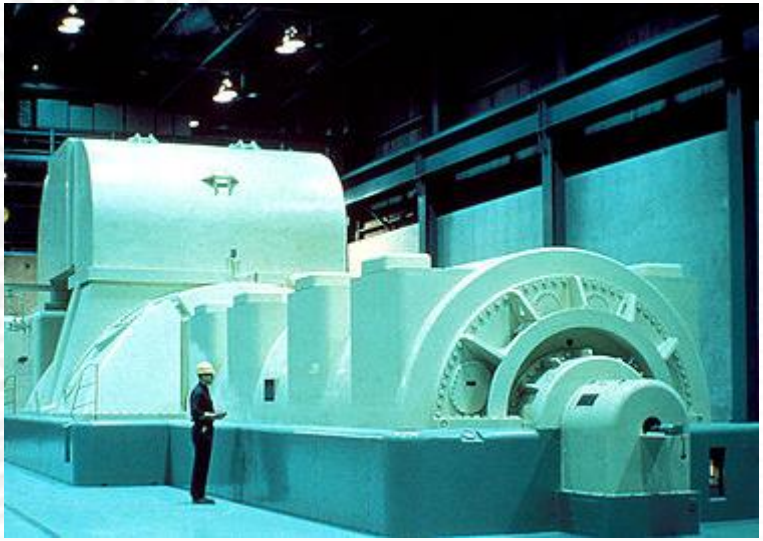
Capacity Market: General Characteristics

Objectives

- Installation of sufficient capacity.
- Pay the fixed costs that aren't recovered in the energy market.
- New investments need long term contracts, but the short term capacity market must pay the right prices.

Features

- Ex-post market to avoid market power concerns and incentives to over-report capacities.
- Demand curve based on the Cost of New Entry.
- Zonal capacity requirements when necessary.



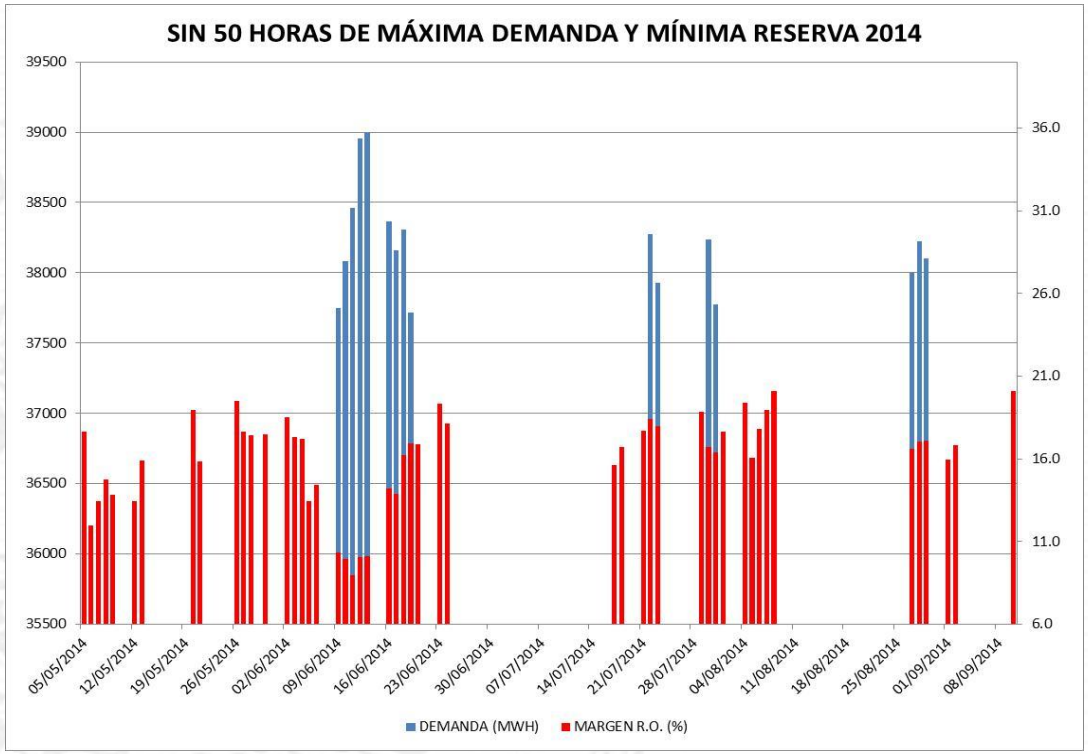
Capacity Definition

Objectives

- Pay for capacity when the system needs it.
- Allow the definition to evolve with the system.

Definition

- Availability in the 100 critical hours of the year:
  - First stage: Maximum demand.
  - Second stage: Minimum reserves.
- Intermittent Plants: Availability as generated.



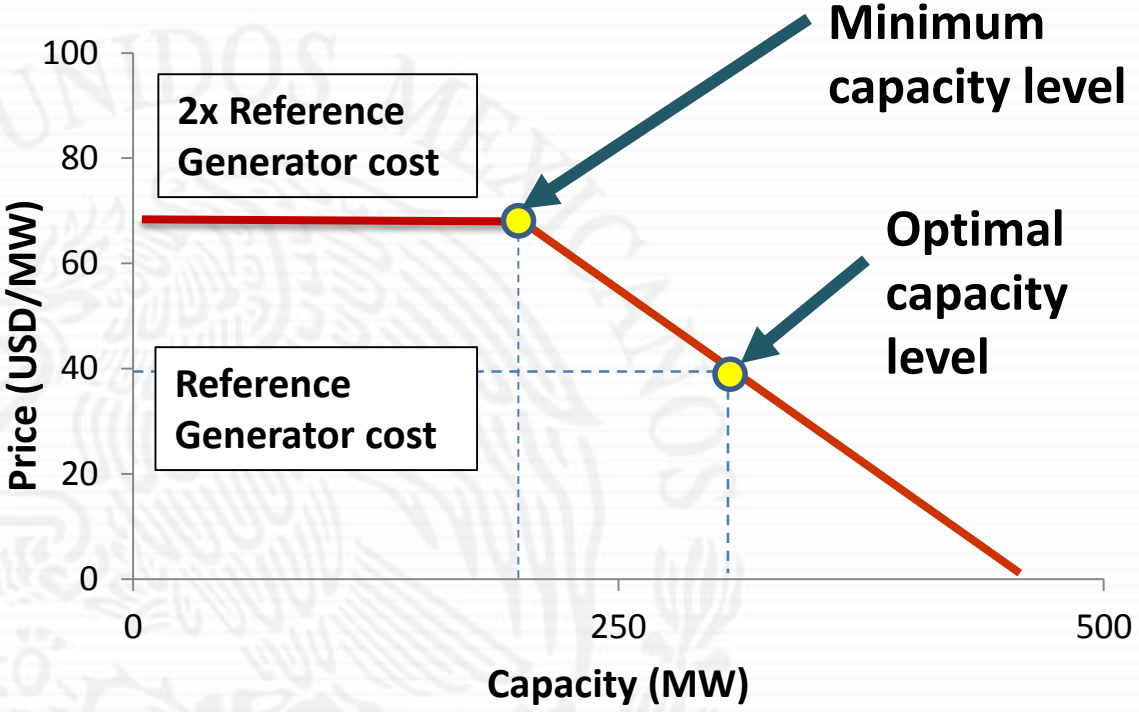
Exceptions

- Unavailability is forgiven when CENACE asks to change a scheduled maintenance.
- Unavailability can only be penalized 2 hours per day when on scheduled maintenance.
- Penalties if CENACE discovers unavailability.

Capacity market

Demand Curve

- CRE sets the minimum and “optimal” capacity requirements.
- CENACE buys capacity in excess of the minimum requirement and charge all LSEs.
  - Combines demand elasticity with fines for non-compliance.



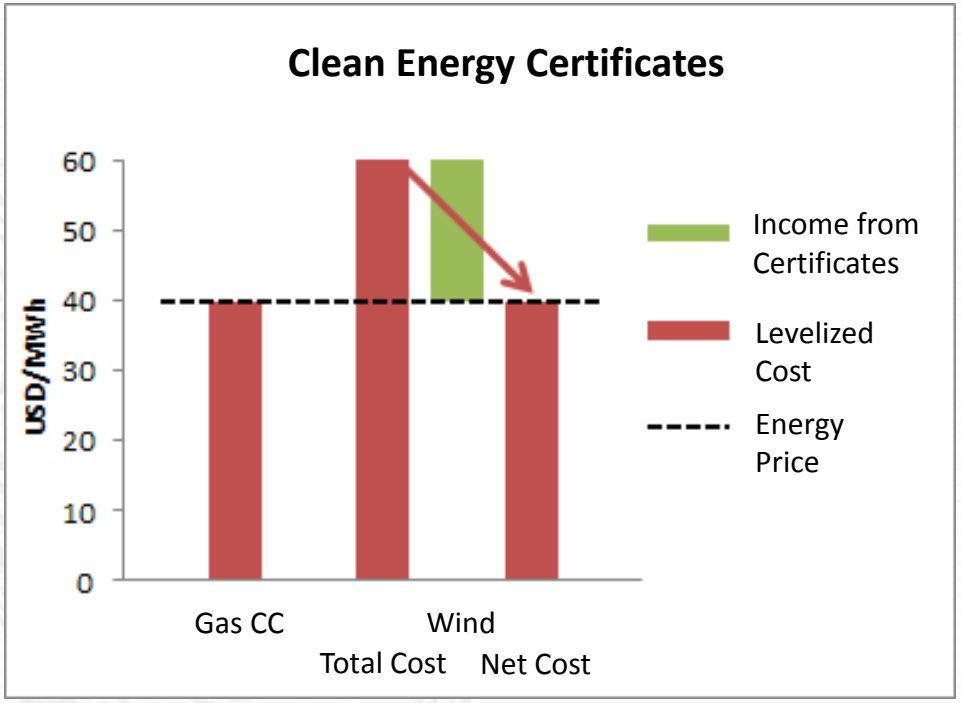
Ex-post market

- Generators have absolute certainty about the quantity delivered.
  - The market monitor can implement an obligation to offer capacity without debate about quantity. Availability is monitored during the year.
  - No debate about cost; costs are already sunk.

Clean Energy Certificates

Objectives

- Solve the “missing money” problem for clean generators.
- Let the market make choices over technology
- Transparency regarding the cost of clean energy
- Maintain flexibility in case of cost surprises



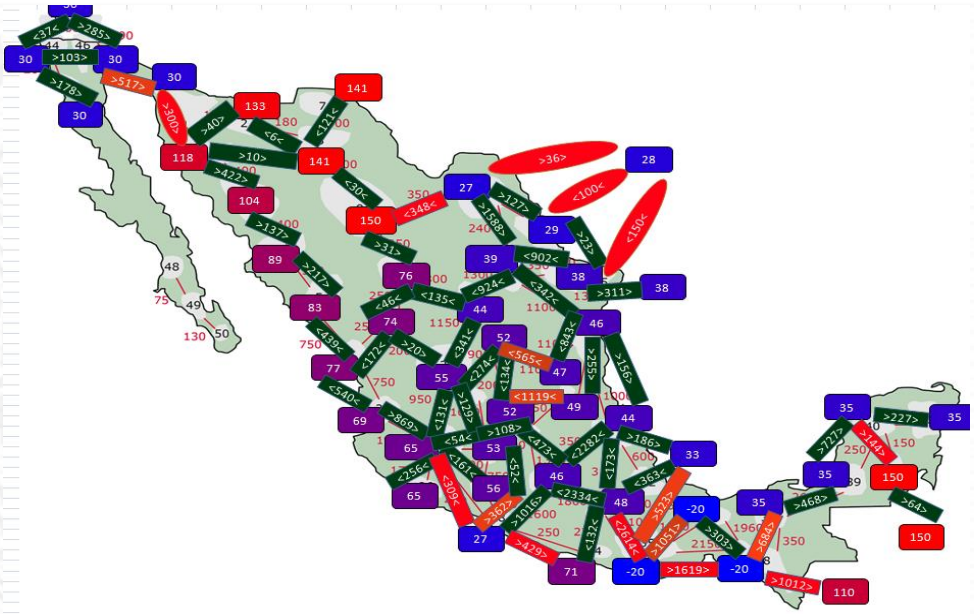
Features

- SENER establishes requirements to use a percentage of clean energy.
- Retailers fulfill their requirements by buying Certificates.
- CENACE operates a market once a year.
- CRE verifies compliance and applies fines in case of non-compliance.

FTRs

Objectives

- Allow market participants to reduce exposure to congestion prices.
- Assure that generators face correct signals to build and operate plants.
- Preserve legacy rights.
- Avoid restricting dispatch.



Features

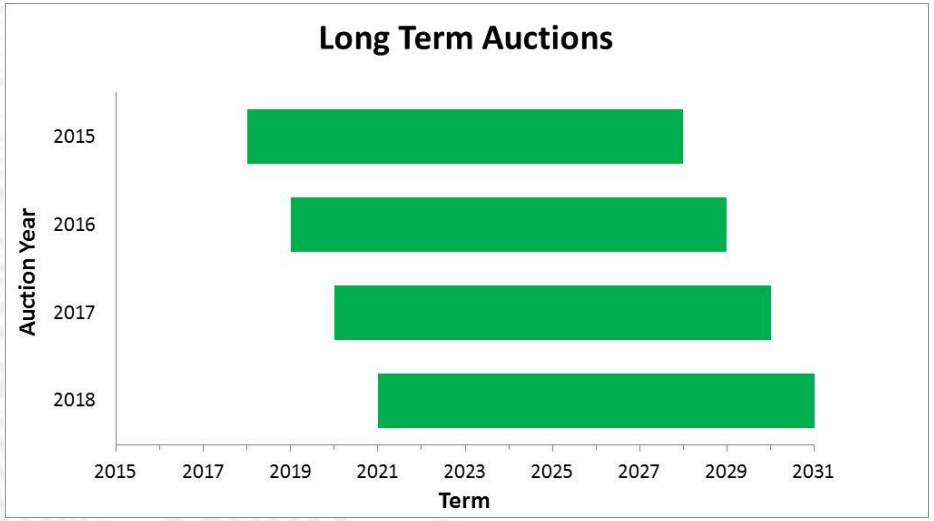
- Allocation process for Grandfathered FTRs.
- General auctions for new FTRs.
- Special FTR mechanism linked to new construction.
- CENACE will only award FTRs up to the simultaneously feasible capacity of the network.

Auctions

Long Term Auctions

Guarantee a stable cash flow that will cover fixed costs, reducing the risk of generation investment.

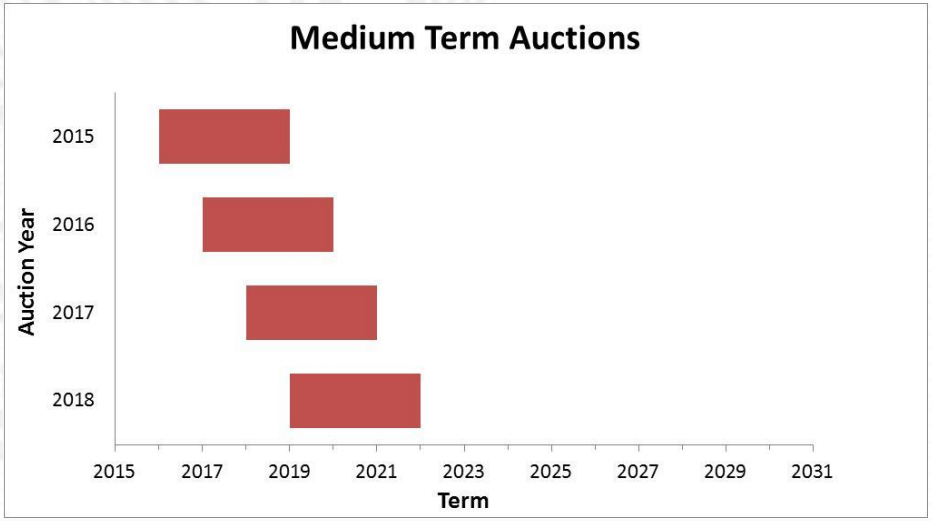
Products	Term	Time to Contract
Capacity CECs Energy	15 years (Cap / Energy) 20 years (CEC)	3 years (or more)



Medium Term Auctions

Allow retailers to obtain an energy hedge prior to the short-term markets.

Products	Term	Time to Contract
Capacity Energy	3 years	4 months



Long Term Auctions

Objectives

1) Attract investment
   - In firm capacity
   - In clean energy

2) Make all technologies compete with each other

3) Ensure efficiency to the buyer:
   - Pay higher prices to generators that produce during valuable hours
   - Reward “good” locations and discourage “bad” locations

Features

Generators offer packages with quantities of:
- Energy
- Capacity
- Clean Energy Certificates

Mixed integer optimization to select complete offers

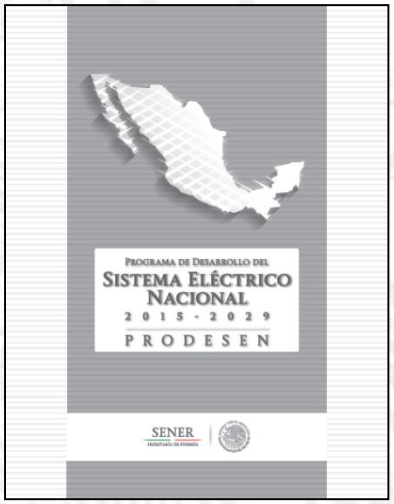
Fixed penalties and bonuses based on forecast:
- For location
- For time of generation

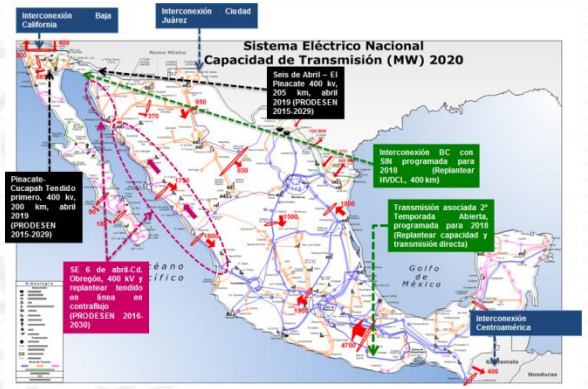
Transmission Planning

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

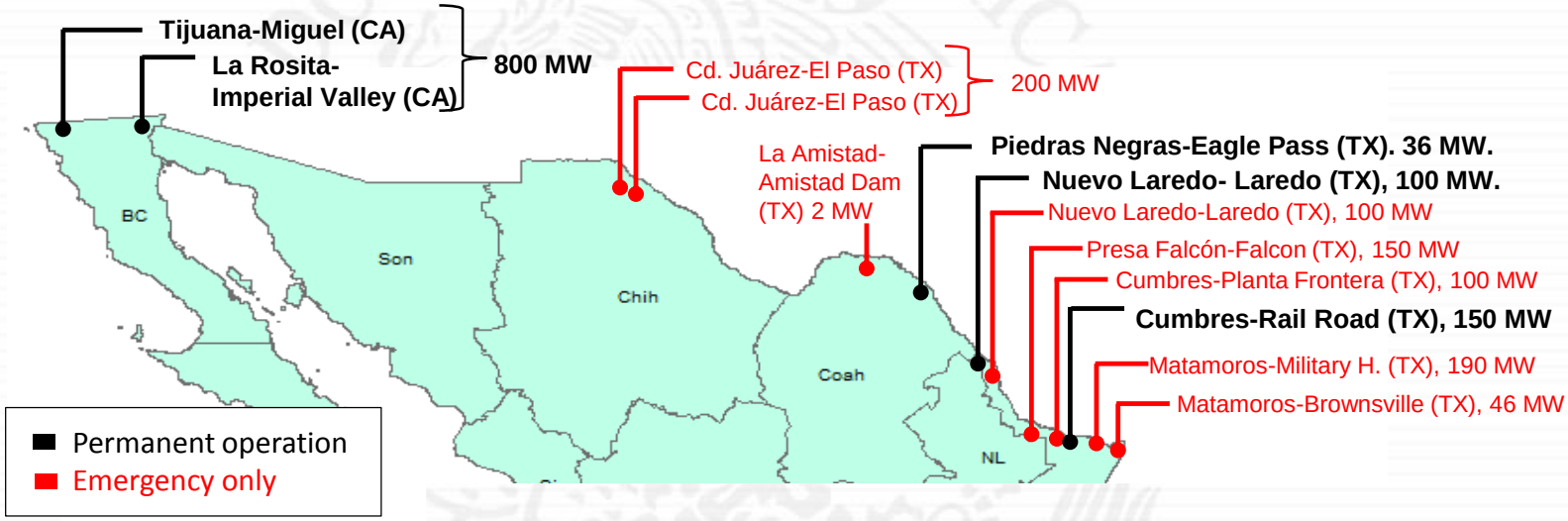




Planned Expansion 2015-2029		
Transmission	24,599	km-c
Transformation	64,352	MVA
Compensation	12,090	MVAr

Cross-Border Interconnections

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

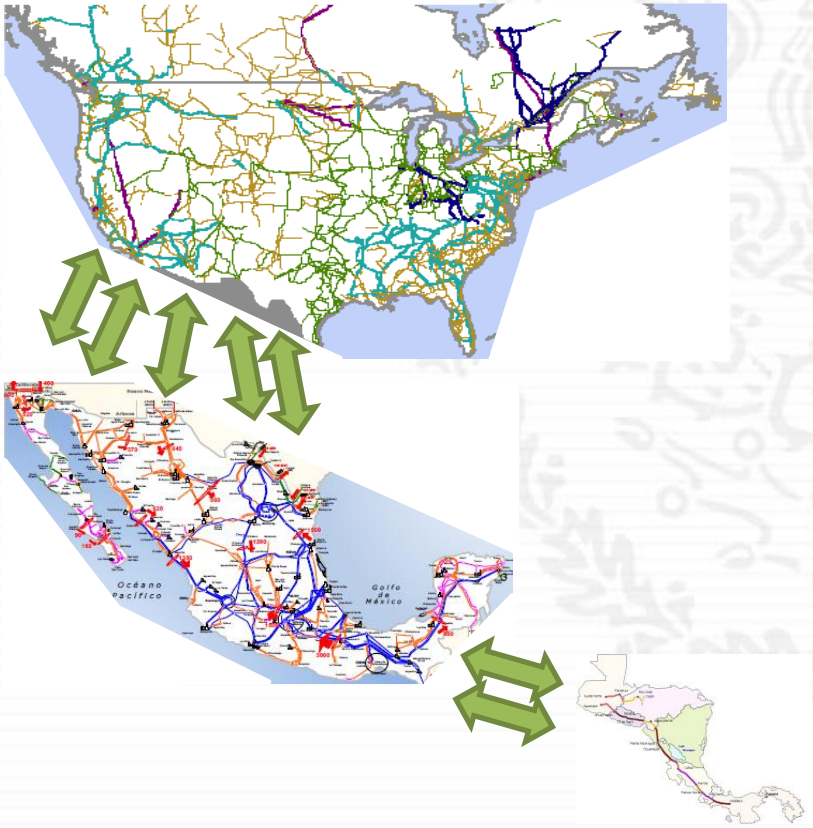


- 2014 statistics (system to system):

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

Cross-Border Interconnections

The PRODESEN 2015-2029 proposes a stronger interconnection from North America to Central America.



Mexico – California:

- Interconnection of the National System with Baja California
  - Pinacate-Cucapáh: 200 km
  - Seis de Abril-Pinacate: 205 km
- Interconnection of isolated systems on the Baja California Peninsula

Mexico – Central America:

- Expansion of connection between the Central and Southern regions of the National Interconnected System
- Back-to-back DC interconnections between Mexico and Guatemala

Participation in the CAISO EIM

LEY DE LA INDUSTRIA ELÉCTRICA

Artículo 67.- Las Reglas del Mercado podrán establecer esquemas especiales para la operación de los pequeños sistemas eléctricos, así como para el **área de control de Baja California** y para el sistema interconectado de Baja California Sur. **El Control Operativo de los anteriores es facultad del CENACE, quien podrá formar asociaciones o celebrar contratos con terceros para la realización de esta actividad**, previa autorización de la Secretaría.

ELECTRIC INDUSTRY LAW

Article 67.- The Market Rules can establish special regimens for the operation of small systems, as well as the **Baja California control area** and the Baja California Sur Interconnected System. **Operative Control of the aforementioned is a power of CENACE, which can form associations or execute contracts with third parties to carry out this activity**, with authorization from the Ministry.

Integration of markets with CAISO was foreseen from the inception of the legal reforms.

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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
Importation	December 2014	• Import rules prior to market start
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**

Next Steps

Market	Milestone	Date
Day Ahead and Real Time Markets	Testing	September 2015
	Operation	January 2016
Long Term Auctions for Capacity, Energy, and CECs	Publication	October/November 2015
	Adjudication	March 2016
Assignment of Legacy FTRs		November 2015
FTR Auctions		November 2016
Capacity Market		February 2017
Medium Term Auctions for Energy and Capacity		October 2016
Clean Energy Certificate Market		2018

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Conclusions

Milestones Reached	• Independence of system operator • Market design • First system expansion plan • Conceptual design for CFE separation
Next Steps	• Start of operations for Spot Market • First auction for long term contracts
	• Implementation of CFE Restructuring
	• First contracts and associations for transmission
Final Result	• Transparent market attracts investment • CFE adapts to compete and grow • Expansion of transmission and clean energy • CRE becomes the authority for the power market

Electricity Reform in Mexico

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