Comisión Federal de Electricidad

New Business Models for Geothermal Energy in the Federal Electricity Commission (CFE)

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GEOTHERMAL ENERGY IN MEXICO

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MEXICO

FOURTH PLACE WORLD WIDE

Geothermal Power Generation

- **Gross installed capacity*:** 1 036.4 MWe.
- **Running capacity*:** 878.6 MWe net.
- **Production** 2015: 6,184.63 GWh.
- **64 MWe** added in the last four years (Includes private).

Source: CFE Files. **Information actualized to july 2015***

MEXICAN GEOTHERMAL FIELDS IN OPERATION

Geothermal Field	Year	Installed Capacity (MW)	Effective Capacity (MW)
Cerro Prieto, BC.	1973	727.8	570
Los Azufres, Mich.	1982	225	225
Los Humeros, Pue.	1990	68.6	68.6
Las Tres Vírgenes, BCS.	2001	10	10
Domo San Pedro, Nay.*	2015	5	5

Total installed capacity of 1 036.4 MW
Total effective capacity 878.6 MW

Average National capacity factor 85.91%

*Private

COMMISSIONED PROJECTS IN 2015

AZUFRES III, FHASE I, U17 POWER PLANT

CFE´S Project	Los Azufres III Fase I
Capacity	53 MW
Date of start up	Nov-2013
Date of commercial operation	Feb-2015
Location	Michoacán

DOMO SAN PEDRO, POWER PLANT
(the first private geothermal power plant)

Grupo Dragon´s Project (Private)	Domo San Pedro
Capacity	5 MW
Date of start up	---
Date of commercial operation	Feb 2015
Location	Nayarit

Source: CFE files, http://piensageotermia.com/grupo-dragon-tiene-una-nueva-planta-geotermica-ya-operativa-en-mexico/,
Juan Luis Del Valle Luarca, Grupo Dragón "Perspectivas de desarrollo privado con la nueva Ley de Energía Geotérmica"

NEW PROJECTS UNDER CONSTRUCTION PHASE

CFE

Project	Los Humeros III Phase A
Capacity	25 MW
Date of Start up	Nov-2013
Date of commercial operation	Sept-2016
Location	Puebla

PRIVATE

Project	CGPP01
Capacity	30 MW
Date of Start up	----
Date of commercial operation	2016
Location	Nayarit

Source:CFE files, http://eleconomista.com.mx/industrias/2015/05/22/grupo-dragon-inaugura-explotacion-privada-geotermia
Juan Luis Del Valle Luarca, Grupo Dragón "Perspectivas de desarrollo privado con la nueva Ley de Energía Geotérmica"

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ENERGY REFORM

Energy reform published on December 22th, 2013, established the need for specific geothermal regulation, to promote the development of new projects.

- **Geothermal Energy Law** (Published August 11th, 2014)
- **Regulations of the Geothermal Energy Law** (October 31th, 2014)

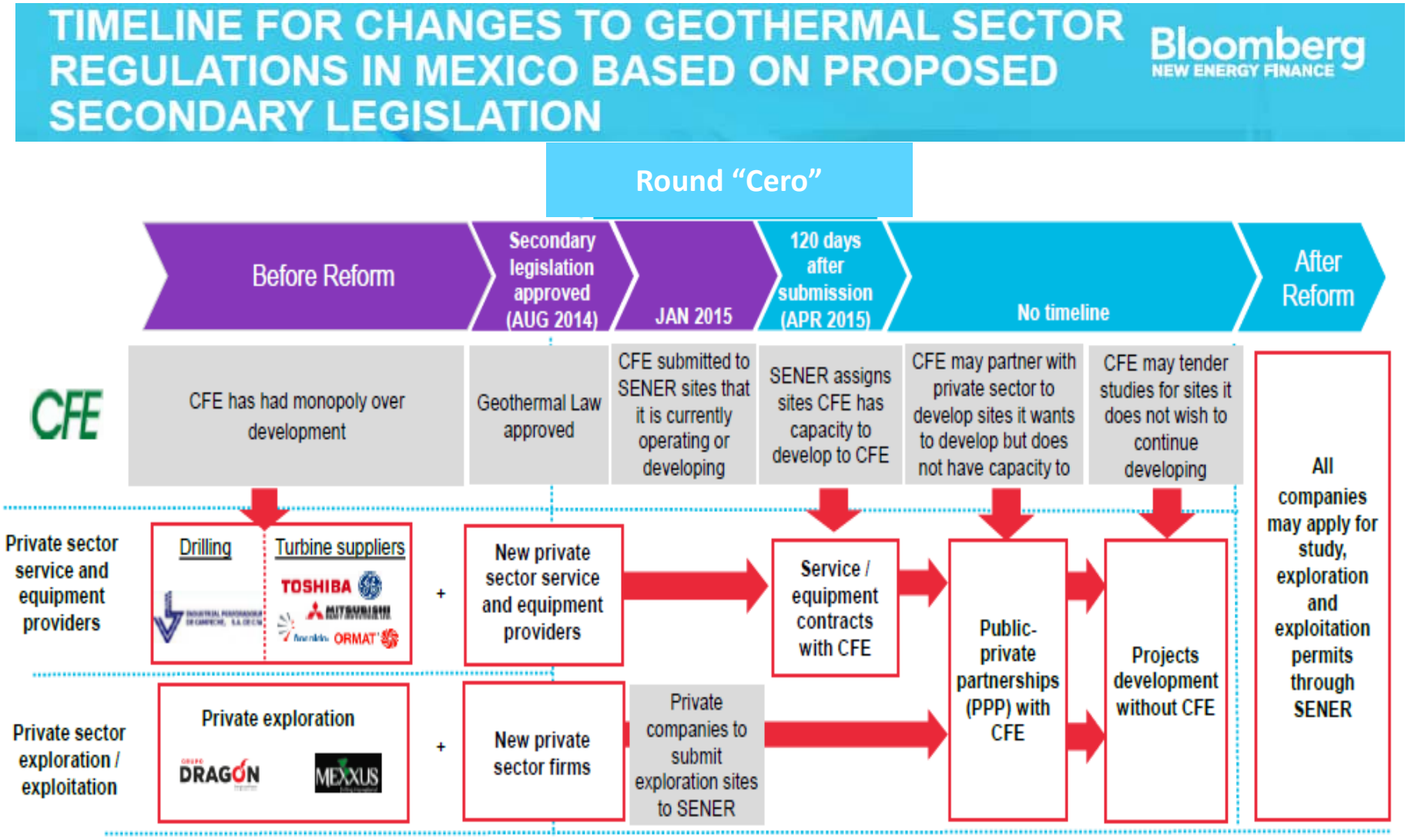
Will permit:

- ✓ *More exploration*
- ✓ *Mitigate drilling risks*
- ✓ *Create a geothermal center of excellence.*

Clean Energy Certificates

Clean energy certificates. CRE will issue a title to certify the production of electric energy produced by renewable sources or clean technologies. These titles would also be traded in the WPM. First long term Clean Energy Auction in progress…
It is expected those mechanisms will add value to all renewable and clean sources, geothermal included.

ENERGY REFORM: TIMELINE FOR CHANGES

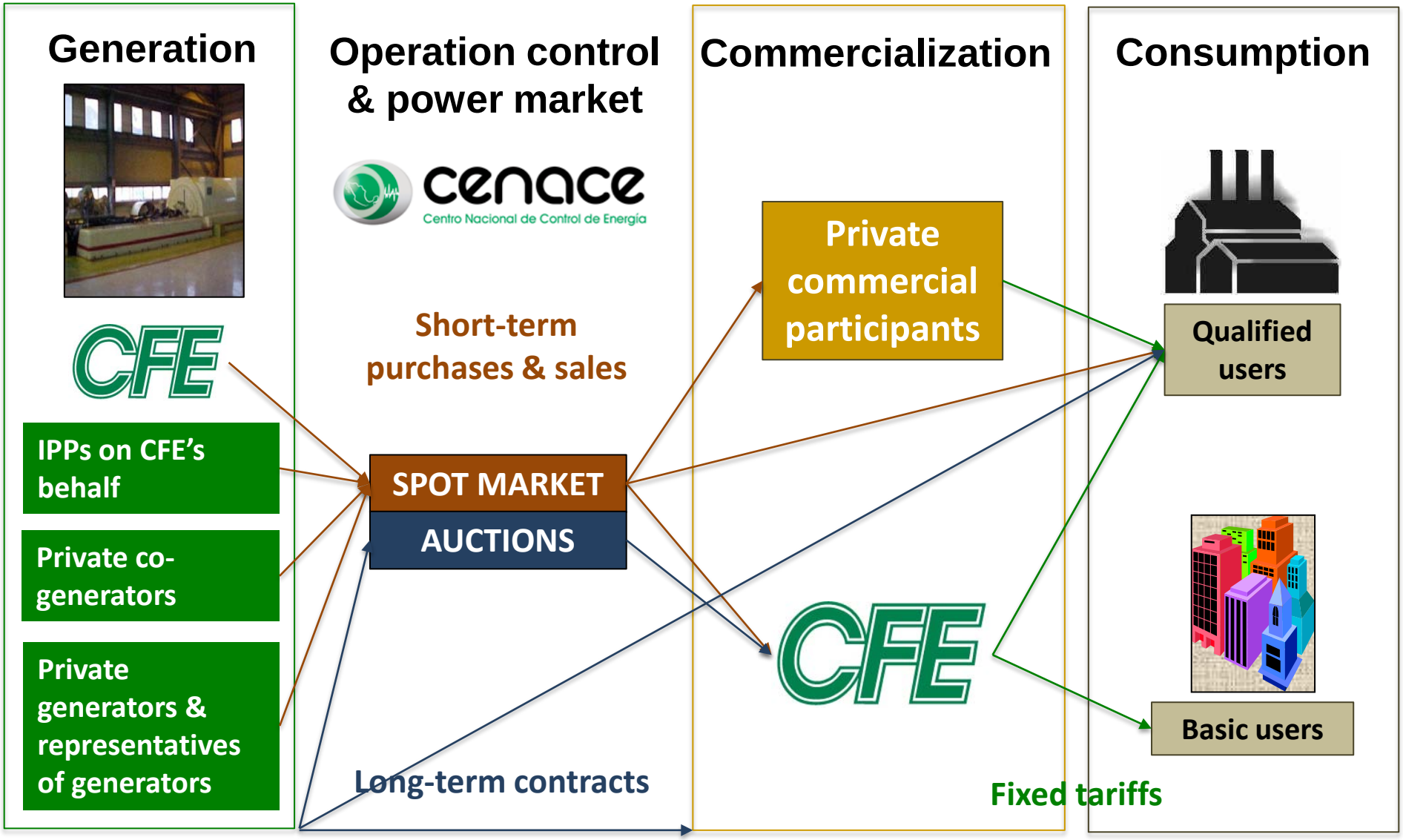


Notes: (*) Blue timeline is an estimated timeline based on content of the secondary legislation and on the date which CFE sent its documents to SENER (30 January 2015).

Source: Mexico Government, SENER, Bloomberg New Energy Finance

Source: Slide developed by Bloomberg New Energy Finance

OPERATIONS AND ACTORS, IN THE NEW POWER MARKET



Source: Luis C.A. Gutiérrez-Negrín, Mexican Geothermal Association, 2nd Annual Geopower Mexico, "Current situation and perspectives for geothermal development in Mexico"

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NEW BUSINESS MODELS

Geothermal Generation	Competitor associated with the generation of clean energy sources	Specialized services in clean energy projects
CFE will continue to operate the 4 actual geothermal fields + projects in progress	Alliances and partnerships to develop new projects and fields.	Advisory services on issues related to prospecting, exploration and exploitation of geothermal energy projects and other clean energy sources.

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13 Geothermal areas located to CFE to continue exploration, representing about 1,591 square kilometers with an estimated potential of 448 MWe, plus the concession for Cerritos Colorados and the four geothermal fields in operation

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Energy Reform promotes greater diversification of sources and technologies for electricity generation

1. **Multiple generators**: The private sector can develop renewable energy projects in the country on their own or in partnership with the CFE.[2]

2. **Ease of interconnection to SEN**: The National Center for Energy Control (CENACE) as an independent market operator will ensure free and fair access to transmission networks.

3. **Clean Energy Certificates**: Establish mandatory targets clean energy. From January 2018, the CENACE will operate market CEL's . First Auction in progress.

4. **Geothermal Energy Act**: Mexico now has a legal framework for sustainable use of geothermal resources. The following rounds encourage the private sector.

CFE is opened to any type of commercial association to move forward from exploration to commercial operation of more clean, renewable, and sustainable geothermal energy

[2] Ley de la Industria Eléctrica, 2014.