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for Economic Affairs
and Energy

SENER
SECRETARÍA DE ENERGÍA



Energie **wende**
Switch to the Future

Growing Investment Opportunities

Mexico's New Energy Era

From Framework Fundamentals to Power Sector Focus



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Acronyms

AC	CFE Affiliated Companies
ALADI	Asociación Latinoamericana de Integración (Latin American Integration Association)
AMI	Average Market Income
APEC	Asia-Pacific Economic Cooperation
ASEA	Agencia de Seguridad, Energía y Ambiente (Agency for Safety, Energy and Environment)
BANCOMEXT	Banco Nacional de Comercio Exterior (National Foreign Trade Bank)
Banobras	Banco Nacional de Obras y Servicios Públicos (National Infrastructure and Public Services Bank)
BCA	Sistema Interconectado Baja California (Baja California Interconnected System)
BCS	Sistema Interconectado Baja California Sur (Baja California Sur Interconnected System)
BEPS	Base Erosion and Profit Shifting
BOE	Barrel of Oil Equivalent
BSS	Basic Service Supplier
BTU	British Thermal Unit
CEC	Clean Energy Certificates
CENACE	Centro Nacional de Control de Energía (National Energy Control Center)
CENAGAS	Centro Nacional de Control del Gas Natural (National Center for Control of Natural Gas)
CFE	Comisión Federal de Electricidad (Federal Electricity Commission)
CNH	Comisión Nacional de Hidrocarburos (National Hydrocarbons Commission)
CNSNS	Comisión Nacional de Seguridad Nuclear y Salvaguardias (National Nuclear Safety and Safeguards Commission)
COFEMER	Comisión Federal de Mejora Regulatoria (Federal Commission for Regulatory Improvement)
CONAGUA	Comisión Nacional del Agua (National Water Commission)
CONAVI	Comisión Nacional de Vivienda (National Housing Commission)
CONUEE	Comisión Nacional para el Uso Eficiente de la Energía (National Commission for the Efficient Use of Energy)
CP	Capacity Price

CRE	Comisión Reguladora de Energía (Energy Regulatory Commission)
DAM	Day-Ahead Market
DG	Distributed Generation
DOF	Diario Oficial de la Federación (Federal Official Gazette)
ECC	European Commodity Clearing
EEX	European Energy Exchange
EvIS	Evaluación de Impacto Social (Social Impact Assessment)
FDI	Foreign Direct Investment
FMP	Fondo Mexicano del Petróleo (Mexican Petroleum Fund)
FSUE	Fondo de Servicio Universal Eléctrico (Universal Electricity Service Fund)
FTR	Financial Transmission Rights
GDP	Gross Domestic Product
GWh	Gigawatt-hour
HAM	Hour-Ahead Market
IADB	Inter-American Development Bank
IDR	Incentive Distribution Rights
IEPS	Impuesto Especial sobre Producción y Servicios (Excise Tax)
IFC	International Finance Corporation
INAH	Instituto Nacional de Antropología e Historia (National Institute of Anthropology and History)
INEGI	Instituto Nacional de Estadística y Geografía (National Institute of Statistics and Geography)
IPP	Independent Power Producer
ISR	Impuesto Sobre la Renta (Income Tax)
JBIC	Japan Bank for International Cooperation
KfW	KfW Development Bank
LAERFTE	Ley para el Aprovechamiento de Energías Renovables y el Financiamiento de la Transición Energética (Use of Renewable Energies and Energy Transition Financing Act)
LEG	Ley de Energía Geotérmica (Geothermal Energy Act)
LGCC	Ley General de Cambio Climático (General Law on Climate Change)
LH	Ley de Hidrocarburos (Oil & Gas Act)

LIE	Ley de la Industria Eléctrica (Electricity Industry Act)	RNT	Red Nacional de Transmisión (National Transmission Network)
LMP	Locational Marginal Price	RTM	Real-Time Market
LMPw	Weighted Locational Marginal Price	SCT	Secretaría de Comunicaciones y Transportes (Ministry of Communication and Transportation)
LORCME	Ley de los Órganos Reguladores Coordinados en Materia Energética (Coordinated Regulatory Bodies for Energy Act)	SE	Secretaría de Economía (Ministry of Economy)
LSE	Load Serving Entities	SEDATU	Secretaría de Desarrollo Agrario, Territorial y Urbano (Ministry of Agricultural, Land and Urban Development)
LTA	Long-Term Auction	SEMARNAT	Secretaría de Medio Ambiente y Recursos Naturales (Ministry of Environment and Natural Resources)
LTE	Ley de Transición Energética (Energy Transition Act)	SEN	Sistema Eléctrico Nacional (National Electricity System)
MIA	Manifestación de Impacto Ambiental (Environmental Impact Assessment Report)	SENER	Secretaría de Energía (Ministry of Energy)
MTA	Medium-Term Auction	SHCP	Secretaría de Hacienda y Crédito Público (Ministry of Finance and Public Credit)
MW	Megawatt	SIE	Sistema de Información Energética (Energy Information System)
MWh	Megawatt-hour	SIN	Sistema Interconectado Nacional (National Interconnected System)
Nafin	Nacional Financiera (National Financing Entity)	SISTRANGAS	Sistema de Transporte y Almacenamiento Nacional Integrado de Gas Natural (National Integrated System for Natural Gas, Transportation and Storage)
NAFTA	North American Free Trade Agreement	SME	Small and Medium-sized Enterprise
NMX	Normas Mexicanas (Mexican Standards)	SOE	State-Owned Enterprise
NOM	Norma Oficial Mexicana (Official Mexican Standard)	SOLR	Supplier of Last Resort
NPC	Net Price for Capacity	SPC	Subsidiary Production Company
OECD	Organisation for Economic Co-operation and Development	STPS	Secretaría del Trabajo y Previsión Social (Ministry of Labor and Social Welfare)
Pemex	Petróleos Mexicanos	TPP	Trans-Pacific Partnership
PETE	Programa Especial de la Transición Energética (Energy Transition Special Program)	TWh	Terawatt-hour
PPA	Power Purchase Agreement	US	United States
PPP	Public Private Partnership	VAT	Value Added Tax
PRODESEN	Programa de Desarrollo del Sistema Eléctrico Nacional (Program for the Development of the National Electricity System)	VCT	Variable Cost of Technology
PROFEPA	Procuraduría Federal de Protección al Ambiente (Federal Attorney's Office for Environmental Protection)	VCTT	Variable Cost of Total Transaction
PRONASE	Programa Nacional para el Aprovechamiento Sustentable de la Energía (National Program for the Sustainable Use of Energy)	WEF	World Economic Forum
QSS	Qualified Service Supplier	WEM	Wholesale Electricity Market
RECAI	Renewable Energy Country Attractiveness Index	WTO	World Trade Organization
RGD	Red General de Distribución (General Distribution Network)		

Executive Summary

This report provides a general overview of Mexico's energy sector as it has emerged from its 2013 Energy Reform. It focuses on the operation of the new electricity market, outlining its main characteristics, results, trends, as well as the participation of private capital that followed the opening and modernization of the sector.

The Energy Reform has created important opportunities, positioning Mexico as one of the most attractive markets for foreign investment among other emerging markets.¹

Up to 2017, three long-term auctions (LTAs) have been held in the electricity sector, generating investments of approximately USD 8.6 billion over the next three years.² In addition, the Ministry of Energy (SENER) has issued the first bid for a power transmission line that will interconnect the state of Baja California with the rest of the country.

It is envisaged, that during the next 15 years, Mexico will attract investments up to USD 100 billion for infrastructure projects in the electricity sector.³

In the oil & gas sector, contracts on exploration and production amount to USD 59 billion. Furthermore, the expected investment for construction of gas pipelines and seismic infrastructure is USD 12 billion and USD 2 billion, respectively.⁴

Government efforts to increase the generation and use of clean energy have boosted market growth. Clean energy goals have been established in the Energy Transition Act (LTE) and planning documents as follows: 25% by 2018, 30% by 2021, 35% by 2024, and indicative targets of 40% by 2035, and 50% by 2050.⁵



¹ Bloomberg (2018) These Are 2018's Most (And Least) Attractive Emerging Markets.

² SENER (2018) EY analysis based on information from the "Program for the Development of the National Electricity System" (PRODESEN 2017–2031) and Blog: 2018, año de arranque de enormes transformaciones en el sector energético.

³ SENER (2017) PRODESEN (2017–2031) and SENER internal presentation: "Nueva Industria Energética en México".

⁴ National Hydrocarbons Commission (CNH) (2017). Estadísticas de petróleo y gas.

⁵ SENER (2017) Reporte de Avance de Energías Limpias, primer semestre 2017, Diario Oficial de la Federación (2015). Ley de Transición Energética, tercero transitorio.

The Energy Reform opened an attractive new market for private investors by allowing their participation in different activities in the oil & gas and electricity sectors.



Oil & gas activities:

- Administration of subsoil deposits through assignments to Petróleos Mexicanos (Pemex) and shared profit agreements between Pemex and private investors.
- Refinement and petrochemicals (downstream).
- Exploration and production (upstream).
- Transport, storage and sale of hydrocarbons, refined products and petrochemicals (midstream).



Electricity activities:

- Generation.
- Transmission.
- Distribution.
- Trading.

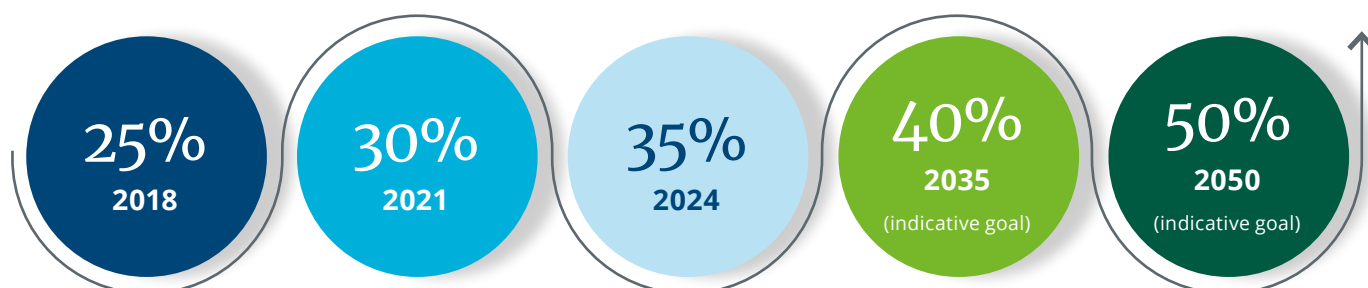
The business models associated with these activities are described in Section 3. Participation of private players in power transmission and distribution activities is limited (further information in Section 2).

Driving clean energy in the electricity sector

Clean energy goals are aimed to trigger the development of alternative generation methods and investment in technologies to improve energy efficiency.



Clean energy goals⁶



Main strengths of the Mexican energy market

- **Energy policy definition:** SENER, as the sector leader, is responsible for the definition of the energy policy, which is aligned to the principles of the Energy Reform.
- **Regulators' institutional strength:** The National Hydrocarbons Commission (CNH) (oil & gas) and the Energy Regulatory Commission (CRE) (electricity and oil & gas) are designed to ensure continuity in the implementation of the Energy Reform and the openness of the market. The governance of these institutions is not affected by the government's term.
- **Growth in energy demand:** Based on SENER's estimates, the average annual growth rate from 2017 to 2031 is 2.9%.⁷
- **Clear clean energy goals:** Goals established in the LTE are expected to drive a sustained growth in clean energy generation and consumption.
- **Tariffs in basic electricity service:** The recently published tariffs are intended to provide certainty and transparency in market information.
- **Competitive prices for renewable energy:** Contracts awarded in the LTAs reached new lows in renewable energy prices.

⁶ SENER (2017) Reporte de Avance de Energías Limpias, primer semestre 2017, LTE, tercero transitorio.

⁷ SENER (2017) PRODESEN (2017 – 2031).



1. Macroeconomic and political environment

1.1 Demographic, economic and political outlook

According to the World Economic Forum (WEF), Mexico is the 14th largest economy in the world. It has a GDP of approximately USD 1,046 trillion (as of Q3 2017) with a weighted annual growth rate of 1.5% since 2015. It has a population of 127.5 million, distributed over a 1,959,247 km² territory and a GDP per capita of USD 8,554.⁸

Despite the depreciation of the Mexican Peso in the last five years (24%⁹) related to: the drop in oil prices, the political situation in the United States (US) and the recent renegotiation of the North American Free Trade Agreement (NAFTA), the conditions in financial markets and the dynamism of domestic demand have remained stable. The decision of Mexico's Central Bank to adjust the rising interest rates as a result of these events and in response to US monetary policy decisions, has allowed the stability of monetary policy.

Along with reductions in public spending and the increase in fuel prices, inflation has been above average in recent years, standing at a cumulative 4.57% between January and December 2017.¹⁰ In spite of this, domestic spending has continued to grow at a sustained rate.¹¹

According to the Renewable Energy Country Attractiveness Index (RECAI) published in October 2017, Mexico is ranked 9th out of 40 countries, while the US dropped from 1st to 3rd place between 2016 and 2017. Appendix 1 contains the RECAI (2016 and 2017).



GDP based on Purchasing Power Parity 1.93% of world GDP

GDP per capita USD 8,554

Source: WEF 2017-2018



Electricity, water and gas supply GDP USD 18.451 billion

Source: Instituto Nacional de Estadística y Geografía (INEGI) 2017



Exchange rate (November 16th, 2017) 1 EUR/22.50 MXN/1.177 USD

Source: Banco de México (2017)



4.57% cumulative inflation from January to December 2017

Source: Banco de México (2017)



Mexico's attractiveness among emerging markets (20 countries)

Mexico	1
Turkey	2
Czech Republic	3
Poland	4
Malaysia	5

Source: Bloomberg (2018)



Global Competitiveness Index in 2017-2018 (137 countries)

United States	2
Germany	5
China	27
Mexico	51

Source: World Bank (2017)



Mexico's position on the RECAI Index (40 countries): 9

Source: RECAI (October 2017)

⁸ World Bank (2017). Macroeconomic data Mexico 2017.

⁹ EY analysis based on World Bank information (2017).

¹⁰ Banco de México (2017). Índice Nacional de Precios al Consumidor (January-November 2017).

¹¹ World Bank (2017). Mexico Overview.

Among emerging markets, Mexico has been one of the largest recipients of Foreign Direct Investment (FDI), particularly after the Constitutional Reforms applied to the country's energy, labor, tax and financial sectors, among others. This has led to a 20% increase in FDI from 2015 to the second quarter of 2017, with investments reaching USD 72.425 billion in that period.¹²

The energy sector is one of the main drivers of economic growth and investment attractiveness. With the objective of strengthening this sector, the Mexican government has made particular efforts to attract investment both domestically and internationally by opening the energy market to private investment.¹³

In the oil & gas sector, investments of around USD 59 billion were raised during the first and second oil bidding rounds for exploration and production and during the farmouts of the Trión block.¹⁴

In the electricity sector, the positive impacts of the reforms are reflected in the Program for the Development of the National Electricity System (PRODESEN 2017–2031). This program anticipates that Mexico will attract investments in infrastructure projects, reaching approximately USD 100 billion over the next 15 years. Of this amount, 81% is expected to be focused on generation, 11% on transmission and 8% on distribution.¹⁵

Moreover, investments in projects awarded in the LTAs add up to an estimated amount of USD 2.6 billion, 4 billion and 2.4 billion in the first, second and third auction, respectively.¹⁶

¹² Organization for Economic Co-operation and Development (OECD) (2017) FDI Financial flows 2017.

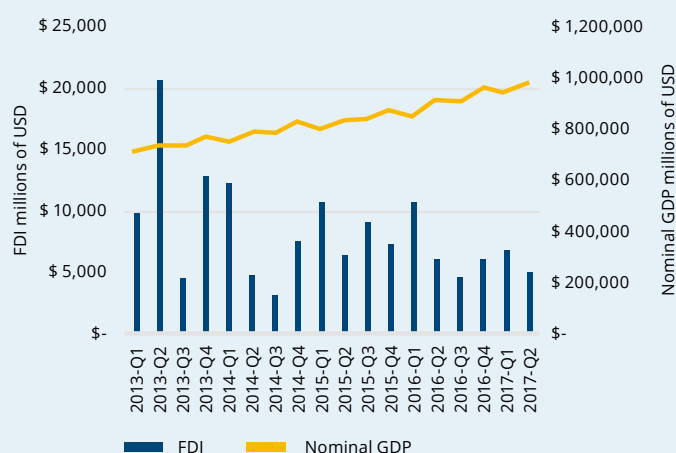
¹³ Trading Economics (2018). Mexico Foreign Direct Investment - Forecast.

¹⁴ SENER (2017) Internal presentation: Nueva Industria Energética en México.

¹⁵ SENER (2017) PRODESEN (2017-2031).

¹⁶ Idem.

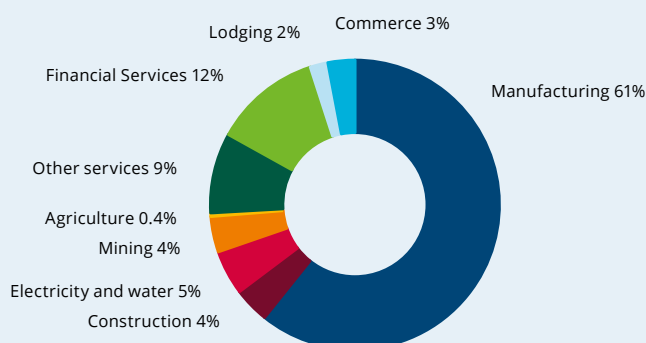
Figure 1: Foreign Direct Investment and Nominal GDP



Source: Organization for Economic Co-operation and Development (OECD), Mexico foreign direct investment, 2017

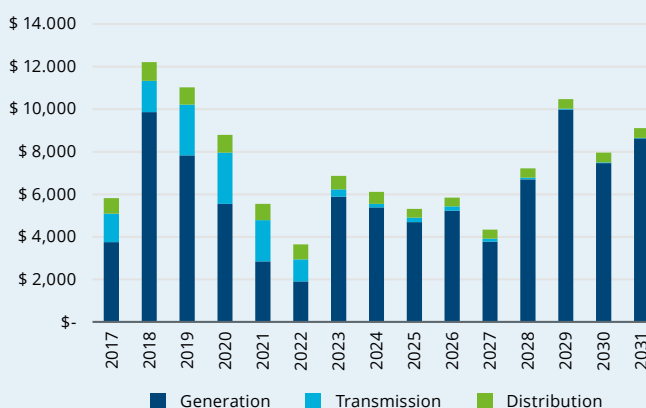
Source: INEGI, Nominal historical GDP

Figure 2: Foreign Direct Investment by Sector (2016)



Source: EY México, Emerging Markets macroeconomic update: México 2017

Figure 3: Electricity Investment Estimates 2017-2031 (USD billions)



Source: EY with information from PRODESEN (2017-2031)

Main results of Mexico's Constitutional Reforms

In an effort to drive Mexico's competitiveness and economic growth, the Mexican government approved eleven constitutional reforms during 2013. Seven of these reforms have a direct impact on productivity¹⁷:



Tax reform

Encourages the creation of a progressive tax system and facilitates compliance in order to increase Mexico's tax collection.



Economic competition reform

Expands the catalogue of anti-competitive practices to protect the rights of both consumers and companies.



Transparency reform

Strengthens the right of continued access to information and seeks to streamline several government administrative procedures.



Financial reform

Expands the role of development banks to be more focused on productive activities and, in the case of financial institutions, to extend credit lines and securities, primarily for the energy sector. It also increases financial support for Small and Medium-sized Enterprises (SMEs).



Energy reform

Broke down the 75-year long oil & gas monopoly, as well as the electricity monopoly, allowing the entrance of private investors to the sector. Among other objectives, this reform and its secondary laws seek to encourage the productivity and quality of services for both the oil & gas and electricity sectors, as well as to reach the highest possible coverage with competitive prices. In regards to the electricity sector, it seeks to encourage the transition to clean energy. Compliance mechanisms have been created in secondary laws to help with this transition; such as the Clean Energy Certificates (CECs) (detailed in Section 3).



Telecommunication and radio broadcasting reform

Strengthens the sector by opening the wholesale radio spectrum market to private investment with the objective of achieving competitive tariffs, as well as enhancing access to information. This reform will improve the connectivity of all industry sectors and will allow the offering of new products that currently are not available in the market.



Labor reform

Encourages job creation and provides more flexible and appropriate working conditions in order to cover both employees' and companies' needs.

¹⁷ Gobierno de la República (2018) Las Reformas.



2. Energy sector

2.1 Most relevant aspects of the Energy Reform

The “Pacto por México” was a political agreement aimed to increase Mexico’s productivity, particularly in strategic sectors. Its main objective was to strengthen the rule of law in order to drive competition in the Mexican market. Amongst the most significant changes were the breakdown of the oil and electricity monopolies that had been operating for more than 75 years, as well as the breakdown of the telecommunications oligopoly.¹⁸

In regards to the energy sector, some of the main drivers that motivated the reforms, were:

- To increase the competitiveness of energy markets.
- To guarantee the sufficiency of energy supply and to optimize electricity and gas prices.
- To encourage investment in the sector, as well as to promote transition to clean energies.¹⁹

Thus, the Energy Reform included opening up the oil & gas and electricity sectors to private investment.

Oil & Gas Sector

Some of the key points of the reform are:

- The oil reserves are owned exclusively by the State.
- Companies from the private sector can now be involved in activities related to the exploration and production of oil & natural gas.
- The restructuring and strengthening of Pemex into a State-Owned Enterprise (SOE).²⁰

Electricity Sector

Some of the key points of the reform are:

- The opening of the generation and trading activities to private investment. For power transmission and distribution, the reform establishes that SENER will determine who may create Public-Private Partnerships (PPP) and will perform bids with private parties and with the Federal Electricity Commission (CFE) (as an SOE).²¹
- The goals for clean energy generation are: 25% in 2018, 30% by 2021 and 35% by 2024. There are also indicative goals of 40% by 2035, and 50% by 2050.



¹⁸ Presidencia (2012) Pacto por México.

¹⁹ Presidencia.(2018) Antecedentes de Reforma Energética.

²⁰ Gobierno de la República. (2014) Reforma Energética.

²¹ Idem.

Oil & Gas Reform

The main objective of the oil & gas reform is to ensure the sufficiency of fuel supply to both the consumers

and industries at a competitive price by creating a competitive market across the value chain.

Figure 4: Changes in the oil & gas sector due to the Energy Reform

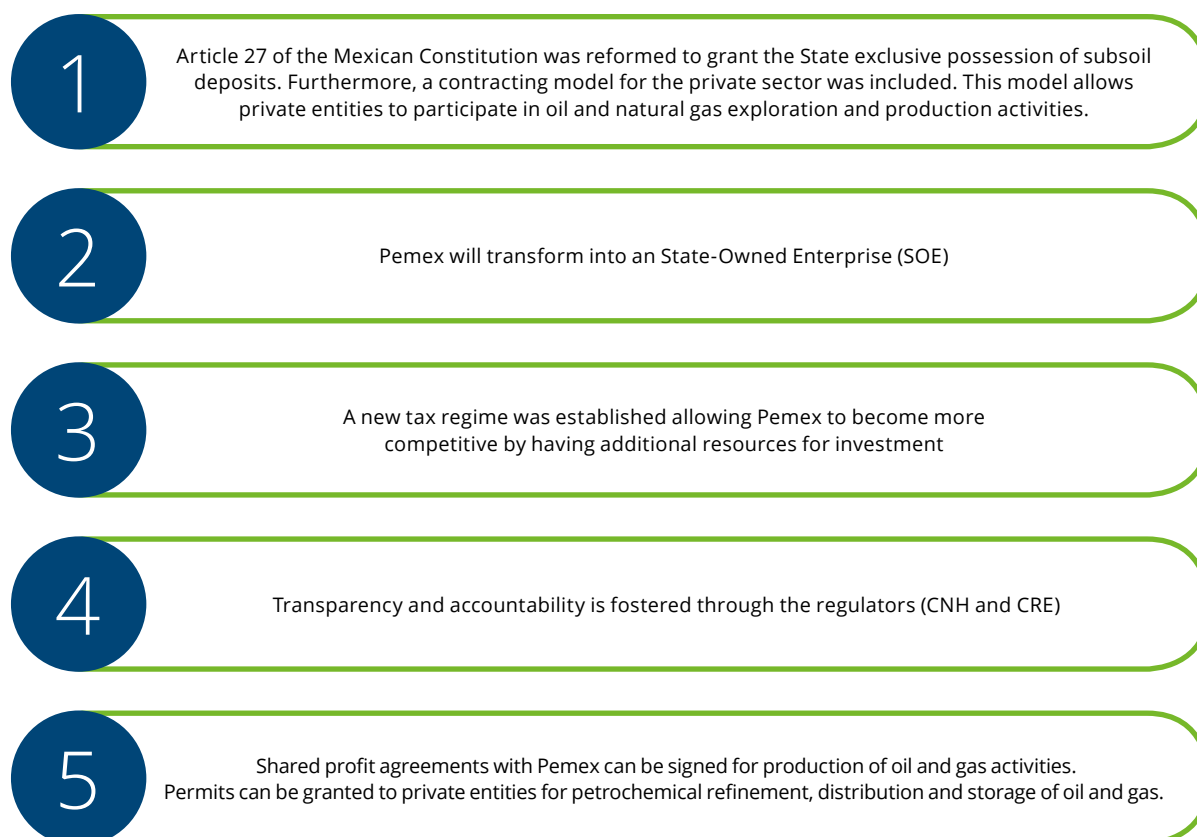
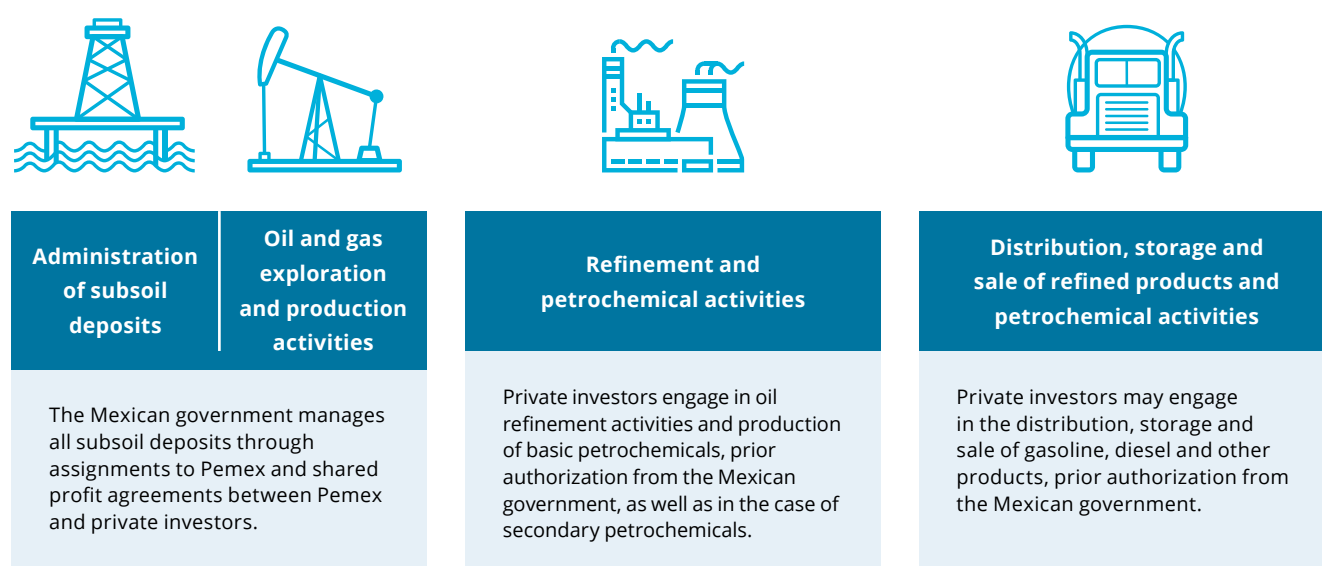


Figure 5: Oil Industry Value Chain



Source: EY with information from SENER

Electricity Reform

An increased competitiveness of the power market, a reduction on power tariffs and a transition towards

clean energy are among the main objectives of the electricity reform.

Figure 6: Changes in the electricity sector due to the Energy Reform

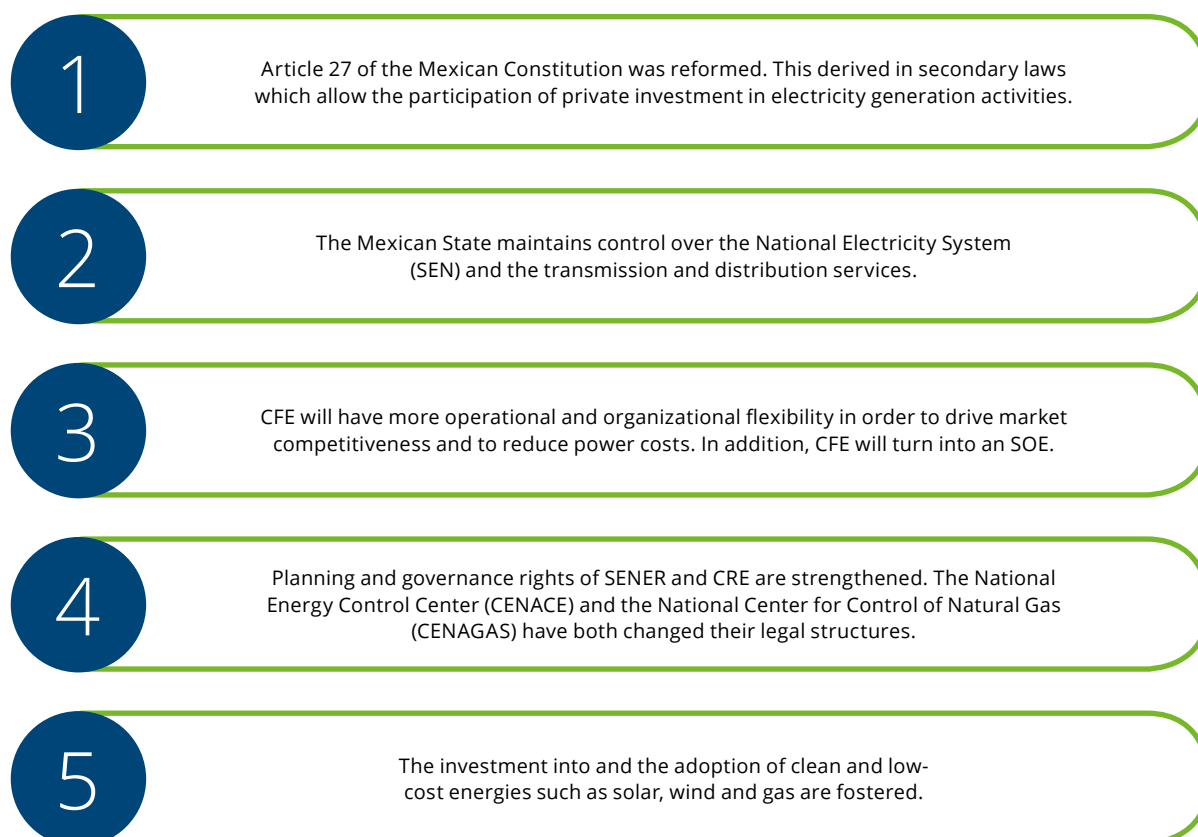
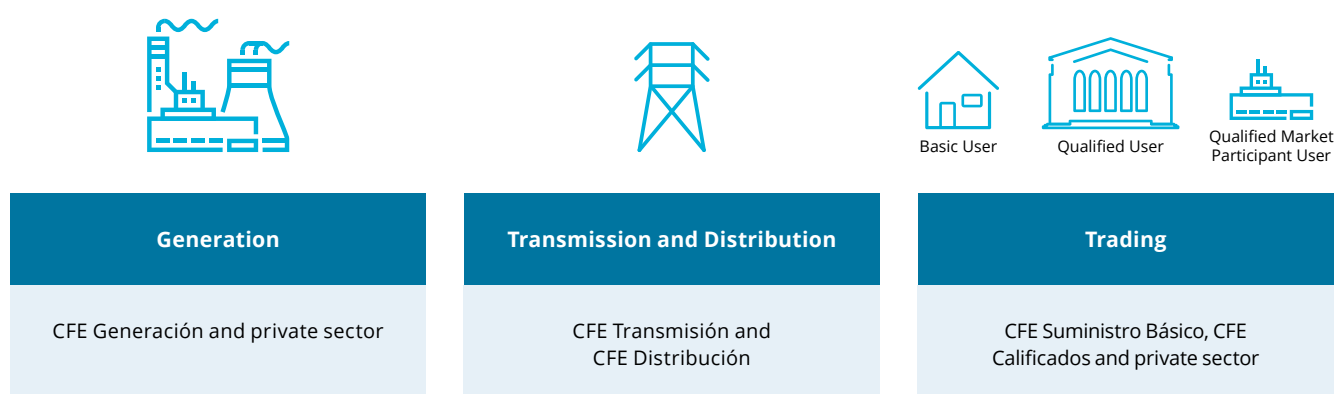


Figure 7: Electricity Industry Value Chain

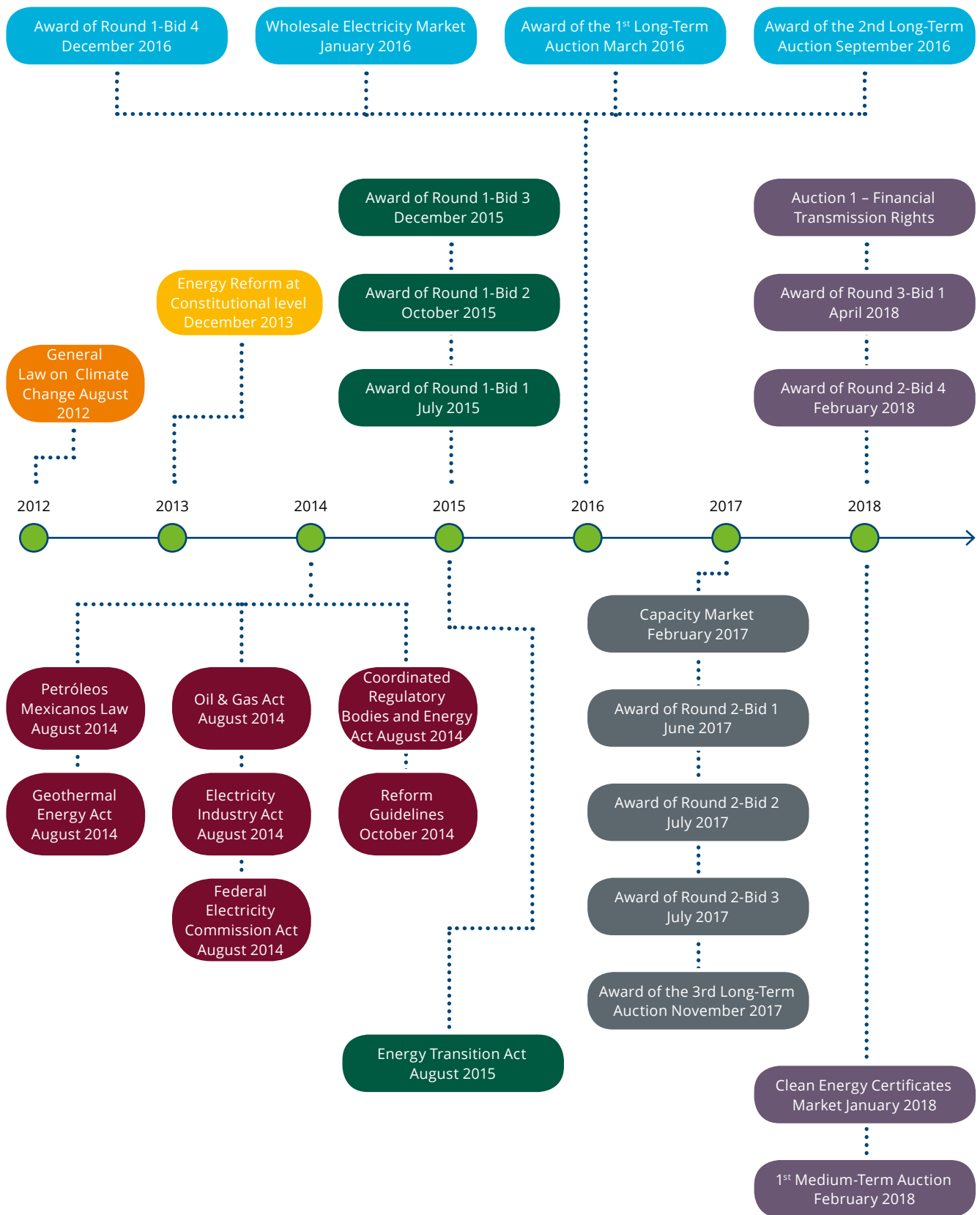


Source: EY with information from SENER

Strategic activities such as planning and control of the SEN, as well as the transmission and distribution of electricity, will remain under the exclusive responsibility of the State. However, the Mexican Government may sign agreements with private entities

to provide financing, maintenance, management, operation and infrastructure expansion of transmission and distribution networks. Moreover, the electricity sector was opened for free market competition for the activities of power generation and trading.

Figure 8: Energy Reform Timeline



Sources: EY with information of CENACE, Rondas México, General Law on Climate Change (LGCC), Geothermal Energy Act (LEG), LTE, Oil & Gas Act (LH), Electricity Industry Act (LIE), Coordinated Regulatory Bodies and Energy Act.

2.2 Key aspects of the energy sector's laws and regulations

Oil & Gas Act (LH)

The main objective of the Oil & Gas Act (LH) was to maximize the income obtained from the hydrocarbons value chain, while complying with sustainability principles, for the benefit of the Mexican society.

This law considers two types of regulations: (1) the regulations of the activities referred to in Title Three of the LH²² and (2) the regulations of the LH²³, both issued in October 2014. In turn, this regulation is complemented by several documents, guidelines and agreements that aim to clarify the scope of laws and regulations.

The new regulatory framework allows the participation of private, national or foreign investment, in all activities of the sector, by regulating the following²⁴:

- Recognition and surface exploration.
- Exploration and production of oil & gas.
- Oil treatment, refining, disposal, trading, transportation and storage.
- Processing, compression, liquefaction, decompression, regasification, transportation, storage, distribution and trading of natural gas.
- Transportation, storage, distribution and trading of hydrocarbon products to the public.
- Transportation by pipeline and storage linked to petrochemical pipelines.

The first two activities are supervised and regulated by CNH,²⁵ while the rest are the responsibility of CRE and SENER.²⁶

Exploration and production of oil & gas are considered strategic activities and, therefore, are the exclusive responsibility of the State. Thus, no concessions will be granted on them; however, these activities can be carried out through (1) allocations to SOE or (2) contracts with individuals.²⁷

Exploration and production contracts with private entities

There are four different kinds of contracts: (1) services,

(2) shared production, (3) shared utility and (4) license. The contracts are awarded through tenders carried out by CNH through bidding rounds.²⁸

The service contracts subscribed in the past between Pemex and third parties continue in force according to the terms and conditions under which they were agreed on, although they may be subject to a process of migration to the new schemes.²⁹

To subscribe contracts, the participants in the CNH tenders must form a Mexican company whose sole purpose is the exploration and production of oil & gas.³⁰ Once the contract has been awarded, individuals must comply with certain obligations, such as prior authorization for drilling, and giving notice to carry out surface exploration works.³¹

Although individuals cannot report oil reserves in the subsoil, they can record the rights to exploit those reserves.³²



Midstream and downstream activities

The rest of the activities of the value chain are carried out through permits issued by the corresponding authorities.³³ Most of the permits are granted for a period of 30 years, which can be extended for 15 years or more.³⁴

All industry participants must comply with the provisions of the Agency for Safety, Energy and Environment (ASEA).³⁵

The ASEA is a new administrative entity dependent to the Ministry of Environment and Natural Resources (SEMARNAT), whose purpose is to regulate and supervise industrial safety, operational safety and environmental protection for each one of the activities of the oil & gas sector.³⁶

²² Diario Oficial de la Federación (DOF) (2014). Reglamento de las actividades a que se refiere el Título Tercero de la LH.

²³ DOF (2014) Reglamento de la LH.

²⁴ DOF (2014) LH Art. 2, frac. I a V, 5, par. II.

²⁵ DOF (2014) LH Art. 7, 11 and 43; Título Segundo.

²⁶ DOF (2014) LH Art. 80 and 81.

²⁷ DOF (1917) Constitución Política de los

Estados Unidos Mexicanos, Arts. 28, par. IV, 27, par. VI.

²⁸ DOF (2014) LH Art. 18, par. I, and 23.

²⁹ DOF (2014) LH Art. 28 transitorio.

³⁰ DOF (2014) Ley de Ingresos sobre Hidrocarburos Art. 31, par. I.

³¹ DOF (2014) LH Art. 47.

³² DOF (2014) LH Art. 45.

³³ DOF (2014) LH Art. 48.

³⁴ DOF (2014) Reglamento de las actividades a que se refiere el Título Tercero de la LH, Art. 11.

³⁵ DOF (2014) LH Arts. 47, frac. VIII and 84, frac. XV.

³⁶ DOF (2014) Ley de la Agencia Nacional de Seguridad Industrial y de Protección al Medio Ambiente del Sector Hidrocarburos Art.1.

Land purchase or surface occupation

The activities of the energy sector take precedence over any other activity involving the use of soil or subsoil.³⁷

In order to utilize the properties, there are different legal schemes that can be used, such as leasing, voluntary easement, surface occupation, temporary occupation, sale, exchange and any other that does not contravene the law.³⁸

According to the agreed-upon scheme, the owners of the land or rights must receive compensation, which will include the following:³⁹

- Payment for damages and mitigation measures, at commercial value.
- Income by concept of occupation, easement or use of land, at commercial value.
- For exploration and production projects, a percentage of the income generated by the project, which will fluctuate between 0.5% and 3.0% of the net income after tax payments.

Compensation cannot involve payment through oil & gas products.⁴⁰

Mexican Petroleum Fund (FMP)

The FMP was created at the time when the opening of the oil & gas sector took place. It is a trust administered by the Mexican Central Bank who takes the role of trustee and the Ministry of Finance and Public Credit (SHCP) as trustor.

The FMP is governed by its own law and is responsible for receiving, managing, investing and distributing the income derived from oil & gas exploration and production contracts, with the exception of the taxes generated by these activities.⁴¹

FMP resources will be allocated to the Federal expenditure budget, stabilization and sectoral funds, the Federation Treasury and long-term savings.⁴²

State-Owned Enterprises: Pemex and CFE

One of the most important innovations of the Energy Reform was the creation of SOEs.

Both Pemex and CFE were endowed with the character of “companies,” whose purpose is the generation of economic value that contributes to the development of the nation.

With this new legal regime, Pemex and CFE became SOEs. Currently, they already have the attributes to operate as true private companies, with more agile and flexible processes, but they are still owned by the State.⁴³

Pemex

Pemex is focused on the development of business, economic, industrial and commercial activities in terms of its purpose, generating economic value and profitability for the State as its owner.⁴⁴

Pemex carries out the exploration, production, collection and trading of oil & gas.⁴⁵ Additionally, Pemex can carry out, among others, the following activities:⁴⁶

- Refining, transformation, transport, storage, distribution and trading of oil, gas and their derivative products.
- Processing of natural gas and the industrial and commercial activities of the petrochemical industry.
- Development of engineering projects, research, and geological and geophysical activities.
- Provision of services to third parties in activities related to exploration and production.

³⁷ DOF (2014) LH Art. 96, par. II.

³⁸ DOF (2014) LH Art. 101, frac. V.

³⁹ DOF (2014) LH Art. 101, frac. VI.

⁴⁰ DOF (2014) LH Art. 101, last par.

⁴¹ DOF (2014) Ley del Fondo Mexicano del Petróleo para la Estabilización y el Desarrollo, Art. 1.

⁴² DOF (2014) Ley del Fondo Mexicano del Petróleo para la Estabilización y el Desarrollo Art. 16.

⁴³ DOF (2014) Ley de Petróleos Mexicanos, DOF (2014) Ley de la CFE.

⁴⁴ DOF (2014) Ley de Petróleos Mexicanos Art. 4.

⁴⁵ DOF (2014) Ley de Petróleos Mexicanos Art. 5, par. I.

⁴⁶ DOF (2014) Ley de Petróleos Mexicanos Art. 5, fracc. II a IV.

CFE

The objective of CFE is to provide the public service of transmission and distribution of electricity.⁴⁷ Also, within its public purpose, it can carry out, among others, the following activities:

- Power generation (divided into units), and trading of electricity and associated products, including their import and export, according to the Electricity Industry Law (LIE).⁴⁸
- Import, export, transport, storage, purchase and sale of natural gas, coal and any other fuel.⁴⁹
- Development and execution of engineering projects; research, development and implementation of energy technologies; geological and geophysical activities; and supervision and provision of services to third parties.⁵⁰
- Any activities related to power generation, transmission, distribution and trading and other activities that are related to the purpose of CFE.⁵¹

Acquisitions, leases, services and infrastructure works are generally done through public tenders.

Electricity Industry Act (LIE)

The Energy Reform laid the foundations for the gradual development of an electricity market in which power generators and consumers will be impacted by the market dynamics associated with supply and demand.

This new regulatory framework sets ground for a competitive and sustainable market, with private participation.⁵² The activities comprised in the electricity industry are:⁵³

- Generation.
- Transmission.
- Distribution.
- Trading.
- Planning and control of the SEN.
- Operation of the Wholesale Electricity Market (WEM).

For the fulfillment of its objectives, the LIE is linked to certain programs and public policy instruments such as PRODESEN and the Universal Electric Service Fund.^{54,55}

PRODESEN contains the market fundamentals and plans for the electricity infrastructure for a period of 15 years, with annual updates. It also incorporates the relevant aspects of the expansion and modernization programs, which are the basis for defining the projects that transmission and distribution companies will take on with prior authorization of SENER. The current PRODESEN covers the period from 2017 to 2031.⁵⁶

The Universal Electric Service Fund aims to provide electricity services to rural communities and marginalized urban areas that do not have this service.⁵⁷

As in the case of oil & gas, the LIE considers appropriate recognition of human and indigenous rights.⁵⁸ Additionally, it establishes the requirement to carry out social impact assessments to evaluate the effects and mitigation or remediation measures for any potential damage caused to impacted populations.⁵⁹

In this context, one of the main documents that companies must obtain to operate in any of the activities of the sector is the Social Impact Assessment (EvIS)⁶⁰ (reference to the EvIS can be found in Appendix 4 - Permits).

Electricity generation and trading activities are carried out under a free competition regime, while the transmission, distribution, planning and control of the SEN are strategic activities that can only be carried out by the State, which can establish PPP contracts for required infrastructure in the network.⁶¹

Clean energy

The LIE establishes clean energies as power sources and generation processes whose emissions or residues, when they exist, do not exceed the thresholds established in the regulatory provisions issued for that purpose. In other words, renewable energies, nuclear power, hydrogen and energy generated by efficient cogeneration power plants are all defined as clean energies.⁶²

⁴⁷ DOF (2014) Ley de la CFE Art. 5, par. I.

⁴⁸ DOF (2014) Ley de la CFE Art. 5, frac. I.

⁴⁹ DOF (2014) Ley de la CFE Art. 5, frac III and IV.

⁵⁰ DOF (2014) Ley de la CFE Art. 5, frac III.

⁵¹ DOF (2014) Ley de Petróleos Mexicanos Art. 75, par. I and II, 77, and DOF (2014)

Ley de la CFE Art 77, par. I and II, and 79.

⁵² DOF (2014) LIE, Art. 1, par. II and 2, par. II.

⁵³ DOF (2014) LIE, Art. 2, pr. I.

⁵⁴ DOF (2014) LIE, Art. 13, 14 and 113.

⁵⁵ DOF (2014) LIE, Art. 11, frac. III.

⁵⁶ SENER (2017) PRODESEN (2017-2031).

⁵⁷ DOF (2014) LIE, Art. 117.

⁵⁸ DOF (2014) LIE, Art. 120, par. I.

⁵⁹ DOF (2014) LIE, Art. 120.

⁶⁰ DOF (2014) LIE, Art. 4, par. I.

⁶¹ DOF (2014) LIE, Art. 2, par. II.

⁶² DOF (2014) LIE, Art. 3, frac. XII.

Table 1: Types of clean energy

	Wind: use of wind velocity on land and offshore		Solar: use of solar radiation in all its forms		Nuclear*: generation of electricity through nuclear energy
	Hydrogen: uses fuel cells to combine hydrogen and oxygen to produce power		Hydroelectric: uses the gravitational potential energy produced by falling water in natural channels		Agricultural waste or solid urban waste: treatment of waste materials through gasification or molecular plasma.
	Sugar refineries: use of waste from sugar refineries		Cogeneration: produces heat and power by steam or other types of secondary thermal energy		Ocean: refers to energy produced by tides, ocean thermal energy conversion (OTEC), waves, marine currents and salinity
	Geothermal deposits: use of the natural heat found underground		Thermal: geological capture and storage of CO ₂		Methane: use of the heating value of methane and other related gases
	Bioenergy: fuels obtained from biomass of organic materials				

Source: EY with information from the LIE

*According to Article 27 of the Constitution, nuclear energy generation is reserved to the State

Wholesale Electricity Market (WEM)

The creation of a WEM was one of the main objectives of the Energy Reform. The WEM is operated by CENACE, whose main activities are: receive the offers, dispatch instructions to generators, balance transmission and distribution centers and networks, pay for the electricity charges and settlements to the participants. The WEM started operations in January 2016.⁶³

In addition to the implementation of contracts for power, capacity and CEC, a market is created for the trading of power and associated products under competitive conditions.⁶⁴

The cost of electricity is determined by short-term day-ahead and real-time nodal prices, based on variable costs. Technology plays an important role, since the power station with the lowest generation cost is the first to be cleared in the market and dispatched (merit order).⁶⁵

The WEM operates through the following structure:⁶⁶

- Short-term power market and ancillary services.
- Capacity Market.
- CEC Market.
- Auctions of Financial Transmission Rights (FTR).
- Medium- and long-term auctions.

Section 3.1 contains further information regarding the operating structure of the WEM.

Participants

The participants in the WEM are:

- Generators.⁶⁷
- Basic Service Suppliers (BSS).⁶⁸
- Qualified Service Suppliers (QSS).⁶⁹
- Suppliers of Last Resort (SOLR).⁷⁰
- Non-supplier traders.⁷¹
- Qualified Market Participant Users.

In addition to the participants of the WEM, the LIE establishes the following legal figures:

- Basic Users.⁷²
- Exempt Generators.⁷³
- Qualified Users.⁷⁴

Section 3.1 provides further information regarding the participants and the new structures included in the WEM.

Related products

The LIE plans to create market conditions for the following products:

- Capacity:⁷⁵ Qualified users and suppliers are required to acquire capacity. The amount of the capacity is determined by CRE.
- CEC.⁷⁶
- FTR:⁷⁷ related to congestion between different nodes.
- Ancillary Services:⁷⁸ products related to the operation of the system.

⁶³ DOF (2014) LIE Arts. 94, par. I, and 108, fracs. V, VI and VII., DOF (2016) RESOLUCIÓN que autoriza el inicio de operaciones del Mercado de Energía de Corto Plazo en los Sistemas Interconectados Baja California, Nacional y Baja California Sur, actualiza el calendario que deberá observar el CENACE para el inicio de pruebas y operaciones del Mercado de Energía de Corto Plazo y establece disposiciones transitorias para su entrada en vigor.

⁶⁴ DOF (2014) LIE Art. 96, frac. III.

⁶⁵ DOF (2014) LIE Art. 3, frac. XXX.

⁶⁶ CENACE. (Obtained in 2018) Mercado y Operaciones.

⁶⁷ DOF (2014) LIE Art.3, frac. XXIV and 17, par. I.

⁶⁸ DOF (2014) LIE Art.3, frac. XLVI.

⁶⁹ DOF (2014) LIE Art. 3, frac. XLVII and 46.

⁷⁰ DOF (2014) LIE Art. 3, frac. XLVIII.

⁷¹ DOF (2014) LIE Art. 3, frac. XXIII.

⁷² DOF (2014) LIE Art. 3, frac. LVI.

⁷³ DOF (2014) LIE Art. 3, frac. XXV, 20 and 21.

⁷⁴ DOF (2014) LIE Art. 3, frac. XXVIII and LV, 59.

⁷⁵ DOF (2016) Manual del Mercado para el Balance de Potencia, Numbers 8.1.1. and 8.1.2.

⁷⁶ DOF (2014) LIE Art. 96, frac. VI.

⁷⁷ DOF (2015) Bases del Mercado Eléctrico, Numbers 13.1.1 and 13.1.7.

⁷⁸ DOF (2015) Bases del Mercado Eléctrico Number 6.2.1.

Former Regime

The permits granted under the previous Electricity Public Service Law for self-supply, cogeneration, small production, independent production, import, export and own uses activities will continue to be valid.⁷⁹

Holders of such permits may request to transfer their contracts to the new framework (LIE), and retain the right to return to the previous regime of the Public Electricity Service Law, within the next five years, if it does not suit their interests.

The change of regimes does not affect the original validity of the permits.⁸⁰ Under the previous regime, permit holders could enjoy the recognition of self-supplied power and the power bank, among other conditions.

Energy Transition Act (LTE)

Since the late 1990's, Mexico has sought to promote the development of renewable energy through various policies and programs; however, it was not until 2008 that the Law for the Use of Renewable Energy and the Financing of the Energy Transition (LAERFTE) and its regulations were published.

In a second step towards the energy transition, the Reform in its secondary legislation imposed obligations for clean energy. It was also pointed out that SENER should include a transition strategy to promote the use of cleaner technologies and fuels in the National Program for the Sustainable Use of Energy (PRONASE).⁸¹

In order to provide the legal basis for this transformation towards a sustainable energy model, in December 2015, the LTE was published, which repealed the LAERFTE.

This law establishes the specific regulatory framework for the generation of energy through clean sources and specifies the instruments for planning the national policy on clean energy and energy efficiency.⁸²

It is important to mention that certain types of energy generation other than renewable energy have also been defined as clean energies. In this regard, according to the LTE, the following types are identified as renewable energy:⁸³

- Wind.
- Solar generation in all its forms.

- Movement of water along natural channels or man-made channels with existing reservoirs, with power generation systems with a capacity of less than or equal to 30 megawatts (MW), or a capacity density (defined as the ratio between the generation capacity and the surface area of the reservoir) of more than 10 watts/m².
- Ocean energy.
- Heat from geothermal reservoirs.
- All bioenergies determined by the Law for the Promotion and Development of Bioenergies.

The instruments for planning the national energy policy set out in the LTE would be reviewed annually and are:⁸⁴

- The transition strategy to promote the use of cleaner technologies and fuels (the Strategy): the guiding instrument of the national policy on clean energy obligations and sustainable use. It should point out goals, give a comprehensive diagnosis and proposals to reduce the use of fossil fuels, and define policies and action plans for the expansion of transmission networks necessary to favor clean energy. The long-term action plan (30 years) must be updated within the first six months of each government term and the medium-term action plan (15 years) must be updated every three years.⁸⁵
- Energy Transition Special Program (PETE): Its objective is to facilitate the implementation of actions established in the Strategy by proposing concrete activities and projects, and to ensure its economic viability.⁸⁶ This program is updated on an annual basis.
- PRONASE: establishes the actions, projects and activities derived from the Strategy that allow achieving goals in terms of energy efficiency. The order of importance of actions to be developed is based upon their social profitability.⁸⁷
- Smart Grid Program: Its objective is to support the modernization of the National Transmission Network (RNT) and the General Distribution Network (RGD) to, among other things, facilitate the incorporation of new technologies that promote the reduction of costs in the electricity and clean energy sectors.⁸⁸

⁷⁹ DOF (2014) LIE Art. 2 transitorio, par. II and III.

⁸⁰ DOF (2014) LIE Art. 10 transitorio, par. II.

⁸¹ DOF (2013) Decreto de Reforma Constitucional en materia energética, Art. XVII and XVIII transitorios.

⁸² DOF (2015) LTE Art. 1 and III transitorio.

⁸³ DOF (2015) LTE Art. 3, frac. XVI.

⁸⁴ DOF (2015) LTE Art. 21 and 26.

⁸⁵ DOF (2015) LTE Art. 27, 28 and 29.

⁸⁶ DOF (2015) LTE Art. 33 y 34.

⁸⁷ DOF (2015) LTE Art. 35.

⁸⁸ DOF (2015) LTE Art. 37.



Likewise, the LTE establishes a Consultative Council for the Energy Transition as a permanent body of citizen consultation and participation, which has the objective of providing recommendations and advising SENER on the necessary actions for the fulfillment of clean energy and energy efficiency goals.⁸⁹

SENER, SEMARNAT, CRE, CENACE and the National Commission for the Efficient Use of Energy (CONUEE) must work in a coordinated manner to comply with the general objectives of the LTE, and in the scope of their competences they will seek for continuous improvements.⁹⁰

In order to verify compliance with the provisions of the LTE, CRE and the Federal Attorney for Environmental Protection (PROFEPA) may conduct inspection visits to the regulated entities.⁹¹ Likewise, the regulated entities will be subject to sanctions ranging from 500 to 370,000 USD if they breach the LTE.⁹²

Geothermal Energy Act (LEG)

In 2014, geothermal energy was in third place in the category of renewable energy in terms of installed generation capacity, with 847 MW.

In this sense, the LEG regulates the activities of (1) recognition, (2) exploration and (3) exploitation of geothermal resources.⁹³

To carry out the studies to determine if a certain territory can be a source of geothermal resources, individuals only need to register with SENER.⁹⁴

The records are valid for a period of eight months and do not grant exclusive rights in the area in which they are granted.⁹⁵

Failure to comply with the LEG may entail the imposition of fines, as well as the loss of assets, facilities and equipment used in carrying out activities when the corresponding permit or concession is not obtained.⁹⁶

Coordinated Regulatory Bodies for Energy Act (LORCME)

The process of liberalization of the energy sector made it necessary to adopt a new institutional model in accordance with the principles of free competition, and at the same time, to remedy market failures as well as monitor the operation and compliance of the applicable regulations.

Therefore, CNH and CRE became Coordinated Regulatory Bodies in Energy Matters.⁹⁷

In August 2014, the LORCME was published, which establishes the organization, functioning and competences of CRE and CNH.

CRE and CNH must “coordinate” with SENER, CENAGAS and CENACE through the Coordination Council of the Energy Sector.⁹⁸

This Council is a channel of communication and institutional cooperation where the energy policy is published and recommendations and proposals are issued and analyzed.⁹⁹

⁸⁹ DOF (2015) LTE Art. 13.

⁹⁰ DOF (2015) LTE Art. 87.

⁹¹ DOF (2015) LTE Art. 20, fracs. I and II, 117.

⁹² DOF (2015) LTE Art 121, 122 and 123.

⁹³ DOF (2014) Ley de Energía Geotérmica (LEG) Art. 1.

⁹⁴ DOF (2014) LEG Arts. 8 and 9 ⁹⁵ DOF (2014) LEG Arts. 8 and 9.

⁹⁶ DOF (2014) LEG Art. 61.

⁹⁷ DOF (2013) Decreto de Reforma Constitucional en Materia Energética, Art. 12 transitorio.

⁹⁸ DOF (2014) LORCME Art. 3, 20.

⁹⁹ DOF (2014) LORCME Art. 21.

2.3 Key institutions and entities

Several public agencies and entities from the energy sector were restructured in order to fulfill the objectives of the Reform. SENER, as head of the energy sector, guides and implements the energy policy.

In the oil & gas sector, SENER establishes the areas that may be subject to grants and contracts. Furthermore, it awards and grants permits for oil treatment and refinement as well as natural gas processing. CNH regulates and oversees the exploration and production of oil and gas, and establishes the bidding basis for awarding contracts to oil operating companies.

CRE is responsible for regulating the gas, refined products, hydrocarbon and electricity industries. In the electricity sector, CRE is the institution that regulates and grants permits for power generation and establishes transmission and distribution tariffs.

Moreover, CENACE oversees the operation of the SEN, the operation of the WEM as well as the open access to the SEN.

Appendix 2 contains the organizational charts of the main institutions and entities related to the energy sector.

Table 2: Key Institutions and Entities

Ministry of Energy (SENER)

SENER drives the country's energy policy aimed at developing the energy sector, including oil & gas and electricity. It promotes the research of new technologies and more efficient uses of alternative energy, and it defines initiatives for the development of the SEN. One of SENER's main objectives is to guarantee the sufficiency, high quality, economic sustainability, and cost-effectiveness of energy production.¹⁰⁰ SENER is also responsible for developing and drafting the PRODESEN through the Under Secretariat of Electricity, with the advice of CENACE. The PRODESEN contains indicators that establish the demand requirements for each region, including the plans for local and private companies.¹⁰¹

National Energy Control Center (CENACE)

CENACE is a decentralized agency of SENER, and is responsible for ensuring that electricity industry companies are able to operate and grow in the market. CENACE oversees the operations of the SEN and the WEM, guaranteeing the transparent process of the RNT and the RGR. CENACE makes proposals for the expansion and modernization of the RNT and the aspects of the RGR that correspond to the WEM. It also develops partnerships with private entities for the provision of ancillary services related to the operation of the WEM and manages the FTR in accordance with the terms and conditions established in the market rules.¹⁰³

National Commission for the Efficient Use of Energy (CONUEE)

CONUEE promotes energy efficiency and acts as a technical body aimed at guaranteeing the sustainable use of energy. It also identifies international leading practices related to energy efficiency programs and projects, and issues Official Mexican Standards (NOMs) on energy efficiency. CONUEE prepares and issues the methodologies for quantifying energy by type and end use. Lastly, it proposes to SENER the criteria used to determine whether users have high energy consumption patterns.¹⁰⁶

Energy Regulatory Commission (CRE)

CRE is a decentralized agency of SENER that has technical and operational autonomy to regulate Mexico's natural gas, liquefied petroleum gas, oil, and electricity industries. CRE promotes the efficient development of the energy sector to ensure reliable supply of oil & gas and electricity. In the oil & gas sector, it regulates and issues permits for the storage, transportation and distribution of oil, gas, oil products and petrochemicals. In the electricity sector, it grants permits for power generation and regulates transmission and distribution tariffs. This institution is responsible for establishing mechanisms for the authorization, review, adjustment and update of Market Operation Rules. It also issues and applies tariff regulations; regulates, oversees and executes SEN standardization and regularization processes; grants permits for the generation, trade and distribution of electricity; and manages the CEC.¹⁰²

National Center for Control of Natural Gas (CENAGAS)

The CENAGAS manages the National Integrated System for Natural Gas, Transportation and Storage (SISTRANGAS). This entity is also responsible for the operation of the national pipeline transportation and storage system. It manages the existing contracts of Pemex and its subsidiaries related to the transportation and storage of gas. Pemex and its subsidiaries must transfer the resources needed to acquire and manage the infrastructure to the CENAGAS.¹⁰⁴

National Hydrocarbons Commission (CNH)

CNH regulates the exploration and production of oil & gas in Mexico. It allocates the rights for the exploration of specific areas and productive fields through grants, which require SENER's approval. The CNH is also responsible for running the bidding processes whenever Pemex contracts private entities to gather geological and operating data. Additionally, the CNH authorizes exploration services, holds bids, and manages grants and technical contracts that maximize field productivity over time.¹⁰⁵

¹⁰⁰ SENER (2018). ¿Qué hacemos?.

¹⁰¹ SENER (2015) Prospectiva del Sector Eléctrico 2015-2029.

¹⁰² DOF (2017) REGLAMENTO Interno de la CRE.

¹⁰³ DOF (2017) Estatuto Orgánico del CENACE.

¹⁰⁴ CENAGAS (2018) ¿Qué hacemos?.

¹⁰⁵ CNH (2018) ¿Qué hacemos?.

¹⁰⁶ CONUEE (2018) ¿Qué hacemos?.

Agency for Safety, Energy and Environment (ASEA)

The ASEA is a decentralized administrative entity of the SEMARNAT with technical and administrative autonomy. It regulates and oversees the industrial security, operating security and environmental protection of activities conducted in the oil & gas sector, including activities related to the decommissioning and abandonment of facilities as well as waste control. The ASEA also aims to guarantee personal safety and environmental protection.¹⁰⁷

National Nuclear Safety and Safeguards Commission (CNSNS)

The CNSNS is a decentralized agency of SENER whose tasks are determined by the Regulatory Law established in Article 27 of the Mexican Constitution. The CNSNS adheres to international commitments and requirements in the areas of nuclear, radiation, physical safety and safeguards. It also proposes and oversees the application of nuclear, radiation and safeguard standards. In addition, the CNSNS issues, certifies, replaces, modifies, suspends and revokes the licenses required to operate radioactive facilities. Lastly, it issues preliminary opinions on authorizations for foreign trade of radioactive materials.¹⁰⁸

There are other public agencies that work together with the energy sector's key institutions in order to ensure a competitive market in Mexico, and guarantee the compliance with the regulations established in the country's energy sector laws.

Table 3: Related Institutions and Entities

Ministry of Economy (SE)

The SE focuses on improving the regulation, market competition and diversification of foreign trade. It also promotes productivity and competition in the Mexican economy by focusing on strengthening the local market and boosting domestic and foreign investment. The SE comprises four Under Secretariats, six units and 26 central offices. Specifically, the Under Secretariat of Industry and Commerce, through the National Content, Value Chains and Investment Unit, oversees energy sector matters.¹⁰⁹

Ministry of Finance and Public Credit (SHCP)

SHCP proposes, directs and oversees the Federal Government's economic policy aimed at ensuring economic growth in Mexico. The SHCP comprises three Under Secretariats, an administrative office, the treasury and five decentralized bodies.¹¹⁰ In the energy field, it is responsible for assigning the federal budget to programs and investment projects related to the energy sector intended to meet the objectives set forth in the National Development Plan. Among its many responsibilities, this ministry is in charge of monitoring and controlling resources through follow-ups on such programs and projects, as well as coordinating subsidies and taxation aspects for the sector.

Ministry of Communication and Transportation (SCT)

SCT promotes the development of Mexico's transportation and communications systems, seeking to expand the coverage and accessibility of these services by strengthening the legal framework, defining public policies and designing strategies that contribute to the growth of the economy as well as a balanced social development.¹¹¹

Ministry of Environment and Natural Resources (SEMARNAT)

This ministry defines the criteria to ensure the protection, conservation and good use of Mexico's natural resources. The SEMARNAT takes actions aimed at preventing and controlling pollution, managing water resources and mitigating climate change. It has three Under Secretariats as well as several decentralized bodies that are part of the Federal environmental sector.¹¹²

Federal Attorney's Office for Environmental Protection (PROFEPA)

The PROFEPA is a decentralized administrative body of the SEMARNAT that has technical and operational autonomy. Its main mission is to increase the market's compliance with Mexico's environmental regulations and standards, contributing to the country's sustainable development.

The PROFEPA is responsible of the handling of public reports and complaints related to environmental damage; the inspection and surveillance of natural resources, and of ports, airports and borders; the inspection, verification and protection of the environment and the verification and promotion of compliance with environmental regulations.¹¹³

Ministry of Agricultural, Land and Urban Development (SEDATU)

This ministry coordinates, manages, generates and executes public policy for land management aimed at promoting urban and rural development and providing legal certainty for the country's agrarian units. The SEDATU also prevents the construction and settlement in risk/dangerous areas and provides assistance during natural disasters. It is comprised of three Under Secretariats, three units and two directorate-generals.¹¹⁴

National Housing Commission (CONAVI)

This commission operates Mexico's National Housing Policy and coordinates the Access Financing Solutions Program, which seeks to provide housing financial support to workers. The operation, management and functioning of the commission includes a governing board and several administrative units.¹¹⁵

¹⁰⁷ ASEA (2018) ¿Qué hacemos?.

¹⁰⁸ CNSNS (2018) ¿Qué hacemos?.

¹⁰⁹ SE (2018) ¿Qué hacemos?.

¹¹⁰ SHCP (2018) ¿Qué hacemos?.

¹¹¹ SCT (2018) ¿Qué hacemos?.

¹¹² SEMARNAT (2018) ¿Qué hacemos?.

¹¹³ PROFEPA (2017) Informe de Actividades (Official Annual Activities Report).

¹¹⁴ SEDATU (2018) ¿Qué hacemos?.

¹¹⁵ CONAVI (2018) ¿Qué hacemos?.

Federal Electricity Commission CFE

In 2014, as a result of the Energy Reform, CFE became an SOE and continued to be the BSS of electricity in Mexico. To achieve this transition, it was necessary to change the attributions of the value chain (see table below) and to establish new standards for the administration, organization, corporate structure as well as

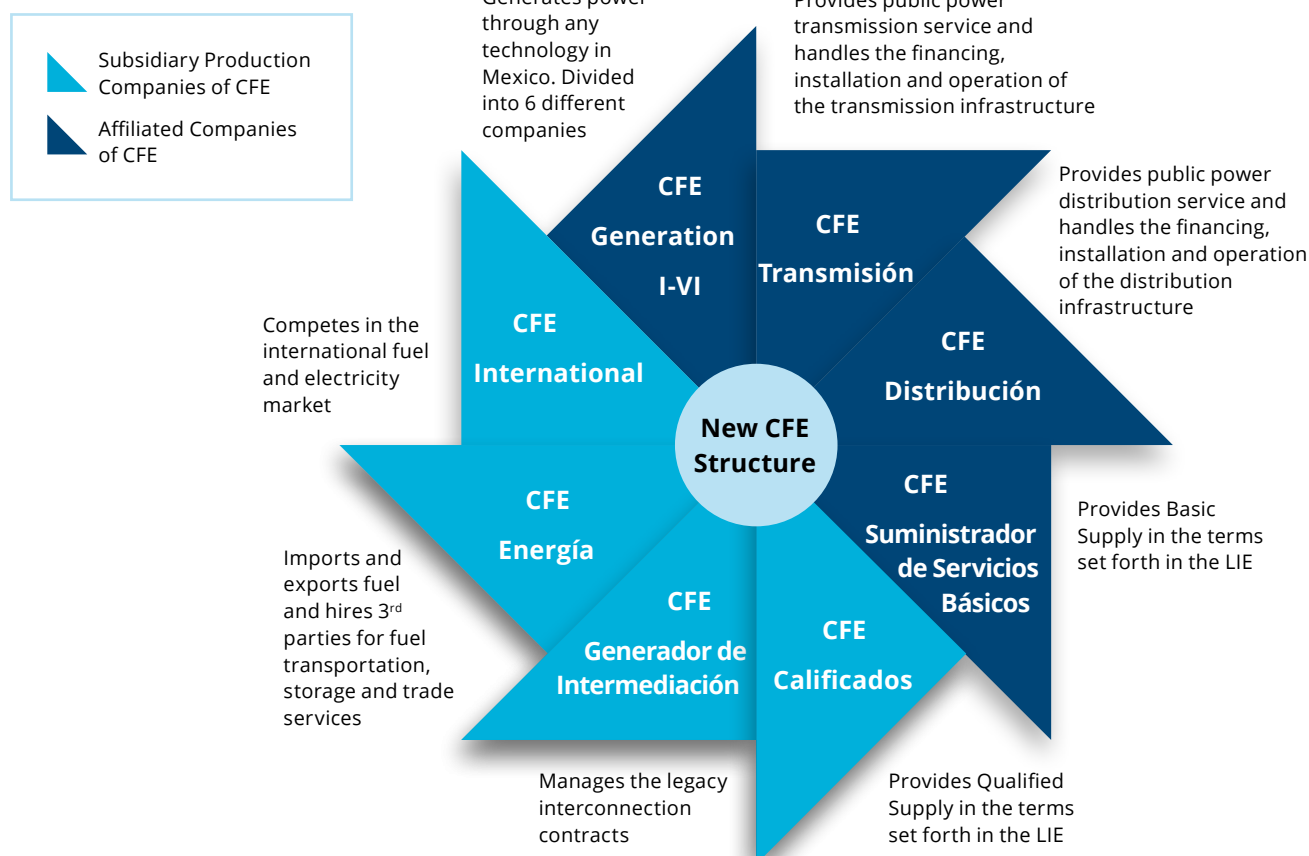
management rules¹¹⁶ through Subsidiary Production Companies (SPC) and CFE Affiliated Companies (AC). CFE is currently divided into 13 entities: 6 SPCs for generation, 1 AC for intermediation for generation, 1 SPC for transmission, 1 SPC for distribution, 1 SPC for BSS, 1 AC for CFE qualified supply and, lastly, CFEnnergía and CFE Internacional.¹¹⁷

Table 4: CFE Value Chain

	Pre-Reform	Post-Reform
Generation Barriers to entry are eliminated and competition is strengthened.	CFE + permit holders	CFE + private entities
Control/Dispatch CENACE is separated from CFE to run the SEN and the spot market.	CFE	CENACE
Transmission/Distribution Strategic areas where the Mexican Government sets the rules but has the possibility of involving private entities through an invitation.	CFE	Operator: CFE
Trading CRE sets the basic user tariffs and provides the basic supply service. In the case of qualified supply, CFE competes against private entities.	CFE	CFE + private entities

Source: SENER, Prospectiva del Sector Eléctrico 2015-2029

Figure 9: New CFE Structure



Source: CFE, Acuerdos del Consejo de Administración

¹¹⁶ SENER (2015) Prospectiva del Sector Eléctrico 2015-2029.

¹¹⁷ CFE (2017) Principales Elementos del Plan de Negocios 2017-2021.

The functions of the critical public entities and agencies in the electricity sector in each stage of the value chain are as follows:

Table 5: Main activities of the public institutions and entities from the electricity sector before and after the Energy Reform



	Generation	Control/Dispatch	Transmission	Distribution	Trading
Pre-Reform	CFE Expansion plan	CFE Dispatch rules and reliability standards	CFE Expansion plan and interconnection generation		SHCP Final tariff
	CRE Permits		SENER Approval of expansion plan		CRE Involvement in final tariff
	SENER Generation mobility and approval of expansion plan				SENER Involvement in final tariff
Post-Reform	CENACE Market operation	CENACE Operating system	CENACE Interconnection planning and studies		SENER Definition of minimum consumption
	SENER Clean energy requirements	SENER Initial market rules	SENER Approval of expansion plan		CRE Quality Service Requirements and final tariff (basic service) and registration of market participants
	CRE Contracting requirements and managing CEC	CRE Reliability Standards and market monitoring	CRE Regulated tariffs and oversight of interconnection		

Source: SENER

2.4 Financial framework

The opening of the Mexican energy market to foreign investment has sparked interest among Mexican and foreign investors. However, one of the main challenges that new market players are facing is obtaining financing in Mexico due to the high levels of uncertainty in this new market.

This risk is even more increased by the possibility – as in all markets – of a drop in spot market prices (for those investors who do not have a Power Purchase Agreement (PPA) and/or a LTA contract in the case of electricity projects) and the uncertainty related to how electricity and oil & gas prices will fluctuate.

There are several institutions in Mexico that offer financing for electricity generation projects involving both conventional and clean technologies, including i) Commercial and Private Banking, ii) Development Banking, and iii) International Financial Cooperation.

Commercial and Private Banking

The top commercial banks in Mexico provide financing for energy sector projects. These banks include: Santander, Citibanamex, Scotiabank, and SMBC México. The main product they offer is project finance, although there are other product options that are not often used, such as private equity, seed capital (in cases where the bank is able to act as a developer), and solar leasing, among others.

Investment banking primarily helps developers issue debt and structure their capital to ensure the optimal debt/equity ratio. They also structure green bonds and sustainable bonds for companies.¹¹⁸

One of the key challenges that companies are facing in Mexico is securing different financing plans for long-term projects of between 15 and 20 years, which currently cannot be obtained through commercial banking. The legal requirements for financing this type of projects make it unattractive for commercial banks due to the large amount of reserves needed for projects that are more than seven years long.¹¹⁹

International commercial banks are required to sign financing or co-financing contracts with a local Mexican bank in order to operate financing in Mexican pesos (when a Mexican peso-denominated loan is required by the borrower).

Development Banking

Development banking in Mexico is an attractive financing option for energy projects, primarily because of the interest among investors due to the opening of the Mexican energy market.

The country's top development banks include National Bank for Construction and Public Services (Banobras), the National Financing Entity (Nafin) and the National Foreign Trade Bank (Bancomext). The main financing products offered by development banks include mezzanine debt, contingent mezzanine debt, direct loans, contingent loans, syndicated loans and co-financing schemes.

These products may be considered complementary to the commercial banking options. Structures like payment guarantees, debt security guarantees, and PPPs – in the case of Banobras – provide a high degree of security for projects by reducing the level of merchant risk. These guarantees allow commercial banks to reduce their capital requirements.

Development banks also participate by providing project financing products that are often combined with corporate loans or public work schemes.¹²⁰

Although development banks offer financing for longer periods than commercial banks, one of the challenges they face is reducing loan approval times, since it can take up to 2 years¹²¹ for applicants to obtain all the permits and procedures required to secure a loan.

Nafin offers products like project financing, loan management or monitoring, long-term debt, partial loan guarantees, loans to cover tax costs incurred during construction, and financing in local currency.

Financing options such as green bonds are also becoming increasingly popular and investors are considering these options due to the diversification that green assets represent for investors and the increased importance of the social and environmental impact.

Nafin launched its first green bond in 2015 for approximately USD 500 million, and by 2016 this security was listed on the Mexican Stock Exchange.¹²²

International Financial Cooperation

In Mexico, international development banking and international organizations have played a key role in financing the country's infrastructure projects.

Entities such as the Inter American Development Bank (IADB), the Japan Bank for International Cooperation (JBIC), the KfW Development Bank (KfW), and the International Finance Corporation (IFC) are some of the institutions that have been investing in energy sector projects in Mexico. The products they offer include: equipment export loans, import loans, direct lines of credit, Independent Power Producer structures, investment loans, political risk guarantees, foreign investment loans, and build-own transfer schemes.

These cross-border organizations have played an active role in funding Mexico's most recent infrastructure projects and since the Energy Reform was enacted, they have had a particular interest in financing clean and renewable energy projects.¹²³

¹¹⁸ Websites of the financial institutions mentioned in this section (2017).

¹¹⁹ Workshop EY Mexico and GIZ with several Mexico electricity sector investors (Comments).

¹²⁰ Bancomext (2017), Nafin (2017), Banobras (2017).

¹²¹ Workshop EY Mexico and GIZ with several Mexico electricity sector investors (Comments).

¹²² Nafin (2017) Bonos verdes.

¹²³ Cooperación Interamericana de Inversiones (2017).

Fibra E

In 2015, the creation of “FIBRA E” was announced as a new investment vehicle that would allow public and private investors to monetize assets with predictable and stable cash flows under a tax regime that reduces the tax burden for such investments.¹²⁴

FIBRA E is a trust created in accordance with the laws of Mexico with a Mexican banking institution acting as trustee, qualified as a FIBRA E for tax purposes, that issues publicly traded securities in the form of trust bonds or *certificados bursátiles fiduciarios de inversión en energía e infraestructura* (“CBFEs”), registered with the National Securities Registry (Registro Nacional de Valores – the “RNV”) and listed on the Mexican Stock Exchange in accordance with the Securities Market Law (Ley del Mercado de Valores – the “Securities Law”) and its regulations.

A corporate sponsor contributes its shares of Mexico-resident companies to the FIBRA E, either via a transfer of shares or an in-kind contribution.

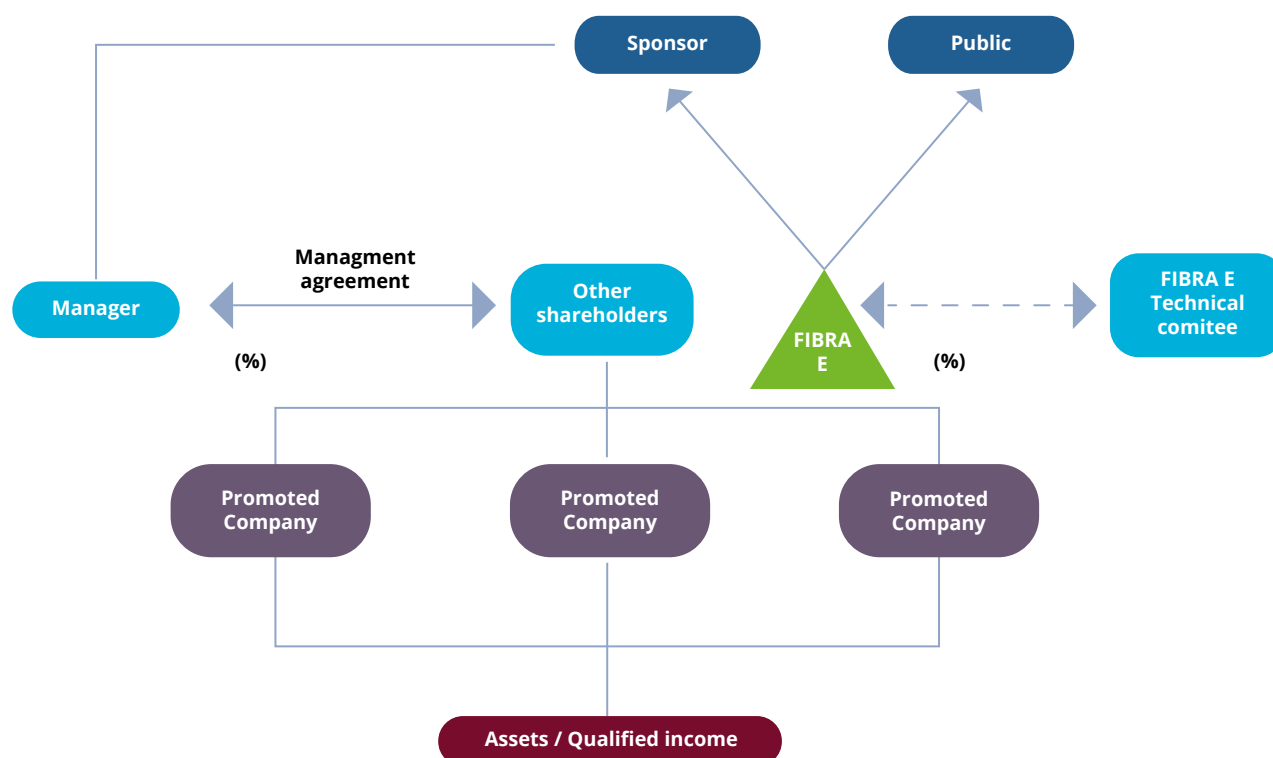
The Sponsor would typically receive CBFEs in exchange

and other rights to receive a greater portion of the FIBRA E incremental cash flow in the future, subject to the payment of a preferred return to the security holders (“incentive distribution rights” or “IDRs”).

Structuring the contribution of such interests will be directly driven by the tax regime applicable to the formation of the FIBRA E and other legal issues, such as contractual prohibitions on asset transfers, consent requirements, licenses and permits, debt covenants, among others.

The ownership of a FIBRA E may be divided into two main groups of security holders: the public and the Sponsor. The FIBRA E may issue different series of CBFEs, including preferred (with limited voting rights) and subordinated CBFEs, the latter typically held by the Sponsor. The Sponsor or any other person generally controlled by the Sponsor (the “Manager”), manages the assets of the FIBRA E, in accordance with the terms and conditions of the relevant Management Agreement and subject to the security holders’ rights provided in the Securities Laws and its Regulations, as described further herein.

Figure 10: FIBRA E Structure



Source: EY analysis with information from SHCP

¹²⁴ Comisión Nacional Bancaria y de Valores (2016) Fibra E, un vehículo de desarrollo para los sectores energético e infraestructura en México.

Outlook and challenges for energy project financing in Mexico

Mexico's interest rates have suffered a steady increase, primarily due to the depreciation of the Mexican peso and other international political factors that have resulted in the renegotiation of NAFTA. This has caused interest rates on Mexican debt to exceed interest rates in other international markets; however, interest rates are expected to stabilize in the medium-term, which will help to attract capital investment in the future. For foreign investors, obtaining financing in a currency other than the Mexican peso may be advantageous considering the devaluation of the peso in recent years.

The role of the private banking sector has primarily been focused on financing construction projects as well as refinancing the capital requirements of commercial banks' reserves.

As of 2017, the financing structures of energy projects, during the project construction stage, have mostly consisted of capital investments, particularly for investors that do not have a PPA and that sell in the spot market. The financial structure over the operating period has involved the raise of additional capital by securing loans or issuing securities.

Placing debt for developers that do have a PPA may be easier as these contracts provide greater certainty regarding the future cash inflows of projects.

Lastly, as in any electricity market, the main financing risk is related to the ability of sellers to increase their sales in the spot market at prices that generate a return on their investments, as well as the ability of investors to ensure payment of the energy contracted through PPAs at the agreed price.



2.5 Taxes applicable to the sector

Operators and investors need to create a legal entity in Mexico in order to carry out commercial transactions in the energy market. The investment structure of this legal entity is subject to applicable local and international taxes.

Mexico has 12 free trade agreements with 46 countries as well as 32 Bilateral Investment Promotion and Protection Agreements. These treaties address tax matters, including the date of effective application of the new rules for implementing Base Erosion and Profit Shifting (BEPS) actions, which consider the contracts or agreements related to the recognition of intangible assets and loans, as well as other aspects related to doing business in Mexico.

There are three main laws related to the payment of taxes in Mexico.

Mexican Income Tax Law (ISR)

This law¹²⁵ addresses matters related to taxes on income generated from transactions carried out in Mexico, including:

- a. Foreign residents that generate income through a permanent establishment or another source of income in Mexico.
- b. Legal entities with a tax residence in Mexico, including joint ventures (two or more entities who perform activities in Mexico through an agreement and participate in the profits or losses derived from such activities).
- c. Foreign legal entities with or without permanent establishment in Mexico generating income from activities carried out in Mexico.
- d. Payment of share of profits or dividends at the rate of 10%.
- e. Multinational companies that engage in transactions with foreign related parties.

The tax rate for legal entities is of 30%.

Excise Tax (IEPS)

This law¹²⁶ considers all the taxes applicable to transactions related to the following:

- a. Sales or imports of goods.
- b. Delivery of services.

Tax rates depend on the product in question. One of the taxes established in this law is the tax on exports of geothermal steam-generated electricity at a rate of 13% of the energy value. In the case of oil & gas, the SHCP publishes the IEPS rates applicable to different types of fuel.

Value Added Tax Law (VAT)

The VAT Law¹²⁷ requires the payment of VAT by individuals and legal entities that perform the following activities:

- a. Sale of goods.
- b. Provision of independent services.
- c. Grant the use (including temporary usage) of assets.
- d. Imports of goods or services.

The general VAT rate is of 16%, although the 0% VAT rate may apply to some transactions, such as the export of goods and certain services.

The VAT calculation of entities that engage in activities subject to the 0% VAT rate and newly created companies during pre-operation periods, commonly result in recoverable VAT balances, which the taxpayer may obtain on a monthly basis either through a refund, by tax offset or by crediting them against other taxes owed (in the cases in which the taxpayer is allowed to do so).

On the other hand, a non-resident entity is not able to register for VAT in Mexico, unless the company has a permanent establishment in the country. Consequently, foreign residents are encouraged to establish a Mexican entity in order to recover the VAT that they pay on most types of contracts, for those transactions executed in Mexico that require local goods or services.

Mexico-resident corporations

The corporate income tax rate in Mexico is of 30%¹²⁸, Mexico-resident corporations must pay income tax on their worldwide income.

A corporation is considered a Mexico-resident taxpayer when the address of its headquarters is located in Mexico. In addition, the permanent establishment of a foreign resident is taxed at the same rate as a Mexican-resident, but only on the income that is earned in Mexico.

In general, expenses incurred by taxpayers related to their activities are deductible for income tax purposes. However, a set of technical requirements, as established in the Mexican laws, must be met in order to deduct the expenses related to each specific transaction.

¹²⁵ DOF (2013) Ley del ISR and Código Fiscal de la Federación.

¹²⁶ DOF (1980) Ley de Impuesto Especial sobre Producción y Servicios.

¹²⁷ DOF (1978) Ley del Impuesto al Valor Agregado.

¹²⁸ DOF (2013) Ley del ISR.

These requirements include obligations such as maintaining accounting records and having tax receipts.

Capital gains and losses are treated as ordinary income and deductions, except for losses derived from sales of shares. Fiscal losses can be amortized for 10 years. However, there are limitations for the use of losses in mergers and divisions of companies in Mexico.

With regard to employee profit sharing, employers in Mexico are required to pay their workers 10% of their taxable income every year.

Also, as of 2014, Mexican-resident corporations must withhold 10% of the dividends or other earnings that they distribute to their foreign shareholders. In the case of individuals, this 10% withholding tax on their earning distributions and dividends constitutes a non-creditable tax payment.

It is important to analyze whether a foreign resident could benefit from one of Mexico's current 50 tax treaties, since this could reduce the maximum withholding rate and in some cases eliminate the withholding requirement entirely.

Likewise, interest expenses on loans with non-resident related parties are non-deductible whenever this loan exceeds the borrower's equity at a ratio of 3-to-1.

Nevertheless, loans subscribed for the construction, operation, or maintenance of productive infrastructure related to Mexico's strategic areas are exempt from the 3-to-1 ratio capitalization requirement.

Transfer pricing

Mexican taxpayers are required to carry out transactions with related parties at market values. They are also required to submit an annual report as well as support documentation (i.e., a transfer pricing study) validating that revenue and deductions that result from intercompany transactions were performed at market value.

Inflation adjustments

Mexican companies must recognize the effects of inflation on the gains or losses associated to their monetary assets and liabilities.

Therefore, in order for companies to determine how investments in Mexico should be financed, they need to

consider the income tax treatment of their borrowing costs, as inflation gains on their debt may fully or partially offset the interest expense.

Mexico currently has tax treaties that address double taxation issues with Germany, Australia, Austria, Barbados, Belgium, Brazil, Canada, Chile, China, South Korea, Denmark, Ecuador, the United States, Spain, Finland, France, Greece, Indonesia, India, Ireland, Iceland, Israel, Italy, Japan, Luxemburg, Norway, New Zealand, the Netherlands, Poland, Portugal, the United Kingdom, the Czech Republic, Romania, Russia, Sweden and Switzerland.¹²⁹

Capital gains

In the case of foreign residents, a 25% tax is applicable to asset disposals whenever the legal entity issuing them is a Mexico-resident or whenever more than 50% of its book value comes from real estate properties in Mexico.

Furthermore, there is an option to tax capital gains (the difference between market value and the tax cost of the shares) at a 35% income tax rate whenever the transaction is audited by a registered public accountant registered and the audit report confirms the income tax was calculated considering the established tax rules. Income tax on these capital gains may be deferred if the taxpayer receives the approval from Mexican tax authorities to do so before the taxable amount is received by the taxpayer.

There are tax treaties in place that may provide an exemption or reduce the tax rate on capital gains generated through the sale of shares.

Royalties and technical assistance fees

Income tax is withheld on royalties and technical assistance fees at the payment date or at the time the amounts become due and payable. Under the Mexican tax law, the withholding rate on know-how is of 25%. This rate is of 35% for the use of patents, trademarks, and brand names. However, the rate is of 40% for royalties paid to a related party that is resident of a tax haven country.

The general withholding rate in Mexico on interest paid abroad is 35%, unless an exception is applied.¹³⁰

¹²⁹ Servicio de Administración Tributaria (SAT) (2017) Doble Tributación.

¹³⁰ DOF (2013) Ley del ISR.

Customs regime

As a general rule, any person who wishes to import goods into Mexico must be registered in the Importers Registry.

Mexico's Customs Law requires that all goods imported into Mexico be classified based on the tariff classification system specified in the Import Duties Law.

Imported goods duties are calculated considering their transaction value as shown on the invoice, as established by the Customs Law. In addition to the price paid for the goods, the transaction value also includes certain expenses, such as custom fees, purchase commissions, packaging and crating costs, packing materials labor costs, freight, and insurance premiums, among other items, incurred before the goods are imported.¹³¹

The Customs Law also establishes that all royalties and licensing fees on goods, paid by the importer either directly or indirectly, should be added to the value of the imported goods.

Importers in Mexico must pay the applicable tariffs, VAT, as well as customs' processing fees on the import merchandise. In certain cases, an importer may also be required to pay antidumping duties.

Below is a description of each of these duties:

- a. General Import Duties:** The duty rate varies based on the type of product being imported and the merchandise's country of origin.
- b. Value Added Tax:** As mentioned above, in Mexico the applicable VAT rate to imports is of 16%. However, the VAT paid on imports may be credited against the VAT charged on the subsequent sale of the merchandise in Mexico.
- c. Customs Processing Fee:** The customs' processing fee rate is equal to 0.008% of the goods' invoice value and its applicable to all goods imported into Mexico.

International treaties

According to the SE, Mexico has 12 free trade agreements with 46 countries, 32 Bilateral Investment Promotion and Protection Agreements with 33 countries, and 9 limited scope agreements (Economic Cooperation Agreements and Partial Scope Agreements) under the Latin America Integration Association (ALADI).

Mexico also participates in multilateral and regional bodies and forums such as the World Trade Organization

(WTO), the APEC, the OECD and the ALADI.

Mexico's major international treaties include the following:

- Free Trade Agreements: North America (United States, Canada), Latin America (Argentina, Bolivia, Brazil, Colombia, Costa Rica, Cuba, Chile, Ecuador, El Salvador, Guatemala, Honduras, Nicaragua, Panama, Paraguay, Peru, Uruguay), Asia-Pacific (Australia, South Korea, China, India, Israel, Japan, Singapore) and the European Free Trade Association.
- Trans-Pacific Partnership (TPP): Australia, Brunei, Canada, Chile, Japan, Malaysia, New Zealand, Peru, Singapore, Vietnam.
- Mercosur: Economic Cooperation Agreement.
- European Union: Economic Partnership Agreement.
- Bilateral Investment Promotion and Protection Agreements: Germany, Argentina, Australia, Austria, Bahrain, Belarus, China, South Korea, Cuba, Denmark, Slovakia, Spain, Finland, France, Greece, India, Iceland, Italy, Kuwait, the Netherlands, Panama, Portugal, the United Kingdom, the Czech Republic, Singapore, Sweden, Switzerland, Trinidad and Tobago, Belgium–Luxembourg Economic Union, and Uruguay.¹³²

Tax benefits

In Mexico, local authorities usually offer tax benefits whenever companies invest in projects that create jobs and support the growth of a specific geographical area (e.g., property taxes, payroll taxes, among others).

In addition to tax benefits, the government also provides incentives such as land donations for construction of investment projects, tax deductions, among others.

The ISR Law currently includes specific incentives for energy sector activities including the deduction of 100% of the machinery and equipment used for power generation from renewable sources or through efficient cogeneration power systems (provided that the income from these clean energies represents at least 90% of the taxpayer's total income).

Companies that apply for this deduction include an account for earnings from investments in renewable energy in their accounting records. In addition, these companies are not required to pay income tax on the dividends or earnings they distribute from this investment earnings account.¹³³

¹³¹ DOF (2015) Ley Aduanera.

¹³² Secretaría de Economía (2017) Comercio Exterior/Países con

Tratados y Acuerdos firmados con México.

¹³³ DOF (2013) Ley del ISR.

2.6 Players and size of the energy market

Key players in the oil and gas sector

The activities related to the exploration and production of oil, are allowed for both SOEs (through direct awards and/or contracts) and private entities (through concessions or partnerships with the SOE).

One of the mechanisms established in the reform for awarding exploration and production of oil & gas contracts, is the execution of bidding rounds. SENER may also grant contracts¹³⁴ to any SOE for the exploration and exploitation of oil & gas.

As of 2017, seven tenders have been carried out through 2 bidding rounds called “Rondas México”: Round 1 (4 bids), and Round 2 (3 bids). These bidding rounds have resulted in the drilling of 104 new wells (66 exploratory wells and 38 development wells). These bids represent more than USD 2.385 billion in approved and committed investment¹³⁵. Appendix 3 lists the companies that were awarded through these bidding rounds.

Likewise, the law allows for farmout agreements¹³⁶ (strategic partnership between SOE and private companies) offered through a public bidding process administered by CNH. These partnerships may arise as a result of the transfer of the exploitation and production rights, or from a joint venture between companies seeking to obtain a contract¹³⁷.

To date, the farmouts that have been awarded are: the Trion block to BHP Billiton, Cárdenas-Mora to Cheiron Holdings, and Ogarrio to DEA Deutsche Erdoel México. As a result of these farmout agreements, Pemex committed investments of its partners for USD 2.513 billion, of which USD 1.974 billion corresponds to the joint investment with Trion, USD 166.5 million with Cárdenas-Mora and USD 373.02 million with Ogarrio. These farmouts represent 23% of Pemex’s investment in 2017.

According to the most recent announcements from Talos Energy and Eni, new oil reserves have been found in the Gulf of Mexico. Talos Energy Offshore Mexico discovered the existence of light oil in the Zama-1 well. Estimates indicate that these reserves range from 1,200 to 1,400 million barrel of crude oil.¹³⁸

Also, Eni announced the discovery of an additional 1 billion barrel of oil in the Amoca field.¹³⁹

Likewise, Pemex found a new oilfield called Ixachi, where 1,500 million barrels of crude oil are expected to be extracted. This discovery represents 350 million barrels of 3P reserves (proved, probable, and possible).¹⁴⁰

In addition, some private companies are changing their Exploration and Production Contracts (that were signed before the Energy Reform between Pemex and these companies) to the new schemes that will allow private companies to become Pemex’ partners, sharing both potential risks and gains.

¹³⁴ Note: The legal-administrative act through which Mexico’s Federal Executive Branch exclusively grants an Assignee the right to perform Hydrocarbon Exploration and Production activities in the Assignment Area during a specific period of time.

¹³⁵ CNH (2017) Estadísticas de petróleo y gas.

¹³⁶ Chadbourne (2014) México abre la industria de los hidrocarburos a la participación del sector privado.

¹³⁷ DOF (2014) LH.

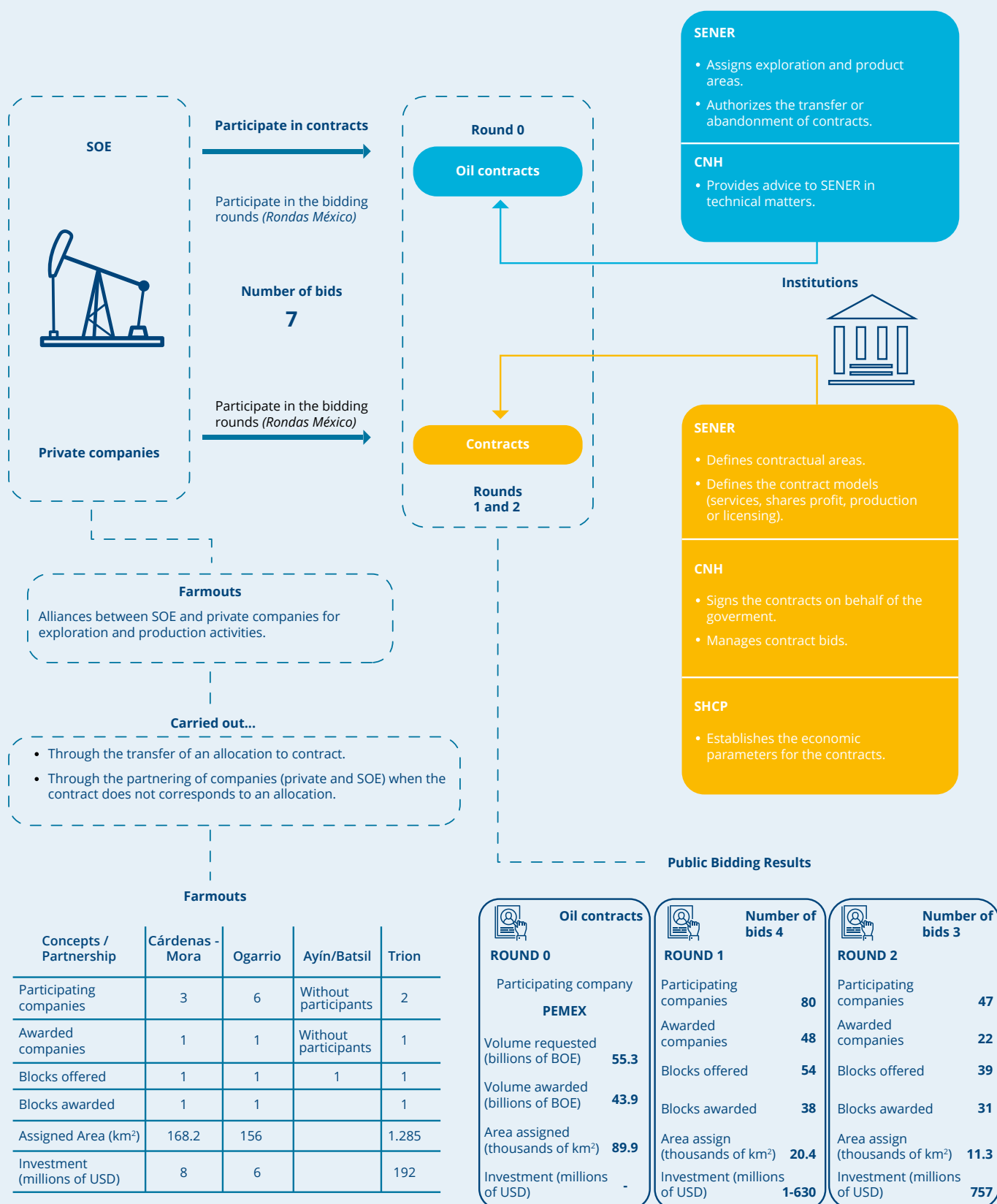
¹³⁸ CNH (2017) Estadísticas de petróleo y gas.

¹³⁹ CNH (2017) Importante descubrimiento de hidrocarburos en el Pozo Zama-1, en la Cuenca del Sureste, uno de los mayores de los últimos años en el Golfo de México.

¹⁴⁰ Eni. (2017) A new offshore well in Mexico boosts Eni’s resources in the Amoca Field triggering a fast track development.

¹⁴⁰ Pemex (2017) Boletines Nacionales: “Anuncia el Presidente de la República el mayor yacimiento terrestre descubierto por Pemex en los últimos 15 años”.

Figure 11: Key players for exploration and production activities



Source: EY with information from CNH

Investment opportunities for seismic companies

The Energy Reform allows private companies to acquire 3D seismic data from the Gulf of Mexico, which is one of the most researched regions in the world.

The investment and business opportunities include: i) updated data to identify exploration opportunities, ii) information for business plans, and iii) the option to trade the seismic information.

"As of 2017, CNH has authorized 56 projects, from which 47 are 2D & 3D acquisition studies as well as seismic reprocessing, 6 are finished, 6 are expired while 7 companies stopped the execution of 9 projects that had been previously authorized"¹⁴¹

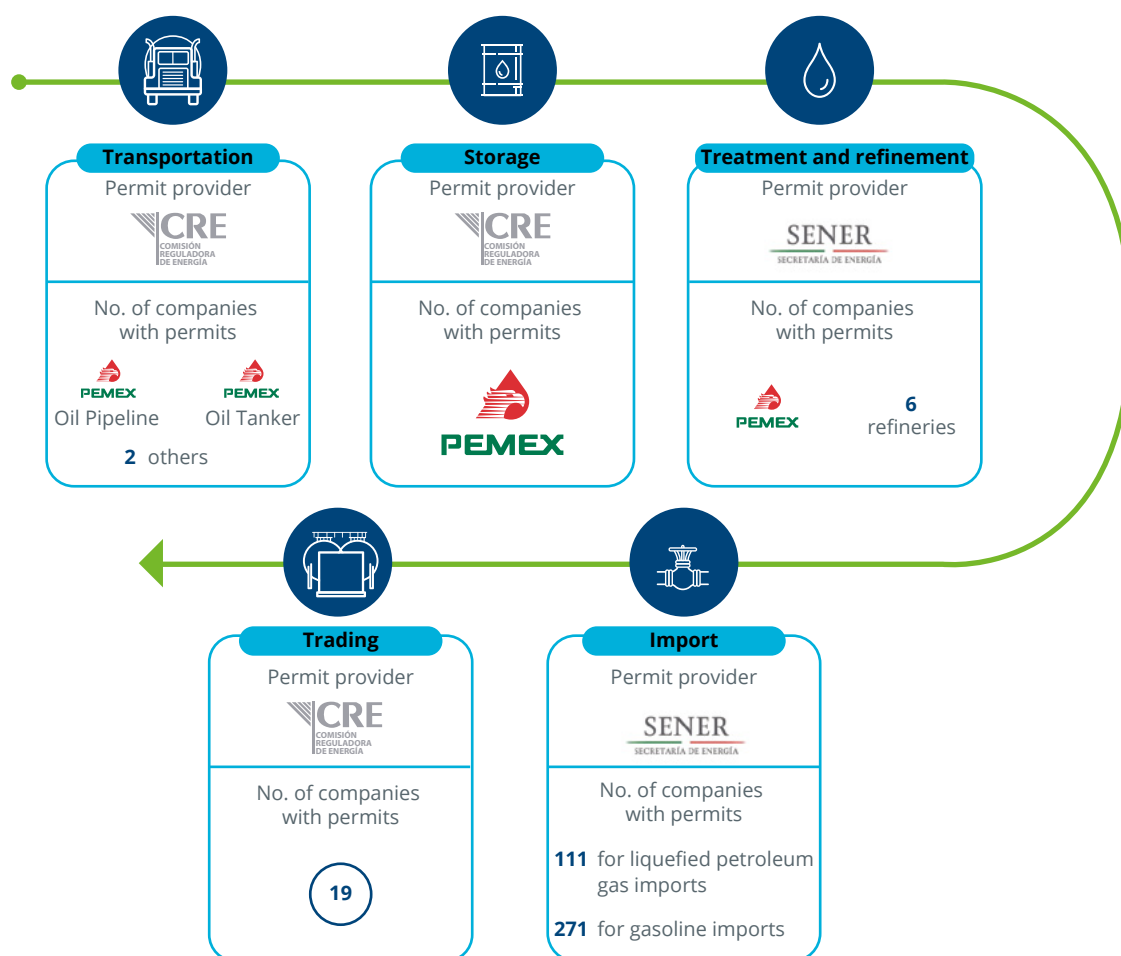
"As of October 2017, 26 surface exploration permits were issued to perform 2D & 3D acquisition studies, as well as seismic reprocessing"¹⁴²

Liquefied petroleum gas and gasoline

The key players in the hydrocarbons market that carry out transportation, storage, treatment and refinement, import and trade activities are described in the chart

below. This chart also shows the agencies responsible for extending permits for each activity, as well as the number of companies that currently own these permits.

Figure 12: Key players for transportation, storage, treatment and refinement, import and trading activities in the hydrocarbons market



Source: EY with information from CNH, SENER and CRE

¹⁴¹ CNH (2017) Autorizaciones de Reconocimiento y Exploración Superficial.

¹⁴² Idem.

Oil & Gas Traders

According to the LH, CNH is allowed to contract an SOE or a legal entity, through a public bidding process, to commercialize oil & gas products obtained by the State through contracts of exploration and production¹⁴³. This will allow the participation of private investors in the Mexican oil & gas market.

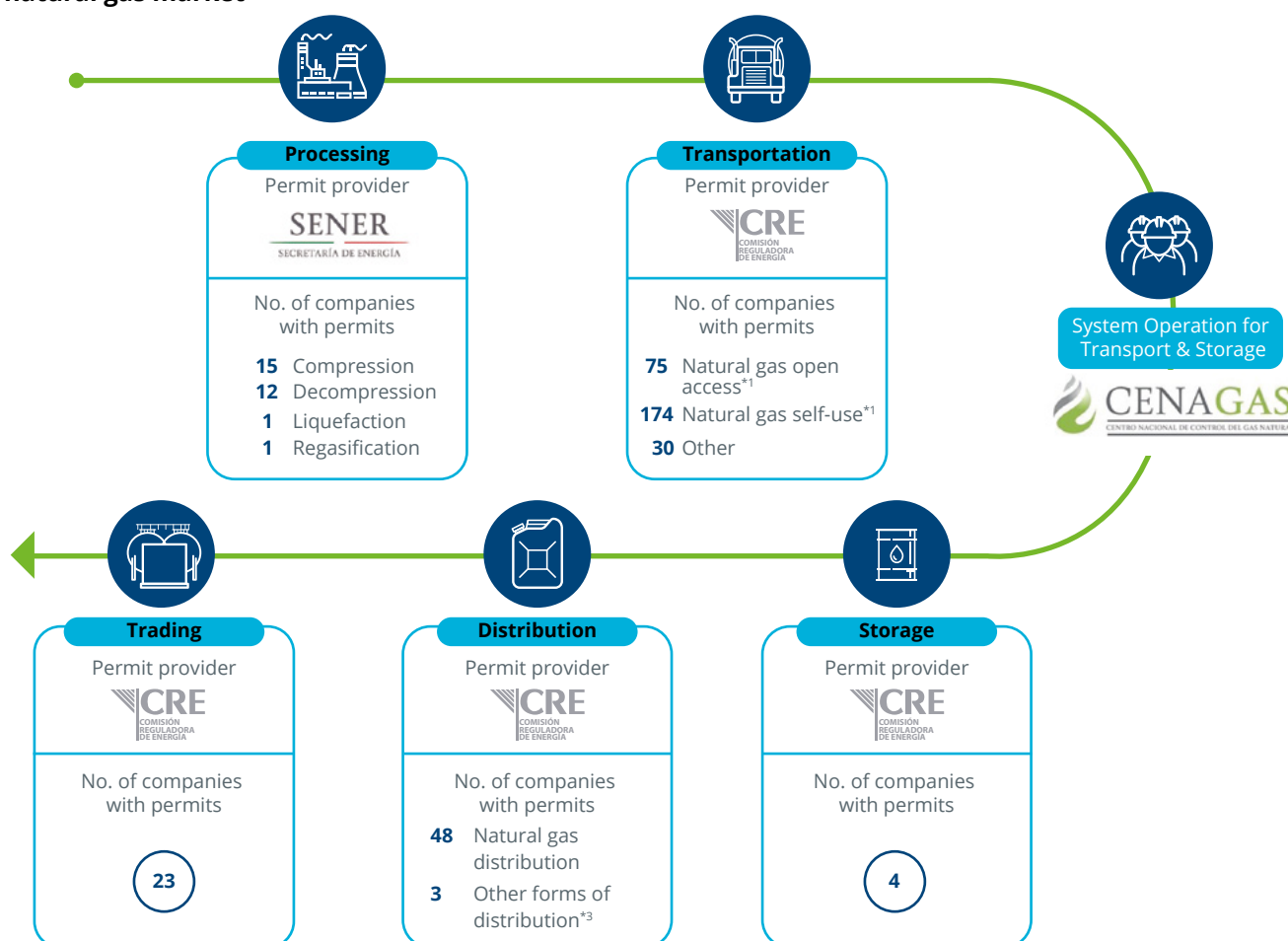
A trader of the State's oil & gas products is responsible to commercialize the products that private oil companies extract from the State's oilfields¹⁴⁴. According to the latest announcement made by the CNH in December

2017, Trafigura México was awarded as the trader of liquid hydrocarbons¹⁴⁵.

Natural Gas

The chart below depicts the key players involved in the processing, transportation, storage, distribution and trade activities of the natural gas market. In this market, CRE is the entity that grants the operating permits for almost every part of the value chain.

Figure 13: Key players for processing, transportation, storage, distribution and trading activities in the natural gas market



Source: EY with information from CNH, SENER and CRE

Notes: * Natural gas transportation infrastructure that allows third-party use.

** The purpose is to exclusively meet the needs of the permit holder.

*** Distribution through non-pipeline channels, trade and end-trade to the general public of liquefied petroleum gas. With information from CNH (empresas participantes en Licitaciones Petroleras en México), SENER and CR

¹⁴³ DOF (2014) LH.

¹⁴⁴ Reuters (2016) Filial de Pemex venderá hidrocarburos del Estado en contratos de producción compartida.

¹⁴⁵ CNH (2017) La CNH adjudica los servicios de comercialización de hidrocarburos en estado líquido y gaseoso.

Open Access to Natural Gas Pipeline

The LH establishes that permit holders of transportation and distribution activities are required to provide open access to their facilities and services to other companies, based on the capacity of their systems. The same happens with SOEs.

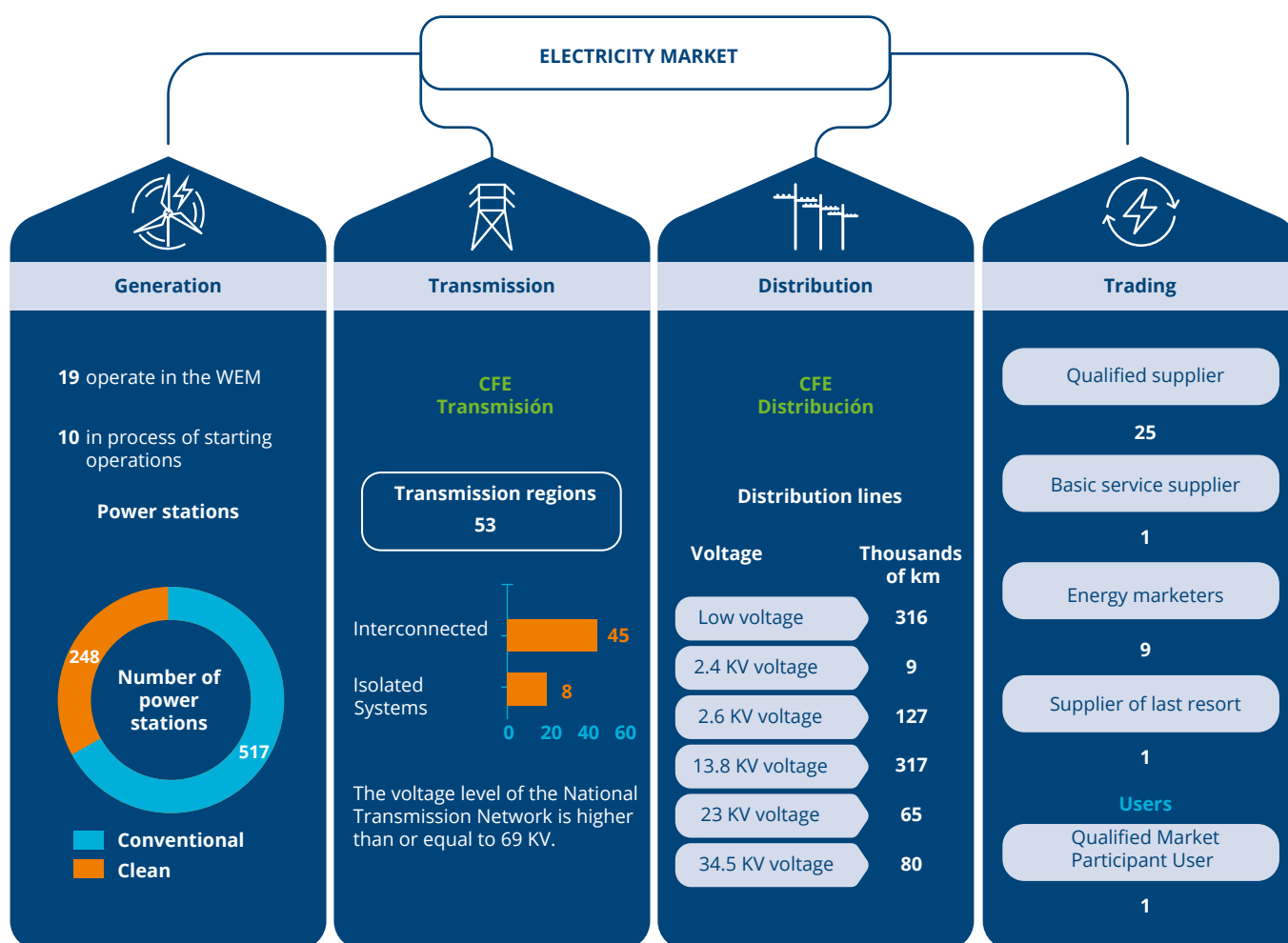
This capacity is auctioned among interested parties who will sign a contract with CENAGAS. Therefore, this activity provides the possibility of third parties

to use the existing transportation and storage infrastructure¹⁴⁶.

Key players in the Electricity Sector

The chart below includes the key players participating in the electricity value chain (generation, transmission, distribution and trading), as well as relevant market statistics.

Figure 14: Electricity Sector in Mexico (2017)



Source: EY with information from CENACE, SENER, and CRE

¹⁴⁶SENER (2016). Mecanismo para implementar la gestión y administración de la capacidad disponible en los Ductos de Internación por parte de CENAGAS a través de un tablero electrónico.

Market size

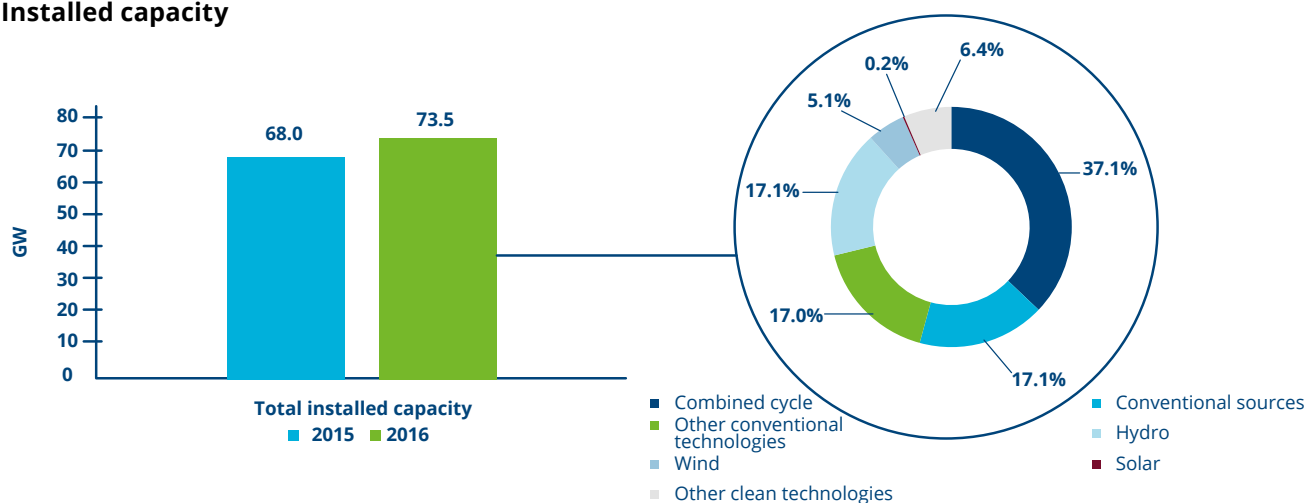
Generation

In 2016, the installed capacity and power generation reached 73.5 GW and 319.4 TWh respectively, which represents an increase of 8% and 3.1% from the previous year¹⁴⁷.

The use of conventional and clean technologies for power generation also increased by 7.2% and 10.2% respectively¹⁴⁸, considering clean technologies the most relevant in terms of installed capacity reaching a growth rate of 157.4%.

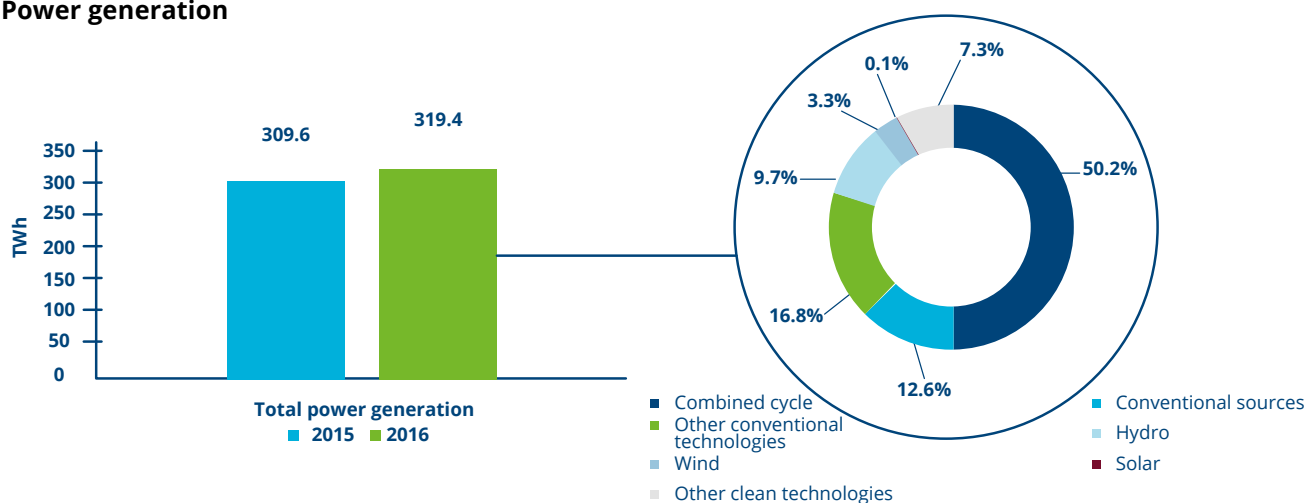
Figure 15: Installed capacity and power generation (2015-2016)

Installed capacity



Source: EY with information from PRODESEN (2017-2031)

Power generation



Source: EY with information from PRODESEN (2017-2031)

¹⁴⁷ SENER (2017) PRODESEN (2017 – 2031).



¹⁴⁸ Idem.

Types of power generation

In the Mexican electricity market, power generators are classified into several types: generator, legacy power station, external legacy power station, self-supply, cogeneration, small-scale production, export, import, self-use and exempt generators¹⁴⁹.

Different types of power generation are shown in the table below. More than half of the participation in power generation (54.9%) is done under the “Generator” form of power generation¹⁵⁰.

Table 6: Types of power generation

Installed capacity by type of power generation (2016)	Generator	Generation by type of power generation (2016)
Total 43.5 GW Participation 59.2 %	 <p>Is the holder of one or several permits granted in the LIE to generate electricity in power stations with a capacity of more than 0.5 MW. It can also be a generator through a contract as a market participant who represents these stations in the WEM, and in the case of stations located abroad with the previous authorization from CRE.</p>	Total 175.4 TWh Participation 54.9 %
Total 0.36 GW Participation 0.5 %	 <p>Power station owned by CFE that is not included in a power generation permit in good operating conditions, or which construction is included in the Federal Government Budget under the direct investment figure. The participation of Legacy Power Stations is low (less than 1%) mainly because there are legacy contracts that are transitioning according to what is established in the LIE.</p>	Total 0.49 TWh Participation 0.2 %
Total 13.2 GW Participation 18 %	 <p>Power station that is included in a power generation permit under the independent production figure, and when its construction and operation is included in the Federal Government Budget under the conditional investment figure.</p>	Total 88.6 TWh Participation 27.8 %
Total 16.1 GW Participation 21.9 %	 <p>Permits and contracts granted under the Electricity Public Service Act (LSPEE).</p>	Total 54.6 TWh Participation 17.1 %

Note: The remaining 0.4% of the installed capacity corresponds to Distributed Generation (DG) and to the Joint Venture Trust.

Source: EY with information from PRODESEN (2017 – 2031)

¹⁴⁹ Note: Exempt generator: is the holder of one or more power stations that does not require permits to generate electricity according to the LIE. Source: DOF (2014), LIE.

¹⁵⁰ SENER (2017) PRODESEN (2017 – 2031).

Transmission

The Energy Reform establishes that transmission and distribution are within the exclusive domain of the State.¹⁵¹ However, the State may contract and partner with private entities to perform activities such as financing, construction, maintenance, management, operation and expansion of the infrastructure.¹⁵²

On the other hand, the RNT is divided into 53 regions, of which 45 are interconnected, while the remaining 8 are isolated systems.

According to the PRODESEN (2017–2031), the total length of the transmission lines ranging from 161 to 400 kV increased by 0.11% between 2015 and 2016. This growth trend is reflected in the increase of the capacity of the transmission infrastructure and the transformation of the transmission systems.

Table 7: Transmission Lines

CFE	2015	2016	Percentage change (%)
Transmission (161 to 400 kV)	52,001 Km	52,061 Km	0.11%
Transmission (69 to 138 kV)	50,656 Km	50,33 Km	-0.6%
Other			
Transmission (230 to 400 kV)	1,736 Km	1,742 Km	0.3%

Source: EY with information from PRODESEN (2017–2031)

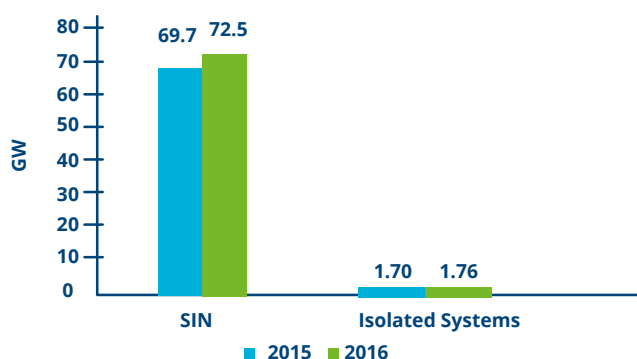
Figure 16: 53 Transmission regions of the SEN (2016)



Source: PRODESEN (2017–2031)

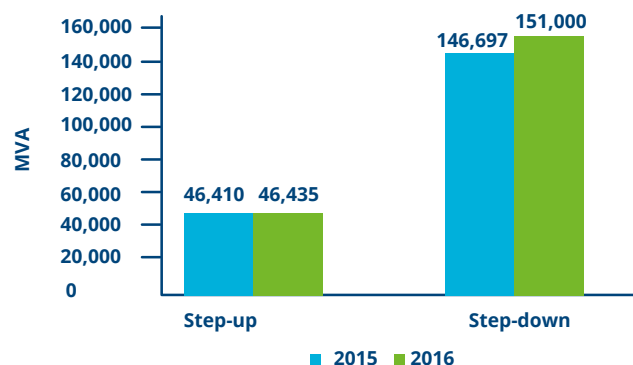
Transmission regions		
1. Hermosillo	19. Huasteca	37. Coatzacoalcos
2. Cananea	20. Tamazunchale	38. Tabasco
3. Obregón	21. Guémez	39. Grijalba
4. Los Mochis	22. Tepic	40. Ixtepec
5. Culiacán	23. Guadalajara	41. Lerma
6. Mazatlán	24. Aguascalientes	42. Mérida
7. Juárez	25. San Luis Potosí	43. Cancún
8. Moctezuma	26. Salamanca	44. Chetumal
9. Chihuahua	27. Manzanillo	45. Cozumel
10. Durango	28. Carapan	46. Tijuana
11. Laguna	29. Lázaro Cárdenas	47. Ensenada
12. Río Escondido	30. Querétaro	48. Mexicali
13. Nuevo Laredo	31. Central	49. San Luis Río Colorado
14. Reynosa	32. Poza Rica	50. Villa Constitución
15. Matamoros	33. Veracruz	51. La Paz
16. Monterrey	34. Puebla	52. Los Cabos
17. Saltillo	35. Acapulco	53. Mulegé
18. Valles	36. Temascal	

Figure 17: Transmission capacity (SIN and Isolated Systems)



Source: EY with information from PRODESEN (2017–2031)

Figure 18: Capacity of substations



Source: EY with information from PRODESEN (2017–2031)

¹⁵¹ SENER (2017) PRODESEN (2017 – 2031).

¹⁵² DOF (2014) LIE.

Distribution

The Mexican Government, through CFE Distribución, provides power distribution services through low and

medium voltage power lines. Currently, there are 16 Distribution Business Units.

Business Units



Based on CFE's mandate, CFE Distribución will carry out its activities through Business Units to provide the public distribution service in each of the 16 Distribution Business Units.

Figure 19: Distribution and length of business unit



Bussines unit	Medium voltage (thousands of km)	Low voltage (thousands of km)
1. Baja California	17.2	8.2
2. Noroeste	39	15
3. Norte	40.9	22.2
4. Golfo Norte	30.1	19.8
5. Golfo Centro	29.7	19.7
6. Bajío	63.6	19.2
7. Jalisco	25.2	18
8. Centro Occidente	22	12.7
9. Centro Sur	30.8	33.6
10. Centro Oriente	25.9	27.8
11. Oriente	34	22
12. Sureste	62.4	40.1
13. Peninsular	18.4	13.5
14. Valle de México Norte	8.2	16.7
15. Valle de México Centro	5.5	5.2
16. Valle de México Sur	9.4	13

Source: EY with information from PRODESEN (2017-2031)

End-users served, capacity and power transformers of CFE Distribución

According to the PRODESEN (2017-2031), the number of end-users served by CFE Distribución increased 2.9% between 2015 and 2016.

Likewise, CFE Distribución increased by 1.8% the number and capacity of its power transformers over the same period.

	2015	2016	Percentage change (%)
Users served	39.6 million	40.77 million	2.9%
Number of transformers	1.42 million pieces	1.446 million pieces	1.8%
Transformer capacity	52,561 MVA	53,528 MVA	1.8%

Source: EY with information from PRODESEN (2017-2031)

Trading

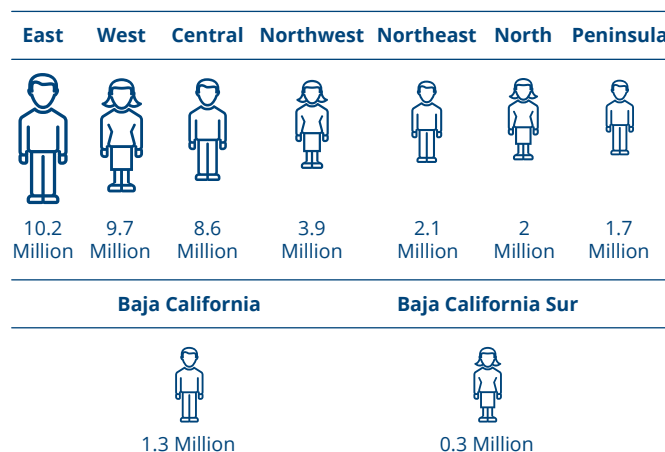
Trading involves power end-users and electricity traders:

As mentioned in Section 2, there are three types of users operating in the electricity market: Basic Users, Qualified Users, and Qualified Market Participant Users.

According to the Mexican Energy Information System (SIE), the areas with the highest number of users are Mexico's Central, Eastern and Western regions, where around 28.7 million users are served.

With regard to traders, there are QSS, BSS, SOLR and non-supplier traders.

Figure 20: Power users by operating region



Source: EY with information from PRODESEN (2017-2031)

Figure 21: Types of users

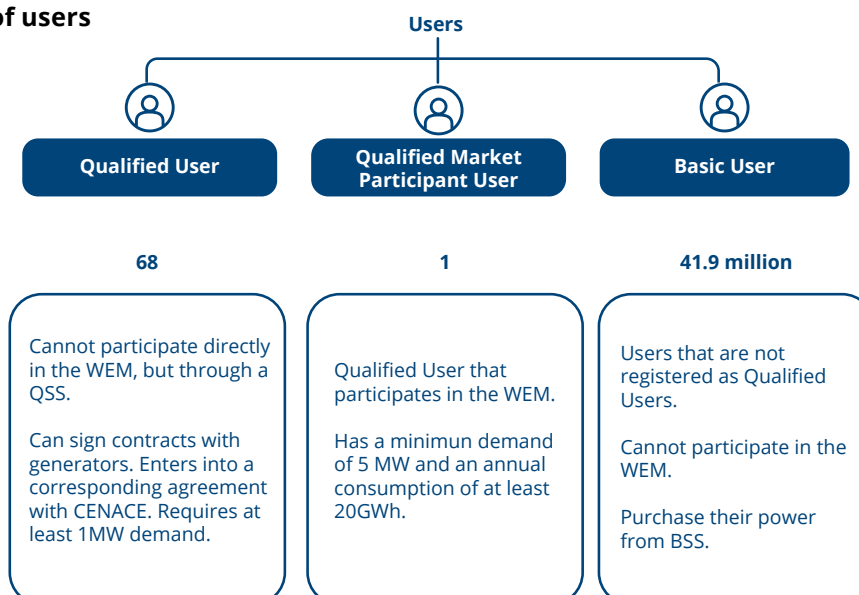
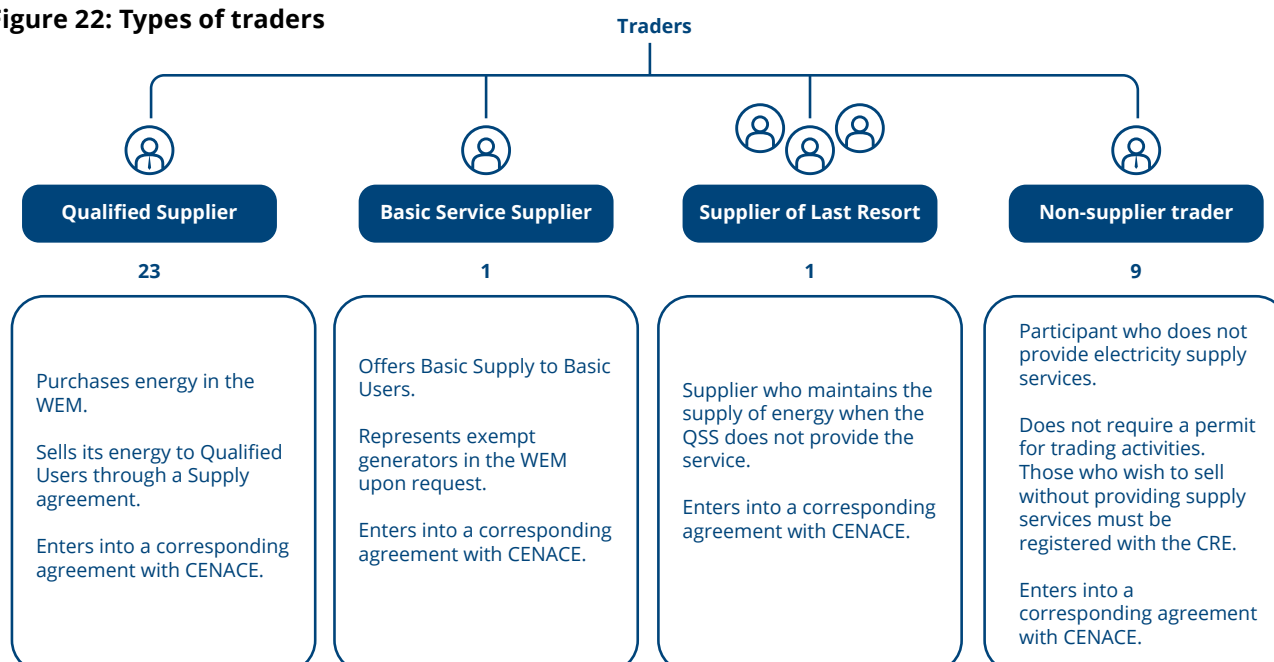
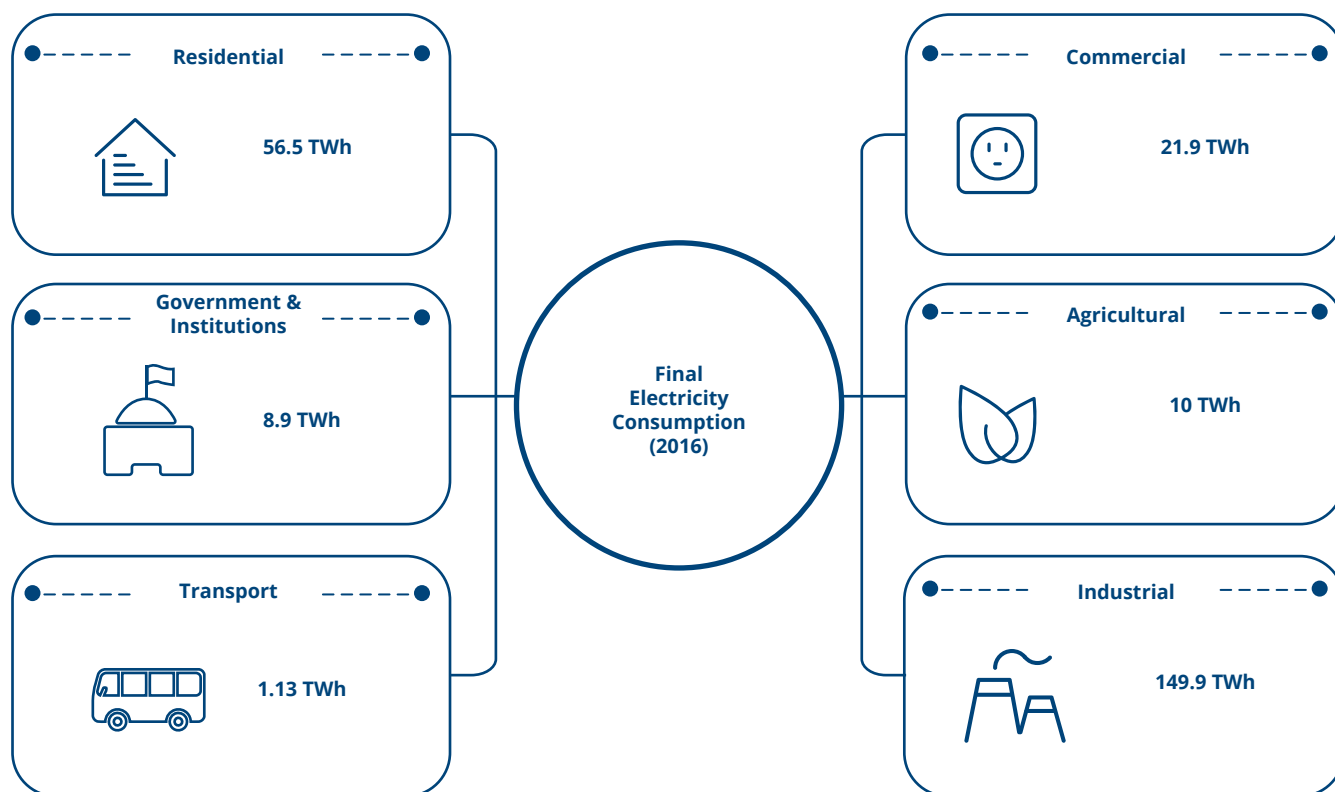


Figure 22: Types of traders



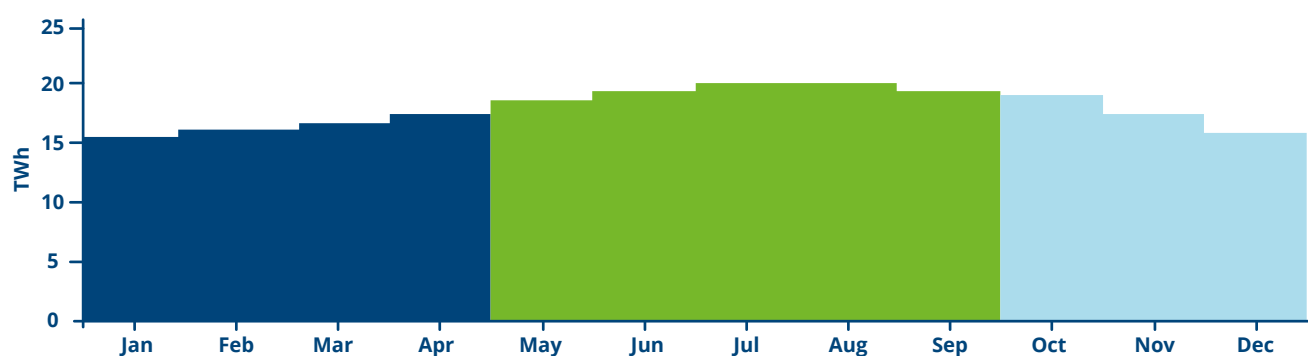
Source: EY with information from CENACE, CRE, and SENER

Consumption

Figure 23: Final electricity consumption by sectors (2016)

Source: EY with information from SIE

According to the PRODESEN (2017-2031), from May to September 2016, 46% of the power was consumed, while the remaining 54% was distributed over the following months.¹⁵⁴

Figure 24: Monthly power consumption in Mexico (2016)

Source: EY with information from SIE

¹⁵⁴ SENER (2016), Prospectiva del Sector Eléctrico 2016 – 2030.

Cross-border electricity trading

Mexico has numerous cross-border interconnections with the United States, Belize and Guatemala. The majority are located along Mexico's border with the US, however, there is one interconnection between Mexico-Guatemala and another one between Mexico-Belize.

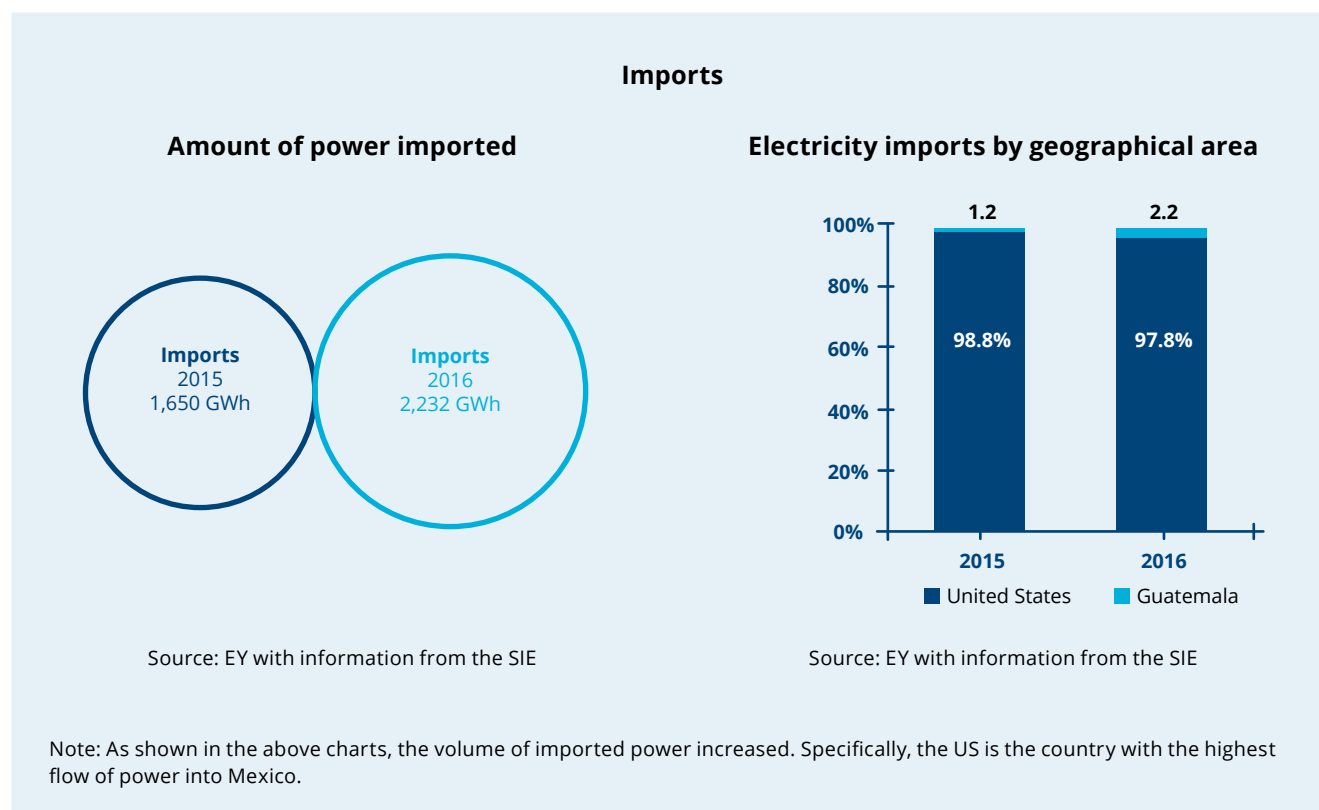
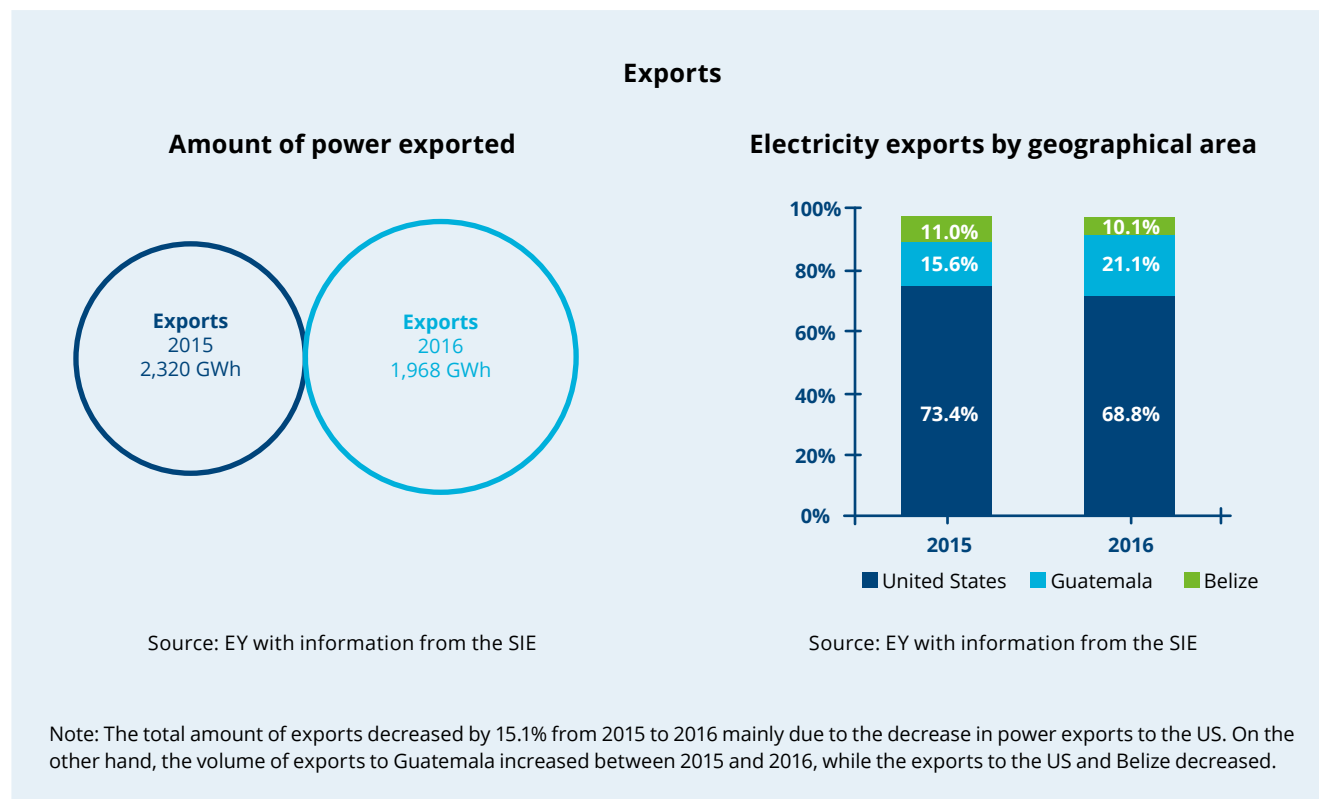
Figure 25: Cross-border interconnections (2016)



Source: PRODESEN (2017-2031)

The charts below show the volume of power exports and imports, as well as the geographical areas with the most significant cross-border electricity trading activities.¹⁵⁵

Figure 26: Electricity exports and imports



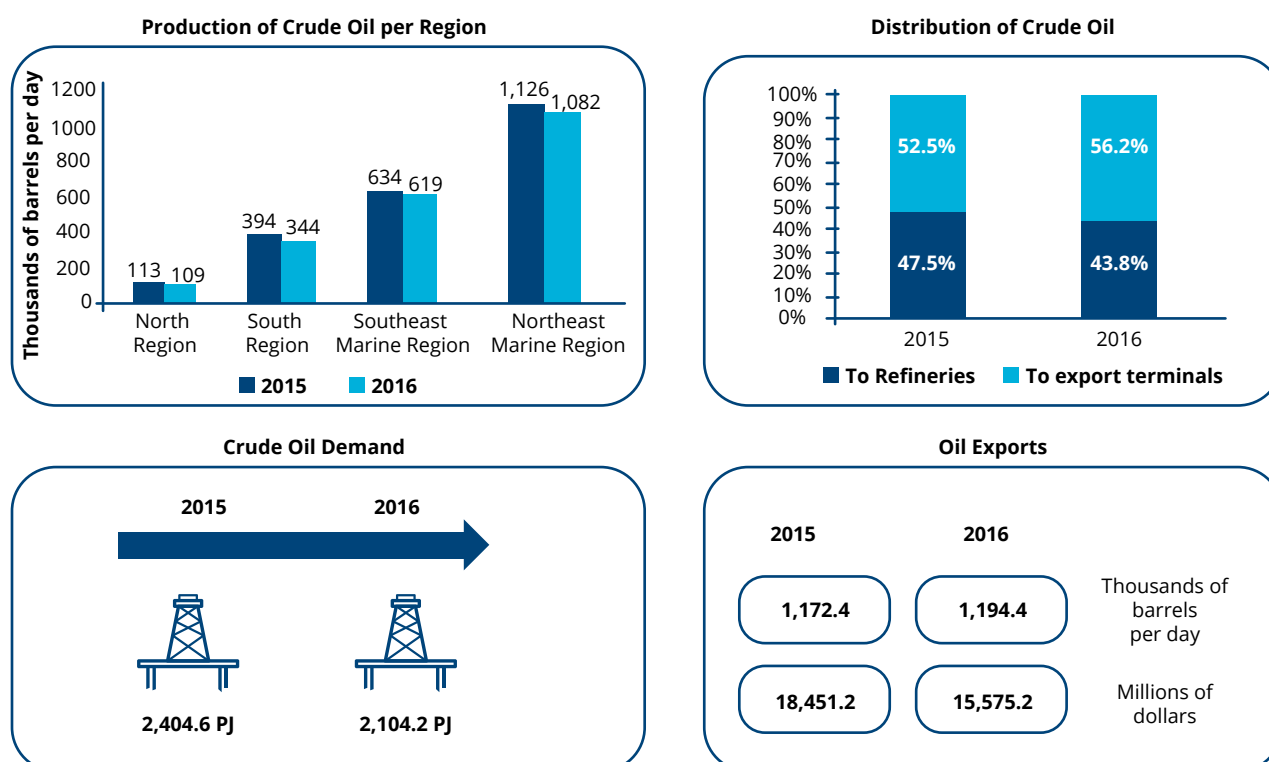
¹⁵⁵ SENER (2018) Sistema de Información Energética (2015-2016).

Oil and gas volumes

The following charts illustrate the volume of the production and distribution of oil and gas.¹⁵⁶ The drop

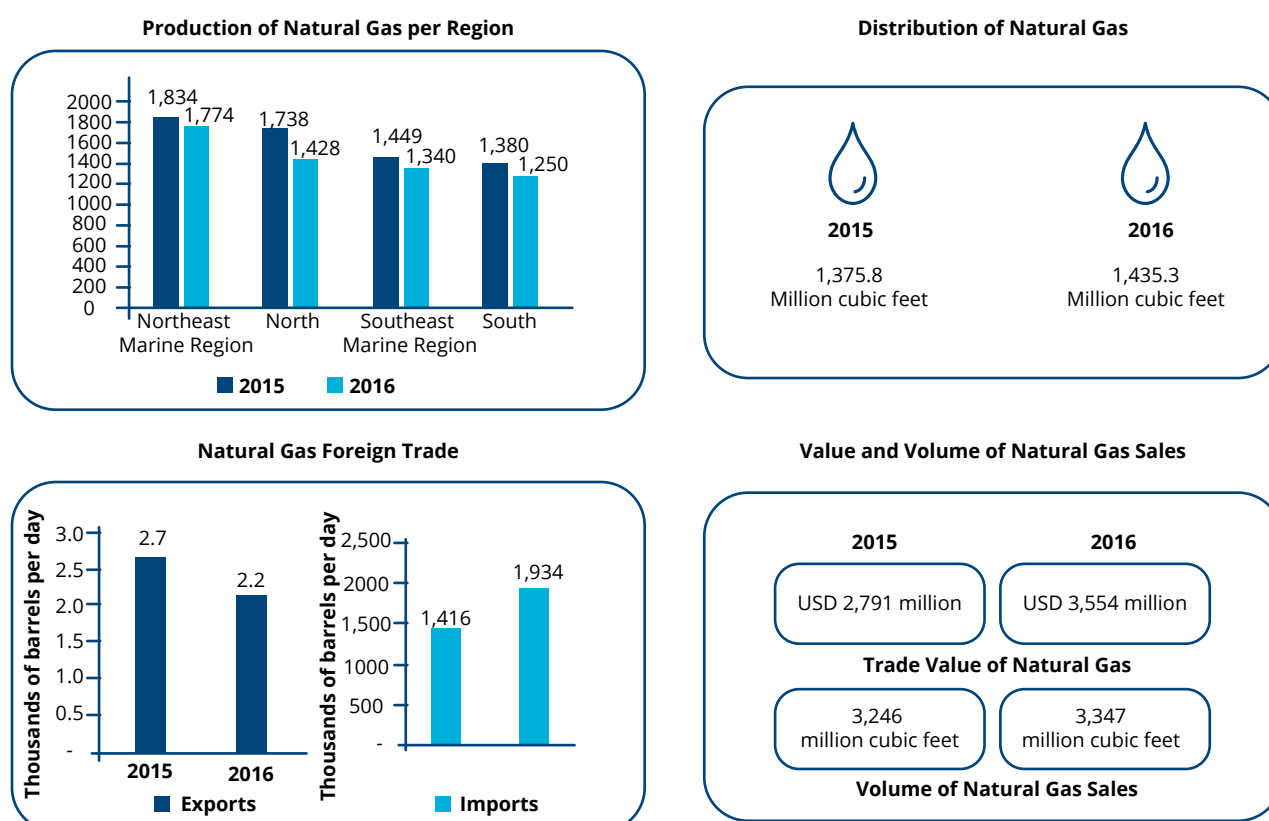
between 2015 and 2016 was due to the depreciation of the peso that resulted in a lower allocation of public budget for the sector, among other factors.

Figure 27: Oil Volumes



Source: EY with information from the SIE

Figure 28: Natural Gas Volumes



Source: EY with information from the SIE

¹⁵⁶ SENER (2018) Sistema de Información Energética (2015-2016).

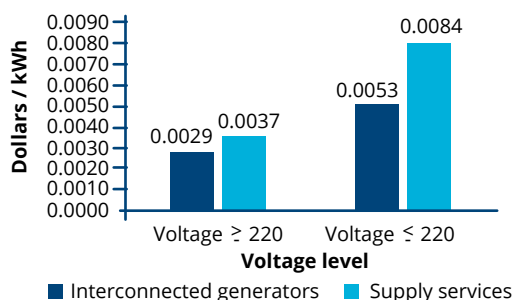
Electricity tariffs and Oil & Gas prices

Electricity

Transmission and distribution tariffs are calculated by CRE. The charts below include the tariffs based on the

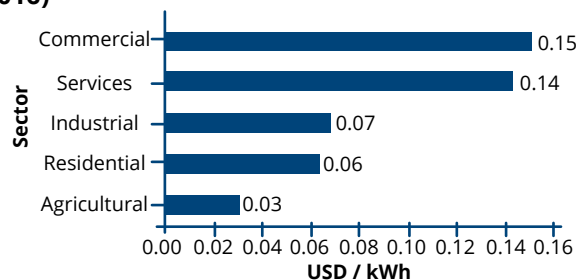
voltage level and the average electricity tariffs by sector. The highest average price is for the commercial sector, followed by the services sector.

Figure 29: Transmission tariffs (2018)



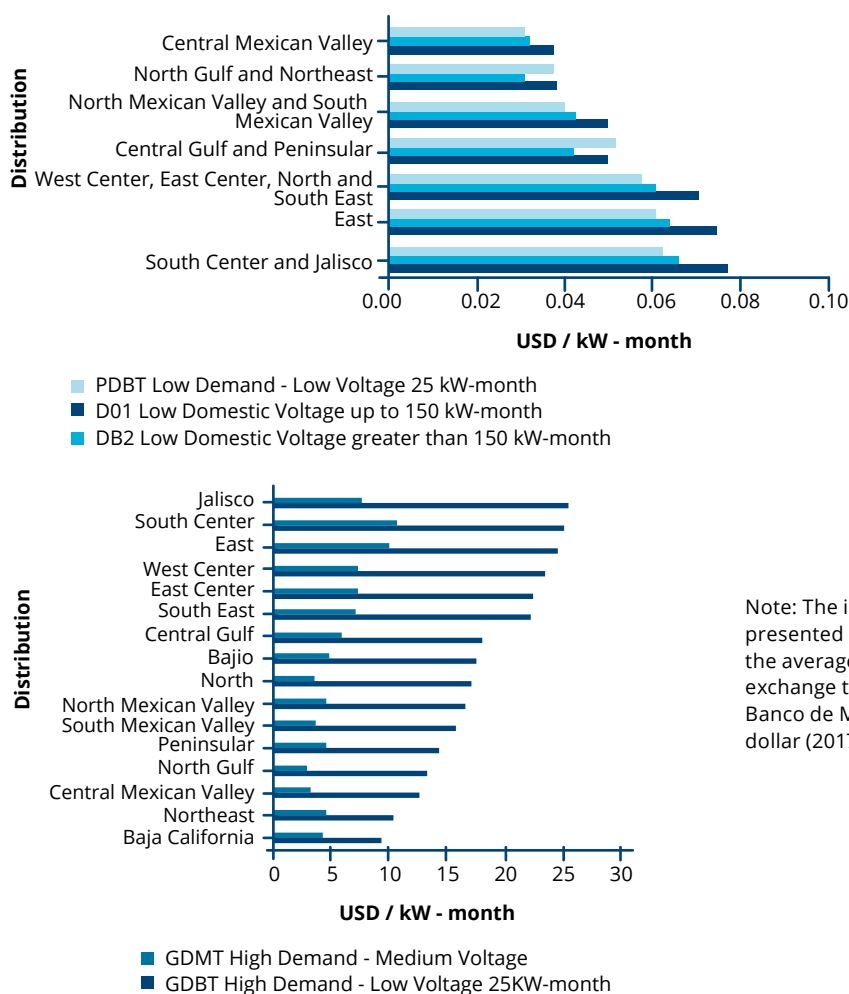
Source: EY with information from CRE

Figure 30: Average price of power by tariff sector (2016)



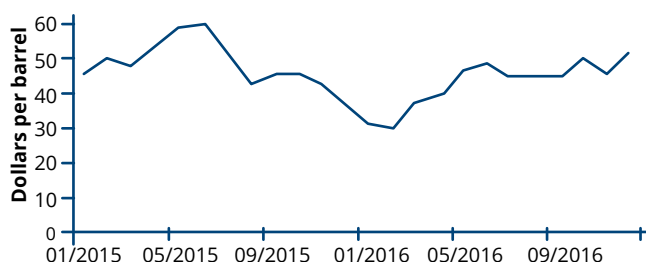
Source: EY with information from SENER

Figure 31 Distribution tariffs (2017)

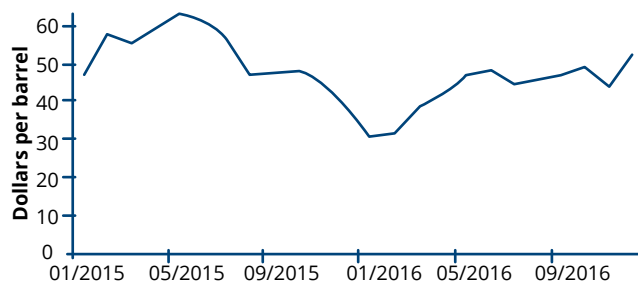


Note: The information is presented in U.S. dollars using the average annual daily FIX exchange tariff published by Banco de México: Pesos per dollar (2017).

Source: EY with information from CRE

Figure 32: Oil prices**WTI**

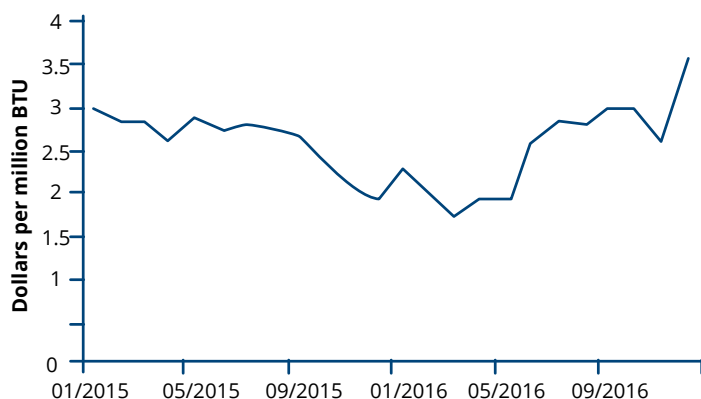
Source: EY with information from the US Energy Information Administration

BRENT

Source: EY with information from the US Energy Information Administration

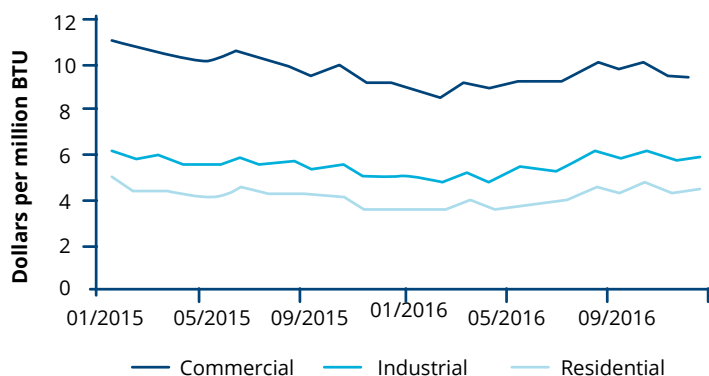
The analyses of the oil prices shown above are based on the WTI and Brent benchmark prices over a period of two years (2015–2016). The price movement of both indicators is similar, with a downward trend between

September 2015 and February 2016, and an upward trend beginning in March 2016 through the end of the analyzed period.

Figure 33: Natural Gas prices**Henry Hub**

The Henry Hub benchmark was used to analyze the price of natural gas, showing a trend ranging from 1.7 to 3 dollars for 1 million BTUs.

Source: EY with information from the US Energy Information Administration

Public Price

The public price of natural gas has had a similar trend to the benchmark price. This trend is recurrent in different market segments, where the residential segment has a price that almost doubles the industry price. This difference may be due to the lower cost of natural gas distribution and the negotiations of gas supply prices.¹⁵⁷

Source: EY with information from CRE

¹⁵⁷ CRE (2018) Precios de gas natural para usuarios finales (2015-2016).



3. Electricity Sector






3.1 Wholesale Electricity Market

Composition and operation of the Wholesale Electricity Market (WEM)

WEM operations started in January 2016. In this market operated by CENACE, participants are able to trade the following products: power, capacity, CEC, ancillary services, and FTR.¹⁵⁸

The WEM operates through different mechanisms, which are classified according to their contractual duration: short, medium or long-term. This chapter contains a detailed explanation of the WEM products and trading mechanisms.

Table 7: WEM products

	Power	Electricity produced by each power station.
	Capacity	Defined as the commitment to maintain a certain amount of installed capacity available for power generation during a given period of time. ¹⁵⁹
	FTR	Mechanism to hedge exposure to the price differences that may exist between two nodes due to congestion in the transmission network. ¹⁶⁰
	CEC	Certificates verifying that the source of power generation is a clean source.
	Ancillary services	Services needed to guarantee the quality, reliability, continuity and security of the SEN. The following are considered ancillary services: reserves (operating and spinning), regulation (frequency, voltage and reactive frequency), emergency start-up, island mode operation and dead bus connection. ¹⁶¹

¹⁵⁸ CRE (2018) Preguntas frecuentes sobre la nueva regulación en temas eléctricos.

¹⁵⁹ DOF (2016) Manual del Mercado para el Balance de Potencia.

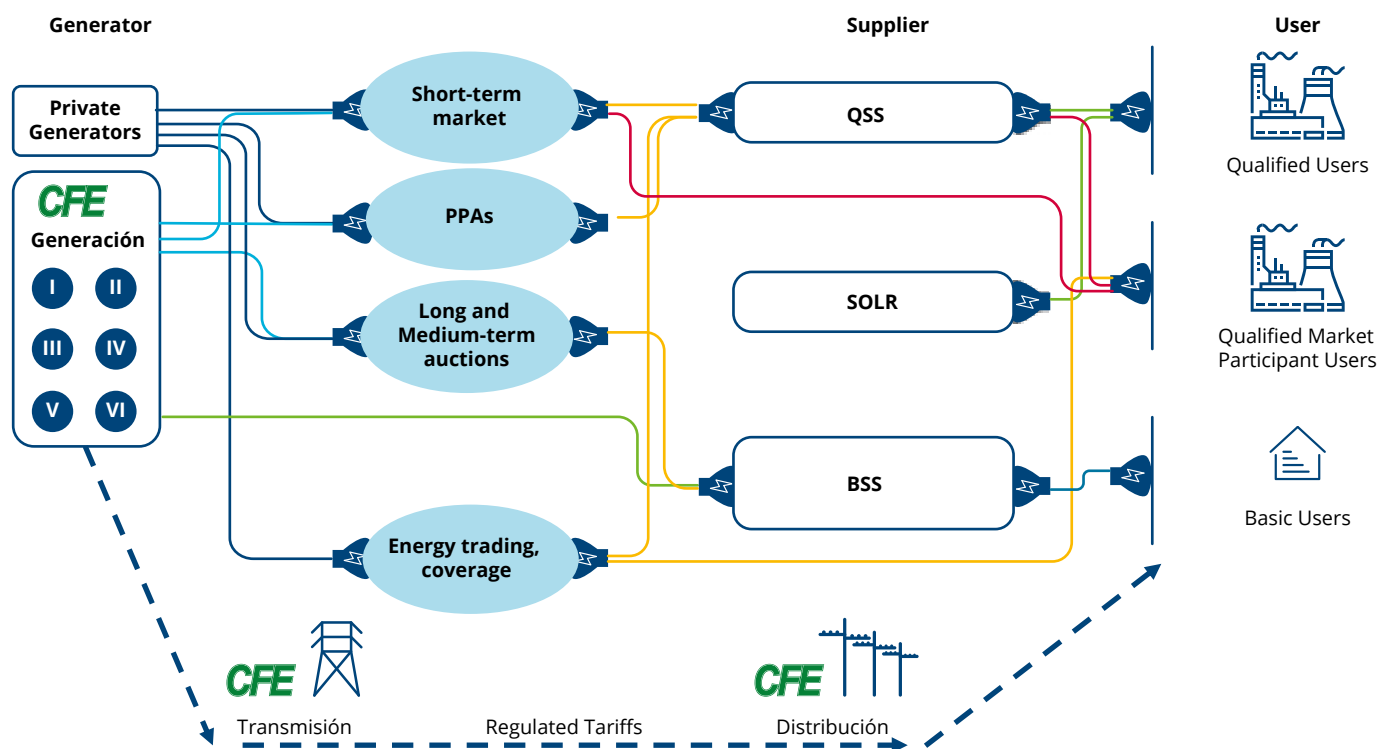
¹⁶⁰ DOF (2015) Bases del Mercado Eléctrico.

¹⁶¹ DOF (2014) LIE.

Out of the four activities of the electricity sector value chain, power generation and trading may be carried out by CFE or by private players; whereas Transmission and distribution activities remain within the exclusive domain of the State and are assigned to CFE.

Large Users (Qualified) may buy energy from QSS or, if they are Market Participants, they may buy it directly in the WEM. Basic users buy energy directly from BSS. Today, CFE is the only BSS and it sells the energy to the basic users at regulated tariffs.¹⁶²

Figure 34: Power sector value chain



Source: EY with information from CFE and CENACE

Participants in the Wholesale Electricity Market and other relevant players in the sector

Generators

Generators are the holders of a generation permit for power stations with a capacity of 0.5 MW or more, or hold a WEM participant agreement to represent these power stations in the WEM. Their purpose is to sell electricity in the WEM, that is, through the Short-term Market, through Energy Auctions or through contracts with Qualified Users and QSS.¹⁶³

Power generators that are interconnected to the SEN are required to:

- Sign interconnection contracts according to CENACE's requirements and operate and perform maintenance

of their power stations complying with CENACE's instructions.

- Notify CENACE of scheduled shutdowns.

- In case of emergency, supply electricity according to CENACE's instructions.¹⁶⁴

Generators may have either clean energy or conventional power stations.

Exempt Generators

Exempt generators own power stations with a capacity below 0.5 MW, and do not require a generation permit. They are allowed to sell power and related products to a BSS under the tariffs determined by CRE. To participate in the WEM, they need a QSS.¹⁶⁵

¹⁶² Enerson Solar (2014) Soluciones energéticas sustentables.

¹⁶³ CRE (2018) Preguntas frecuentes sobre la nueva regulación en temas eléctricos.

¹⁶⁴ DOF (2014) LIE Art. 18 and 25.

¹⁶⁵ DOF (2014) LIE Art. 3, frac. XXV, 20 and 21.

Consumers

Consumers are individuals or legal entities that acquire electricity as end users. There are three types of end users: Basic Users (low demand), Qualified Users (high demand) and Qualified Market Participant Users (high demand and consumption).

Basic Users

They obtain electricity from BSS at a regulated tariff.¹⁶⁶

Qualified Users

Load centers with a capacity of more than 1 MW. These are required to be registered on a Qualified Users Registry, which is managed by CRE.

It is mandatory for load centers to be registered as Qualified Users when they fulfill the minimum demand requirement (1 MW) but were not receiving electricity from CFE by the time the LIE was established.

Load centers that were receiving electricity from CFE and comply with the demand requirements have the possibility, but not the obligation, to register as Qualified Users.




Load centers that were included in Legacy Interconnection Contracts when the LIE was established, have also the right, but not the obligation, to register as Qualified Users; they can opt to either participate in the WEM as Market Participants or through a QSS.

The law allows load centers to be aggregated to reach the minimum demand required to be Qualified Users.¹⁶⁷

Qualified Market Participant Users

Qualified users with a minimum demand of 5 MW and a minimum annual power consumption of 20 GWh, may participate directly in the WEM, with no supplier or trader required. In this case, they must subscribe an interconnection contract with CENACE and with it, they will be named Qualified Market Participant Users.

Table 8: Types of users

	 Basic Users	 Qualified Users	 Qualified Market Participant User
Characteristics	<ul style="list-style-type: none"> • Demand below 1 MW. • Residential customers, small commercial customers. 	<ul style="list-style-type: none"> • Demand >1 MW and < 5 MW. • The demand must be verified and registered with CRE. 	<ul style="list-style-type: none"> • Demand >5MW.
Supply Options	<ul style="list-style-type: none"> • Until 2017, basic supply continues to be provided exclusively by CFE. • Basic users can aggregate loads and become Qualified Users. 	<ul style="list-style-type: none"> • Supplied by: <ul style="list-style-type: none"> • QSS (CFE or Private). 	<ul style="list-style-type: none"> • Supplied by: <ul style="list-style-type: none"> • Participation in the short-term market. • Subscription of PPAs.
Prices	<ul style="list-style-type: none"> • Tariff regulated by CRE and implement by CFE. 	<ul style="list-style-type: none"> • CFE tariffs based on the type of demand. • Prices contracted with private QSS. 	<ul style="list-style-type: none"> • Prices contracted and PPA structures. • Short-term market prices.

Source: EY with information from the LIE and the basis for the electricity market

Suppliers

Suppliers are traders who offer Electricity Supply. There are different types: BSS, QSS or SOLR.

The type of supplier is determined by the type of users they serve. The BSS provide services to Basic Users, while QSS provide services to Qualified Users.

¹⁶⁶ DOF (2014) LIE Art. 3, frac. XXVIII and LV, 59.

¹⁶⁷ DOF (2014) LIE Art. 3, frac. LVI.

Load Serving Entities

CRE defines Load Serving Entities as: “any representative of a Load Center: Basic Service

Suppliers, Qualified Suppliers, Suppliers of Last Resort, Qualified Market Participant Users or Intermediation Generators.”¹⁶⁸

Table 9: Types of suppliers

Who?	What do they do?	How do they do it?	Who do they do it for?
QSS	Buy power in the WEM in order to provide them to Qualified Users. To obtain a permit, they must specify their operating zone, end users and expected sales.	This type of supply is provided to Qualified Users under a competition regime.	Qualified Users
BSS	Provide power to all users who do not participate directly or indirectly in the WEM. Up to 2017, the only BSS has been CFE BSS.	This type of supply is provided under a regulated tariff to any non-Qualified User requesting the service. In addition, BSSs subscribe electric coverage contracts exclusively through auctions.	Basic Users
SOLR	These suppliers represent Qualified Users for a limited time in order to maintain service continuity when a Qualified Supplier suspends its power supply; that is, SOLR offer a backup service.	This type of supply is provided to Qualified Users based on maximum prices regulated by CRE.	Qualified Users (for limited time)

Source: EY with information from the LIE

Non-supplier traders

Non-supplier traders are market participants who trade energy without providing supply services. These players act as intermediaries with no physical assets and simply need to be registered with CRE as “Non-supplier traders” (Comercializador no Suministrador).

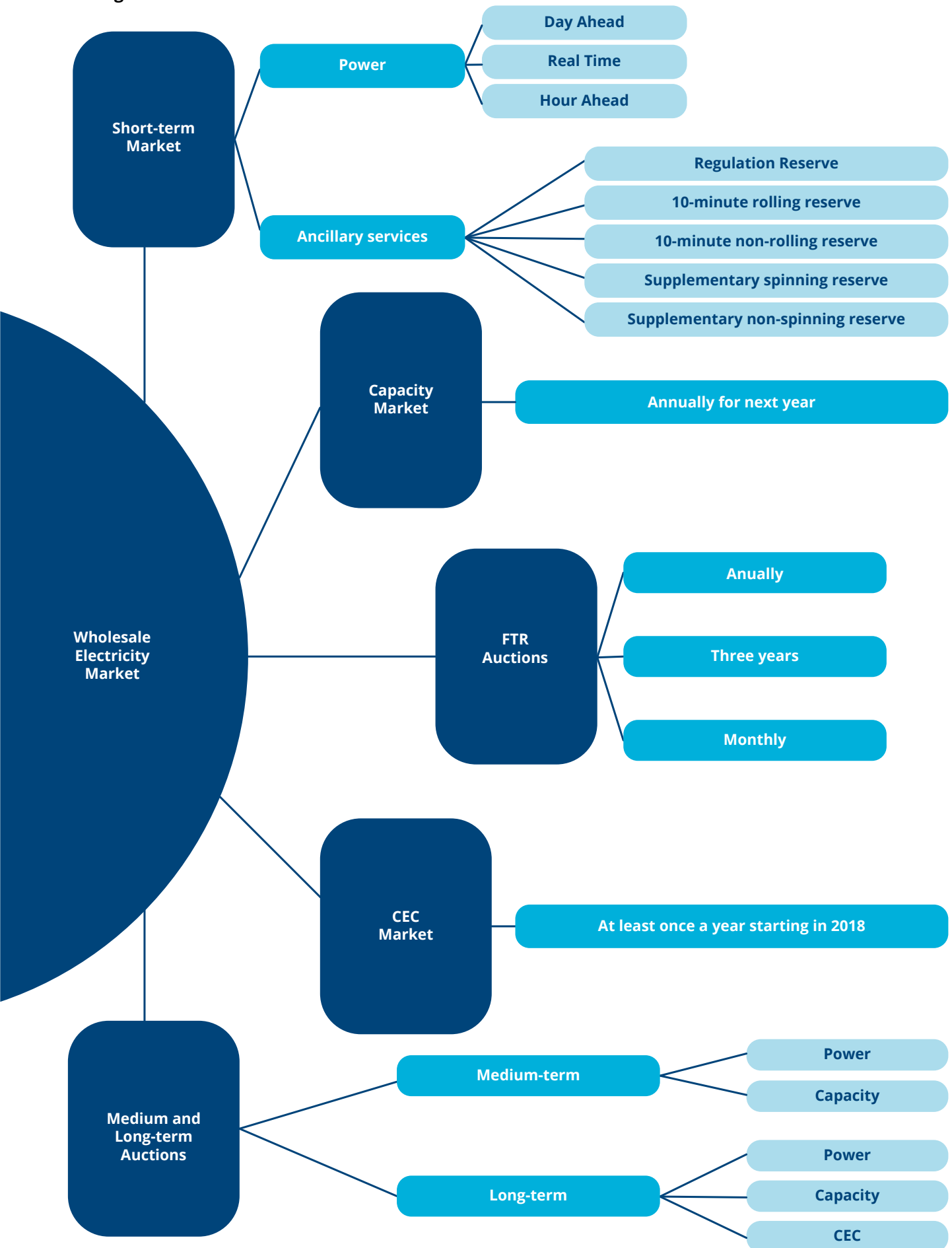
Non-supplier traders may perform the following activities:¹⁶⁹

- Trading of electricity, ancillary services, capacity, FTR and CEC.
- Import and export of electricity, ancillary services and capacity.
- Subscription of contracts for the purchase of electricity, capacity, ancillary services in a certain node of the SEN, FTR and CEC.

¹⁶⁸ DOF (2016) RESOLUCIÓN Núm. RES/916/2015.

¹⁶⁹ DOF (2014) LIE Art. 3, frac. XXIII.













Figure 35: WEM mechanisms



Source: CENACE

The WEM trading mechanisms can be classified based on their contractual duration: as short, medium or long term.

Table 10: Contractual length of WEM mechanisms

Classification	Mechanism	Term
 Short-term	Day-Ahead Market	One day 
	Real-Time Market	Real time 
	Hour-Ahead Market	One hour 
	Capacity Market	1 year – real time* 
	CEC Market	Real time 
 Medium-term	Medium-term Auctions	3 years 
	Financial Transmission Rights	3 months-3 years 
 Long-term	Long-Term Auctions	15 and 20 years 
	PPAs	As agreed upon 

Source: EY with information from the Manual de Subastas de Mediano Plazo, Manual de Subastas de Largo Plazo, Manual del Mercado de Balance de Potencia, Manual del Mercado de Corto Plazo and Bases del Mercado Eléctrico

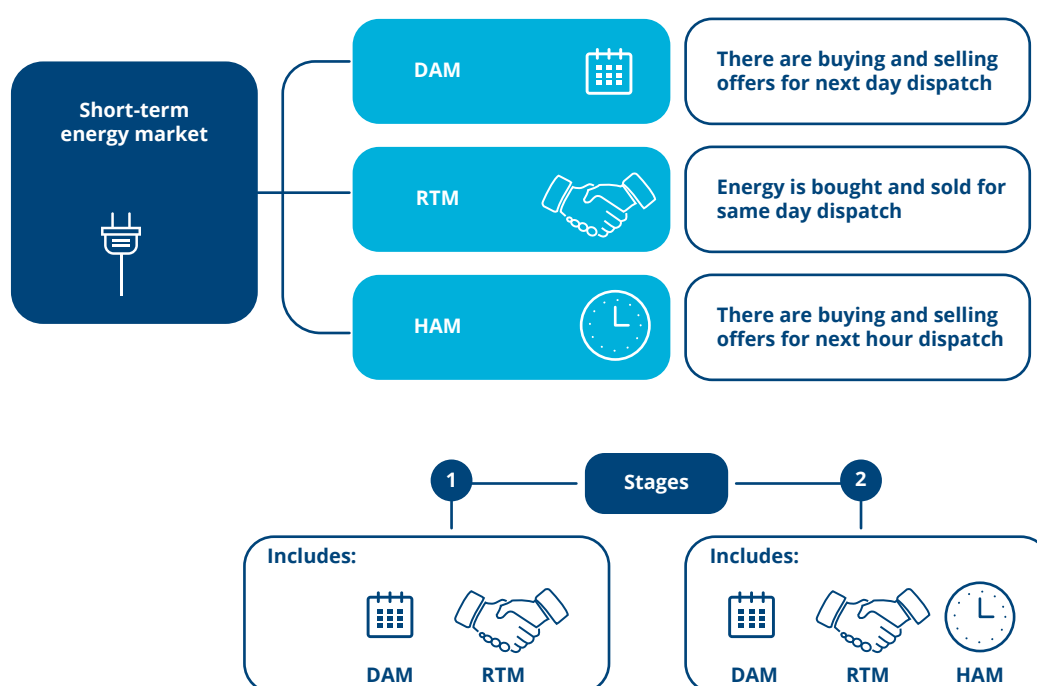
*Note: Load Serving Entities (LSE) are obliged to comply with the annual capacity requirements. If an LSE has a capacity deficit or surplus, it may buy it or sell it in the capacity market. Capacity market transactions are executed only once a day. CENACE calculates the capacity deficit and surplus that each LSE must buy or sell.

Short-term energy market

In this market, power generators sell energy and ancillary products to Qualified Suppliers and Qualified Market Participant Users. CENACE issues dispatch instructions to create a balance between supply and demand. Short-term market transactions are based on Locational Marginal Pricing (LMP) for energy and zonal pricing for ancillary services.

This market operates through three different mechanisms: Day-Ahead Market (DAM), Real-Time Market (RTM) and Hour-Ahead Market (HAM). The implementation of the market comprises two stages: the first stage includes the DAM and the RTM, and the second stage also incorporates the HAM.¹⁷⁰

Figure: 36: Mechanisms and stages of the short-term energy market



Source: EY with information from Manual de Mercado de Energía de Corto Plazo

Capacity market

Capacity can be offered for sale by power generators in the WEM. It is defined as the commitment to maintain a certain amount of installed capacity available for power generation during a given period of time.

The capacity market establishes price signals derived from the scarcity or excess in power generation capacity of the SEN, encouraging appropriate demand levels.

That is, it makes it easier for market participants to purchase or sale the capacity needed to cover

imbalances between their capacity requirement and the amount they have registered.

The amount of capacity that a generator can offer in the market is based on its generation availability in the 100 critical hours of the prior year (see page 56). This market will operate annually through capacity trading contracts.

Capacity is a tool that allows the LSEs to comply with the minimum requisites for reserves planning.¹⁷¹

¹⁷⁰ DOF (2016) Manual de Mercado de Energía de Corto Plazo.

¹⁷¹ DOF (2016) Manual del Mercado para el Balance de Potencia.

Capacity in the WEM is sold by generators and bought by LSEs. The Electricity Market Basis classify the LSEs in the Capacity Market as:

- Suppliers
- Qualified Market Participant Users
- Intermediation Generators

100 critical hours

The availability of physical production will be calculated based on the average availability for power generation in the 100 critical hours of the interconnected system or capacity zone. That is, the 100 hours in which each of the systems had the greatest need for capacity.¹⁷²

In 2016 and 2017, the 100 critical hours were the ones with the highest demand of capacity for each interconnected system or capacity zone.

Starting in 2018, the 100 critical hours are the ones with the lowest generation reserves in each interconnected system or capacity zone.

Who needs to buy Capacity?

All LSEs will be required to buy an amount of capacity (CENACE calculates this amount for each LSE, proportional to its consumption).

All suppliers must subscribe contracts (either through PPA or auctions) to establish the terms and conditions of the purchase of capacity for a fixed period of time.¹⁷³

Capacity Market Operation

This market will operate independently for each capacity zone (specific set of nodes that are interconnected) and CENACE will determine the local price of capacity for each zone



Zones: SIN, the BCA and the BCS.¹⁷⁴

¹⁷² DOF (2015) Bases del Mercado Eléctrico.

¹⁷³ CRE (s.f.)

¹⁷⁴ DOF (2016) Manual del Mercado para el Balance de Potencia.

CEC market

One of the objectives of the Energy Reform and its secondary laws is to stimulate investment in clean energies. Therefore, this reform includes escalating clean energy goals and CEC requirements. The latter must be complied with by the mandatory participants.

Clean Energy Certificate

Permanent titles that certify a given source of power generation as being a clean source (i.e., a source of energy whose emissions do not exceed the thresholds established in the regulatory requirements - see page 17). The period in which the clean power station may receive a CEC is 20 years.¹⁷⁵

1 CEC = 1 megawatt-hour (MWh) of clean energy

Mandatory participants

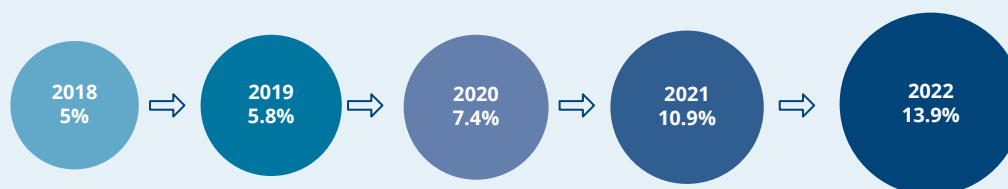
Mandatory participants must certify that they hold an amount of CEC corresponding to a given percentage of the total power they consume. This percentage is based on the CEC requirements established by SENER for each year. If they fail to meet their CEC obligations, mandatory participants will be required to pay a fine.

The following are mandatory participants:

- Suppliers: BSS, QSS and SOLR.
- Qualified Market Participant Users.
- End users supplied through Isolated Supply.
- Holders of Legacy Interconnection contracts (including load centers or charging points in which the total of their energy is not provided by a clean source).¹⁷⁶

CEC obligations

Mandatory participants must certify the possession of a given percentage of CEC compared to their total power consumption. The figure below shows the CEC requirements for future years.^{178,179}



¹⁷⁵ DOF (2014) LIE.

¹⁷⁶ CRE (2018) Preguntas frecuentes sobre la nueva regulación en temas eléctricos.

¹⁷⁷ DOF (2015) Adquisición de CEC en 2018.

¹⁷⁸ DOF (2016) Adquisición de CEC en 2019.

¹⁷⁹ DOF (2017) Adquisición de CEC en 2020, 2021, 2022.

How the CEC market works

CENACE will operate a spot market for CEC at least once a year. Market Participants with CEC may submit selling offers and mandatory participants may submit buying offers, with no restrictions on price on any side. This means that there are no fixed prices, the pricing depends on supply and demand. The CEC market started operating in 2018.¹⁸⁰

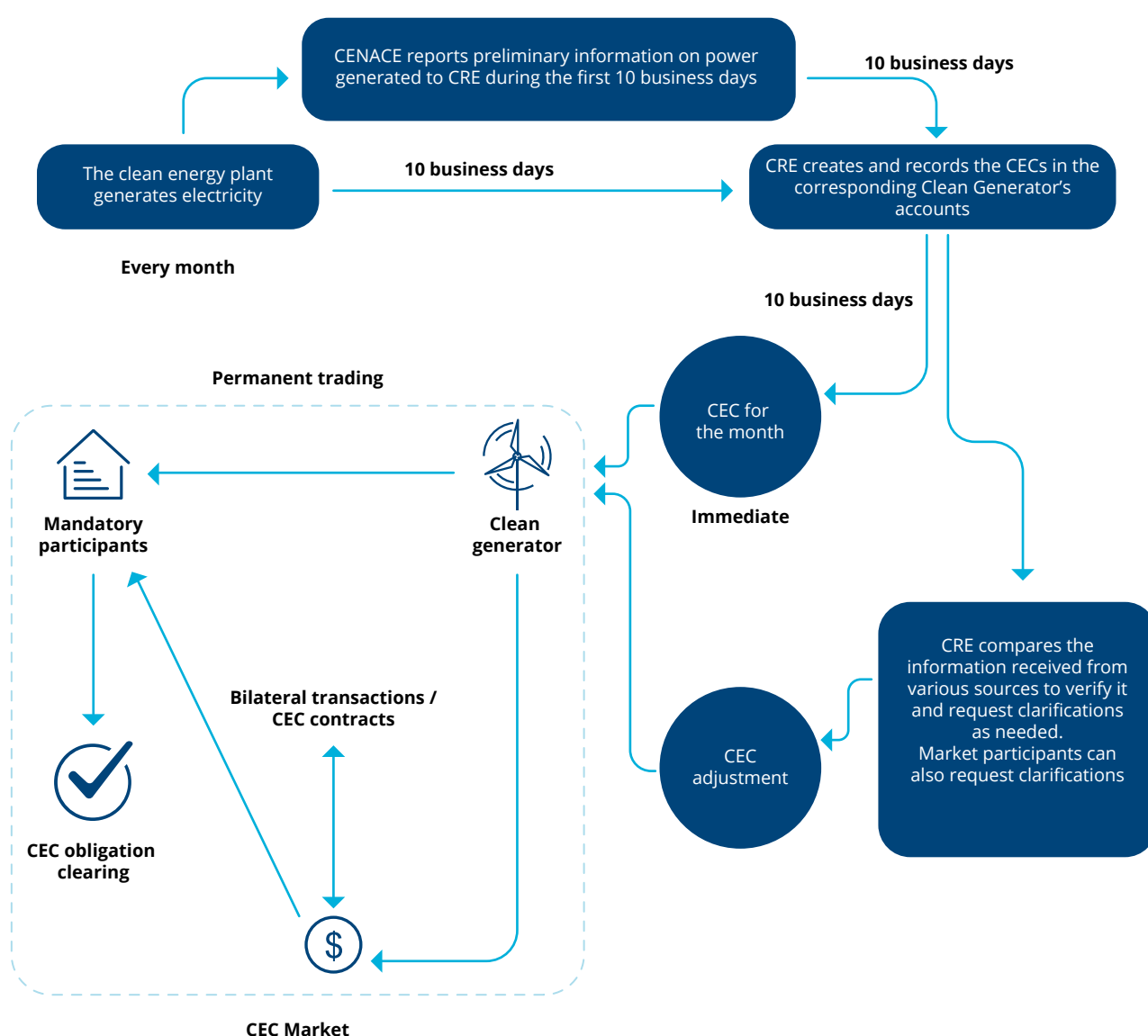
Moreover, anyone can buy and sell CEC through contracts.

Trading of CEC

Generators will receive a CEC for each MWh of clean energy generated in plants that commenced operations after August, 2014.

CEC may be traded between market participants in order for each mandatory participant to meet the CEC requirements. In order to maintain control over CEC transactions, CRE keeps records in the System for Certificates' Management and Compliance with Clean Energy Obligations.¹⁸¹

Figure 38: CEC acquisition and trading process



Source: CRE

¹⁸⁰ DOF (2015) Bases del Mercado Eléctrico.

¹⁸¹ CRE (2018) Preguntas frecuentes sobre la nueva regulación en temas eléctricos.








Medium and long-term auctions

Auctions are a trading mechanism used by CENACE. The first three LTAs executed up to 2017 were organized by SENER. However, in December 2017, SENER delivered the Manuals and the Rules for the WEM and the auctions to CRE in order for CRE to take over the organization of the auctions as of that date.

In these auctions, there are buying offers as well as selling offers.

CENACE publishes the winning offers in order for the corresponding contracts to be signed. The auctions are classified as medium or long term depending on the contractual duration. The products that may be traded in the Medium Term Auctions (MTA) are power and capacity, whereas in the LTAs, the products are power, capacity and CEC.

Table 11: Main characteristics of medium and long-term auctions

	Long-term auctions 			Medium-term auctions 	
Products and Term	 Capacity 15 years	 Power 15 years	 CEC 20 years	 Capacity 3 years	 Power 3 years
Frequency	At least one per year			One per year	
Clearing House	Does not exist for LTAs 2015 and 2016		Exists for LTA 2017 and onwards	In process	
Potential buyers	LTAs 2015 and 2016: <ul style="list-style-type: none"> BSS 		LTA 2017: <ul style="list-style-type: none"> BSS QSS SOLR Qualified Market Participant Users 	<ul style="list-style-type: none"> BSS QSS SOLR Qualified Market Participant Users Non-supplier traders 	
Potential sellers	Any market participant, with the condition that in case of being awarded, they should be legally registered as a Generator			<ul style="list-style-type: none"> Any market participant* 	

* Subject to compliance with the requirements and conditions established in the Basis for the Electricity Market, the Manual and the LTA and MTA Basis

Source: EY with information from Manual de Subastas de largo Plazo and Manual de Subastas de Mediano Plazo.

Clearing House

Generally speaking, the previously mentioned Clearing House facilitates the sellers' and buyers' compliance with contractual obligations. Its functions include:

- Acting as an intermediary that facilitates the clearance of products and payments. The contracts for the auctions performed after the creation of the Clearing House will be adapted to include the Clearing House. The Clearing House will sign as the buyer the contracts with the sellers and as the seller the contracts with the buyers.
- Administer the Compliance Guarantees.
- Play a risk management role; that is, if there is a payment default (and the guarantees are insufficient to cover for it) the default will be absorbed by all of the sellers ratably. If there are losses tied to product shortfalls (and the guarantees are insufficient to cover it and the seller cannot be held responsible), the product shortfalls will be absorbed by all of the buyers.

The Clearing House for the LTA started its operations in 2017 during the 3rd LTA. For MTA, it will be established too, during 2018.¹⁸²

The operating principles of the Mexican Clearing House are based upon the operation of some of the US Clearing Houses and Independent System Operators, being closest to the Pennsylvania New Jersey Maryland Interconnection (PJM). However, one of the main differences is that in the United States there is a different clearing house for each interconnected system,

while in Mexico there is only one (considering that there is only one market).

In the European market, the European Commodity Clearing (ECC), as a subsidiary of the European Energy Exchange (EEX), is focused on ensuring a proper clearing and settlement of trading transactions among more than 30 countries. An important difference with the Mexican market is that in Europe usually no financial mechanisms are used to hedge.

Financial Transmission Rights (FTR)

Products

FTR: Mechanism to hedge exposure to the price differences that may exist between two nodes due to congestion in the transmission network. One FTR corresponds to one energy unit (1 MWh) for every hour in which the FTR is in effect.¹⁸³

How do FTRs work?

They give the holder the right to charge or the requirement to pay for the price difference between the electricity's source node and destination node. They do not grant a physical right to use the Transmission network and are calculated based on the Marginal Congestion component (of the Locational Marginal Pricing) of the DAM.

How are FTRs obtained?

There are four ways to obtain FTRs: Legacy FTR, FTR auctions, PPAs, or by funding a network expansion.

Table 12: Financial Transmission Rights

<p>Legacy</p> <p>The following participants have the right to acquire legacy FTR free-of-charge: holders of Legacy Interconnection Contracts and BSS. The FTRs are allocated based on the historic utilization of the transmission network and to the holders of Legacy Interconnection Contracts that included transmission services by the time the LIE came into effect. When FTRs are allocated, the holders may either accept or reject them; the allocation of each FTR will only be made once.</p> <p>Term:</p> <p>Legacy Interconnection Contracts: during the term of the contract</p> <p>BSS: during the life span of the power station</p>	<p>Auctions</p> <p>After the assignment of Legacy FTRs, the remaining FTRs are sold through auctions. The purchasing offers establish a price for a certain amount of FTRs between any source node and any destination node. Market participants choose the combination of source and destination nodes and they are free to submit as many offers as they see fit. CENACE assigns the amount and selection of FTRs that maximize the economic surplus.</p> <p>Up to 2017, no FTR auctions have been performed but there has been an allocation of legacy FTRs. Term: 3 months, 1 year or 3</p>	<p>Network expansion funding</p> <p>Market participants and Legacy Interconnection Contract holders can invest in the expansion of the transmission and distribution networks whenever a given expansion project is not included in the Expansion and Modernization Programs. After financing the expansion, the corresponding FTRs are allocated to the investor. These FTRs identify the injection and withdrawal points and CENACE calculates the capacity available before and after the expansion; the increase in capacity is then allocated to the interested party. Term: 30 years.</p> <p>PPAs</p> <p>CENACE is not involved in these transactions.</p> <p>Term: agreed upon by the parties.</p>
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¹⁸² DOF (2017) Guía Operativa de la Cámara de Compensación para contratos asignados a través de LTA.

¹⁸³ SENER (2016) Derechos Financieros de Transmisión: implementación en México.

3.2 Compensation models

After the creation of the WEM, new markets were opened up, unlocking different options for power generators to recover their investments and cover their operating and maintenance costs.

As mentioned before, the short-term energy market allows for power generators to cover their variable costs, which leads to the question of how they will cover their fixed costs.

Power generators may sell a wide variety of products in addition to electricity, including capacity and CEC, which allows them to cover the plants' fixed costs.

Depending on the technology used, the generator may sell capacity or CEC in the market, considering that CRE

establishes an obligation for power consumers and/or their market representatives to buy a certain amount of capacity and CEC. There is also the possibility to trade these products through PPAs.

Compensation of variable costs

Short-term market

- DAM
- RTM
- HAM

Compensation of fixed costs

- MTA
- LTA
- PPAs
- Capacity Market
- CEC

The National Atlas of Zones with High Clean Energy Potential is a digital tool that contains information on areas with a high potential for the use of renewable energy sources in Mexico. This atlas provides information on the potential for the generation of solar, wind, geothermal and biomass energy in order to identify investment opportunities and advance the performance of prefeasibility studies. The atlas can be found at the following website: <https://dgel.energia.gob.mx/AZEL/>

Short-term market

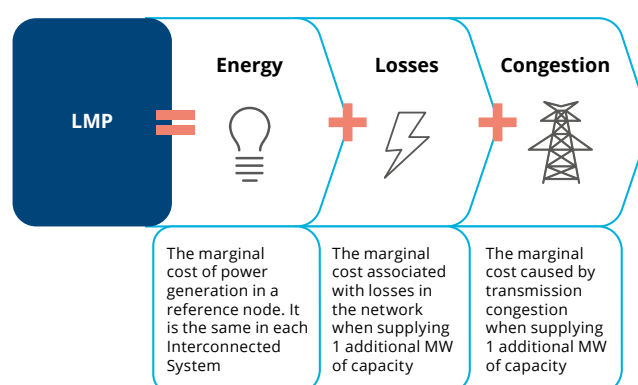
Locational Marginal Price (LMP)

The LMP represents the increase in marginal costs of generation to supply an additional MW of capacity

demand in a given node of the electricity network. They are primarily used to price transactions in the short-term market.¹⁸⁴

These prices are calculated based on three main components:

Figure 39: LMP components



Source: EY with information from CENACE

The purpose of these components is to ensure that prices incorporate economic signals that indicate the saturation levels of the network, as well as the volume of power losses during transmission.

Power generators operating in the short-term market may receive income from two products:

1. Income from power sales = LMP * Energy Sold * # of hours
2. Income from ancillary services = Price of the ancillary services * MW sold + # of hours

Total income = Income from energy sales + Income from

ancillary services

If the income received by the seller is lower than the total costs incurred by the power generator (assignment costs, production of electricity, and supply of ancillary services), a guarantee of revenue sufficiency should be paid.

3. Guarantee of revenue sufficiency = Max (\$0; (Total Costs - Total income))

Source: Prepared by EY with information from CENACE. Manual del Mercado de Energía de Corto Plazo

¹⁸⁴ CENACE (2016), Manual de mercado de energía de corto plazo.

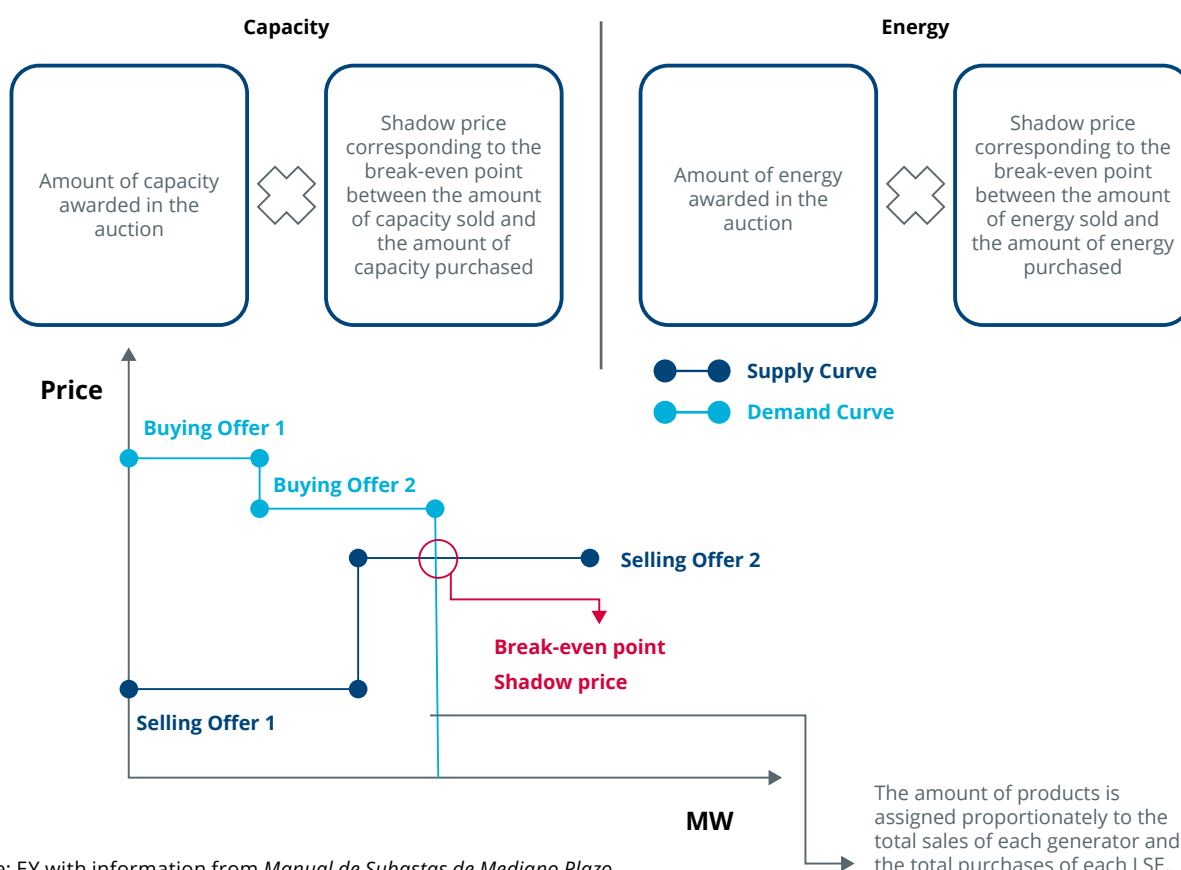
Medium-term auctions (MTA)

The objectives of MTAs are: to award energy and capacity contracts in a competitive environment, to meet capacity and power consumption needs, and to

reduce or eliminate exposure to price fluctuations.

Through these auctions, generators can receive payments for capacity and energy¹⁸⁵.

Figure 40: MTA compensation model



Source: EY with information from *Manual de Subastas de Mediano Plazo*

Long-term auctions (LTA)

The purpose of LTAs is to assign contracts for the purchase of Capacity, Power, and CEC.

Under this mechanism, the total income is the result of multiplying the price offered times the amount products included in the selected package (amount of energy, amount of Capacity and amount of CEC).

For these schemes, there are two types of adjustment factors: i) expected differences and ii) time adjustment.

Expected differences adjustments are used to compare the selling offers that include power delivery in zones with different prices. A calculation is made for the estimated difference between the average LMP in the SEN and the LMP of each pricing zone during the time considered in the auction.

On the other hand, time adjustments consider a payment or charge that reflect the projected value of electricity at different times of the day and month of the

year. For each MWh of energy produced by generators with variable clean sources, there will be a payment or charge adjustment.

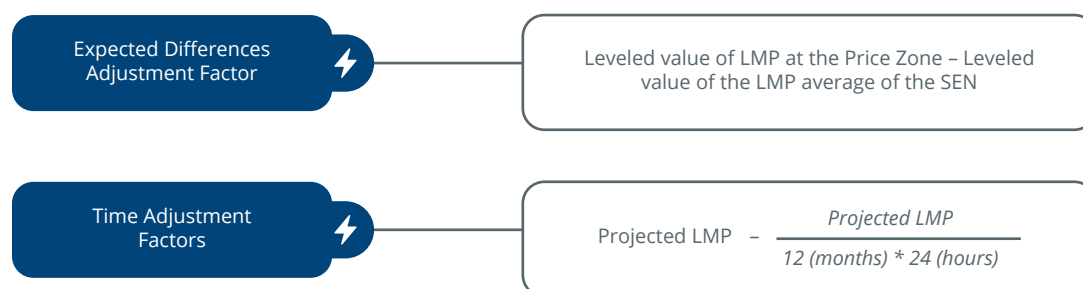
This means that generators with variable clean sources will receive a monthly payment equal to the time adjustment factors, multiplied by the amount (MWh) of energy produced each hour. This will be additional to the income they will obtain from their winning offers.

Selling offers from firm clean sources may include power, but whenever they do, the energy offer shall be considered to be a constant volume in each hour of the year and there will be no monthly adjustment payments.

At the end of every year, there will be a payment or charge to balance the differences between the amount of energy supplied and the amount of energy subscribed in the contracts, the balance will be made according to the LMP of the RTM.¹⁸⁶

¹⁸⁵ DOF (2017) Manual de Subastas de Mediano Plazo.

¹⁸⁶ DOF (2015) Manual de Subastas de Largo Plazo.



Source: EY with information from *Manual de Subastas de Largo Plazo*

Results of the LTAs

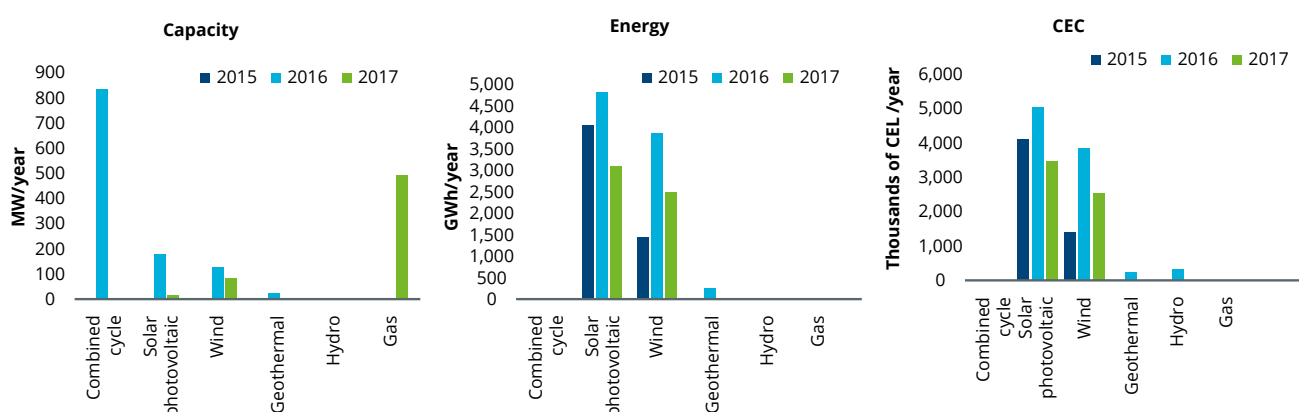
As of the first quarter of 2018, three LTAs have been executed in the Mexican market. The first auction was carried out in 2015, the second in 2016 and the third in 2017. In the first auction, there were 18 winning selling offers from 11 companies and the products that were sold were: Energy and CEC. In the second auction there were

56 winning selling offers from 23 companies and the products that were sold were: Energy, Capacity and CEC.

In the third auction there were 16 winning selling offers from 10 companies.

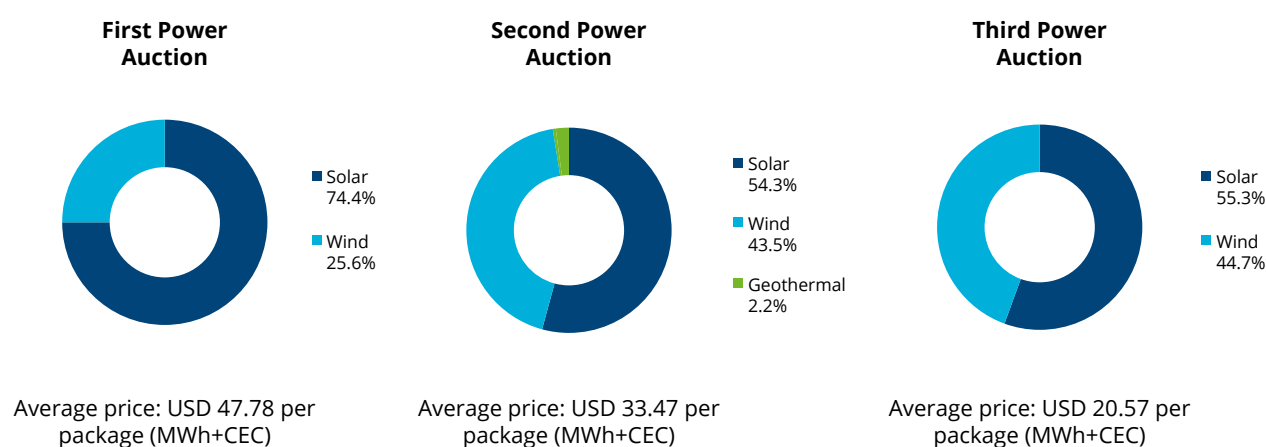
The graphs below show the results of the auctions by product and by generation source.¹⁸⁷

Figure 41: Results of the three LTAs by product and generation source



Source: EY with information from CENACE

Figure 42: Power generation sources and average prices in the three LTAs



Source: EY with information from SENER

Note: The information is presented in U.S. dollars, the average annual daily FIX exchange rate published by Banco de México is: 2015 (15.88 MXN/USD), 2016 (18.69 MXN/USD), 2017 (18.89 MXN/USD)

¹⁸⁷ SENER (2017) Nueva Industria Energética en México.

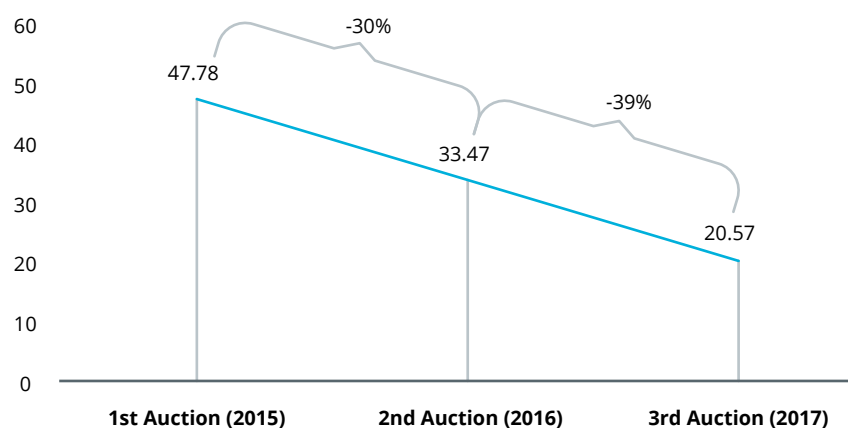
Power awarded through the first and third auctions, will come from wind and solar sources only.

The second auction awarded contracts to wind, solar and geothermal power stations.

The average energy and CEC package price decreased by 30% from the first auction to the second auction.

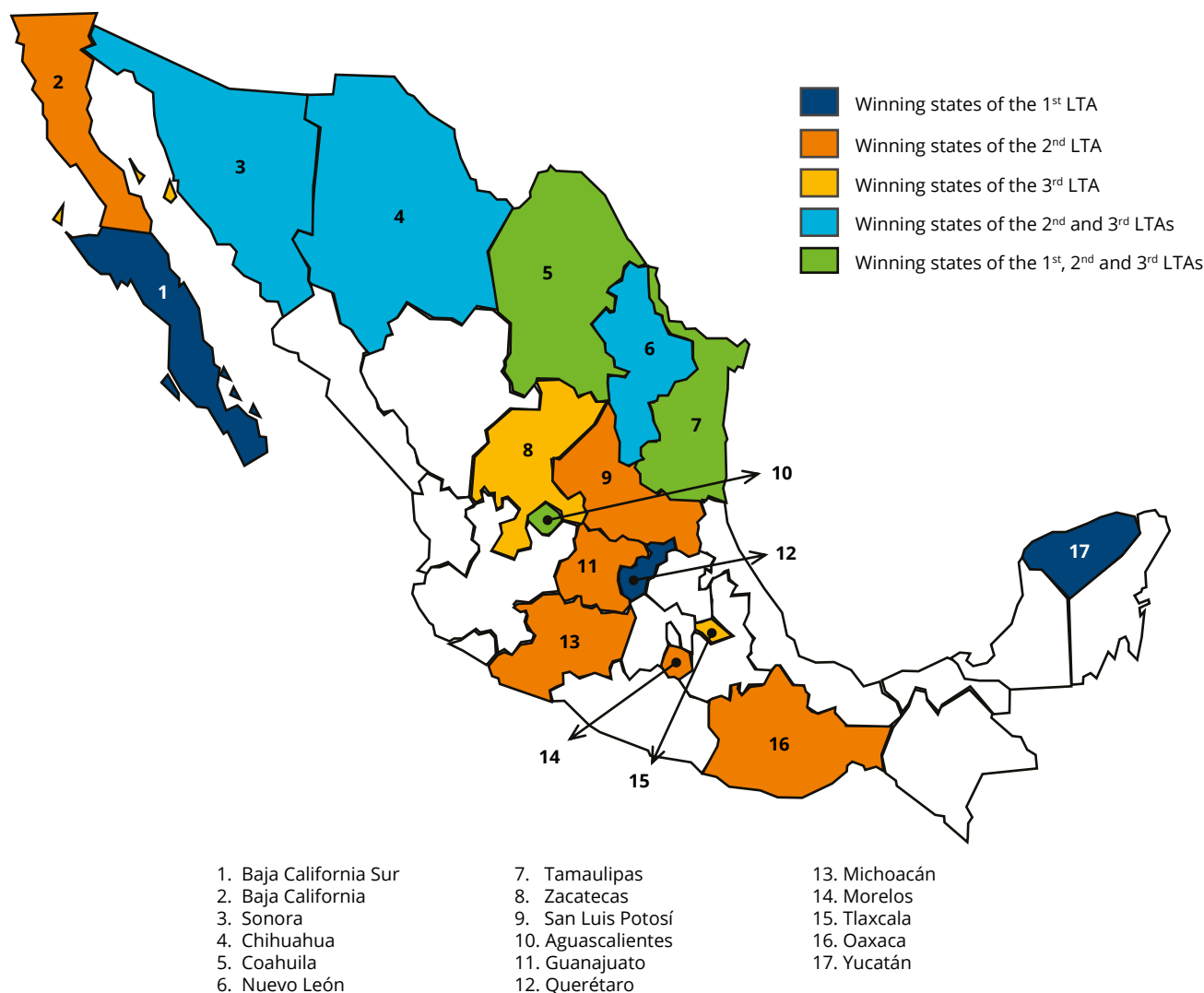
The price decreased by 39% from the second to the another third auction.

Figure 43: Average price per package (USD/package)



Source: EY with information from CENACE

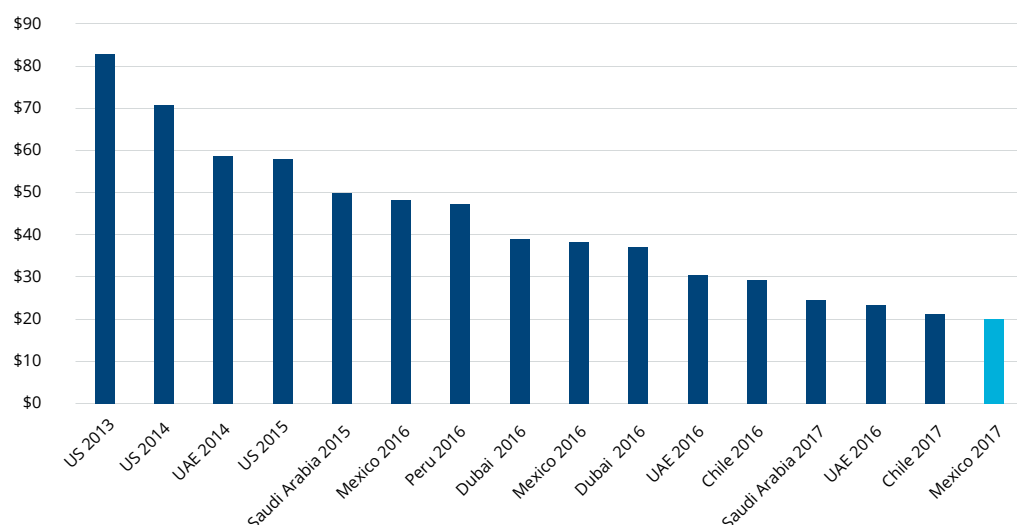
Figure 44: Winning states of the first three LTAs



Source: EY with information from CENACE

Mexico emerged as one of the most competitive countries in the world regarding clean energy prices.

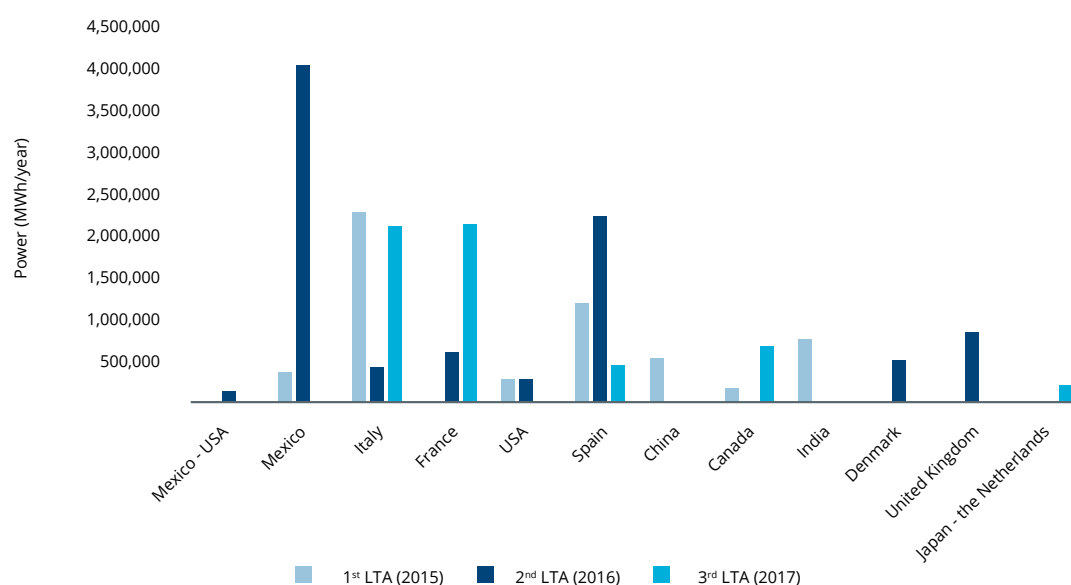
Figure 45: Lowest clean energy prices



Source: EY with information from CRE (2017) and Electrek (2017)

With the results of its third LTA, published in November 2017, Mexico had reached the lowest prices for clean energy worldwide: An average price of 20.57 USD/MWh, with the lowest price for solar of 17.9 USD/MWh and 17.7 USD/MWh for wind.

Figure 46: Countries of origin of the winning companies of the LTAs



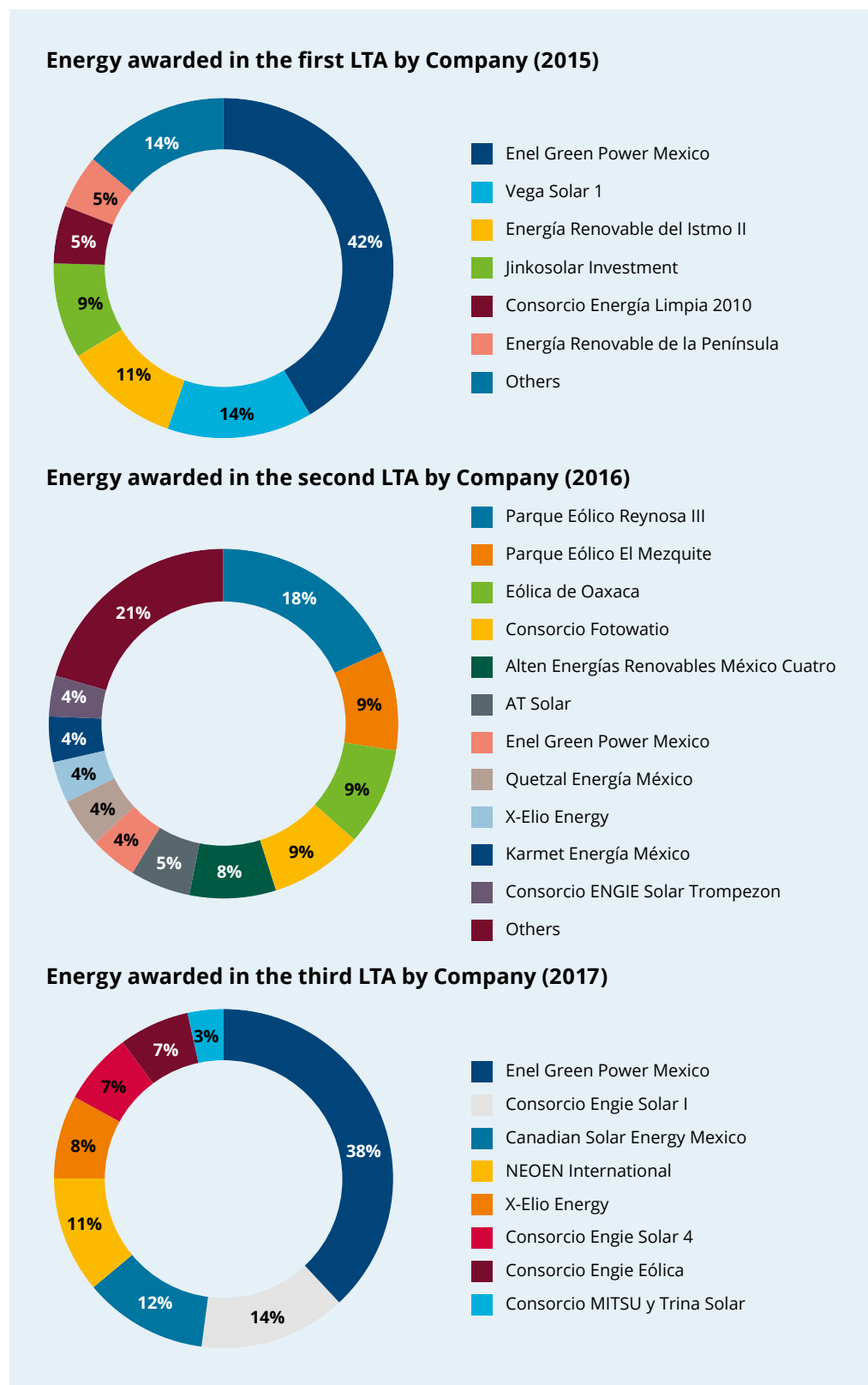
Source: EY with information from CENACE

The graph above shows the countries of origin of the winning companies of the LTAs held in 2015, 2016 and 2017. Mexican companies increased dramatically their participation in the electricity market from 2015 to 2016. This increase was largely due to the Parque Eólico Reynosa III project, a project owned by a Mexican company, Zuma Energía, and which is being built by Acciona. However, in 2017, no Mexican company won at the energy auction. Only companies from Italy and Spain have won contracts in all three LTAs.

The following graphs show the participation of the major winning companies, based on the amount of energy awarded in the contracts through the LTAs held in 2015, 2016 and 2017.

In all three auctions, the company with the highest percentage of share awarded has been the Italian company Enel Green Power with 42% of the electricity contracts in 2015, 5% in 2016 and 38% in 2017.

Figure 47: Energy awarded in the first three LTAs



Source: EY with information from CENACE

The companies listed above refer to the winners' registered name, as published by CENACE for every LTA.

PPAs

Under the PPA structure, purchase-sale agreements are subscribed for any of the WEM products (energy, capacity, CEC, Controllable Demand) at a future date at an agreed price that may be fixed or may include arranged price increments.

Therefore, it is clear that in the case of PPAs, the compensation model to be considered will depend on the agreement reached by the parties.

Capacity Market

The compensation model in the balancing market is the result of multiplying the amount of capacity offered by the net price of capacity. Based on the demand and the minimum capacity requirements established by CRE, CENACE will calculate the gross capacity requirement for each LSE, considering the location of the loads in the interconnected system or capacity zone, to then calculate the capacity requirement of the ERCs and the generators.

1. Net capacity requirement for LSE = Gross capacity requirement – amount of capacity acquired in bilateral transactions.
2. Net capacity requirement for generator = capacity shortfall contracted through bilateral transactions.

The sum of these two items is the total net requirement (amount) based on which the new obligatory demand curve will be established, with the price being two times the balanced fixed costs for the benchmark technology(*) calculated by CENACE.

Subsequently, the demand curve for efficient capacity is calculated considering a price equal to the balanced fixed costs for the technology of reference and an amount equal to the total value of the efficient level of capacity determined by CRE.

Based on the capacity delivered in the prior year, CENACE will calculate the amount of the gross supply of capacity in the interconnected system or capacity zone for each generator and then calculate the net capacity supply for each market participant, as follows:

3. Net capacity supply for LSE = Amount of capacity surplus generated by bilateral transactions. Net capacity supply for generators = Gross supply of capacity – amount of capacity sold through bilateral transactions.

The supply curve will thus be a vertical line equal to the amount of the net capacity supply.

(*)Price adjusted for inflation and exchange rate

The intersection point between the supply curve and the demand curve will be the closing price, which is considered for determining the net price of capacity that will be used to pay for the capacity sold in this market.

CENACE also estimates the variable costs of the benchmark generation technology and determines the Weighted Locational Marginal Pricing (LMPw), considering the LMPs of the DAM weighted by the physical delivery of energy at each node. It also identifies the hours of the year where:

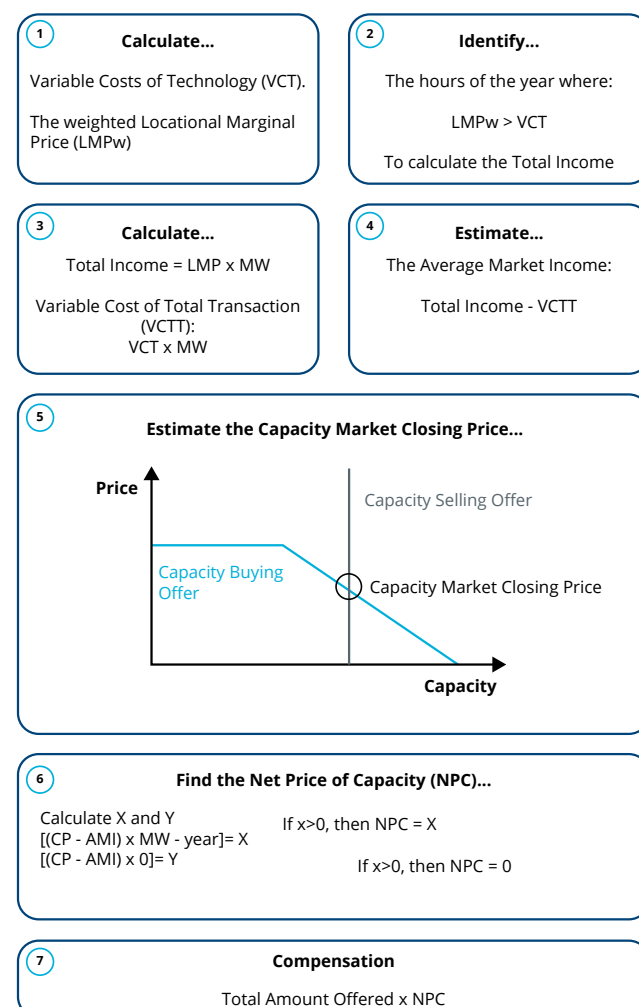
$LMPw > \text{Variable Costs of the referred Technology}^{188}$

In addition, CENACE calculates the Average Market Income based on the following formula¹⁸⁹:

$$\text{Average Market Income} = \underbrace{(LMP * 1MW)}_{\text{Total Income}} + \underbrace{(\text{Variable Cost} * 1MW)}_{\text{Variable Cost of Total Transactions}}$$

Lastly, the Capacity Closing Price minus the average market income multiplied by MW/year, or zero, whichever is higher, is the Net Price of Capacity in each interconnected system and in each capacity zone.

Figure 48: Capacity market



¹⁸⁸ DOF (2015) Bases del Mercado Eléctrico.

¹⁸⁹ DOF (2015) Bases del Mercado Eléctrico.

Source: EY with information from Manual del Mercado para el Balance de Potencia

Clean Energy Certificates (CEC)

The configuration of the price of the CEC takes place through a spot market that involves parties that buy and sell CEC. Based on the market basis issued by SENER, the market operator is CENACE.

Through this entity, both the buying and selling parties tender different prices to buy or sell different sets of certificates.

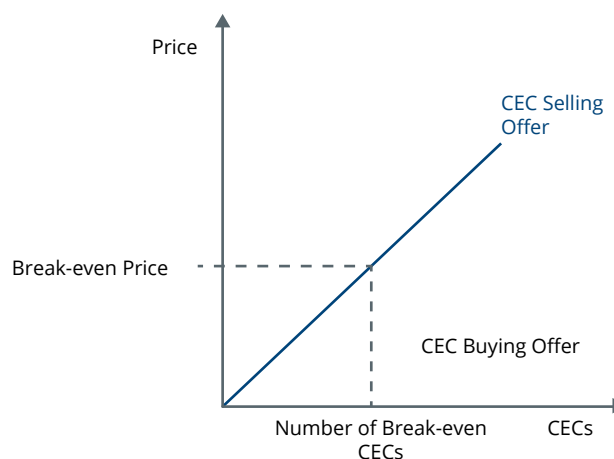
When offers have been closed, the operator calculates the break-even price.

Based on the Electricity Market Rules issued by SENER in 2015, this break-even price is obtained when: the total amount of selling offers with prices lower than or equal to the break-even price is equal to the total amount to buying offers with prices higher than or equal to the break-even price.¹⁹⁰

Under this method, there may be times when the break-even price is not a value, but a range. In this case, the median of the range will be calculated. With respect to the assignment of CEC amounts, every selling offer with prices strictly lower than the break-even price and every buying offer with prices strictly higher than the break-even price shall be assigned the total amount of CECs included in their offers.

However, the offers that are exactly within the break-even range shall be assigned to the amount of CECs based on the proportion of their amounts offered,

Figure 49: CEC price mechanism



Source: EY with information from SENER. Bases del Mercado Eléctrico

considering the amounts that lead to a balance between supply and demand.

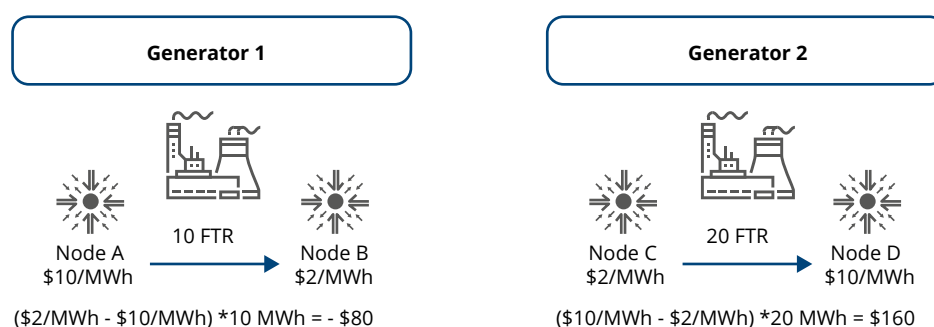
Financial Transmission Rights Auctions

Auctions are done once a year and FTRs are acquired for three months, one year or three year periods.¹⁹¹

FTRs grant holders the right and the obligation to charge or pay the difference between the marginal congestion component of the locational marginal pricing of the DAM for a source node (S) and a destination node (D). In other words:

$$\text{Collection/Payment} = (\text{Marginal Congestion Component}_D - \text{Marginal Congestion Components}_S) * \text{Amount}_{\text{FTR}}$$

Figure 50: Determination of break-even price



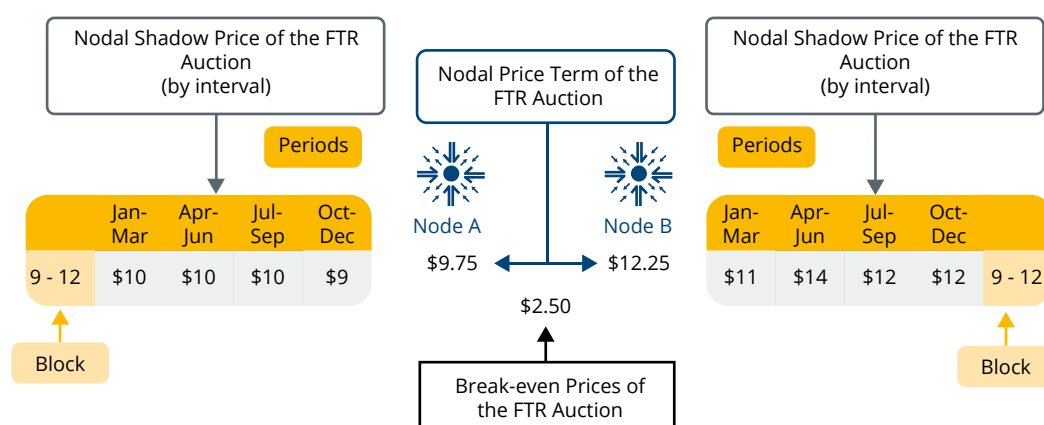
Source: CENACE

During the auction, a break-even price is determined and represents the difference between the Nodal Price Term of a destination node (D) and a source node (S). The Nodal Price Term represents the average of the shadow price for the entire term.

A shadow price is the optimal value of the solution of a given model. In this case, the restriction of the model is the capacity balance in a node of a given interval.

¹⁹⁰ DOF (2015) Bases del Mercado Eléctrico.

¹⁹¹ DOF (2015) Manual de Subastas de Derechos Financieros de Transmisión.

Figure 51: Calculation of break-even price

Source: CENACE

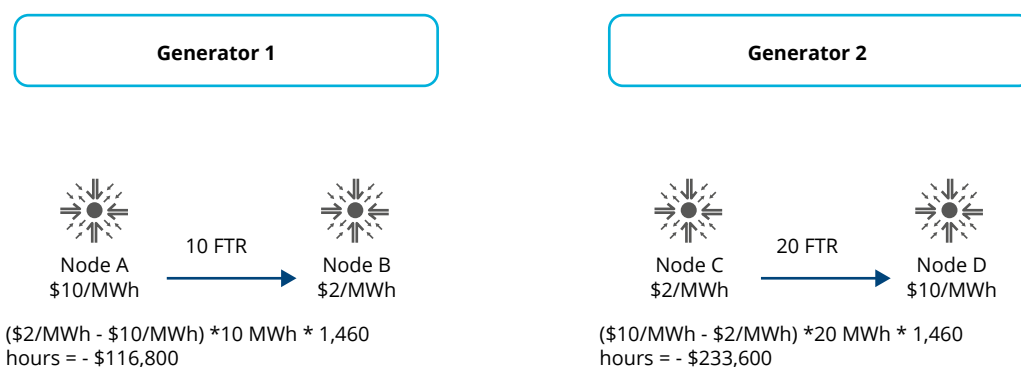
When the break-even price is positive, the market participant pays to CENACE the result of multiplying the FTRs by the break-even price of the FTR auction. Otherwise (i.e., when the break-even price is negative), the market participant charges CENACE:

$$\sum \frac{(\text{FTR}) (\text{BEP})}{\text{days of the term}}$$

Auctions revenue rights

In the second stage of the WEM, the Legacy FTRs are automatically converted into auctions revenue rights. Through these rights, market participants receive charges or payments arising from the Nodal Price Term of the Annual or three-year Auction of FTRs.¹⁹²

$$\text{Collection/Payment} = (\text{Nodal Price Term}_D - \text{Nodal Price Term}_S) * \text{Amount}_{\text{FTR}} * \text{Hours}$$

Figure 52: Auctions revenue rights

Source: CENACE

¹⁹² DOF (2015) Manual de Subastas de Derechos Financieros de Transmisión.



Transmission Management Contract

Transmission and distribution of electricity

PPPs are long-term investment schemes between two or more companies from the public and private sectors, related to the development of infrastructure which is built and operated by the private sector company.

These types of arrangements often include the creation of trusts to guarantee the payment of the considerations and to provide legal certainty to investors.

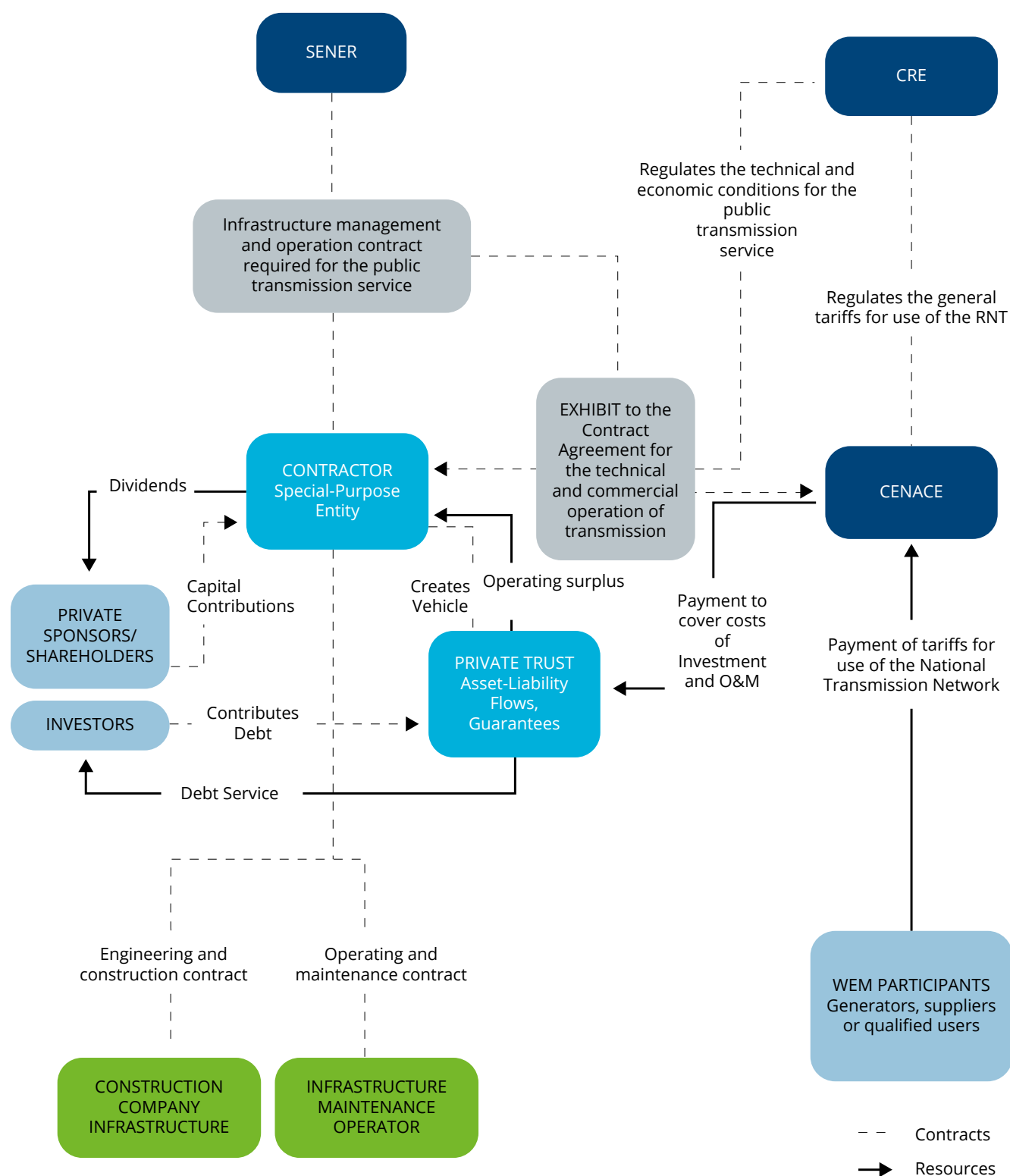
The new contracting model for power transmission lines establishes that SENER shall be required to apply competition and free concurrence processes in order to assign Power Transmission Management Contracts among private entities for them to handle, among other activities, the financing, installation, maintenance, management, operation, and expansion of the infrastructure needed to provide the public transmission service.

The costs related to the contracts or partnerships shall be included in the required income from public transmission and distribution services. A series of conditions are established in order to ensure that the method used to determine the winning contracts awards the entity that requires the lowest net present value of constant yearly payments over a number of years equal to the lifetime of the expansion or modernization.

The results of the bids will make it possible to determine the amounts of compensation that will be paid to the winning bidder. Their annual contractual payments will be included by CRE in the required income from the public transmission service of the RNT and will be recovered through the payments of the general network usage fees.

Under these types of contracts, private entities acquire the obligation to carry out the financing, installation and maintenance, management and operation of the infrastructure and assume the construction risks related to the new infrastructure. At the end of the contract term, the assets are transferred to the State, meaning that the main asset for the contractor is the right to receive future income paid by the participants of the WEM.¹⁹³

¹⁹³ SENER (2017) Modelo de Contrato de Gestión de Transmisión de Energía Eléctrica.

Figure 53: Transmission contract process

Source: SENER

Once the new infrastructure has been built and enabled for the transmission service, the contractor shall receive the income established in the bid covering: operating costs, debt services, payback, among others. This income is a fixed annual payment considering monthly

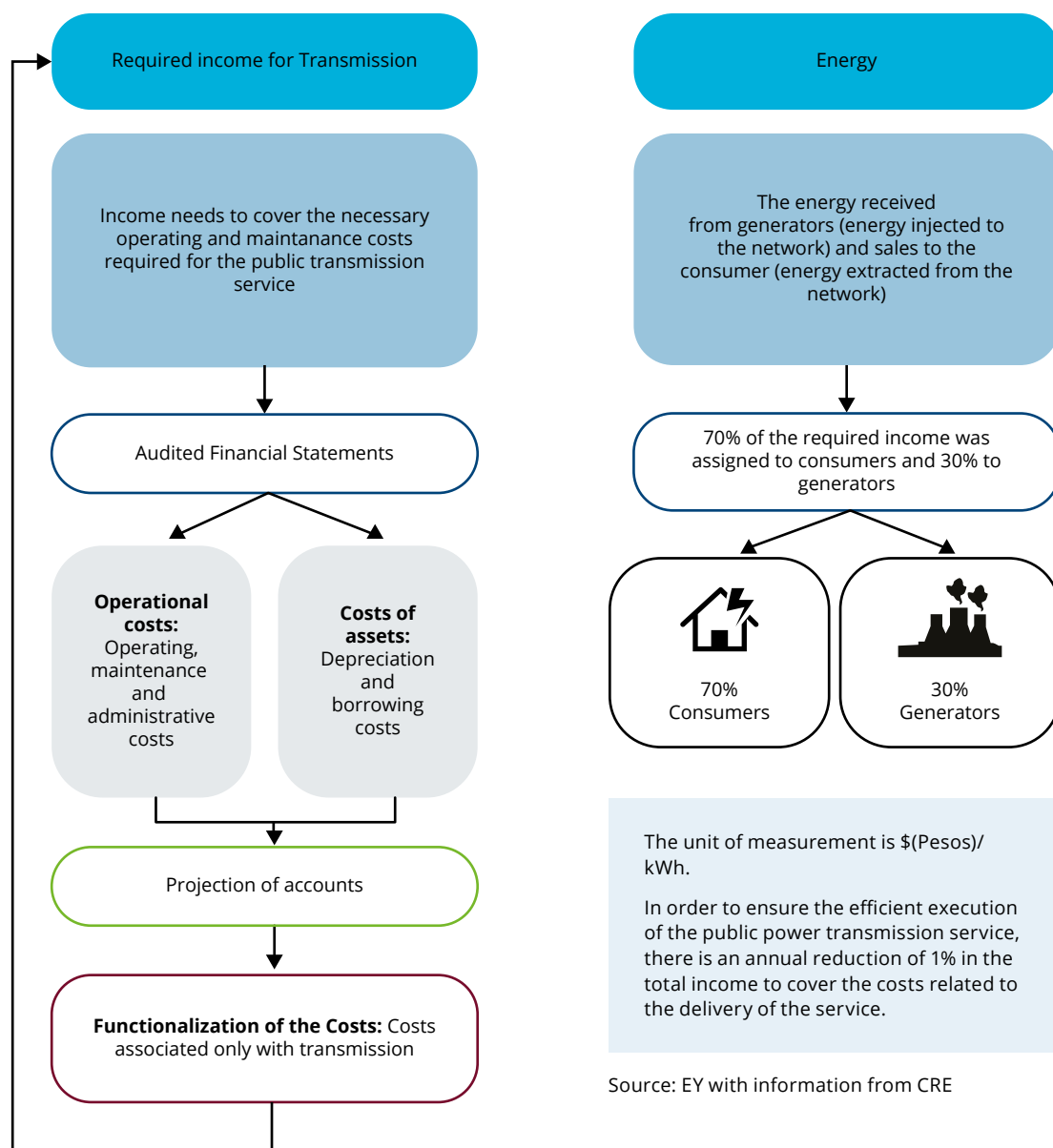
installments, as a result of the compensation requested by the contractor during the bidding process.

The annual payment shall only be modified based on the periodic adjustments indexes or formulas issued by CRE.

Tariffs

The tariffs were developed using the “postage stamp” method based on the injections and extractions of electricity that each generator or consumer makes to and from the RNT, which gives rise to two voltage level charges for each demand group: 1) generators (injection into the RNT) and 2) consumers (extraction from the RNT).

Figure 54: Tariffs calculation process



Transmission and distribution funding expansion

Market participants may pay for expansions of the transmission and distribution networks when the expansion in question is not included in the Expansion and Modernization Programs for the RNT and the RGD.

This methodology determines charges without any geographic distinction; that is, a tariff is determined for all generators and consumers based on the voltage level of the interconnection or connection they make, regardless of the distance over which the electricity is transmitted.¹⁹⁴

The tariff includes two main components: the required income and the electricity.

These expansions result in the assignment of an FTR to the participant who executed the expansion for an effective period of 30 years.

The purpose of this mechanism is to protect the related investments.¹⁹⁵

¹⁹⁴ CRE (2016) Memoria de cálculo usada para determinar la tarifa que aplicará la CFE por el Servicio público de Transmisión de energía eléctrica durante el periodo tarifario inicial que comprende del 1 de enero de 2016 y hasta el 31 de diciembre de 2018.

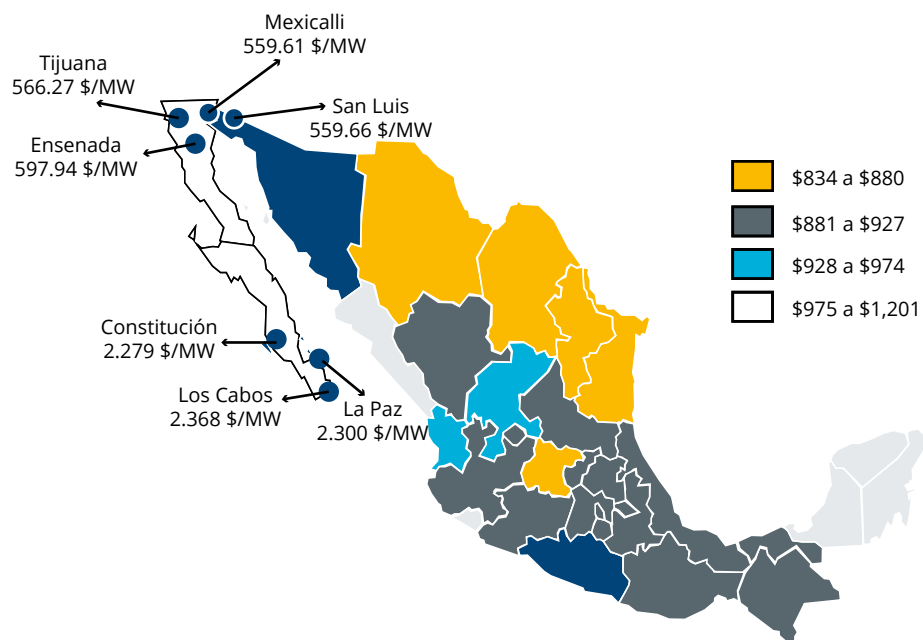
¹⁹⁵ DOF (2015) Manual de Subastas de Derechos Financieros de Transmisión.

Average Locational Marginal Pricing - Nodes

There are 2,417 price setting nodes (NodosP) across the three Interconnected Systems that comprise the SEN:

SIN (2,284), BCA (104), and BCS (29), for which the LMP are determined for the financial settlements in the WEM.¹⁹⁶

Figure 55: LMP – Interconnected System nodes



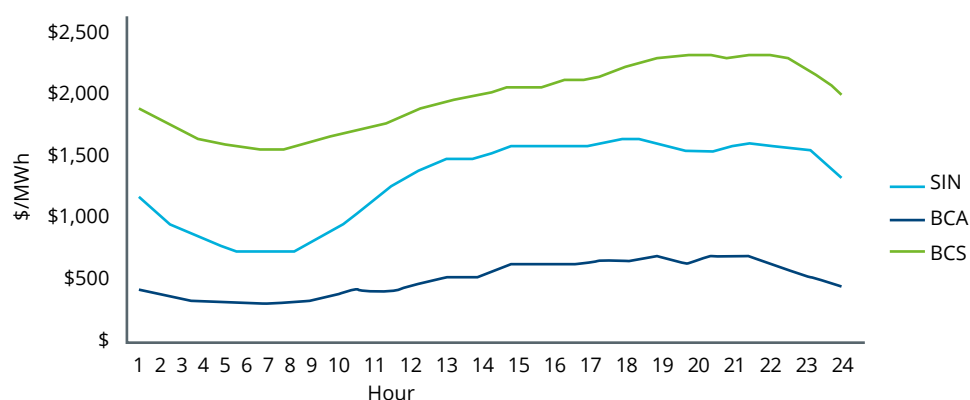
Source: EY with data from CENACE

(*) SIN: From January 29 to December 31, 2016. The average includes 2,258 nodes

BCA: From January 27 to December 31, 2016. The average includes 104 nodes

BCS: From March 23 to December 31, 2016. The average includes 27 nodes

Figure 56: Average LMP per hour (Jan-Dec 2017)



Source: EY with information from CENACE

3.3 Permits, Mexican and International Quality Standards

Quality Standards in all sectors

Companies in the electricity sector in Mexico must

comply with a series of quality standards and specific catalogs. The Mexican Catalogs of Standards comprise the Official Mexican Standard (NOM) and the Mexican Standards (NMX).

¹⁹⁶ CENACE (2017) Formación de Precios en el MEM y su aplicación a mercado de derivados.

There are 1,049 NOMs that regulate products and services. These are aimed at mitigating the potential risks that may arise for people, animals, and the environment, related to such products and services. There are three different types of NOMs:

Final standards: validated and verified; they are valid for indefinite time.

Emergency standards: issued under an emergency

situation and do not need drafting or verification. They have a six months validity,

Standard draft: projects for new standards that go through a verification process.

There are 5,240 NMX that establish the minimum quality standards for products and services to protect and guide consumers. In the electricity sector, there are 890 NMX while there are 8 NMX in the solar sector.

Table 13: Types of Quality Standards

Agency	Final Standard	Emergency Standard	Draft Standard
Ministry of Economy	125	2	37
Ministry of Tourism	7	0	1
Ministry of Agriculture, Cattle, Rural Development, Fishing and Food	120	0	34
Ministry of Environment	118	2	24
Ministry of Labor and Social Welfare	43	0	8
Ministry of Energy	90	0	26
Ministry of Health	145	0	32
Ministry of Transport	109	0	109
Ministry of the Interior	3	0	2
Ministry of Public Safety	1	0	0
CRE	3	1	0
ASEA	2	2	3
Total	766	7	276

Source: Dirección Nacional de Normas, Gobierno de la República 2017

Environmental Standards

There are environmental standards that are classified into six categories:

1. Wastewater (4 NOM).
2. Solid urban waste, hazardous waste, and waste requiring special handling (3 NOM).
3. Emissions (2 NOM).
4. Noise and vibrations (1 NOM).
5. Wildlife (1 NOM).
6. Land (2 NOM).

These standards are established by SEMARNAT with the objective of regulating emissions, discharges, the use of

natural resources and, in general, all matters involving environmental impact.¹⁹⁷

Social standards

There are social standards classified into four categories¹⁹⁸:

1. Safety standards (13 NOMs)
2. Health standards (8 NOMs)
3. Organization standards (6 NOMs)
4. Special standards (8 NOMs)

These standards are regulated by the Ministry of Labor and Social Security (STPS), and determine the minimum conditions necessary to prevent workplace risks.¹⁹⁹

¹⁹⁷ SEMARNAT (2018) NOM – Normas Oficiales Mexicanas ordenadas por materia.

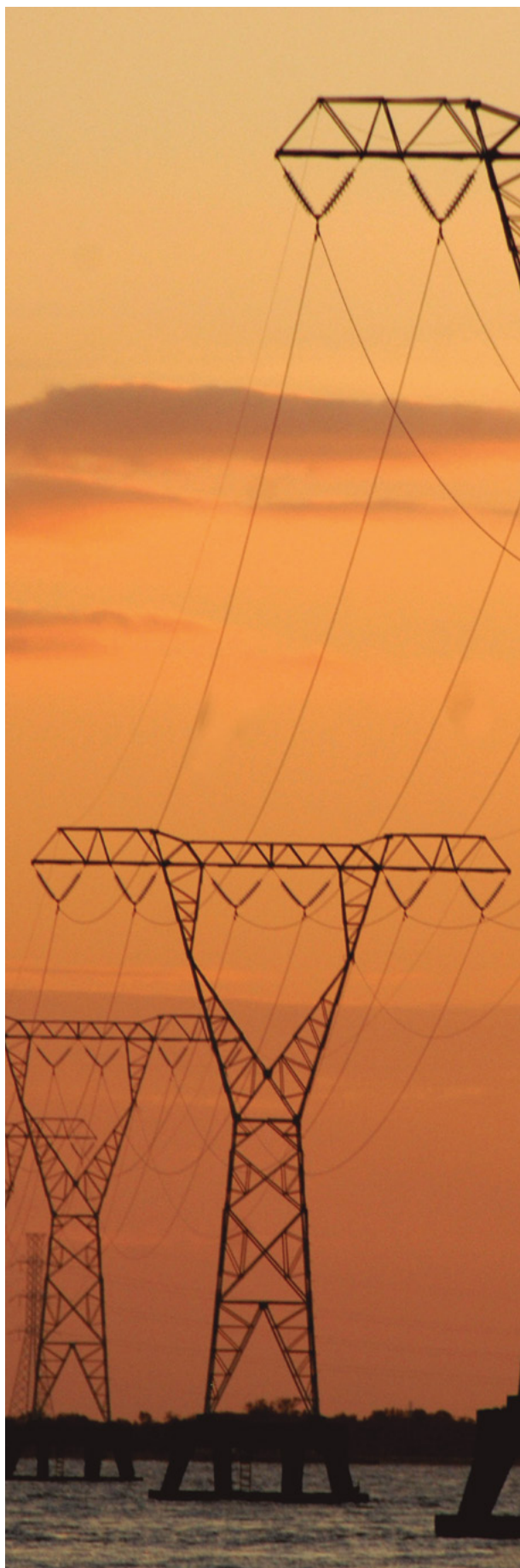
¹⁹⁸ DOF (2017) Acuerdo por el que la Agencia Nacional de Seguridad Industrial y de Protección al Medio

Ambiente del Sector Hidrocarburos, hace del conocimiento los contenidos normativos, normas oficiales mexicanas y otras disposiciones que regulan las emisiones, descargas, el aprovechamiento de

recursos naturales y, en general, todos los impactos ambientales relevantes que puedan producir las obras y actividades de las estaciones de gas licuado de petróleo para carburación, a efecto de que sea procedente la

presentación de un informe preventivo en materia de evaluación del impacto ambiental.

¹⁹⁹ STPS (2018) Marco normativo de seguridad y salud en el trabajo.



Permits

The entities that grant permits are SEMARNAT, the National Institute for Anthropology and History (INAH), CRE, SCT, the National Water Commission (CONAGUA), as well as state and municipal environmental authorities.

Most permits are only submitted once, however some may need to be renewed based on the stage of the project. A detailed list of permits can be found in the Appendix.

Right-of-way

One of the key permits required for construction projects is the “Right-of-way” (“Derecho de Vía”) permit. This permit is acquired over the land where the project and infrastructure elements will be built (highways, bridges, ports, airports, among others).

Appendix 5 lists the permits and procedures that are required to obtain right-of-way permits from the Federal Commission for Regulatory Improvement (COFEMER).²⁰⁰

Interconnection contracts

One of the requirements to interconnect power stations with transmission networks is to subscribe an interconnection contract authorized by CENACE.

CENACE determines the technical specifications for the interconnections of power stations as well as the connections of load centers to the RNT and the RGD.

The interconnection and connection process includes defining required construction works as well as the contractual instruments that must be fulfilled by the party requesting a power source interconnection (renewable or non-renewable) or a load center connection to the RNT and to the RGD.

The Appendix includes additional information and links to other useful information regarding interconnection contracts.²⁰¹

²⁰⁰ SCT (2016) Trámites.

²⁰¹ CENACE (2018) Interconexión y Conexión.

3.4 General overview of risks and mitigation strategies

Political risks

Internationally, Mexico is considered a country with a moderate political risk. In 2016, different organizations such as the World Bank and the Transparency International Organization, classified Mexico's risk according to the following categories²⁰²:

- a. Political stability and violence/terrorism (1 = high instability, 7 = low instability): covers matters related to violence and terrorism: 5 out of 7.
- b. Rule of law (0 = low, 100 = high): considers government institutions' strength and governance, including contract, property rights, and law enforcement, among others: 33rd percentile out of 100.
- c. Regulatory quality (7 = low risk): ability of the government to define and implement policies and regulations that promote private sector development: 6 out of 7
- d. Bribery (1 = very common, 7 = almost never): considers the frequency in which bribery is requested to expedite (out of law) government paper work or procedures: 3 out of 7.
- e. Corruption perception (0 = very corrupt, 100 = low corruption): considers public power used to persuade or obtain personal benefits against the law, including all types of corruption: 30th percentile out of 100.
- f. Control of corruption (0 = very low, 100 = very high): the extent to which public power is exercised for private gain, as well as favoritism in cases of conflicts of interest: 23rd percentile out of 100.

In addition to the political risks analyzed by the World Bank, a series of interviews by government institutions have identified a certain degree of uneasiness among investors related to the presidential elections that will be held in 2018. However, Mexico's general institutional strength and recent Constitutional Reforms will not be affected by the results of the election.²⁰³

Technical risks

One of the main technical risks in the energy sector in Mexico is its geographical complexity. The location of an energy project plays a key role in the investment decision; thus, it is important to consider, among other factors, a region's cost structure, quality and availability of networks, transportation and infrastructure in order to ensure maximum connectivity and profitability.

PRODESEN (2017-2031) lists and details several electricity infrastructure projects that will boost and

strengthen the country's infrastructure. In this regard, the first bid for the construction of a transmission network in the north region of the country has been recently published.

Some mitigation strategies that may be used by investors to reduce these technical risks include having a close communication with the sector's regulatory authorities, ensuring compliance with standards and permits, and monitoring the progress of the transmission network under the CFE's responsibility.

It is also important to consider the risks related to the transmission and interconnection, which must be indicated in the PPA, including who assumes the risk of connecting to the network and thus transmitting energy to the substation.

Offtaker risks

The lack of data from the electricity market, that includes relevant KPIs for investors, represents a huge challenge.

For instance, in the case of congestion prices, the offtaker may consider the lack of historical data as a risk, due to the fact that current forecasts are based on estimations of demand behavior that use limited data.

Another risk for the offtaker may be the exchange rate. The prices agreed with generators are most often indexed to USD dollars, which could lead to an increase in the prices that offtakers must pay to the generators.

Some of the options available for mitigating these risks include hedges and the diversification of supplier portfolios.

Foreign exchange risks

As mentioned before, the renegotiation of NAFTA, the volatility of oil and gasoline prices, and the increase in interbank interest rates as set by the Central Bank have resulted in, among other effects, the devaluation of the Mexican peso.

In recent years, the Mexican peso has decreased its value by approximately 24%. The Mexican Central Bank, based on the document "Survey on the expectations of the private sector specialists in Economy" published in February 2018, positions the Mexican peso at an average closing price of around 18.83 pesos per USD dollar²⁰⁴. However, 2018 is a presidential election year in Mexico, which could make investors more cautious and lead to a slowdown in the investment market.

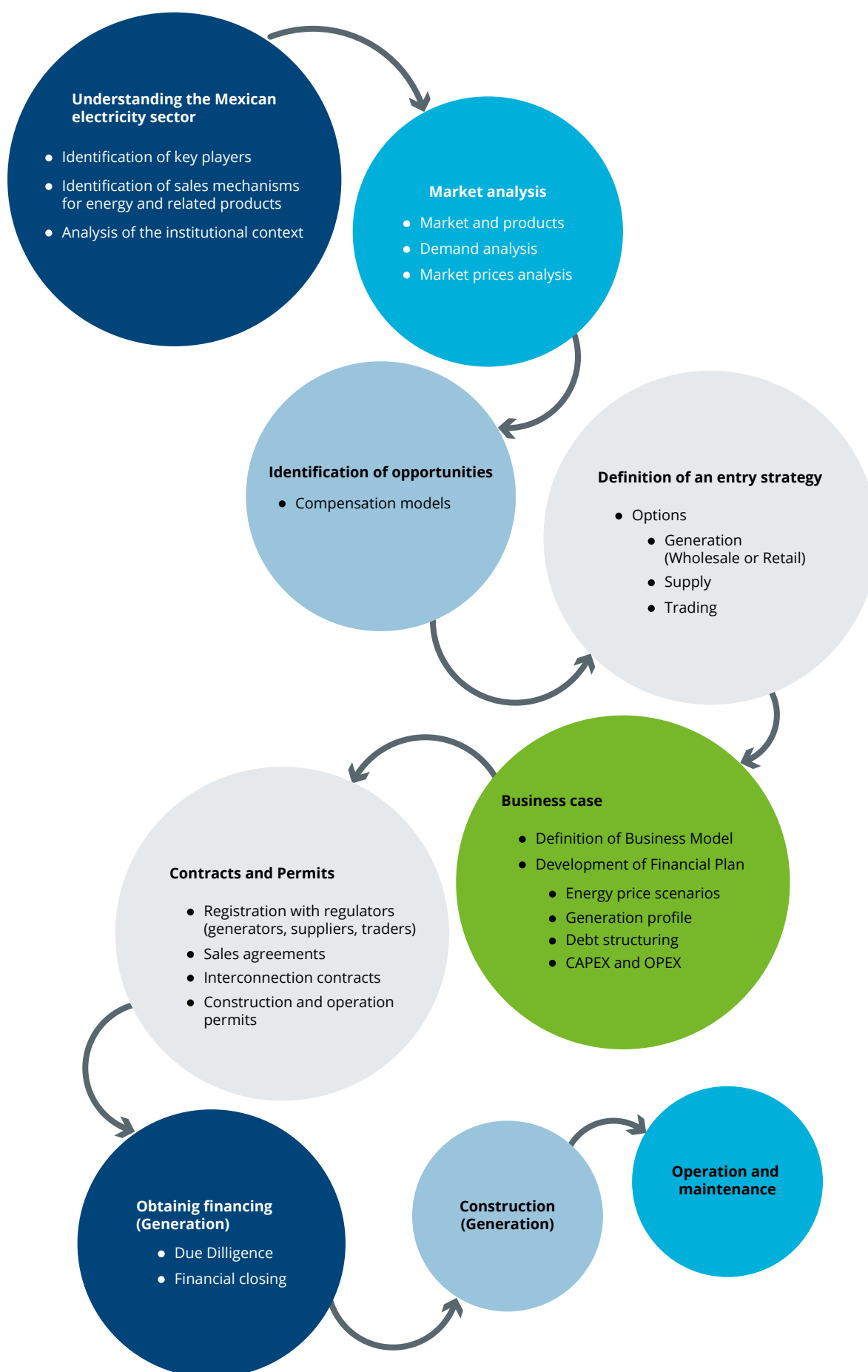
This risk could be mitigated by defining contractual terms and conditions that include the negotiation of fixed rates and/or use foreign currency hedges.

²⁰² EY Tool (2017) Growing Beyond Borders.

²⁰³ World Bank (2016) Mexican General Panorama.

²⁰⁴ Banco de México (February 2018) Encuesta sobre las Expectativas de los Especialistas en Economía del Sector Privado: Enero de 2018.

3.5 Steps to follow to participate in the Mexican electricity market



3.6 Market trends

Investment and financial framework

The power generation sector represents one of Mexico's most attractive investment markets, especially clean energy production.

The Mexican government has provided a strong framework and thus greater certainty levels to investors through the definition of clear rules and operating manuals. This has resulted in an increased level of participation in the LTAs.

However, there are a few concerns in regards to the operation of the electricity market. For example, some investors are not clear on the Clearing House's operation and activities. Another major concern is related to how the ancillary services will be paid.

With respect to financial issues, some companies are facing challenges to secure attractive financing schemes. Companies that have PPAs usually prefer to leverage through debt as they have contracts to offer as

collateral. In these cases, commercial and private banks can offer attractive debt structures.

These investors can raise capital through equity offerings during the construction period of projects and then leverage through securitized debt.

Lastly, the low energy prices reached on the LTAs may cause concerns among investors due to rising uncertainty in the market regarding the execution of projects with such prices and the possibility that some companies may decide to cancel these projects due to cash flow problems.

Clean energy generation

As mentioned throughout this document, the Mexican government's support on clean energy projects has and will continue to attract investment. As a result, clean energy installed capacity is expected to increase as shown in the graphs below:

Figure 57: Installed capacity (% by energy type in 2017)

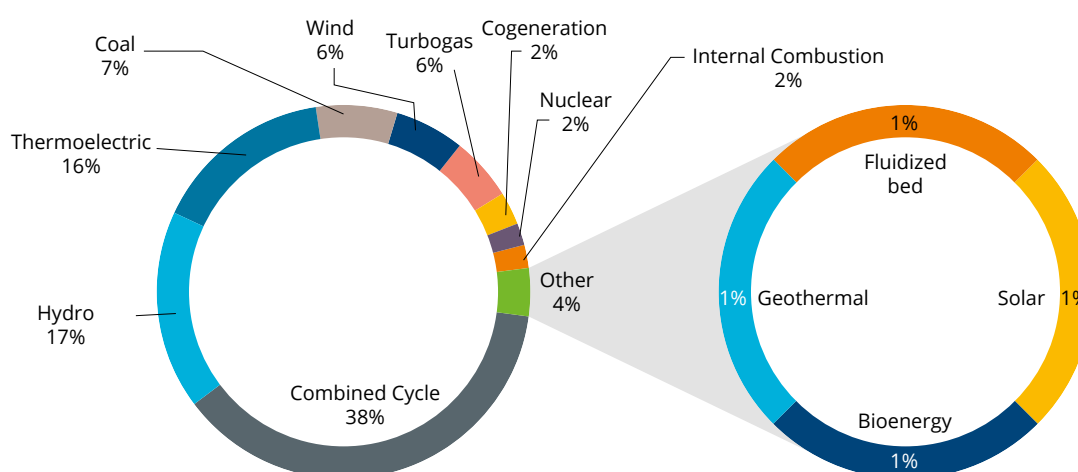
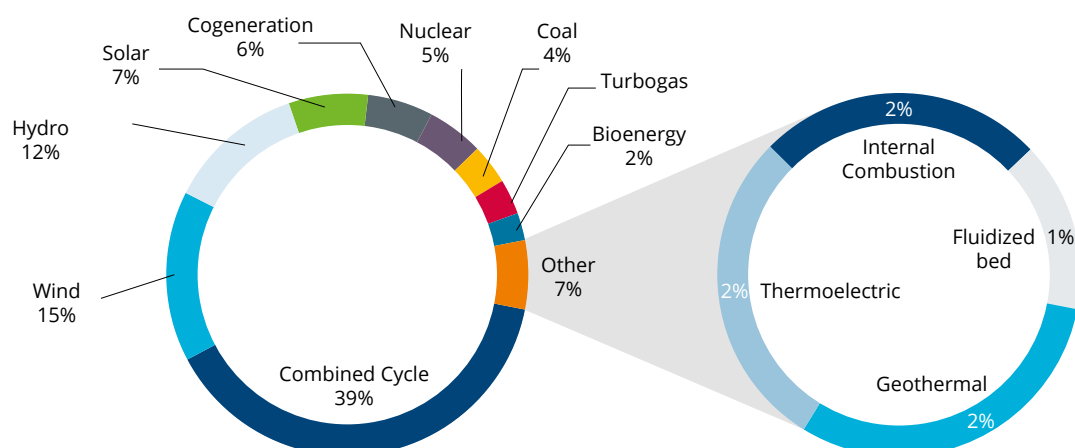


Figure 58: Installed capacity (% by energy type in 2031)

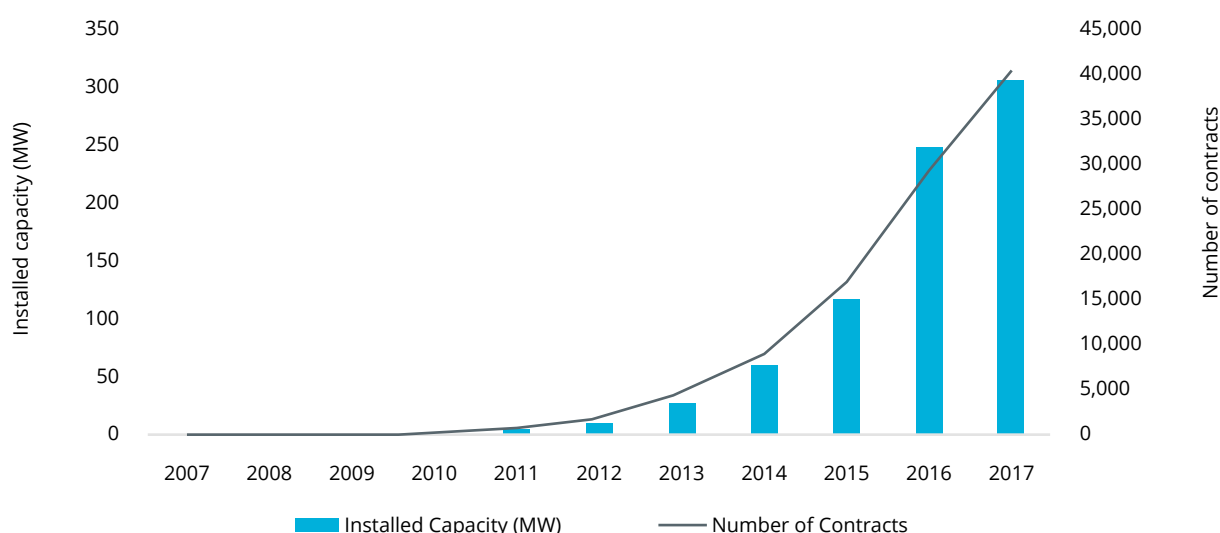


Distributed Generation (DG)

The clean energy goals have been one of the key drivers behind DG. As a result, the total installed capacity has grown at an exponential rate since 2014, after the Energy Reform was issued.

Since 2014, installed capacity of small and medium scale power stations has grown from 61 MW to 304 MW as of July 2017 as a result of approximately 40,000 small and medium scale interconnection contracts.²⁰⁵

Figure 59: Contracts and installed capacity for small and medium scale interconnection (2007- 2017)



Source: EY with information from CRE

Prior to the Energy Reform, DG was only allowed for self-consumption and production surpluses could not be sold.

However, with the Energy Reform, power trading is now allowed under the DG structure.

In order to operate under the DG structure, CRE issues different types of contracts, methodologies for calculating payments and general technical specifications for DG plants.

The payment scheme is the contract model that is celebrated between the BSS and the exempt generators (which deliver electricity to the RGD), considering any of the three types of payment foreseen by the regulation associated with the interconnection of a power station with capacity below 0.5 MW: net metering, net billing; and total sale of energy.²⁰⁶

Prior to the definition of a payment scheme, it is necessary to have an interconnection contract.

Net metering

Net metering considers the exchange of energy flows between the power station and one or more load centers to and from the RGD, balancing the energy delivered with the energy received during the period in which the services are invoiced.

This contract must be associated with one or more supply contracts according to the final tariff.

The net metering is applied to a power station and a load center that share the same interconnection point with the distribution networks

²⁰⁵ CRE (2017) Contratos de interconexión en pequeña y mediana escala. Estadísticas 2017.

²⁰⁶ CRE (2017) RESOLUCIÓN Núm. RES/142/2017.

Calculation method for Net Metering

The calculation method depends on the voltage level at which the interconnection with the power generation is set.

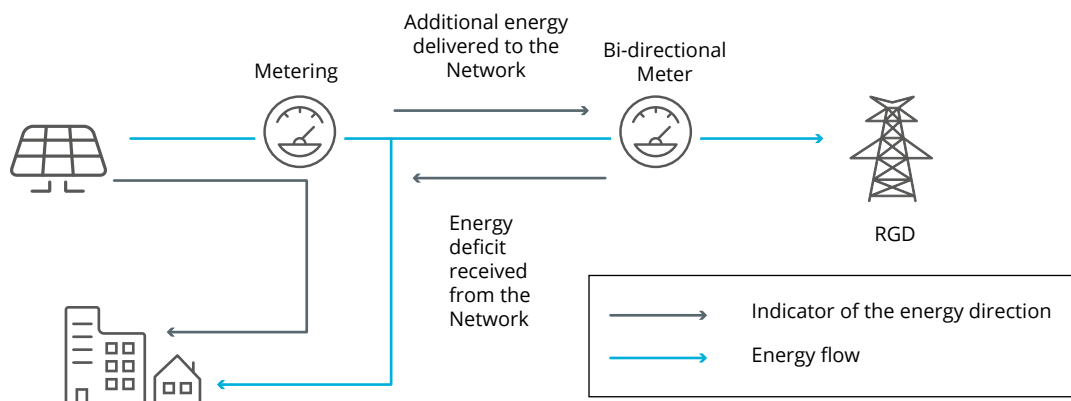
For low and medium voltage interconnection, the measurement is bi-directional in order to provide values of four different time periods. The difference between energy surplus and energy deficit will be calculated at the end of the billing period.

Optional requirements for medium voltage: the measurement will be bi-directional, with meter data

measured separately. The energy measurement will be the cumulative value of the energy generated. The remaining energy will be the cumulative one during the billing period.

The energy surplus will be accumulated for subsequent periods up to twelve months. Then, the energy will be paid based on the average LMP of the corresponding node. The energy deficit will be compensated with the energy surplus and paid according to the supply tariff.

Figure 60: Net metering



Source: EY with information from CRE

Net Billing

Through this system, exempt generators deliver energy to the distribution network, while, independently, the Load Centers receive energy from the distribution network.

In net billing, the interconnection contract must be related to a supply contract.

This is due to the fact that in this type of payment, the electricity is delivered to and received from the distribution networks starting from the same interconnection point.

Calculation method of Net Billing

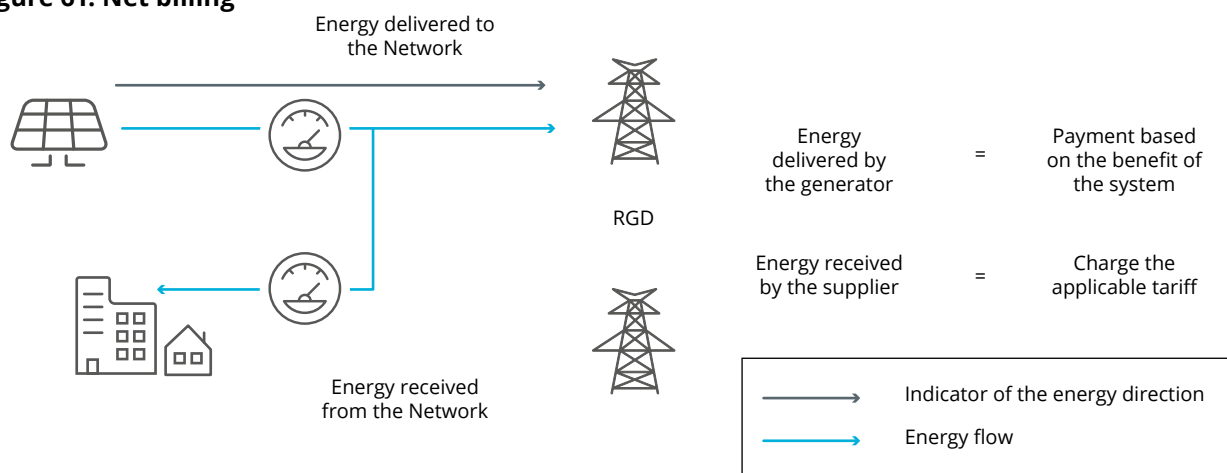
The calculation method depends on the requirements for low and medium voltage.

Those requirements are that the generation is active energy (kWh) with memory to store a time profile of at least 35 days. At the end of the billing period, the total amount of energy generation will be determined by the reading of the power generation meter (kWh).

The consumption will be in accordance with the supply contract.

Net billing considers the generation and delivery of power to the RGD based on the LMP price and, separately, the consumption of power charged at the basic supply tariff.

Figure 61: Net billing



Source: EY with information from CRE

Total Sale

Total sale considers the flow of power delivered to the distribution network at a certain value.

The payment occurs when there is no power contract from the same interconnection point of the power station.

The energy delivered by the BSS to the end user at the interconnection point is settled at the value of the final contracted supply tariff.

The total power that the exempt generator delivers to the distribution network is recorded independently of the energy that an end user may receive from the supplier at that interconnection point.

The energy delivered by the exempt generator will be paid at the LMP value in the corresponding node, at the moment in which the energy is delivered to the distribution network.

Energy delivered by the generator = \$

Figure 62: Total sale



Source: EY with information from CRE

Calculation method for Total Sale

The calculation method considers the payment for the energy delivered to the distribution network at a certain time in the LMP node of the interconnection point of the power station at the billing period.

Total sale considers the power delivered to the RGD. The selling price will be determined according to the LMP.

Required contracts for DG

According to the regulation issued by CRE, there are two contracts necessary to trade power in the DG scheme: (1) interconnection contract and (2) service contract.

Interconnection contract

The interconnection contract has to be subscribed before the payment scheme contract. This contract applies to the applicant and the distributor when carrying out the interconnection of a DG power station, distributed clean energy or any station with a capacity below 0.5 MW.

The information of the power station will be associated with the power contract and, according to the voltage and capacity level, the interconnection contract will be taken with its respective payment scheme.

Service Contract

The service contract is signed between the BSS and the exempt generator for the power generated and delivered to the distribution networks and according to the payment associated with the interconnection of the power station with a capacity below 0.5 MW.

For the end users, the net metering and net billing schemes described above will be used according to the corresponding tariffs and the LMP.

For those who are third parties and not end-users, the net billing and total sale described above will be taken into account in accordance with the corresponding tariffs and LMP.

Expansion and modernization of the RGD

According to PRODESEN (2017 - 2031), an Expansion and Modernization Program developed for the RGD will be implemented from 2017 to 2021. This program aims to meet the growing demand for power in urban and rural areas.

The program considers the integration of DG. Some of the main projects included in the program are:

1. Installation of link-ups and meters: focused on meeting the demand of new users at the medium and low voltage levels through the installation of aerial and underground networks. The plan is to acquire and install meters and link-ups to replace old equipment, and to make the respective connections: 14.6 million connections, 8.8 million disconnections, and 4.9 million adjustments. A total of 251,740 km of cable and 11.48 million meters will be installed.
2. Replacement of an underground cable at Holbox Island: a 34.5kV circuit will be built with an aerial and underwater connection to meet the growing demand, which is expected to reach 6.4 MW by 2024. The total estimated project investment is USD 11 million.
3. Creation of a electricity service fund: bring power to 1.8 million people over five years and cover the power needs of 99.8% of Mexico's total population.
4. Reduction in technical and non-technical losses: during 2016 there was a loss of 13,800 GWh, with a value of approximately USD 553 million. To reduce these losses, new backbone distribution networks will be built, reactive compensation equipment will be installed, the medium voltage network will be reconfigured, the circuit conductors will be recalibrated, distribution transformations will be monitored, and the load between circuits will be balanced. The total investment is estimated at USD 74 million in one year.

Regarding non-technical losses, in 2016 an equivalent of USD 1,300 billion was lost. The plan is to implement new technologies, replace electromechanical meters, strengthen the certification of medium voltage supply meters, and restructure the sales process, among other actions.

Other projects comprising this program include: modernization and expansion of the RGD infrastructure network, replacement of distribution transformers and circuit breakers for an estimated investment of USD 88 million, and implementation of a smart grid, among other actions.²⁰⁷

²⁰⁷ SENER (2017) PRODESEN (2017 -2031).



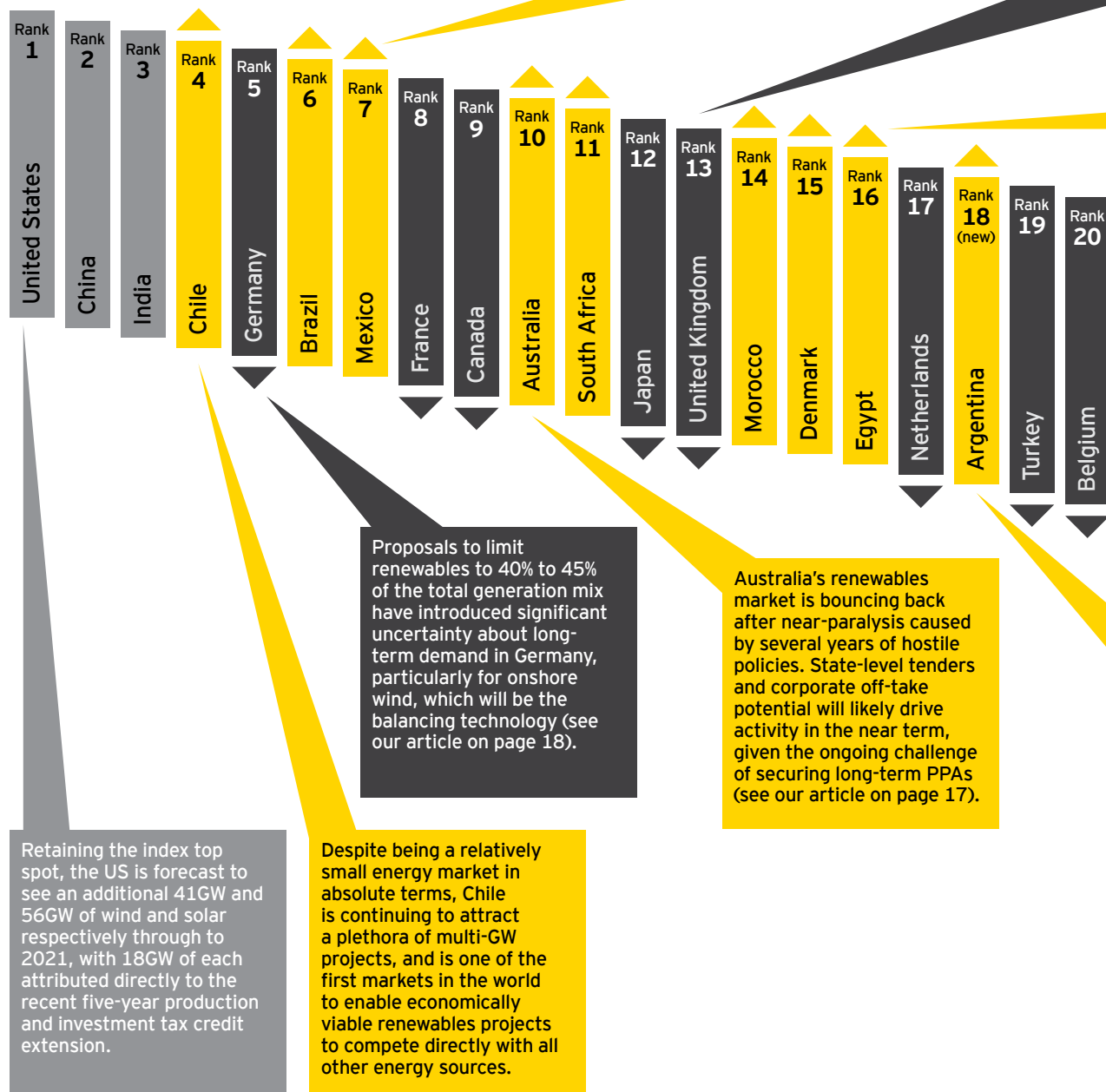
4. Appendix

Appendix 1 - RECAI

Renewable energy country attractiveness index

recai

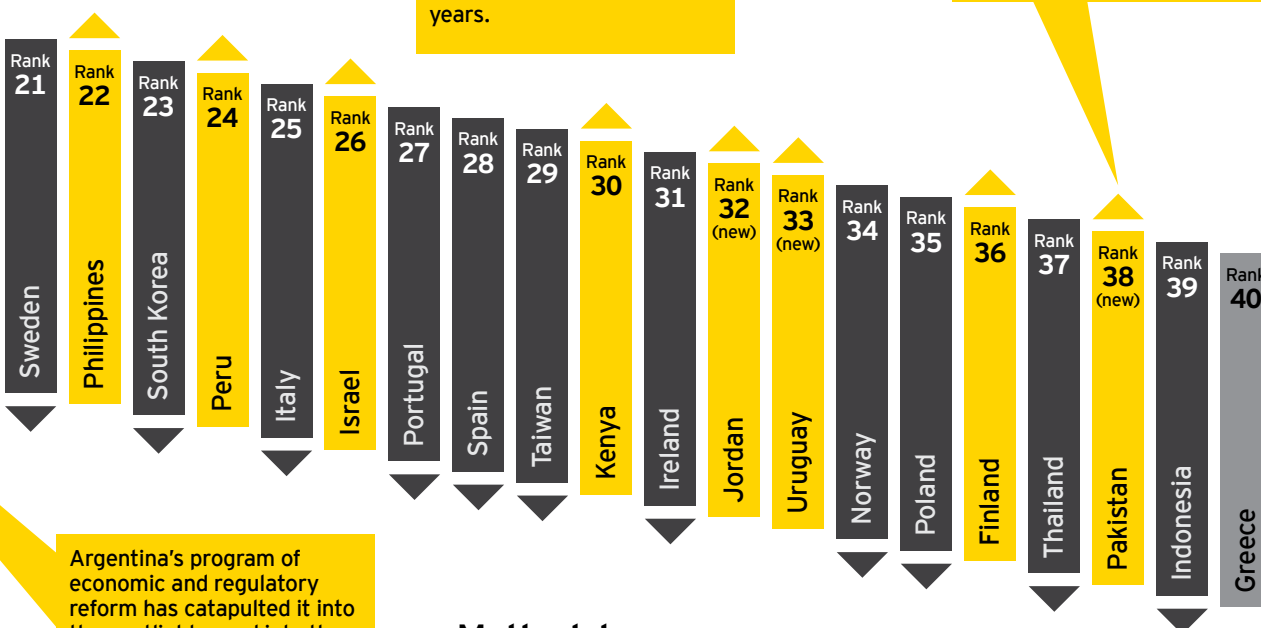
May 2016



The UK Government's noncommittal, if not antagonistic, approach to energy policy continues to go against the grain of almost universal global support for renewables. Not only stalling project development and investment inflows, this is arguably jeopardizing UK energy security.

Interest in Egypt's resource-abundant renewables market continues to grow, with a mix of tendered projects and multi-GW bilateral agreements contributing to the estimated 13GW of additional capacity required to meet soaring domestic demand over the next five years.

A robust policy framework and reported US\$3b of foreign renewables investment in 2015 sees Pakistan enter the index for the first time, already boasting mega projects such as the 1GW Quaid-e-Azam PV Solar Park and 1GW of proposed wind capacity in Punjab.



Argentina's program of economic and regulatory reform has catapulted it into the spotlight – and into the index – as a raft of targets, fiscal incentives and tender announcements provide the market with strong visibility over the country's long-term energy strategy (see our article on page 14).

Methodology

The index has been refreshed, with the measures driving all scores recalibrated to match the new reality of imminent grid parity. To see these measures and the background to our methodology please go to ey.com/recal.

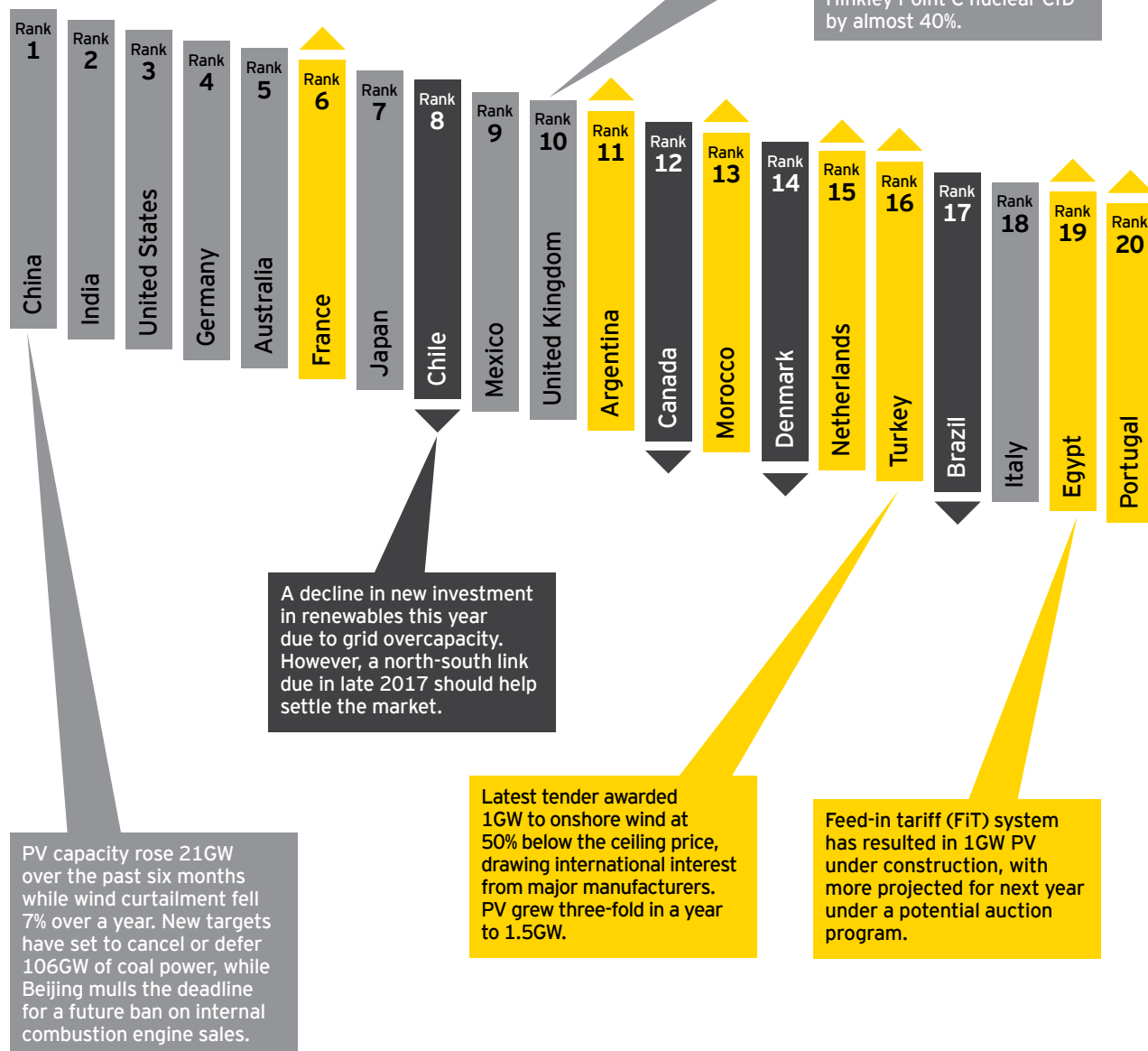
Legend

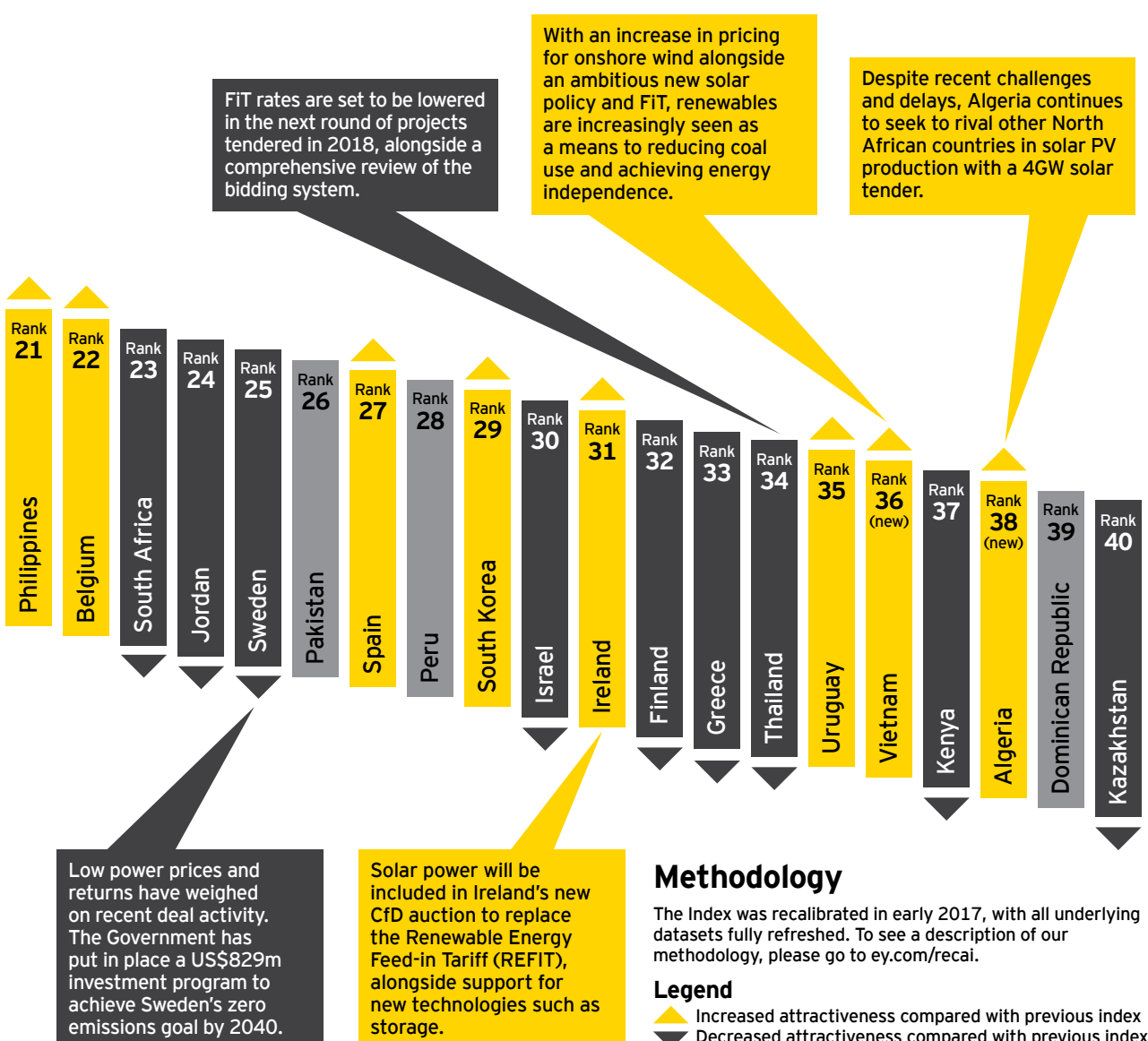
- ▲ Increased attractiveness compared to previous index
- ▼ Decreased attractiveness compared to previous index

Renewable energy country attractiveness index

recai

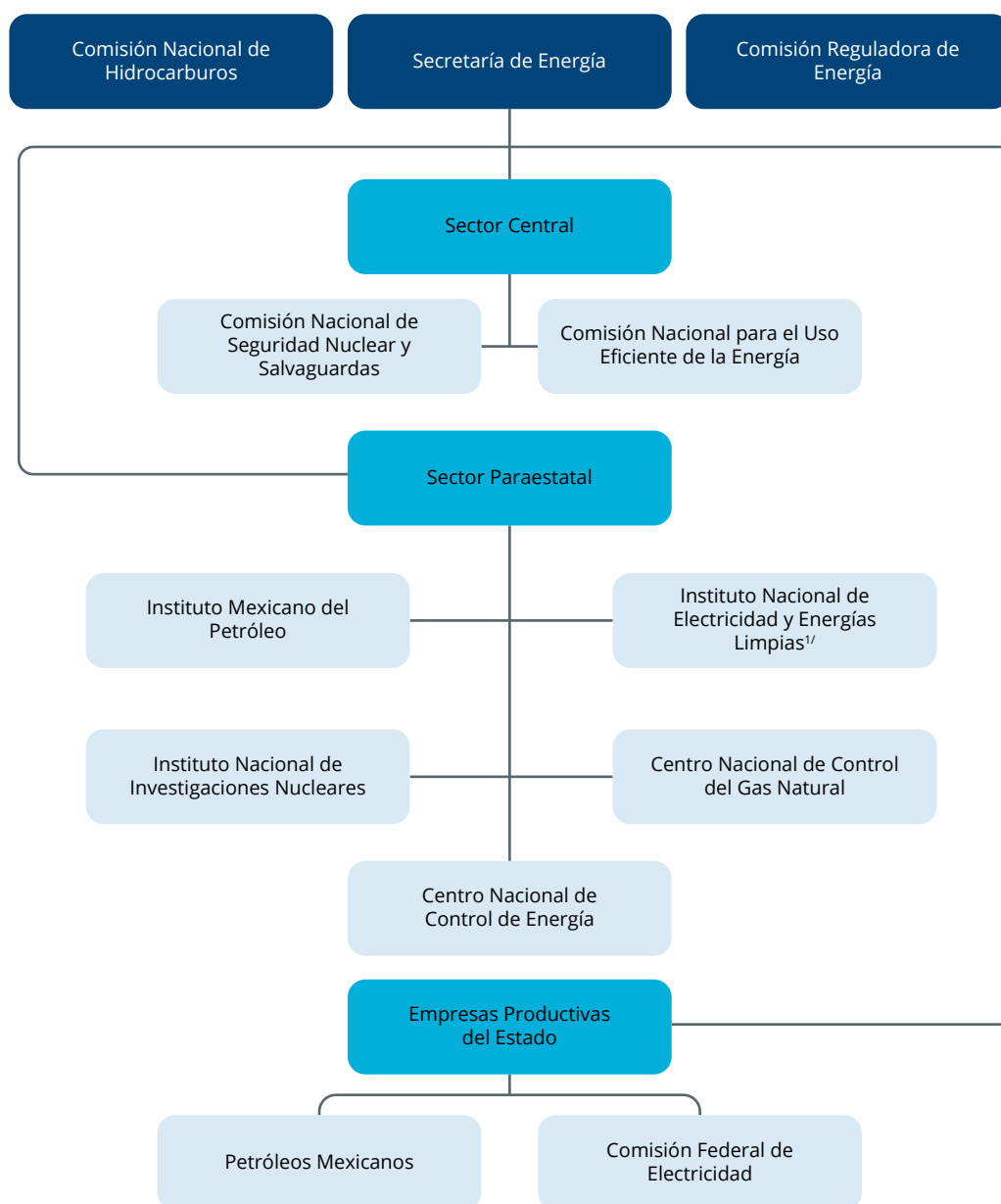
October 2017





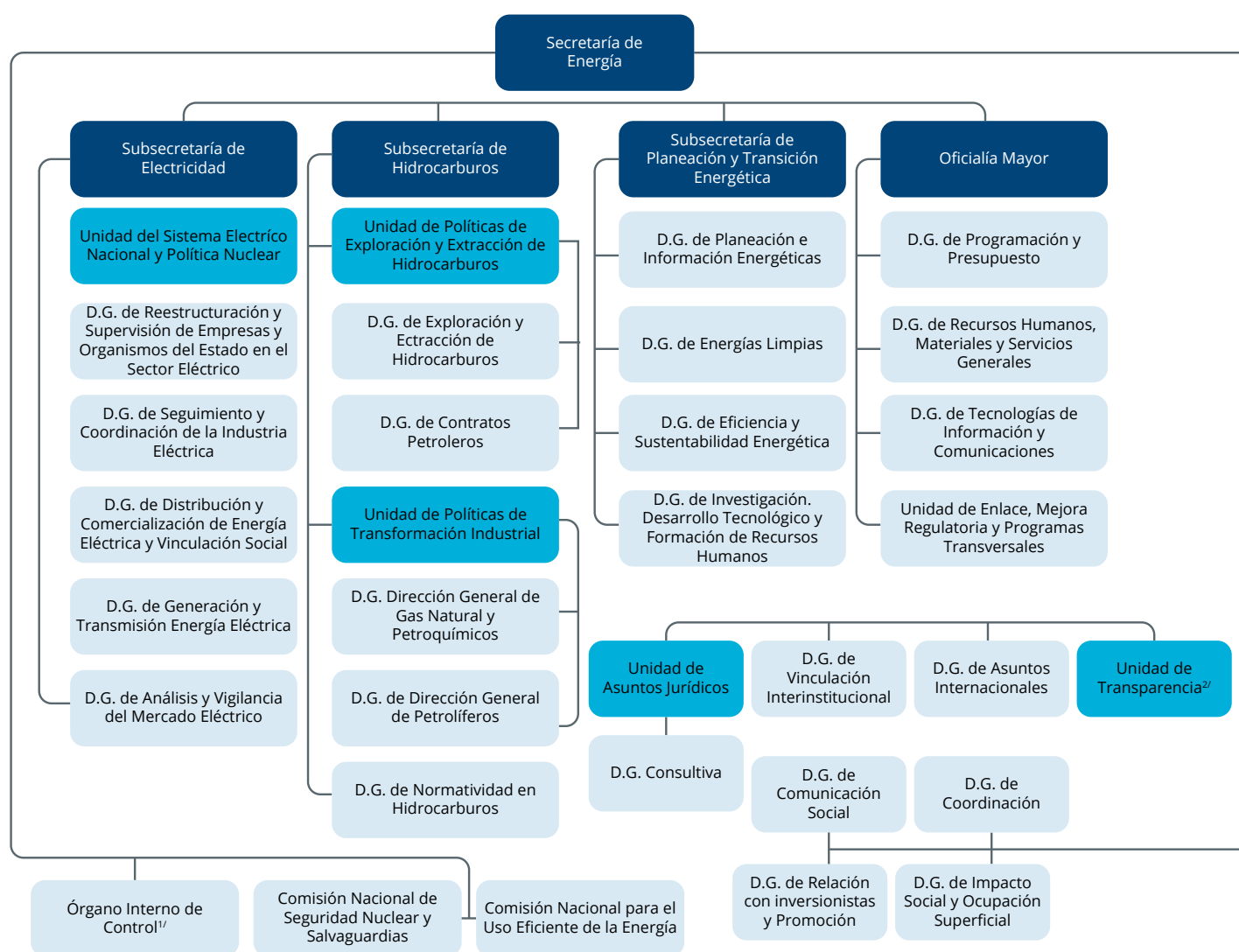
Appendix 2 – Organizational charts of institutions and entities

Energy Sector Structure



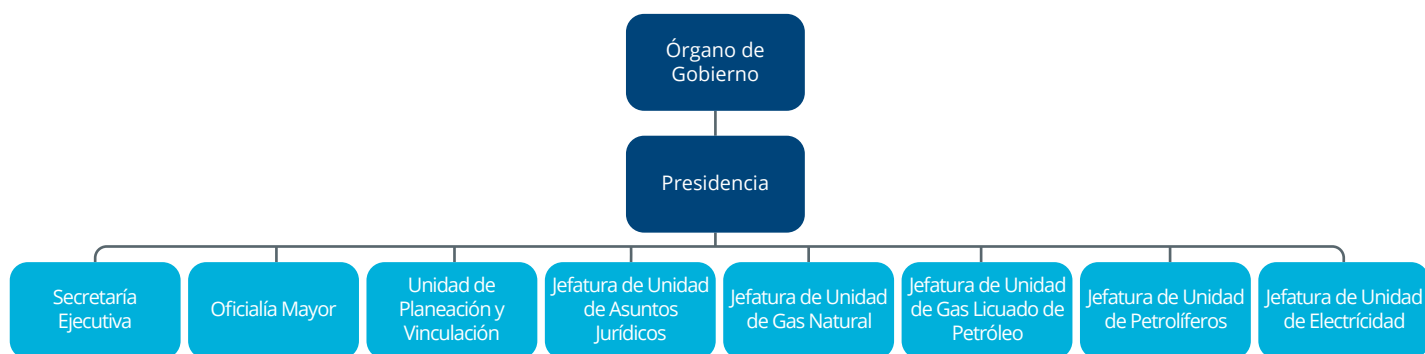
Source: SENER

Ministry of Energy



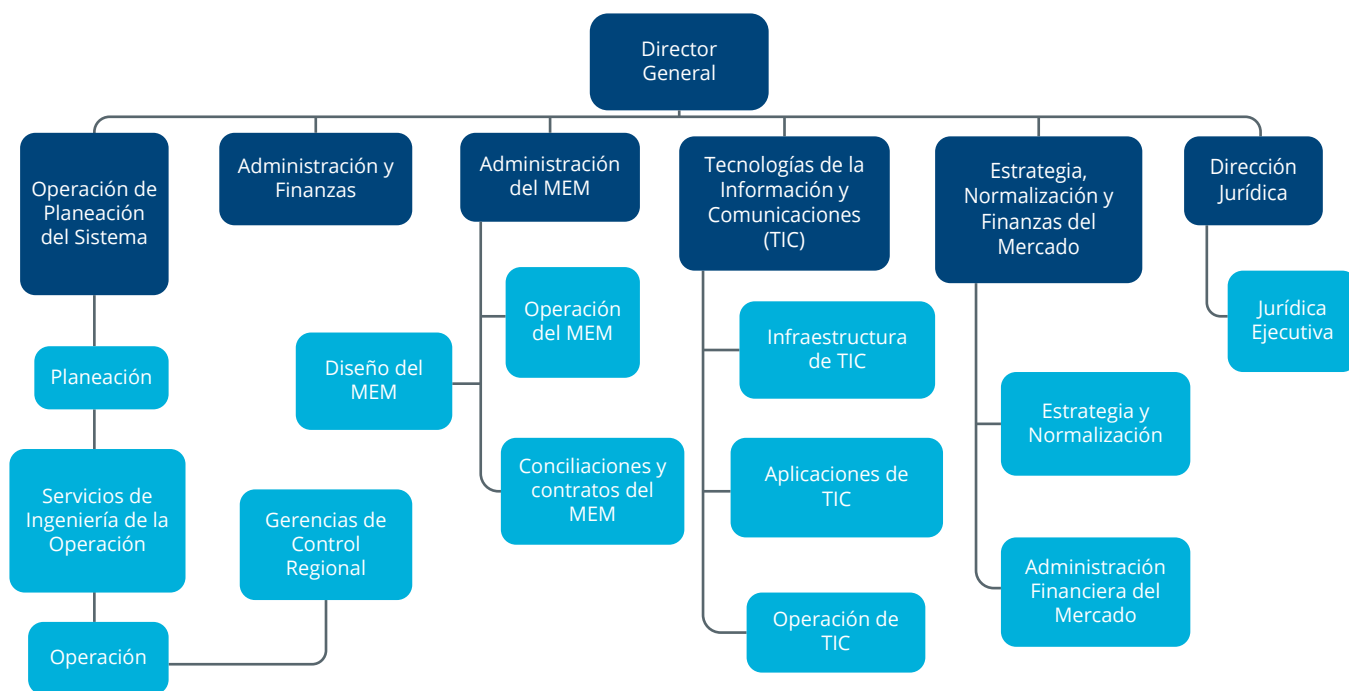
Source: SENER

Energy Regulatory Commission



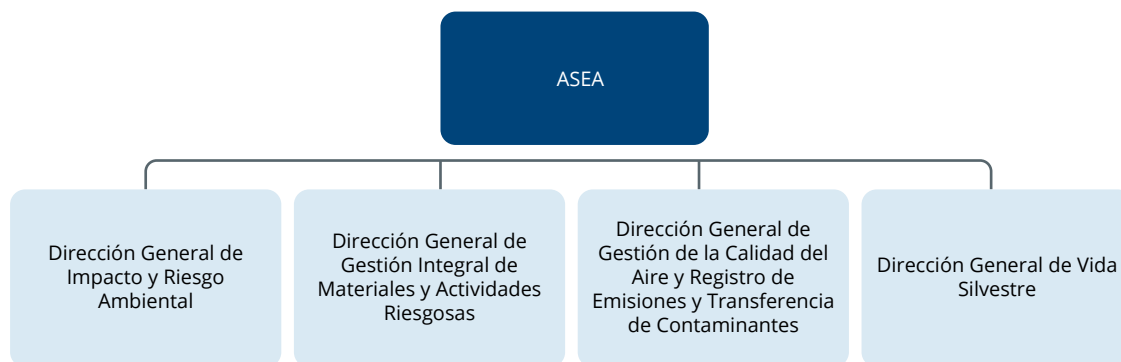
Source: DOF (2017) Manual de organización de la CRE

National Energy Control Center



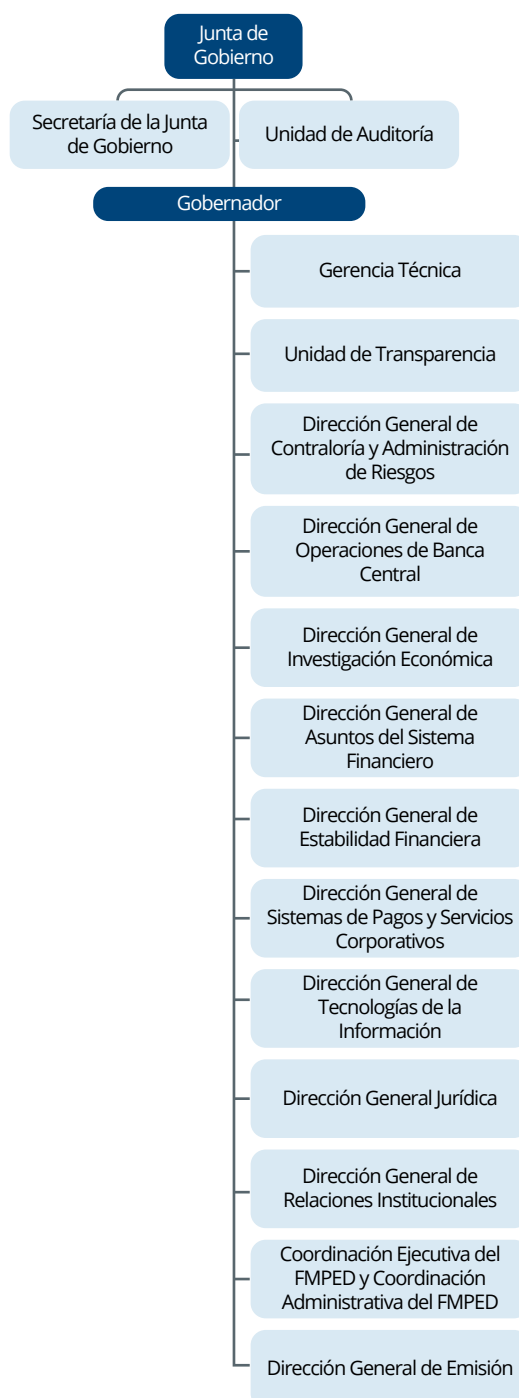
Source: DOF (2016). Estatuto Orgánico del CENACE

Agency for Safety, Energy and Environment



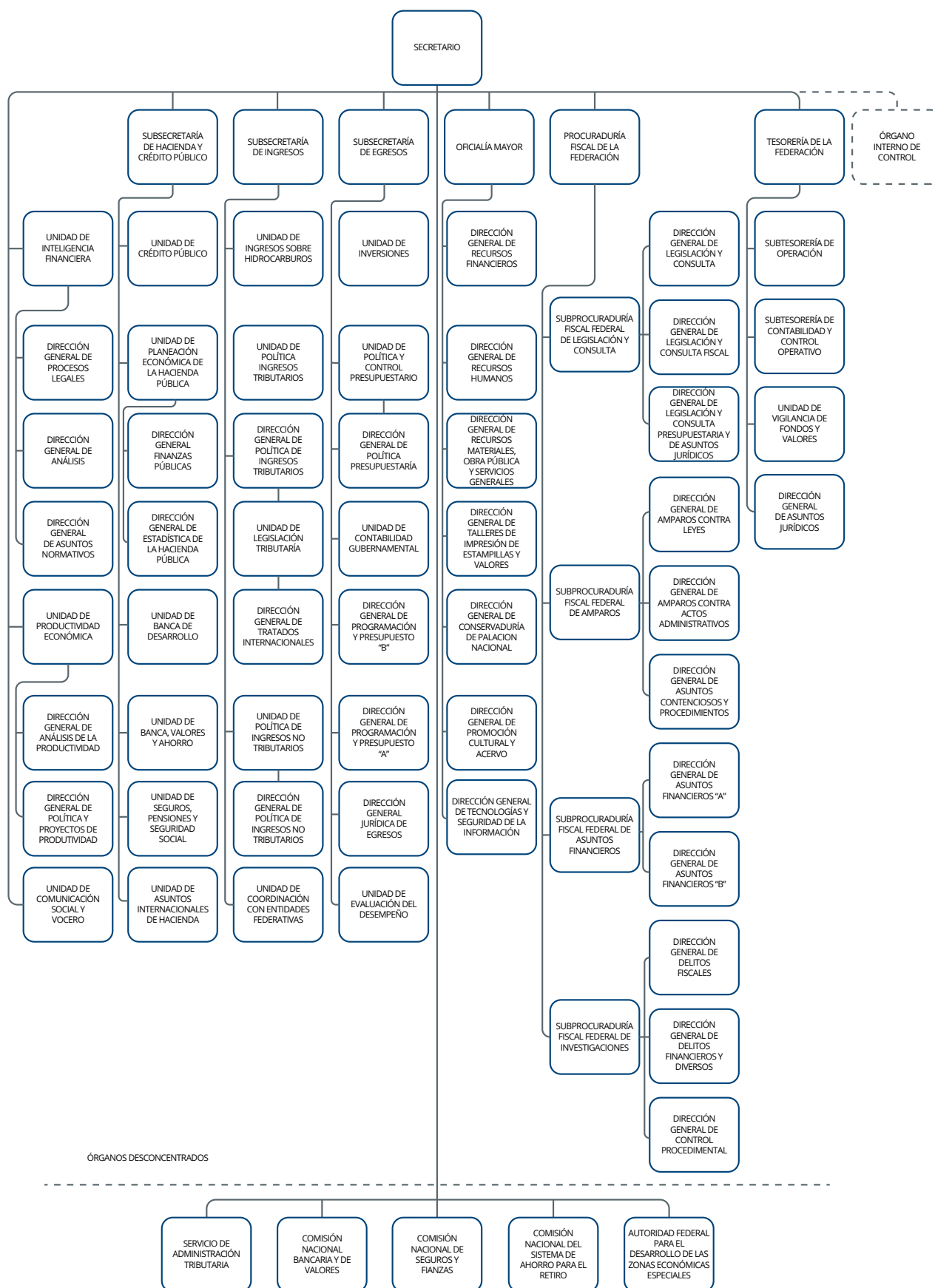
Source: ASEA (2016) Primer informe de labores

Mexican Central Bank



Source: Banco de México (2018)

Ministry of Finance and Public Credit



Appendix 3 – Companies awarded in the bidding rounds

International companies awarded in the bidding rounds

Germany		
Name	Group	Round
DEA DEUTSCHE Erdöl AG	DEA Erdoel	2
Argentina		
Name	Group	Round
E&P Hidrocarburos y Servicios, S.A. de C.V. Pan American Energy LLC		1
Canada		
Name	Group	Round
Renaissance Oil Corp	Reinaissance Oil Corp	1
Sun God Energía de México, S.A. de C.V.	Sun God Resources	2
China		
Name	Group	Round
China Offshore Oil Corporation E&P México, S.A.P.I de C.V.	CNOOC	1
Shandong Kerui Oilfield Service Group Co. Ltd	Kerui Group	2
Colombia		
Name	Group	Round
INDUSTRIAL CONSULTING	Industria Consulting	1
INGENIERÍA CONSTRUCCIONES Y EQUIPOS CONEQUIPOS	CONEQUIPOS	1
Ecopetrol, S.A.	Ecopetrol	2
Spain		
Name	Group	Round
Repsol Exploración México, S.A. de C.V.	Repsol	2
United States		
Name	Group	Round
AMERICAN OIL TOOLS S. de R.L. de C.V.	American Oil Tools	1
Chevron Energía de México, S. de R.L. de C.V.	Chevron Corp.	1
ExxonMobil Exploración y Producción México, S. de R.L. de C.V.	ExxonMobil	1
Fieldwood Energy LLC	Fielwood Energy	1
GX GEOSCIENCE CORPORATION, S. DE R.L. DE C.V.	ION Geophysical Co.	1
Murphy Worldwide, Inc.	Murphy Oil, Corp.	1
ROMA ENERGY HOLDINGS, S.A. DE C.V.	Roma Energy Holdings	1
Verdad Exploration Mexico LLC	Verdad Oil an Gass	2
France		
Name	Group	Round
Total, S.A.	Total, S.A.	1 y 2
Netherlands		
Name	Group	Round
CANAMEX DUTCH B.V.	Canamex Resources	1
Shell Exploración y Extracción de México, S.A. de C.V.	Royal Dutch Shell	2
Italy		
Name	Group	Round
Eni International B.V.	Eni International	1 y 2
Japan		
Name	Group	Round
Inpex Corporation	Inpex Corp.	1
Malasia		
Name	Group	Round
PETRONAS Carigali International E&P B.V.	PETRONAS	1 y 2
Norway		
Name	Group	Round
Statoil E&P México, S.A. de C.V.	Statoil ASA	1
United Kingdom		
Name	Group	Round
BP Exploration México, S.A. de C.V.	BP Global	1
Ophir Mexico Holdings Limited	Ophir Energy	1
Premier Oil PLC	Premier Oil PLC	1
CAPRICORN ENERGY LIMITED	Cairn	2
Russia		
Name	Group	Round
Lukoil Overseas Netherlands B.V.	Lukoil	2

Source: EY with information from CNH (2017)

Mexican companies awarded in the bidding rounds

Mexico		
Name	Group	Round
Sierra Oil & Gas	Sierra Oil & Gas	1
Petrobal	Grupo Bal	1
Diavaz	Grupo Diavaz	1
Desarrolladora Oleum	Desarrolladora Oleum	1
MARAT INTERNATIONAL	MARAT INTERNATIONAL	1
CONSTRUCTORA TZAULAN	CONSTRUCTORA TZAULAN	1
CONSORCIO MANUFACTURERO MEXICANO	CONSORCIO MANUFACTURERO MEXICANO	1
Grupo Diarqco	Grupo Diarqco	1
PERFOLAT DE MÉXICO	PERFOLAT DE MÉXICO	1
SERVICIOS DE EXTRACCIÓN PETROLERA LIFTING DE MÉXICO	SERVICIOS DE EXTRACCIÓN PETROLERA LIFTING DE MÉXICO	1
Strata Campos Maduros	Strata BPS	1
Sistemas Integrales de Compresión	Sistemas Integrales de Compresión	1
Nuvoil	Nuvoil	1
Constructora Marusa	Constructora Marusa	1
Streel Serv	Grup Steel	1
CONSTRUCTORA HOSTOTIPAQUILLO	Grup Hosto	1
Desarrollo de Tecnología y Servicios Integrales	Desarrollo de Tecnología y Servicios Integrales	1
Mercado de Arenas Sílicas	Mercado de Arenas Sílicas	1
Grupo R - Oil & Gas Company	Grup R	1
Constructora y Arrendadora México	Constructora y Arrendadora México	1
Compañía Petrolera Perseus	Compañía Petrolera Perseus	1
Tonalli Energía, S.A.P.I. de C.V.	Grupo IDESA y Petrofrontera	1
Construcciones y Servicios Industriales Globales	Construcciones y Servicios Industriales Globales	1
Pemex	Pemex	1
Sierra Perote E&P,	Sierra Perote E&P,	2
Citla Energy E&P	Citla Energy E&P	2
Iberoamericana de Hidrocarburos	Monclova Pirineos Gas, S.A. de C.V. (México) and Cobra Instalaciones y Servicios S.A. (Spain)	2
SERVICIOS PJP4 DE MÉXICO	SERVICIOS PJP4 DE MÉXICO	2
Jaguar Exploración y Producción	Jaguar Exploración y Producción	2
SICOVAL MX	SICOVAL MX	2
Nuevas Soluciones Energéticas A&P	Nuevas Soluciones Energéticas A&P	2
Carso Oil & Gas	Gupo Carso	2
NEWPEX EXPLORACIÓN Y EXTRACCIÓN	Alfa	2

Source: EY with information from CNH (2017)

Appendix 4 - Permits

Area	Permit	Term / Frequency	Responsible entity
Prefeasibility studies	MIA (Environmental Impact Statement) Environmental Permit	One-time issuance*	SEMARNAT
	Technical Justification Study	One-time issuance*	SEMARNAT
Land use	Change in Land Use Restrictions (with technical justification study)	One-time issuance*	SEMARNAT
	Land lease agreement/Land use license	One-time issuance*	Municipal authority
	Site access permit	One-time issuance*	Municipal authority
	Archeological Authorization (release of the plant and power line)	One-time issuance*	INAH
Construction	Construction License	One-time issuance*	Municipal authority
	Energy Generation Permit	One-time issuance*	CRE
	Interconnection Contract	One-time issuance*	CFE
	Communication and Transportation Permits (crossing high- and medium-voltage power lines, acceleration and deceleration lanes for access to the site)	One-time issuance*	Ministry of Communication and Transportation (SCT)
Environment	Permit (validated water study and reviewed runoff drainage plan)	One-time issuance*	CONAGUA
	Registration as a Generator of Hazardous Waste	One-time issuance*	SEMARNAT
	Registration as a generator of solid urban waste and/or waste requiring special handling	Depending on the entity, it may be permanent or may require subsequent renewal	State Environmental Authority
	Registration of Waste Management Plans	One-time issuance*	SEMARNAT
	Civil Protection Risk Audit	One-time issuance*	Municipal authority
	Annual operating certificate	Annually	SEMARNAT
Social	Social Impact Evaluation (EVI)	One-time issuance*	SENER

* It is required to be updated in case of substantial change of scope during the construction period or changes to the project itself.

Appendix 5 - Right-of-way Procedures

Code	Description
SCT-08-001-A	Permits for the use of and access to right-of-way on Federal toll highways and surrounding areas (access)
SCT-08-001-B	Permits for the use of and access to right-of-way on Federal toll highways and surrounding areas (intersections)
SCT-08-001-C	Permits for the use of and access to right-of-way on Federal toll highways and surrounding areas (installations of announcements)
SCT-08-001-D	Permits for the use of and access to right-of-way on Federal toll highways and surrounding areas (information signs)
SCT-08-001-E	Permits for the use of and access to right-of-way on Federal toll highways and surrounding areas (marginal installations)
SCT-08-001-F	Permits for the use of and access to right-of-way on Federal toll highways and surrounding areas (changes to the original project)
SCT-08-003	Request for extension for conclusion of the construction of projects derived from permits for access to right-of-way on Federal highways and surrounding areas
SCT-08-004	Request for authorization for the assignment of rights and obligations related to permits for access to right-of-way on Federal highways and surrounding areas

Appendix 6 - Interconnection Contracts

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- <http://www.cenace.gob.mx/Docs/MarcoRegulatorio/Criterios/Criterios%20de%20Interconexión%20de%20Centrales%20Eléctricas%20y%20Conexión%20de%20Centros%20de%20Carga%20DOF%202015%2006%2002.pdf>

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