UNIVERSIDAD PONTIFICIA COMILLAS

ESCUELA TÉCNICA SUPERIOR DE INGENIERÍA (ICAI)

OFFICIAL MASTER'S DEGREE IN THE
ELECTRIC POWER INDUSTRY

Master's Thesis

EVOLUTION OF THE ELECTRICITY SECTOR IN MEXICO

Author: Alejandra Breva Calatayud

Supervisor: Claudio Chaves López

Madrid, July 2016

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SUMMARY

In December 2016, Enrique Peña Nieto, the President of Mexico, enacted a new energetic Reform that transformed the existed system. With this Reform, the centralised and vertically integrated system would be transformed in an opened system, with a liberalised market, private competitiveness, etc. The Reform includes several steps to be followed in order to achieve a liberalised electric market.

This thesis shows the evolution of the Mexican electric sector from 2012 to 2018, from the previous system to the new and reformed one, analysing each one of the 4 periods in which we have divided our review and studying the implications of this Reform in the industry. In order to apply the theory to the practice, we have studied which should be the behaviour of a company in this changeable period according to the external agents that could affect to its strategy.

This has been a huge reform and it will take time to achieve transparent and quick procedures of a competitive, reliable and modern electric industry. In 2016, generators, suppliers, organisations, etc. are learning how to deal with these changes and it will require much more time till everything suits perfectly.

ACKNOWLEDMENTS

This thesis has been possible thanks to the effort and patience of my colleagues of Iberdrola while explained me the Mexican electric sector. It is a completely new world to me which has seemed me very interesting and fascinating as I have been following the process of generation of a new electric system, something not very common nowadays. Specially, I would like to mention Claudio Chaves, Carlos Mendivil, Pedro Montoya and Emilio Antuña.

Furthermore, my acknowledgement to Luis Olmos for the interest shown as Director of the Master and for following the evolution of the thesis, giving us orientation and advices to get good results. And thank you to the rest of the ICAI teachers for their implication in the "Master in the Electric Power Industry".

In this Master I have made really good friends, which have supported me and helped me when I have needed. My gratitude is to Celia Rodriguez, Rosa Martínez, Dania Acosta, Paco Fournier, Elena González and Alejandro Labanda.

And finally but not least important, my recognition and gratitude to my family. They are always with me, helping me and encouraging me in all the things that I have done.

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ABREVIATIONS

[CFE] Federal Electricity Commission

[CENACE] National Energy Control Centre

[CRE] Energy Regulatory Commission

[SEN] National Electricity Sector

[SENER] Secretary of Energy

[IEA] International Energy Agency

[LSPEE] Law of Public Service and the Electric Energy

[LEI] Law of the Electric Industry

[IPP] Independent Power Producer

[SHCP] Secretary of Finance and Public Credit

[CAN] National Water Commission

[SEN] National Electricity System

[DOF] Official Diary of the Federation

[LAERFTE] Law Use of Renewable Energy and Energy Transition Financing

[WECC] Electricity Coordinating Council of the Western United State

[RM] Reserve Margin

[PEMEX] Pemex Gas and Basic Petrochemicals

[WM] Wholesale Market

[CTCP] Total cost in the short term

[MDA] Day-Ahead Market Day

[MTR] Real Time Market

[AUGC] Assignment of power plant for reliability

[PMW] Power Market Balance

[ERC] Responsible Entities of Charge

[LEI] Law of Electric Industry

[LT] Long Term

[MT] Medium Term

[MCC] Marginal Congestion Components

1

1.1 INTRODUCTION

The electric energy is closely related with the social and economic development of a country. It is difficult to think about the improvement of one of them without changing the other. In the long term, electric coverage limitations of the increased demand or bad electric quality service are elements that could stop the technologic development, the growth of the GDP per habitant and the population´s welfare in general. So that, it is normal that the countries have executed deep transformations of the structure of the electric industry in order to modernise the system, strengthen the competitiveness and provide better services to the users.

Mexico is one of the countries that are suffering this transformation, as the public provision of the electric services is incompatible with an increased demand, competitive prices, the sustainable requirements and the quality objectives that the country needed. Some of the options to achieve these goals are opening the industry to private investors, user´s freedom to choose a supplier, creation of a wholesale market, etc.

The start of this transformation was 12th August 2013 when the President of the Republic, Enrique Peña Nieto, presented the Constitutional Reform of the New Energetic Reform that was approved by the Senate the 11th December

2013. What it promotes is the development of a national electricity system based on technical and economic principles controlled and regulated by the State.

What does it take to adopt that measure?

Until 2013, the electric sector belonged to the Federal State and CFE (Federal Electricity Commission) which executed all the control. Since 1992, private participation was allowed in generation but in transmission and distribution CFE had the monopoly. Private companies had not the right to sell directly to basic users (small consumer) so the retail sector was completely monopolised by CFE, as private companies should sell their production to them, in charge of the commercialisation.

At the beginning, the State monopolisation was a good option to take advantage of the economies of scale and to expand the services around the country but the lack of competitiveness reduced the incentive to achieve better results in efficiency, quality and prices. This provoke serious limitations in the electric system as:

- Limitation of the public finance to invest in new infrastructure.
- Higher tariff price in Mexico than in other countries. CFE had to pay a lot to satisfy the service to the users and this is due to the inefficiency in the generation system caused by the obsolescence of the plants and the high operational expenses as the cost of the commodities (natural gas, diesel and fuel oil) were lower than in other counties.
- Insufficient net system, not arriving the electricity to some parts of the country like Oaxaca, Chiapas, Veracruz and Guerrero.
- Unreliable supply service: The minutes of net interruptions in Mexico were 50% higher than in Spain or Switzerland and four times more than in UK and Holland.

- High level of energy losses.
- Difficulty to control the tariff that used to be “artificially” low, for political reasons, what results in high taxes and indebtedness. The State has to pay a subsidy to the producers to cover the difference between the tariff and the generation costs.
- Lack of innovations or technological changes to increase the efficiency of the system or reduce costs as there are no competence.
- Low coverage and bad customer service as there are 1 person to attend to lots of clients.
- Not guaranty of the long-term supply.
- The restriction of the private capital investment limits the modernisation of the sector, increasing the generation costs.

And what do they want to achieve with this reform?

The objectives followed by this reform were:

- Change to a more sustainable mix of production, with more efficient plants that use less contaminant fossil fuels like coal or fuel oil.
- Lower electric and gas tariff to strengthen the domestic economy and to impulse the industrialisation and the exportation of Mexican products.
- Higher productivity of the Mexican economy.
- Reliable supply to cover the demand requirements.
- Guaranty the long term supply with the construction of new plants to satisfy the generation capacity needed.
- Reduce losses in the system.
- Design of the Wholesale Market
- Unbundle of generation, retail, transmission and distribution. The last two will continue being regulated.
- Higher investment in infrastructures, better technologies and innovation.
- Creation of new companies as well as attraction of the investment of foreign

companies.

- Increased participation of private investors to complete the State budget and to guaranty the equilibrium of the state finances in medium and long term.
- To impulse the job generation and high quality of employment
- Strengthen of CFE and PEMEX, public Mexican companies, to achieve better results having similar conditions as the private companies.
- Increased competence in order to provide more competitive prices, more efficiency and better quality and services.
- Reform of laws and institutions to allow private capital participation, to ease competence and the decrease of the prices.
- Increased use of clean energies in order to provide 35% of the total energy in 2024.
- Construction of new gas pipelines.
- Strengthen of the exportations helping the companies to produce competitive products.
- Universal Electric Service: expansion, modernisation and improving quality of the transmission system. In distribution are necessary more interconnections and higher reliability.

All these objectives are difficult to achieve and need time to prepare the new Organisms, laws, regulations, etc. So, 2014-2018 is the proposed period to organise the new electricity sector. Each one of these items needs time and several actions to be ready. For example, the designing of the Wholesale market is one of the main items and requires lots of processes to prepare. These are some of the bullets to accomplish:

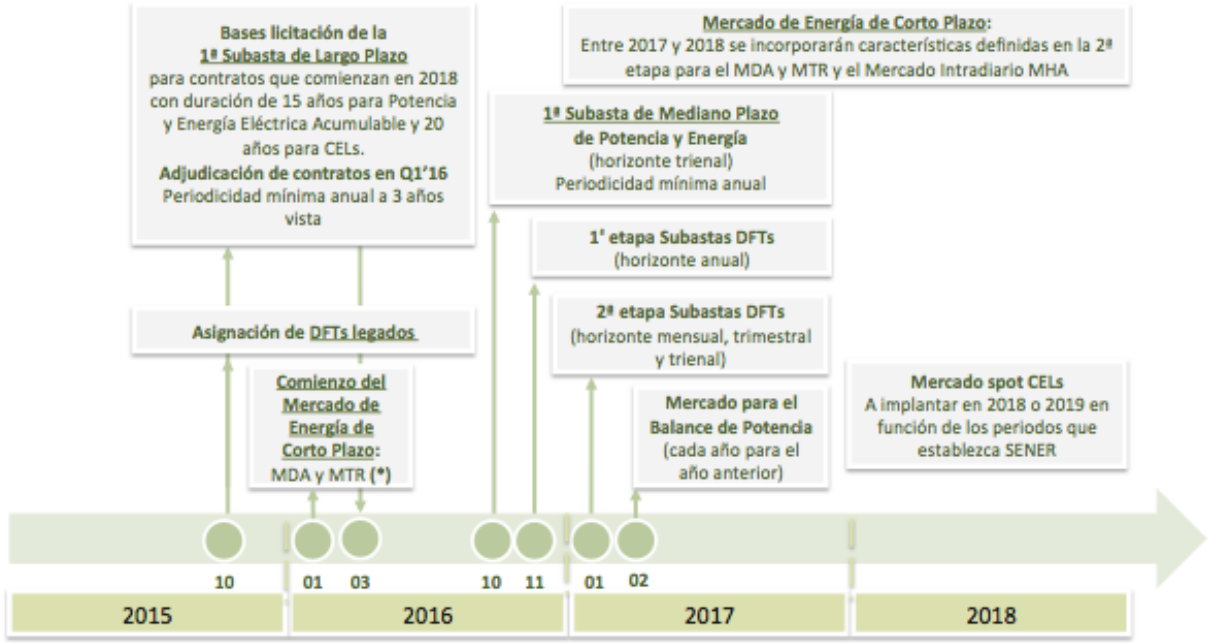

Image 1. Calendar of the Wholesale market (IBERDROLA)

Apart from the Wholesale market is important to consider the development of the long and short term tenders; expansion of the systems; clean energy generation; financial rights of transmission tender (DFT); restructuring of CFE; design the Clean energy certificates ´s Market (CEC); improvement of the installations, etc.

So, at what point are we now?

In 2016, some of these actions have taken place, so in this moment we are in a revolutionary period in this new electric sector, learning while working, as companies should adapt their strategies to this changeable situation. They need to learn how to operate in the new market, adapt their costs to the new tariff influenced by changes in the market, learn how to get CECs, etc. Meanwhile, companies have to continue working with their habitual clients, under legacy contracts, selling to CFE, analysing how is going to affect them the new tariff or if it is preferable to sell to the clients or to sell as surplus energy

to CFE or to take part of the market when finishing the contracts, etc.

After 2 years of preparation, finally in 2018, the sector should be running controlled by CENACE (National Centre of Energy Control), SENER (Secretary of Energy) and CRE (Energy Regulatory Commission). CENACE control the wholesale market, where the generation tariff is determined, and the CRE determines the distribution and transmission tariffs. As we see, there are lots of aspects to consider in a sector that, years ago, was very stable, and in which now everything is changing and we need to know how to operate it.

1.2 MOTIVATION

All this changes, that are happening in our days, have motivated my thesis as I want to show the evolution that has been suffering the electric sector in Mexico from 2012 to 2018. Companies that are already operating in the country or the new ones that want to work in Mexico need to know how has been this evolution to design the strategy that they should follow to get good results. For them is important:

- What happened before the Reform. If they are new companies they need to know how are operating their competitors and if they were already working, they will need to understand how to change from the previous system to the new one.
- What is happening now. New and old companies have to adapt their strategy to the new situation and this is being created now so they need to know which decisions are being adopted.
- What is going to happen. Companies have to think in long term so that they will require information to adapt their strategy according to the new system.

I am working in Iberdrola and Mexico has been one of its strategic territories for 18 years. Iberdrola Generación México, S.A. of C.V and Iberdrola Renovables México, S.A. of C.V. are the head of the business of the company there.

In Mexico, Iberdrola has installed 5449 MW between combined cycles and wind farms. It is the first private producer of electricity in the country supplying to more than 20 million people and, at the moment, it is investing more than $1 billion in 2 new combined cycle plants (Baja California III and Dulces Nombres II), 3 cogenerations (Ramos Arizpe, San Juan del Río and Altamira) and 2 wind farms (Pier 2 and Dos Arbolitos). In 2015, Iberdrola was adjudicated with the tender to build other combined cycle with 850 MW in Nuevo León (municipality of Escobedo), the most industrialised state in the north of the country, which should be running in 2018. The company has forecasted the investment of more than $5.000 million in the next 5 years with the idea to produce more electricity than in Spain in 2019.

So, I have a double motivation in the development of this thesis, on one side, for my personal interest as I am working in the implantation of the Energy Management Department in our company in Mexico and for me is essential to know this evolution, to understand the changes that are happening nowadays and the ones that will affect to our company and clients in the future. And on the other side, for the interest of Iberdrola, as I mentioned before, Mexico is a strategic territory so it is important to have this information to adapt its strategy to this changeable period.

1.3 OBJECTIVE

The objective of this thesis is to show the evolution of the electricity market in Mexico after the Energetic Reform in 2013. We are going to study from 2012 to

2018 to present how it was before the Reform, how the preparation till 2018 is being, when the system should be working in all its stages, and finally what should happen after 2018.

To explain the main objective of this thesis, we have studied how should be the behaviour of a company in these stages to adapt its strategy to the new circumstances.

1.4 METHODOLOGY

The methodology of this thesis has being oriented in showing how a company would act according to the evolution of the electrical market in Mexico. To ease the process we have divided the years of study into 4 periods:

- 1st Period: 2012
- 2nd Period: 2013-2016
- 3rd Period: 2016 – 2018
- 4th Period: 2018 - …

Firstly, we have done a research of information of each period searching in web pages of the official institutions, studies made by consulters, web pages, assistance to conferences, etc. Initially, we have made a general study of the situation and afterwards, we have looked for more specific information of each of the topics treated along the thesis. With all this information, we have centred the situation of the electric market in Mexico.

Secondly, we have created an imaginary company to relate all this information with the strategy of the company. This company is MACEX POWER!

MACEX POWER

Image 2. Logo of our company

A combined cycle company located in Veracruz and founded in 2012. The plant has 2 modules of 400 MW. One of them has a contract to supply electricity to CFE for 25 years so it acts as a IPP. The other module provides electricity to 7 clients under a CFE reference in regime of self-supply with a contract for 6 years. With this characteristics and considering the circumstances of each stage, we have analysed the reality under the prism of a company with regulated and non-regulated business that have allowed us to make a deeper analysis of the situation.

In each period, we have studied how should be the behaviour of MACEX POWER to get the best results. To do this we have raised which are the several options for the company, things to mark out when taking a decision, new regularisation to consider, etc. in order to provide a guide for the companies who want to operate in Mexico.

2

2.1MEXICO: General ideas

Image 3. Map of Mexico (WIKIPEDIA)

Mexico, officially the United Mexican States, is a federal republic located in North America. With 31 States and a Federal District, its capital and largest city.

The country is bordered to the North by the United States; to the south and west by the Pacific Ocean; to the southeast by Guatemala, Belize, and the Caribbean Sea; and to the east by the Gulf of Mexico. Covering almost 2 million km^2, Mexico is the 5^{th} largest country in the Americas by total area and the 13^{th} largest independent nation in the world. With an estimated population of over 120 million, it is the 11^{th} most populated country and the most populated Spanish-speaking country in the world.

The Tropic of Cancer divides the country into temperate and tropical zones. Land north of the twenty-fourth parallel experiences cooler temperatures during the winter months, they generally have from 20 to 24 °C yearly temperature average. South of the twenty-fourth parallel, temperatures are fairly constant year round and vary as a function of elevation. For example, areas south of the 24th parallel with elevations up to 1,000 m have a temperature average between 24 to 28 °C. Temperatures here remain high throughout the year, with only a 5 °C difference between winter and summer. Both Mexican coasts, except for the south coast of the Bay of Campeche and northern Baja, are vulnerable to serious hurricanes during the summer and fall. This gives Mexico one of the world's most diverse weather systems.

Mexico is a member of the United Nations, the World Trade Organization, the G8+5, the G20, the Uniting for Consensus and is an observer of the Organisation Internationale de la Francophonie since 2014.

By 2050, Mexico could become the world's 5^{th} or 7^{th} largest economy. The country is considered both a regional power and frequently, it is identified as an emerging global power.

Here we have some data according politics, economy and energy in the country:

POLITICS: Mexico is a federation whose government is representative, democratic and republican based on a presidential system according to the 1917 Constitution. The constitution establishes three levels of government: the federal Union, the state governments and the municipal governments. According to the constitution, all constituent states of the federation must have a republican form of government composed of three branches: the executive, represented by a Governor and an appointed cabinet; the legislative branch constituted by a unicameral congress and the judiciary, which will include the Supreme Court of Justice. They also have their own civil and judicial codes. Actually, Enrique Peña Nieto is the President of the Republic and his six-year term began in 2012.

ECONOMY: Mexico has the 15th largest nominal Gross Domestic Product (GDP). The local currency is the Mexican Peso. It is a developed country with an economy based on: the extraction of crude oil, tourism, industry, mining and agricultural activities. For many years, oil has been the main source of income for the public sector; nevertheless, world prices and the lack of investment are affecting a lot the economy of the country. The services sector, tourism in particular, is another contributor offering more than 26 places of natural or cultural heritage of the world. Industry is one the most important activities which employs a quarter of the economically active population. The main industry products are: automobiles, cement, steel, electronics, textiles, chemicals and drinks. Mining, silver in particular, represent another important economic field. In agriculture the main products are: corn and beans (base of the Mexican diet), coffee, potato, tomato, plantain, sorghum and sugar cane. United States of America is still major import in Mexico. Main exports are: crude oil, machinery, textiles, coffee and chemical products. Despite the fact that the country's economic expansion has held a steady rhythm in the last few years, this has not been enough to improve competitiveness and reduce poverty, both in urban and rural areas.

The Mexican economy is strongly linked to those of its North American Free

Trade Agreement (NAFTA) partners, especially the United States. Mexico was the 1st Latin American member of the Organisation for Economic Co-operation and Development (OECD), joining in 1994. It is classified as an upper-middle income country by the World Bank and a newly industrialized country by several analysts.

ENERGY: Energy production in Mexico was managed by state-owned companies: the Federal Commission of Electricity (we talk about it later) and Pemex. Pemex is the public company in charge of exploration, extraction, transportation and marketing of crude oil and natural gas, as well as the refining and distribution of petroleum products and petrochemicals. Mexico is one of the main oil producers in the world. The generation capacity comes from 215 power-generating plants, equivalent to 54.374 MW, including those independent producers who are authorized by law to generate it. Demand increases by 1.1 million applicants each year. The main forms of generation are: 55.60% of thermoelectric, 30.4% of hydro, 7.2% of coal-fired power, 3.8% of nuclear, 2.6% of geothermal and 0.2% of wind farms energy.

3

3.1 1st Period: Pre-Reform (2012)

In 2012, the electric sector was controlled by the Federal State and CFE (Federal Electricity Commission). In 1992, there were some modifications to the Mexican Electricity Law to allow private investment in the industry through self-supply, cogeneration and independent power producers (IPP). This reform allowed to the IPP companies to build and operate the power plants but limiting the sale of power to CFE under long-term contracts. Meanwhile, in transmission and distribution, CFE had the monopoly. Private companies had not the right to sell directly to basic users so the retail sector was monopolised by CFE and private companies should sell their production to them, in charge of the commercialisation. CFE also controlled the planning for new generation projects and expansion of the transmission grid.

Under this paradigm, the sector has to deal with several challenges. The price of the electricity is high and not competitive. For example, compared to EEUU the tariff is 25% higher (with the subsidy) and without the subsidy the tariff would be 73% higher. This acts like a break for the Mexican economy, as the electricity is fundamental for the industrial, commercial and service industry.

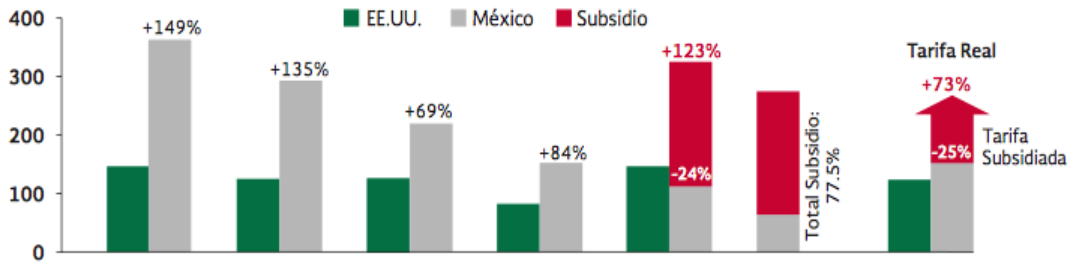

Image 4. Average Tariff (cent/KWh) (MEXICAN GOVERNMENT, 2013)

Other challenge in this period, more than the 20% of the energy generated use fuel oil and diesel, commodities more expensive and contaminant than clean energies or natural gas. The slow rhythm of replacement of the old plants is due to the exclusivity of CFE to supply electricity to the public service. Public participation is allowed but the most important projects depend on the Commission and the budget constraints of the State and this situation limits the quick change to other energies that would help to produce electricity at a lower cost.

Another aspect to deal with is the lack of investment in the transmission lines. CFE plans to expand the net 1.1% on yearly average till 2026 while the increase of the demand is a 4.1%. So, this measure is completely insufficient and it would be necessary to increase the mesh of the net and to interconnect zones of the country with high clean energies and, to achieve it, private generators, wind farms and solar plants would be required. President Peña Nieto noted that 47% of national transmission lines in Mexico are more than 20 years old and only 8% have been built in the last 5 years.

Even distribution was suffering problems of operational inefficiency due to the high level of losses, double that the average in other countries of the OCDE (Cooperation and Economic Development Organisation). Additionally, more than the 21% of these losses are not paid to CFE and no company can afford this situation without having economic problems.

3.1.1 Organisms

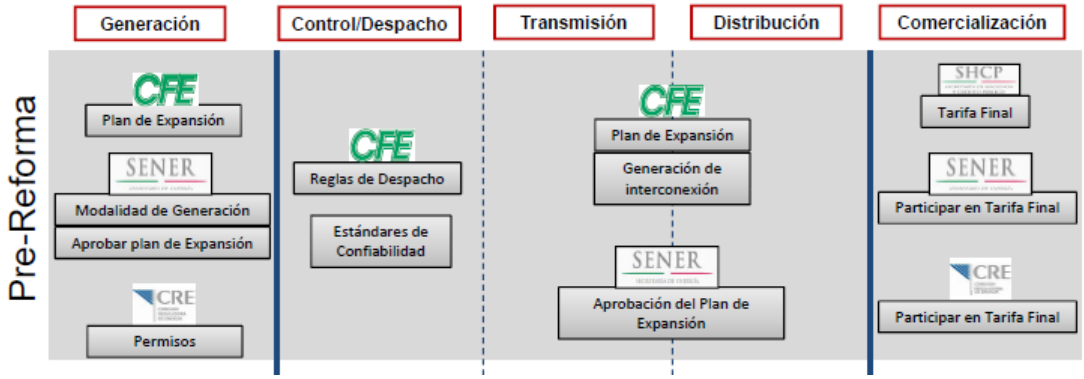

Image 5. Main organisations in the Pre-Reform and its duties (SENER, 2015)

The main regulatory entities in the Mexican Energy Industry:

- Federal Electricity Commission (CFE): Is a decentralized, vertically integrated electric energy service company wholly owned by the Mexican Federal Government. CFE generates, transmits, distributes and commercialises electricity nationwide in Mexico to more than 34.9 million customers, representing more than one hundred million people, and incorporating every year more than one million of new customers. Its challenge is achieve a balanced sustainable development for the country.

- Pemex Gas and Basic Petrochemicals (Pemex Gas) is the subsidiary of Petroleos Mexicanos that produces, transports and markets natural gas and other liquid hydrocarbons and basic petrochemicals. Also, Pemex Gas offers its industrial customers various services, including hedges natural gas prices. The main purpose of Pemex Gas is satisfy, in an efficient, safe and punctual way, the domestic demand for those products, while maximizing its profits and increasing its value added.

- Energy Regulatory Commission (CRE): Is in charge of elaborating clear rules

for independent power production, sales and reserve purchase contracts between private generators and the public utilities, wheeling charges, and overseeing the power generation and natural gas concessions being awarded.

- Secretary of Energy (SENER): In charge of conducting energy policies with the aim of guaranteeing a competitive, efficient, high-quality, economically viable and environmentally sustainable energy supply.

- Secretary of Finance and Public Credit (SHCP): Member of the Mexican executive cabinet and is appointed by the President of Mexico. It is active in developing financial inclusion policy and is a member of the federal executive cabinet. Proposes and directs the Federal Government's economic policy as regards finances, tax, spending, income and public debt and statistics, geography and information, in order to ensure quality, equitable, inclusive and sustained economic growth.

3.1.2 Regulation

Here there is a list of the legal systems applicable to the activities of generation, transmission, transformation, distribution, supply, import and export of electricity. In addition, regulatory instruments to promote the development of renewable energy and efficient cogeneration in Mexico:

- Constitution of the United Mexican States (Articles 25, 27 and 28) Policy
- Organic Law of the Federal Public Administration
- Law of Public Electricity Service (LSPEE)
- Law on Energy Regulatory Commission
- Law on the Use of Renewable Energy and Energy Transition Financing
- Law for Sustainable Use of Energy

- Regulatory Law of Constitutional Article 27 in Nuclear Matters
- Law on Civil Liability for Nuclear Damage
- Schedule System Act in the United Mexican States
- Federal Law of Parastatal Entities
- Federal Law on Metrology and Standardisation
- Energy Law Field
- Planning Law
- Federal Budget and Fiscal Responsibility
- Regulation of the Law of Public Electricity Service
- Regulation of the Law of Public Service Electric Energy in Matter
- Contributions
- Regulations of the Law on the Use of Renewable Energies and
- Financing of Energy Transition
- Regulation of the Law for Sustainable Use of Energy
- Regulations of the Federal Law on Metrology and Standardization
- Regulation of the Federal Law of Parastatal Entities
- Regulations of the Federal Budget and Fiscal Responsibility
- General Radiological Safety Regulations
- Internal Regulations of the Ministry of Energy

3.1.3 Generation

Since 1960, CFE is the owned-Mexican State Company in charge of the generation, transmission, distribution and retail of the electric energy in the country.

At the end of 2011, the installed capacity was 61,570 MW, 52,512 MW corresponded to the public service, including the contracted capacity with the IPP scheme, and 9,058 MW to private companies. Meanwhile, the CFE

contributed 63.8% of the total installed capacity in the country and 19.3% IPP. The private sector permits: self-supply, cogeneration and export of electricity contributed 14.0 %.

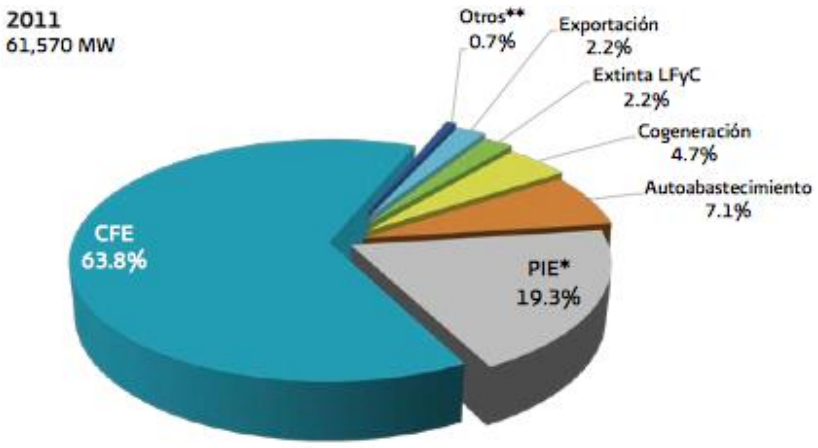

Image 6. Effective installed capacity (2011)

This capacity was diversified in: 43.77% of thermoelectric; 12.84% of hydroelectric, 6.23% of coal fire power plants; 3.58% of nuclear and clean energies as 2.30% of geothermal and 0.04% in wind farms. The remaining % of generation is provided by independent producers (IPPs), who maintain a better use of their respective sources, combined cycles and cogenerations.

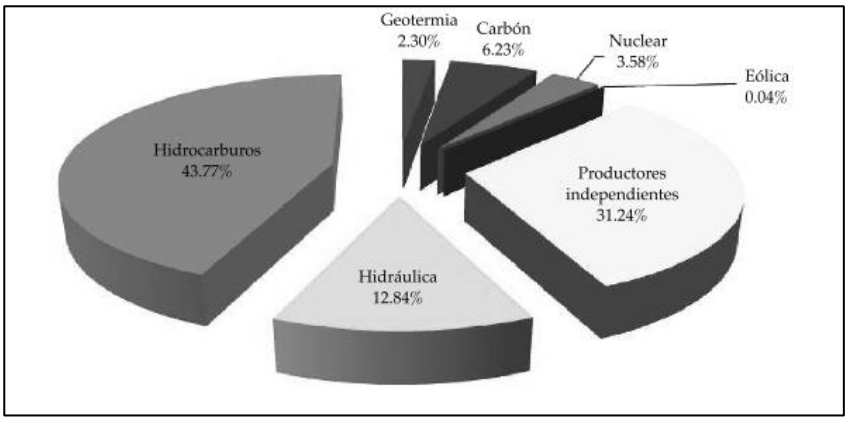

Image 7. Electric generation in Mexico (December 2011)

The generators in this period were CFE, accounts for nearly 77% of Mexico's total installed capacity and electricity production, and private producers under

different ways of participation:

- Self-supply -> The self-supply are IPPs that supply directly to the customer in several ways: embedded (local self-supply and cogeneration plants), through the network and used by the owner. The surplus is provided to CFE.
- Cogeneration -> Getting the electricity directly, or indirectly, from the production processes. Such electricity will be for the owners' consumption and the surplus for sale to CFE.
- Independent power producer (IPP) -> Generating electricity from a plant with more capacity than 30 MW, exclusively for sale to the CFE or export.
- Small producers -> Electricity generation by authorized individuals or Mexican corporations, which can sell: to CFE (plants with capacity lower than 30 MW); to small rural communities or isolated areas with lack of electricity service, with projects that may not exceed 1 MW or to export (max. 30 MW).
- Importation -> Purchase of electricity from foreign generators to be used by the importer under authorisation of SENER for its own consumption.
- Exportation -> Sale of electricity from cogeneration, IPP´s and small producers under the authorisation of SENER.

So, the way of working in generation is that CFE has its power plus the private initiative, that corresponds to IPP´s, small producers, self-supply and cogeneration, which sells their surplus energy to CFE which checks, the self-supply. This is plausible as long as the plants improve their efficiencies, in order to supply the Mexican society with the cheapest electric resource.

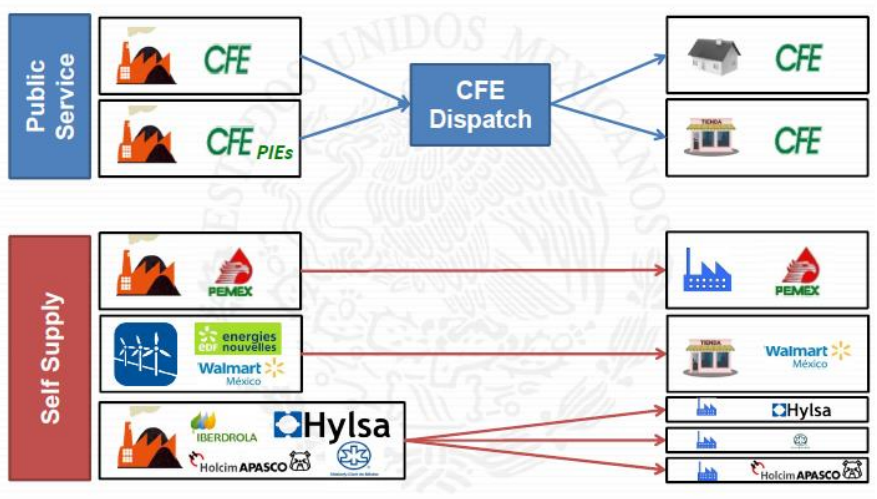

Image 8- Pre-Reform Energy Structure (SENER, 2016)

The main IPP´s are Iberdrola, Mitsui, Gas Natural, Mitsubishi, Intergen and AES:

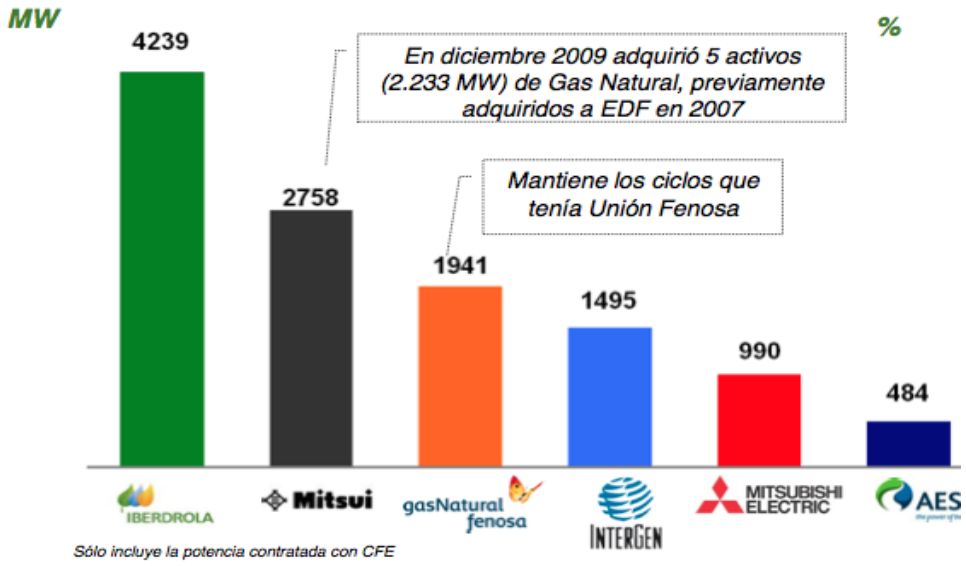

Image 9. Main foreign IPP's in Mexico (IBERDROLA, 2011)

To facilitate the private participation in the electric generation, the regulatory framework has instruments through which private companies can apply for interconnection to the National Electricity System (SEN). The feasibility of interfacing with the network of public service, the certainty of having electric power of support and the possibility of surplus, etc. provide flexibility to the

companies in their generation and import operations. There are 4 kinds of contracts:

- Interconnection Agreement: Establishes the terms and conditions for interconnecting the central power generation with SEN. This contract gives to the companies the necessary elements to manage demand load centres, as well as allows calculating payments for ancillary services provided by the supplier.
- Backup service contracts of electricity: They are intended to support the central supplier of power generation in case of failure, maintenance or both. The charge for this service is determined based on the rates published by the SFPC
- Convention for the sale of surplus power: Also known as an economic power, it establishes the procedures and conditions though which the company delivers the electricity to the supplier according to the SEN rules.
- Convention for service of power transmission: It states that the supplier receives electrical power from the generation plant at the point of interconnection and it is transported from the load centres of the company according to the portage capacity contracted.

In the last 10 years the private sector has been winning importance as in 2002, the private sector had a share of 3,495 MW and in December of 2011 had an installed capacity of 11,907 MW. This encourages progress in Mexico and guarantee jobs in the private sector for citizens. On the other side, CFE had to maintain a balance in the growth of installed capacity because in 2002 had a capacity of 36,885 MW and December 2011 recorded an output of 39,270 MW. So private sector is improving more than CFE and CFE needs to change its mix of production due to it is not using renewables resources. The State needs to diversity more in order to adapt the sector to the reality and the sustainability criteria.

CFE´s suppliers are divided into: industry, 57.8%; residential, 26%; commercial 6.8%, services 4% and 5.4% in agriculture.

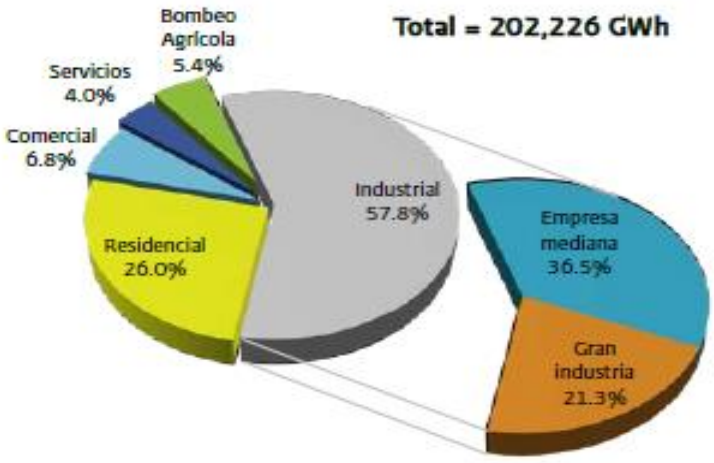

Image 10. Electric consumption in Mexico (SENER, 2011)

In this period, Mexico should act as EEUU, China and Japan which generates progress through the electric energy production. To achieve this, Mexico needs to invest in renewable resources and to improve the existing installations and to do this the private investment is essential as the federal government cannot afford it.

IMPORTATION: Electricity Coordinating Council of the Western United States (WECC) is the organism that regulates the transactions between CFE and the import companies located in the control area of Baja California. In the interconnection agreement, CFE performs the power transmission between the interconnection point and the point of load of the company. All impot companies are located in the control areas of Baja California and the Northwest, specifically in the states of Baja California and Sonora, with the exception of 3 licensees established in the state of Coahuila.

3.1.4 Transmission and distribution

CFE uses the SEN infrastructure to make possible the transformation, transmission, distribution and marketing of electricity throughout the country. This infrastructure is operated by control areas, which maintain the reliability and integrity of the system. These areas monitor that the demand and the supply of electric power are balanced at all times.

At the end of 2011, the transmission and distribution network reached a total length of 845.201 km. The transmission network is constituted by lines 230-400 kV (5.9%), lines of 69-161 kV (5.8%), lines of 2.4-34.5 kV (47.7%), low voltage lines (30.4%) and lines belonging to the area of central control (10.2%). Looking at in detail:

- 98.749 km of lines between 400 kV and 69 kV.
- 402.857 km of lines of 2.4 kV to 34.5 kV.
- 257.152 km of low voltage lines.
- 86.443 km corresponding to the LFC extinct.

The capacity of the transport network is formed by the capacity of the public service plants (CFE + IPP) and the capacity of the self- supply and cogeneration plants. With this capacity, the system should satisfy the necessities of the consumers of the public service plus de self-supply local (no transmission system required) and remote (far away from the generation centre that needs the transmission system). Many companies choose to disconnect from the network of public service in prime time and generate their own electricity through small-capacity plants and mostly using diesel to avoid the costs of transmission with CFE and the high costs of the prime time.

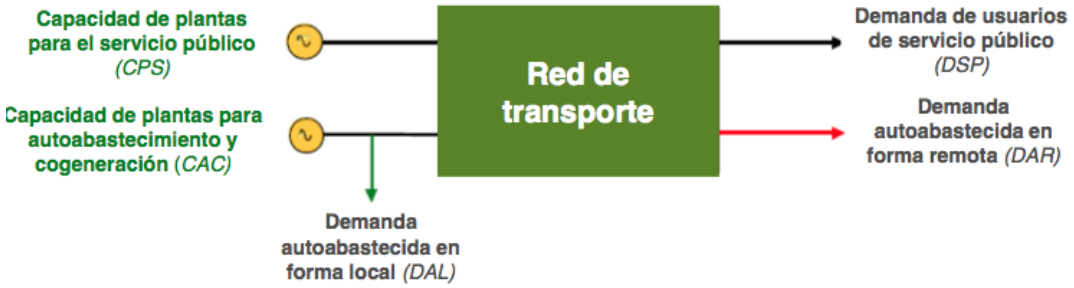

Image 11. Transport network organization (IBERDROLA, 2011)

There are nine tariff regions in the country that are controlled by 13 divisional distribution directions; the 7 areas of the continent are interconnected and form the SIN, while the 2 areas of Baja California (north and south) remain isolated and linked to the network of the western US by two 230 kV interconnections.:

Image 12. Distribution zones (IBERDROLA, 2011)

The sources of power generation are interconnected through a network of high voltage transmission lines from the border with the United States to the

border with Guatemala, controlled by the National Centre for Control of Electric Power (CENACE).

Private companies take part of the transmission section of the electric industry through the international tenders to award the turn-key projects. In these projects, companies are responsible for the financing during construction and, upon completion, assets (and all operational risks) are transferred to CFE after paying for the total contract value.

To guaranty the reliability of the transmission and distribution system is important to consider the reserve margin (RM) that is defined as the difference between the energy available versus the annual consumption demanded. It consists of the thermoelectric generation, generated but not dispatched, and hydroelectric reservoirs, which can be transferred on-year to become electricity. The hydroelectric plants should start the year with a minimum storage between 15,000 and 18,000 GWh, which will depend on the conditions and eventualities evaluated each year.

The idea is that the system capacity is greater than the maximum annual demand. For this reason, effective factors such as plant capacity, availability and meshed grid, should be determined to secure the electricity supply. This is very important as the power is produced at the moment when it is demanded and the capacity of the system is subject to reductions as a result of departures scheduled, maintenance operation and random events such as faults, degradations, weather phenomena, etc.

In 2012, the RM should cover the 6% of peak demand, random failures of generating units and critical events in the system. In isolated systems, as Baja California, the reserve margin is determined separately according to their load curves and the maximum demand. In Baja California is considered as minimum RM the maximum between the capacity of the higher unit or the 15% of the

maximum demand. This system acts in a different way as it is interconnected in the western United States being governed by the standards of reliability of the WECCs.

To calculate the cost of the transmission services we have to differentiate between:

- Voltages greater than or equal 69 kV, it takes into account the impact on the network of each portage service requested individually. This costs has a fix and a variable part depending the fix of the use of the transmission infrastructure and the cost of generation and transmission capacity due to power losses; and the variable depends on the cost of energy generated to cover the losses caused by the transmission service requested.

- Voltages lower than 69 kV, it has the procedures called Path point to point or proportional demand, depending on whether single loads of more than 1 MW or multiple loads grouped by type of fare, with small claims than 1 MW. This methodology sends an economic signal to the companies to encourage a location of the energy plant that favours the reduction of losses in the SEN. The costs depend on the use of the net and the administrative expenses.

3.1.3 Retail

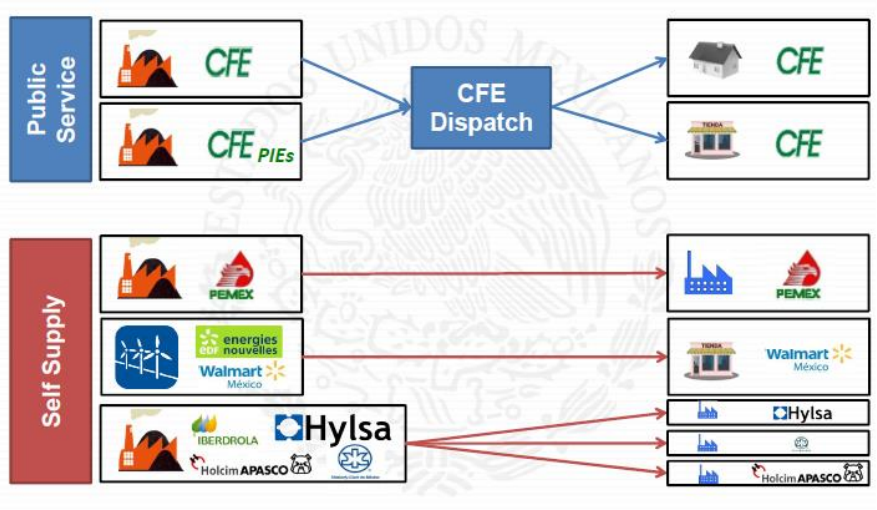

Image 13- Pre-Reform Energy Structure (SENER, 2016)

Retail activity to the basic users is developed by CFE and it supplies the electricity to the consumers using the CFE Dispatch. Part of the electricity that goes to the dispatch is produced by CFE and other part comes from the private companies that sell to CFE (IPP) to make use of it and to satisfy the total consumption.

The national consumption integrates the internal electricity sales that are the power supplied to the users from public service resources (CFE + IPP) and the self-supply that includes the energy generated by the private companies in the modalities of self-supply, cogeneration, small-production, import and export and that can be sold to the consumers following several kinds of bilateral contracts.

Regarding the contracts, we can talk about generation contracts, the ones between private generation companies and CFE, and the ones between the private companies and the consumers, called retail contracts:

- IPP contracts with CFE: Under this kind of contracts, companies receive a "Capacity Charge" from CFE that is a fixed income stated in the tender and multiplied by the FADD that is the real availability of the last 12 months. The FADD may vary between 105% and 65% and below 65 % CFE has the right to expropriate the plant. Some of the plants receive the capacity charge every six months, so they need to do a linearization of income. The income from O & M is also regulated under the contract. The income is in pesos. Gas charges are also paid by CFE but the company can achieve a positive margin of gas if the efficiency of the plant is higher than the one fixed in the tender. So the margin of gas is variable. If the plants have additional capacity, they can sell its production to private consumers or as surplus energy to CFE.
- Retail contracts with private companies:

    - General Agreement: It consists of a pass-through agreement with a clause of competitiveness. The maximum possible rate is CFE tariff minus the competitiveness, so in the end is equivalent to a Reference CFE contract with a high discount. They include high penalties when you are unavailable and have to buy back.
    - Pass- Through: Similar contract than with CFE that is charged according to availability
    - CFE Reference plus a discount: The discount over the CFE tariff varies between 3% and 7%.
    - Flat-Roof Contract: Long-term contracts, led to large consumption. The tariff is between a maximum and a minimum value. In this mode the discount you can get is 10% -11 %. The floor of the contract is the formula for pass-through of costs. If incurred during an extended period in clause floor, customers can leave the contract.

The generating company has special conditions of portage, back-up and surplus with CFE. CFE will supply to the clients in case the generation

company cannot do it and in case of extra-energy, they company will provide it to CFE. More details about it:

- Portage-> The capacity of portage contracted by a generator determines the maximum demand to be provided to a client. The portage is contracted for interconnection projects that require the use of the system to transport the energy to the load points.
- Backup -> Purchased energy when the generator cannot guarantee the portage contracted to the customers. When the level of energy delivered at the point of interconnection is insufficient begins to provide energy from the compensation band, which is the 5% of the demand reserved in case of failure. If the band of compensation is not enough, CFE provides support and the compensation given during the day will be considered backup power. CFE concept charges a fixed for the capacity reserve of backup and the variable cost depends on the cost of energy that corresponds to the CFE rate point at which the central is connected.
- Surplus -> The surplus energy of the private generators is sold to CFE and it is paid according the 85% of the Total cost in the short term (CTCP) published by CFE.

CFE TARIFF: In the last years, average electricity tariffs in Mexico have been held below cost with the aim of maintaining macroeconomic and social stability. For all tariffs, an interagency group composed of: CFE, SHCP, SENER, CRE and CNA, meet regularly and once a year they prepare a tariff proposal for the subsequent year. Tariffs are approved by SHCP and not by the energy regulator. There are residential, commercial, services, agriculture and industrial tariffs. For the industrial and commercial sectors, electricity supply is priced on a rational cost basis for large firms. As a result, they receive no government subsidy. On the other hand, agricultural and residential customers have traditionally received large subsidies since the electricity they consume is significantly under-priced. General rates are updated by a monthly factor of

automatic adjustment reflecting variations in the prices of fuel and inflation. Likewise, some fees have charged for consumption and demand with regional, time and seasonal differences. The rest of the rates (domestic, agricultural and public services) are adjusted using fixed factors, no time differences.

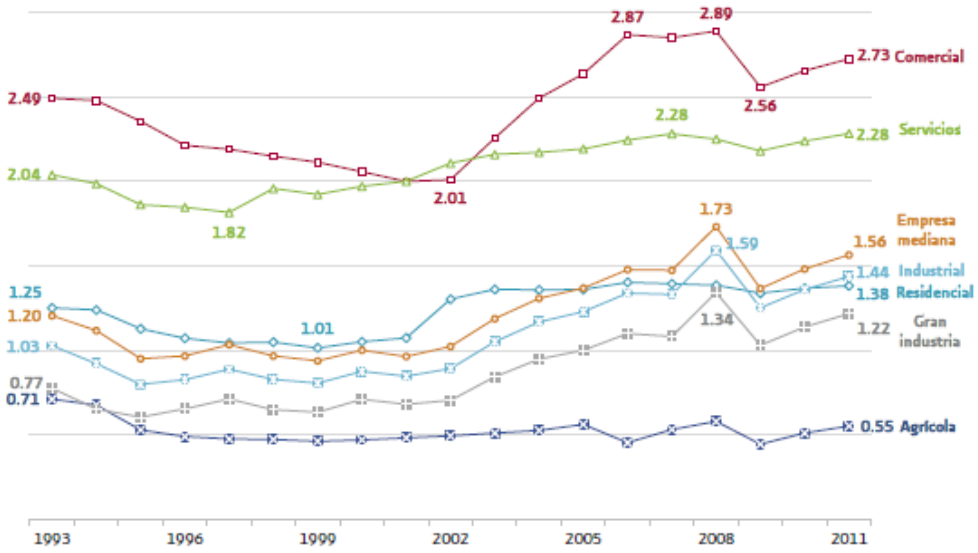

Image 14. Average price of the power tariff by kind of consumer (SENER, 2011)

3.1.5 MACEX POWER Strategy in 2012

MACEX POWER (MP) is the company that we have created to study the evolution through this changeable period of the Mexican electric sector. As mentioned before, the company was created in 2012 and has 2 units off 400 MW. With one of them (MODULE 1) has a contract with CFE to provide energy under the regime of Independent Power Producer (IPP). With the other module (MODULE 2), it has to provide energy to 7 clients with whom it has a contract of self-supply called Reference CFE. We are going to see what happens in each situation.

MODULE 1

This module should provide the energy stipulated in the tender to CFE which will be responsible to provide electricity to the basic users or small consumers. If MP provides the accorded electricity, it will receive a capacity charge but it depends on the availability of the plant, so the main problem for MP is to be ready to provide the electricity to CFE. In case the module will not be operative, the company has the module 2 to provide it.

Other aspect to have into account for MP is the efficiency of its plant. The use of gas in MP is afforded by CFE which will pay the stipulated quantity in the tender as a pass-through. Also the Operation and Maintenance is fixed in the tender, thereby, as less requirement of maintenance needed, more margins for the company. If MP achieve to improve its efficiency, it will obtain a higher margin than expected in advanced.

So, MP in this module has to guaranty the provision to CFE and to try to increase the efficiency and under this situation this module will have not any risk and even could earn more money than predicted.

MODULE 2

With the module 2, our company has to provide to 7 clients with the contracted energy and to do it they have sign a contract under Reference CFE. Private companies can take place in generation but controlled by CFE, which will supervise its invoices. In this contract the tariff stipulated is the one provided by CFE minus a discount decided by MP. The tariff depends on the expenses of CFE and the variations of fuel price and inflation.

According to the required demand, the company has to contract a portage to transport the energy to the load points and they will have to pay this quantity, being divided this cost over the clients.

Other characteristic of this kind of contract supervised by CFE is the backup of CFE in case of impossibility to provide the service. This is like an insurance to guaranty that MP can supply to their clients with the agreed energy. In that case, MP will pay to CFE a fix quantity as a reserve of capacity and a variable according to the nodal prices. The use of the backup can be due to a failure or maintenance reasons. If the cause is a failure, MP pay the fix quantity as insurance and this provides the right of backup for 31 days and in that time MP only pays the energy cost. But, if the failure takes more than 11 consecutive days, MP pays for the energy and for the accumulated demand. And if the maintenance is the reason for the no supply, it should be noticed from 1st February to the 15th April. In case of being correctly declared, MP pays for the 20% of the max. peak demand accumulated but if the maintenance takes more than 35 days, there will be considerate the 100% of the accumulated demand for the extra-days. The cost is similar that the ones due to failure.

In this period, MP can have extra energy to sell, in case one of its clients do not need as much energy as contracted. In this situation, MP must sell the surplus to CFE and it is paid according the 85% of the CTCP.

Considering all this aspects, for my company 2012 is a year quiet stable. On one side, fix contract that guaranties half of my business while my availability and efficiency would be the one expected. And on the other side, close contracts with 7 clients and the backup of CFE which will provide the required energy in case of failure or maintenance.

4

4.1 2nd Period: 2013-2016

This second period is marked by the beginning of an enormous change in the electric sector. The president of Mexico, after analysing the serious problems of the electric system, enacted the Energetic Reform in which one objective was transform the vertical integration, existed under the head of CFE, into an unbundled system with the objective to increase the private participation in order to intensify the competence in the electric sector. Law of Electricity Industry establishes a general principle that the functions of generation, transmission, distribution, marketing and supplying primary inputs, such as fuel oil and natural gas, to power plants, must be carried out independently and with strict legal separation from the other functions. In this new paradigm, generation and retail would be liberalised, while transmission and distribution would continue being regulated by the State to ensure no discrimination in access of generators and consumers to the network.

In order to liberalise the market, this Reform contains the generation of a Wholesale market where all generators will be able to sell their electricity and consumers will buy directly to the market, as qualified users, or to the supply company that they prefer. To achieve this is essential to change the previous way of working, starting by the unbundling of the organisation of CFE, which must be separated into several companies of generation, transmission,

distribution and retail.

In this period, CENACE will take control of the new market and operator of the national electrical system.

This period could be considered the preparation for the new electric system, which starts in 2016, and there have been several aspects to prepare: creation of CENACE, publication of the basis of the Wholesale Market, terms for the unbundling of CFE, clean energies requirements, etc. as we can see in the next schedule:

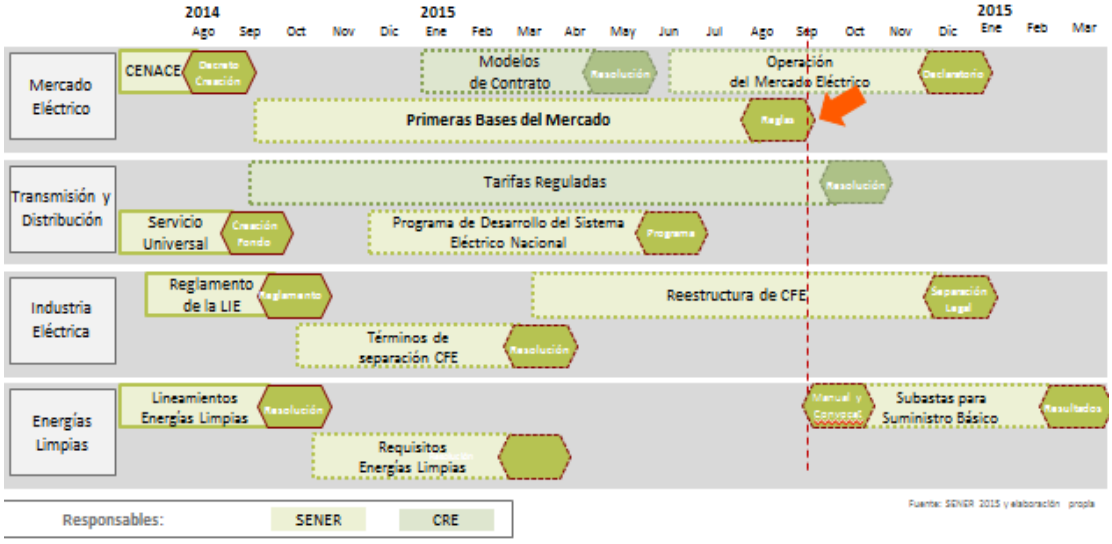

Image 15- Schedule of the Energetic Reform (IBERDROLA, 2015)

4.1.1 *Regulation*

The main regulation generated in this period is:

- Hydrocarbons Law
- the Hydrocarbons Revenues Law
- Law of Coordinated Regulatory Agencies,

- Law of the Electricity Industry,
- Pemex Law,
- Law of the Federal Electricity Commission
- Geothermal Energy Law
- Law of the Agency for Environmental Protection and Industrial Safety for the Hydrocarbons Industry

Amendment and adjustment of various federal statutes, including the Foreign Investment Law, the Mining Law, Public-Private Partnership Law and government procurement laws.

4.1.2 *Organisms*

The same main organizations of the previous period continue existing, plus CENACE that appears as a new decentralised organism, but with differences in the kind of duties developed.

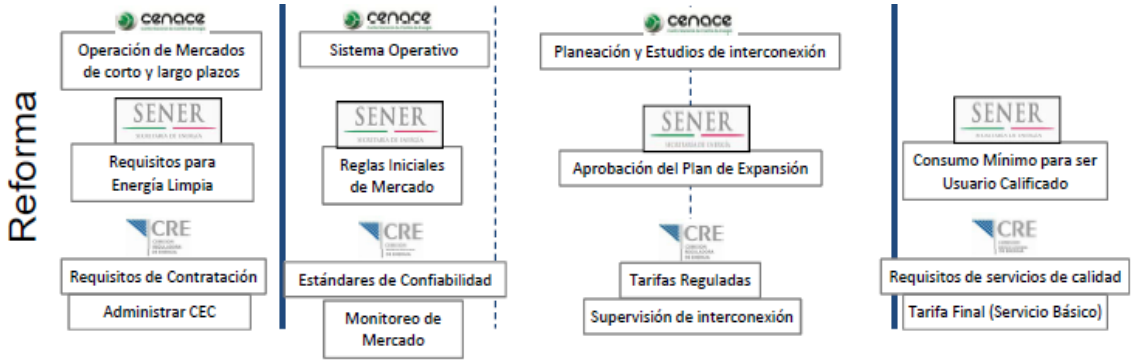

Image 16. Main Organisations with the Energetic Reform (SENER, 2015)

- National Energy Control Centre (CENACE): Till now it was part of CFE but with the Reform it becomes a public organism decentralized on charge of operational control of the national electricity system. CENACE will operate the electric wholesale market, ensuring to the generators the open access to the national grid transmission and distribution networks, maintaining

system reliability, and proposing plans for transmission and distribution expansion to the Ministry of Energy, among other activities. So, it boosts the investment in new generation plants with clean and efficient technologies. CENACE will be permitted to enter into agreements with private parties for the provision of services relating to the operation of the Wholesale Electricity Market.

- Ministry of Energy (SENER): It is required to establish legal separation among the various power industry functions, to monitor compliance and enforce the rules, including by ordering the divestiture of assets, rights or equity interests.
- Energy Regulatory Commission (CRE): Now, it is the primary regulator of the energy industry in Mexico. CRE will be responsible for issuing permits to participate in the wholesale electricity market, either as acquirers or supplied with the principle of preventing conflicts of interest and ensuring open access. CRE also is responsible for setting the rates of transmission, distribution and sale of basic electricity service, establishing the general conditions for market participants, issuing interconnection model contracts and managing certificates for clean energy. He also issued the template model that CENACE held with the participants in the wholesale electricity market

4.1.3 *Generation*

With the Energetic Reform in the electric sector, generation is opened to the private investment and to an open and fair access to the market. The participation of individuals, together with CFE, increases the flexibility in the power generation. CFE could build new plants, modernize the generating base and increase its competitiveness.

By avoiding vertical integration and allowing free entry to private companies

in different industry segments, competition between generation companies and distribution companies which offers their services to end users, increases. A market with several competitors generates incentives to introduce new technologies, reduce production costs, expand coverage services and reduce consumers' prices.

The new Law of Electricity Industry states that permits for self-supply, cogeneration, small production, independent production, import, export and own use that were issued before the Reform remain valid and in effect for their original terms, and will be governed by the pre-existing law that stipulate such permits: the Law of the Public Service of Electrical Energy and Regulations. Their tariff will continue be regulated and determined by CFE.

The Energy Reform supports a change in the mix of production as it wants to lower the price of the light. The price of electricity depends on the fuel used to generate it. Natural gas is cheaper, four to six times cheaper, and friendlier to the environment than fuel oil and diesel, with which currently is generated the electricity. Mexico has multiple deposits of natural gas, however, this production is decreasing, as the State cannot afford its extraction, so that today they import 30% of its consumption. With the Energy Reform, in Mexico there will be multiple operators to extract the natural gas needed to produce electricity cheaper and cleaner.

On the other side, with the Reform, the State wants to empower the construction of new renewable plants as they are the cheapest and cleanest and follows the path to achieve the reduction of the price and to comply with the clean energies requirements for the 2024, 35% of clean production over the total generation of the country.

At this moment, CENACE will exercise the operational control of the national electricity system.

The power generation under the rules of open and fair access, with the participation of particulars in the transmission and distribution segments and in the development of infrastructure, will result in a greater participation of cleaner and more efficient energy. The objective is that with Energy Reform in the electric field, the national productive plant and Mexican households will have more power at a better price and from less contaminants sources.

4.1.4 *Transmission & Distribution*

In the Energetic Reform is provided that the planning and control of the national electricity system as well as the transmission and distribution of electricity correspond exclusively to the Nation. However, it is possible to sign contract with individual, on behalf of the Nation, to carry out financing, maintenance, management, operation and the expansion needed to provide the electricity infrastructure of the public service. With this the state control over the electrical system is strengthen, reaffirming the benefit for the Mexicans.

In order to increase the security of CFE, the State encourages to the individuals to make contracts with CFE for this maintenance, expansion and operation of the transmission and distribution of electricity to take advantage of its experience and its technology and reduce the operating costs and energy losses.

One of the objectives of the State is increase the meshing of the transmission network to interconnect areas of the country with high potential of clean energies. And in distribution, it is important to improve the operational system to reduce the losses and to solve the problems in the financing system as the 21% of the energy produced by CFE is not paid and this is difficult to support.

The Law of Electricity Industry requires the Ministry of Energy to develop programs for the expansion and modernization of the national transmission network and the general distribution networks, taking into account the CRE's point of view with respect to such proposals, and the input from participants in the Wholesale Market and other parties interested in developing electrical infrastructure projects. Such expansion and modernization programs will be based on proposals formulated by CENACE. These programs have to be included in a Development Program for the National Electrical System issued by SENER.

In the Law of Electricity Industry is included the creation and oversee a Universal Electrical Service Fund to finance electrification projects in rural communities and marginalized urban areas, and to finance the supply of efficient lighting and electricity supply to marginalized end users. This expansion projects should be included in the Development Program for the National Electrical System mentioned above. It will be endowed with the surplus resulting from the management of technical losses in the Wholesale Market and also from third parties. Funds from the market that are not used will be remitted to CENACE, to be returned to the market participants.

4.1.5 *Retail*

With the Energetic Reform, clients have full freedom to choose the retail company of choice. High consumption users (trade and industry) must be able to hire the electricity service directly with generating companies. This freedom of choice for users is an effective system to "reward " or "punish" the quality of services received. The power of consumer's choice and the competition among suppliers provide strong incentives to improve the service, expand the coverage and reduce the transaction costs in the electricity market.

In this period, the generation and retail bilateral contracts (with CFE and private users) explained in the previous chapter, continues existing and the active once will be viable till 25 years later. Once finished, all the clients should take part of the market, the contracts cannot be reactivated with the previous conditions that they had in terms of portage, surplus energy and backup.

In the next point, Basis of the new Wholesale Market, I have explained this kind of users that I am mentioning now. With the Reform, consumers will have several options to buy the electricity:

- As a Qualified user: Consumers could choose between buying the electricity in the market, to a supplier, buy it using long term contracts or buy it to CFE. They can study the best option for them.
- As a basic user: They cannot go directly to the market so they have to buy the electricity through an intermediary that in this case is CFE.

Really in 2013-2016, the market does not exist so the retail activity continue being as before, controlled by CFE and waiting for the beginning of the new wholesale market and the liberalisation of the sector. Depending on the setting of the clients, it would be convenient one kind of supplier or other according the transport costs, as they affect in the tariff. Customers can have internal network or the network of CFE. For the interconnection with CFE network, it is necessary an interconnection agreement to indicate how CFE will distribute the energy supplied by the permit holder at the point of interconnection (Portage). The cost for the transmission service is based on several elements such as the type of loads connected, the location of the loads, and network congestion. This cost will be passed through the clients.

4.1.6 *Basis of the new Wholesale Market*

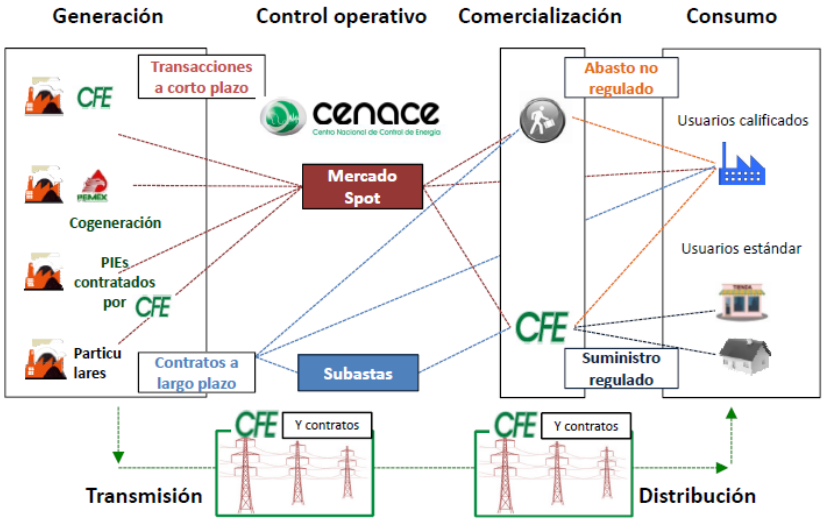

Image 17. New model of the electric industry (SENER, 2015)

In order to allow all generators of electricity to offer their output for sale in open competition under fair and impartial rules, the Law of Electricity Industry requires the establishment of a Wholesale market (WM) for electricity in Mexico to be operated by the National Energy Control Centre (CENACE). The 8th September 2015, the 1st Basis of the Wholesale Electricity Market (WM) is published.

In the Wholesale Market, CENACE will set the spot price for electricity based on information regarding supply and demand provided by market participants, according to the relative scarcity of service in the region and the time when is demanded, being responsible for ensuring that the demand for electricity is met at the lowest possible cost. A feature of this market is that the supply of electricity is given by variable costs and the price received by generators is the variable cost of the last plant dispatched.

CENACE is the agency responsible to indicate the dispatch instructions according to the most economical option. CENACE will also be the operator of the national electrical system, controlling the dispatch of electrical power and

the operation of the national transmission grid and general distribution networks.

Three types of entities will be permitted to participate in the Wholesale Market:

- Generators: Generators, including both private sector generators and CFE, will be able to offer electricity for sale submitting bids based on their operating costs. The generators with a legated contract must go to the market using an Intermediary generator.
- Qualified Users: It includes entities whose electricity consumption and demand is higher to 3MW, as well as existing self-supply, cogeneration and importation/exportation users. Qualified Users will be able to purchase electrical power directly in the Wholesale Market and will be required to report their demand of electricity to CENACE. In addition, the qualified users will have the option of acquiring electrical power indirectly through a "Supplier" of electricity service.
- Retailers: This includes Suppliers and Non-Supplier agents. Entities that provide electricity to end users and represent the qualified users in the Wholesale Market are referred in the Law of Electricity Industry as "Suppliers" and now include both: private sector companies that supply to qualified users, CFE or its commercialization subsidiaries, which will provide this service to qualified users and basic users. These Suppliers will be able to purchase electrical power in the Wholesale Market to satisfy the requirements of their customers and will be required to report their demand for electricity to CENACE. In addition to Suppliers, other "Non-Supplier agents" will be permitted to buy and sell the other products and services that will be traded through the Wholesale Market. Suppliers of last resort may provide services only in the last resort to qualified users, at a regulated price and for a specified period, in order to maintain continuity of

service electricity. They may also represent exempt generators in the wholesale market.

To participate in the market is necessary a permit emitted by CRE and it is necessary for generators, exempt generator which want to go directly to the market without the intermediation of a supplier, suppliers of qualified services and suppliers of basic services and last resort suppliers.

The legated contracts under the Law of the Public Service of the Electric Energy can maintain its conditions till its dead line, unless the contractor wants to change to the new scheme and consider the new regulation. Migration is performed by CRE and it is free. These contracts cannot be extended, cannot change the generation capacity and at the end of the term they shall require a new license with the new regulation. If the legated participants want to continue with the project, they have to communicate it to CRE up to 60 days since the publication of the Law of the Electric Industry (LEI). Moreover, they must sign a "Contract of Legated Interconnection" with CENACE and they can go to the market through a generator of intermediation. If they change to the new regulation and change its mind, they can come back to the previous scheme of contract in the next 5 years but maintaining the dead line of the contract.

The Wholesale Market will also facilitate the purchase and sale of other products and services, called Associated Products, including, among other things: capacity, CEC´s, transmission and distribution services, financial transmission rights and certain ancillary services required in order to ensure the reliability and security of the national electrical system, such as: frequency regulation, voltage regulation, operating reserves, spinning reserves, black start services, and demand response.

Apart of the Wholesale Market, generators, Qualified Users and retailers also are permitted to enter into bilateral contracts (contracts for differences and other types of financial contracts) relating to electricity. In these contracts, the parties will agree on the purchase and sale of electrical energy and the making of payments based on the contract price. The parties are obligated to inform CENACE of any such contracts. These contracts will provide an alternative to the spot market for industry participants, offering some insulation from price fluctuations in the Wholesale Market and helping to facilitate long-term planning.

On the other side, generators and consumers need access to the transmission and distribution network. All power plants and load centres that meet the interconnection requirements will have open access under equal conditions by CENACE. To interconnect power plants and load centres with the net, it is mandatory to sign a contract with the Transporters and Distributors.

The rates of transmission and distribution are determined by CRE. The principles of tariff regulation are transparency, stability, feasibility, efficiency and predictability in charges for users. Tariffs should be efficient and ensure the recovery of the costs of the company that performs the activity. Transmission rates take into account:

- The charge will be made through the form of Portage, which is determined based on injections or withdrawals the network's users, weighted the voltage level and depending on whether users are generators or consumers (Qualified Users or Qualified and Basic Suppliers)
- The rates are divided into two blocks according to the voltage level (≤220 kV and >220 kV)
- Generators will pay 30% and consumers 70%.

This is a general explanation of the running of the Wholesale Market, explained in the Basis, and the details of the main measures taking into account are explained in the next chapter. Here we have the list of those measures:

- Nodal Market Energy and Ancillary services with mandatory offer based on costs.
- Market Power: decentralized market of capacity obligations.
- Clean Energy Certificates Market (CEC's): decentralized market of obligations of renewable energy supply.
- Long Term Tenders of power, energy and CEC's together.
- Medium Term Tender of power and energy to reduce exposure to prices in the short term
- Tender of Financial Transmission Rights (DFT's) to cover the price difference between the output node and the power supply
- The market will have an initial design and the evolution to the final market with an intraday market, more auctioning of transmission...

4.1.7 *Restructuring of CFE*

CFE was the unique responsible for developing the infrastructure for transmission and distribution of electricity throughout the country. Individuals are already allowed to generate electricity to sell to CFE (through the figure of the IPP) or with contacts controlled by CFE. This scheme is limiting the budget and capacity of design and operation of the CFE. This critical situation has resulted in high electricity costs for the national production plants and Mexican householders. For all the above, a change in the legal framework was needed, to provide to CFE more flexibility to operate and incorporate the highest standards in transparency and accountability.

With the Reform, CFE stops being a decentralized public body and becomes a

Productive State Company with a series of subsidiary companies and affiliates. It will continue being 100% a Mexican company and 100% State propriety. To strengthen CFE as a national company, it will have budgetary autonomy, subject only to a financial balance and a limit on personal services in accordance the Congress Union. For administration, organization and corporate structure, should adopt the best international practices to ensure transparency, efficiency, effectiveness, honesty and productivity in the development of its activities to obtain higher revenues for the State.

CFE will be coordinated with the Secretary of Finance and Public Credit (SHCP), so that its financing operations do not affect to the public sector and by SENER that will determine the points to be followed in the institutional design of the company. CFE will pay an annual dividend to the state, in an amount to be determined by the SHCP, taking into account a financial report and five-year forecast to be provided annually by CFE. CFE's profits will be reinvested as determined by CFE's Board of Directors.

CFE and its subsidiaries will have a special compensation regime, which will be different from the general regime governing federal employees and which will permit a greater degree of incentive compensation than is currently allowed, equivalent to the incentive compensation that is typically payable in the industry or industry segment in question.

According to the CA-011/2016 Agreement, to comply with the terms published on 11 January by the Ministry of Energy, CFE has decided the division into 10 companies: 6 of generation, 1 of distribution, 1 of transmission and 1 for basic supply. The Council also authorized the creation of a subsidiary called brokerage Generator of intermediation a through which will handle the legated contracts of interconnection (self-supply). All companies should initiate their functions no later than 28 June 2016 and they should have a

director and a Board of Directors, which should be formalized no later than 30th June 2016.

CFE and its various subsidiaries can enter into agreements and joint ventures with private parties for the financing, installation, maintenance, management, operation and expansion of the transmission and distribution networks, as well as for the provision of collection and billing services in connection with the commercialization of electrical energy. The contracts are required to be awarded by means of competitive bidding processes that guarantee open and free competition, as well as complete transparency. This potential involvement of private parties in transmission infrastructure, distribution and commercialization is intended to give CFE and its subsidiaries access to experience and technology in these areas that do not exist to reduce the debilitating losses that CFE has suffered and improve the efficiency of the transmission and distribution systems.

4.1.8 *Requirements of the clean energies*

Clean energy generation in many cases is not the easiest option for the development of new projects as high potential resources often are in remote areas of the country that require large transmission works to interconnect, plus the risks and challenges of development and operation.

The Electricity Law requires to SENER to implement measures to comply with policies on diversification of energy sources, energy security and the promotion of clean sources of energy.

The new regulatory framework is designed to have competitive clean energy sources without creating market distortions. The Wholesale Market is a market of variable costs, which means, energy generation with lower variable

cost are the first to be dispatched to the National Electric System. The clean energy power plants generally have lower variable costs than generation plants based on fossil fuels, so that, these can take priority in the despatched by the CENACE. This means that clean energy power plants can generate their electricity at a price equal to the variable cost of the last plant that dispenses and this is an incentive to invest in this kind of technologies. In order to recover the fix costs of the plants, they will receive the income for buying and selling clean energy certificates (CEC's).

CEC´s are negotiable, promote the execution of long-term financial contracts that include such certificates, and permit the transfer of excess or needed certificates between periods to promote price stability.

SENER impose obligations to acquire clean energy certificates on Suppliers, Qualified Users that participate in the Wholesale Electricity Market, end users that receive power from isolated supply sources and the parties to legacy interconnection agreements that cover load centres, public or private, excluding any such load centres that already produce energy from clean energy sources in sufficient quantity to fully cover their consumption of electricity. The acquisition of CEC´s should be equivalent to 5% of the total electrical energy consumed at all load centres. During the first quarter of each year, SENER will establish the requirements for acquisition of CEC´s that will be applicable for the following three years, and such requirements for future years cannot subsequently be reduced.

SENER will also establish criteria for the issuance of such certificates to generators that produce electrical energy from renewable sources or clean technologies. But it will be the CRE that grants these CEC´s and verifies compliance with such obligations.

For the self-supply participants would be interesting the change to he new

electric system, and to the clean energies, as they will start being "generator" and will sell all its energy to the market. The consumers (the 2nd part of the contract) will take part of the market as Qualified users or using a Supplier of Qualified Services. They will be able to sign contracts of difference outside the Wholesale Market, so they will maintain its previous contracts. Other reason, if they start producing clean energies, they would be able to sell 95% of its CELS and the price received will be the price of the last central considered in the despatched. And other one, the participants will be able to sell all its capacity to the market as now the energy is for the general use.

Finally, one goal of the national policy is to increase clean energy production and diversification in the energy mix to 25 % in 2018, 35% in 2024 , 40% in 2035 and 50 % in 2050.

4.1.9 *MACEX POWER Strategy in 2013-2016*

In this 2nd period, the normal situation for MP is to continue equal as in 2012 due to everything is taking form but anything has started yet. But is a period to be informed, to analyse all the possible changes that can affect us and how to deal with them. In this period, apart from the normal competence that we had before, we should add the new competence of the market.

It is the moment when the Basis of the market has been published, the new Law of Industrial Electricity, vertical integration has to disappear, CENACE has been created, etc. And MP must consider all this new information and analyse the possible consequences.

MP has 60 days, from the publication of the Law of the Electric Industry (LEI), to decide if they want to continue under the same principles of the Law of the Public Service and the Electric Energy or to benefit of the new LEI. In that case,

we have decided to continue under the same scheme as we do not know what is going to happen in the future and we are hedged with our IPP contract and our 7 clients.

Having taken this decision, MP will start being an External Legated Central. It will have to sign a Legated Interconnection agreement with an Intermediate Generator if they want to take part of the market but it will happen in the next chapter, although we start taking it under consideration.

MODULE 1

MP continue with the IPP contract with CFE as it is signed for 25 years so the normal thing is to continue without changes, apart than the aspects considered in the previous chapter that we must not forget: availability and efficiency.

MODULE 2

In the module 2, the top situation will be continuing as before, with the 7 clients, the backup of CFE and using this time to be ready for the new Wholesale market and the new way of working in the future.

Our company has had the chance to choose between the previous system or the new one and has decided to continue under the same regime.

Same chance has had our clients that could have thought about continue the contract with MP or to terminate it and start being supplied by CFE till the beginning of the market when they will have freedom to choose the supplier as they prefer.

Taking into account our experience, based on the events of Iberdrola companies, we think that clients would prefer to continue under the same

situation and to have an idea of their electric expenses rather than move to a new situation that they do not know how it is going to be. They have with us a contract for 6 years so they have time to decide whether choose or not.

One aspect to point out and that should be taking into consideration is that maybe our company would need a supplier company if they want to go to buy energy to the market.

So that, this is a moment to be informed, learn and meditate about our situation, our future, the competence and the alternatives. And our BEST OPTION is to continue in the same way as in the previous chapter and maintain our clients and our contracts.

5

5.1 - 3rd Period: 2016 – 2018

In this innovative period, the Mexican electric industry enters into the new system that has been prepared since 2013. The first step of the Short term Wholesale market starts in January 2016, the first Long Term tender took place in March 2016, at the end of 2016 will be the first Medium term Tender of Power and Energy, etc. We can see all the main events in detail in the next picture:

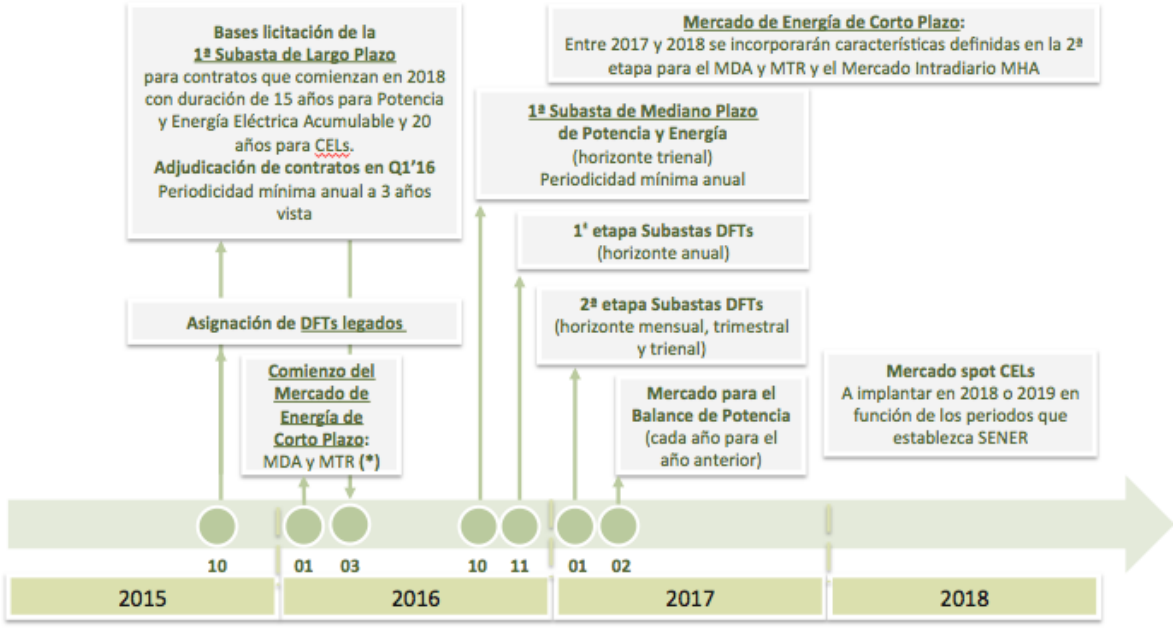

Image 18. Schedule of market implementation (IBERDROLA, 2015)

Under this situation, private companies enter into a profitable moment as they have the opportunity to compete with CFE and with other companies in:

- Generating electricity for sale in a competitive, open wholesale market or under long-term contracts with qualified users or suppliers and not only for sale to CFE or self-supply
- Entering into public-private partnerships with the federal government with respect to the generation of electrical power
- Acting as retailers of electricity service to large-scale end users, competing on equal terms with the marketing subsidiaries or affiliates of CFE
- Entering into contracts and joint ventures with the state (including with CFE's subsidiaries) for the construction, financing, operation and/or maintenance of transmission and distribution network infrastructure, as well as contracts to provide services relating to billing and collection, and relating to the operation of the wholesale electricity market.

So 2016-2018, it is a period to learn how is going to be this new system and to take advantage of the novelties that it can provide. It should be profitable for: private companies, for consumers as the electric tariff should decrease and for CFE. CFE should divide its structure and this should empower it thanks to the private investors, which are going to carry on projects that previously were done by CFE.

5.1.1 1st Stage of the short term market

The participants in the Wholesale Market are: generators, suppliers, traders, non supplier trader, users of basic supply (with total consumption lower than 3 MW), qualified users (with total consumption of more than 3 MW, 2 MW at the end of the 1st year and 1 MW at the end of the 2nd year). Transporters and distributors are not considered participants of the market. They will sign deals

with CENACE to determine its rights and obligations.

Generators, suppliers and qualified users may become direct participants in the Wholesale Electric Market by means of contracts with CENACE. To register, as Market Participant by the CRE, must have at least a demand of 5MW and an annual consumption 20GWh. Qualified users who do not meet these requirements should go to the market through a Qualified Service Supplier. Generators with power plants that are intended only for personal use, in case of emergencies or interruptions in the power supply, do not require permission from the CRE to participate in the market.

Each generator, which participates in the Wholesale Market, can set their own price for electricity generated based on operating costs. They will have to report to CENACE daily and it will maintain a database of the operating costs of all generators to determine whether prices offered are being competitive or not.

In the Wholesale Market enters: offers of the participants of buying and selling energy and ancillary services and imports/exports quantities. After matching all these products, CENACE determines which unit should run, in which quantity and at what price; determines too the ancillary services quantity and price to be produced and the imports and exports considered to perform. Prices determined are nodal, so they vary in function of the zone.

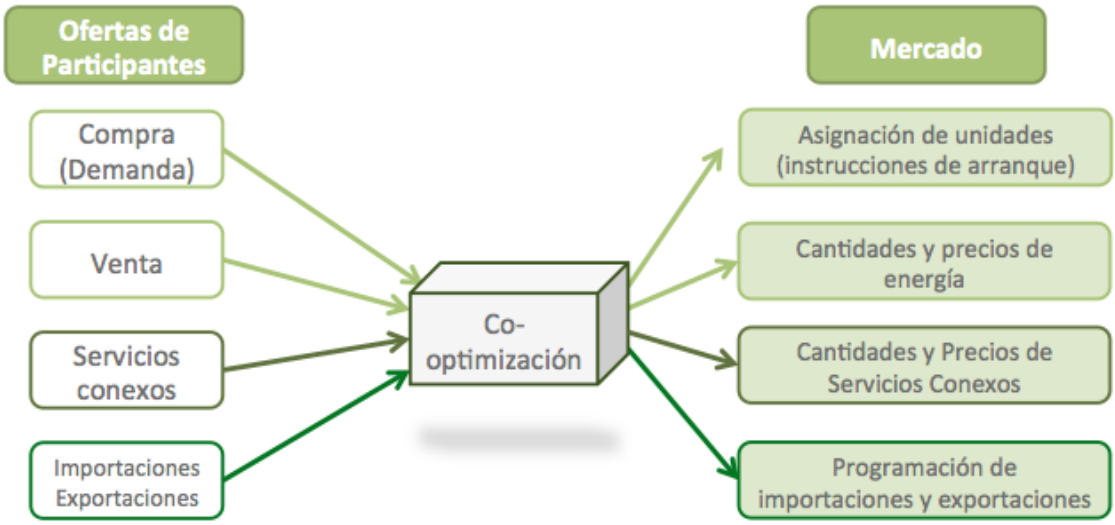

Image 19. 1st Stage of the Short Term Market (IBERDROLA, 2015)

Some characteristics of the Short Term Market:

- Joint optimization of energy cost and reserve obtaining a marginal price of energy per node, which includes 3 components: energy, congestion and losses, and a marginal reserve price by area.
- The economic dispatch search to balance supply and demand in each node while meeting the reserve requirements.
- This Short Term Market consists initially of 2 markets of buy/sell energy and ancillary services:

  - Day-Ahead Market Day (MDA): hourly periods. Closes at 10:00 am.

  - Real Time Market (MTR): periods each 15min. every hour for the next 8 runs periods.
- It is complemented by:

  - Allocation of power plants in extended horizon. Plants for safety or weekly economic dispatch must be assigned before the MDA the next 7 days

  - Assignment of power plant for reliability (AUGC): to produce a feasible solution of the economic dispatch. CENACE forecast the demand not considering virtual offerings and the result is produced after MDA. (AUGC-S after MDA in 2018)

- Price cap: the higher cost of the power plant.

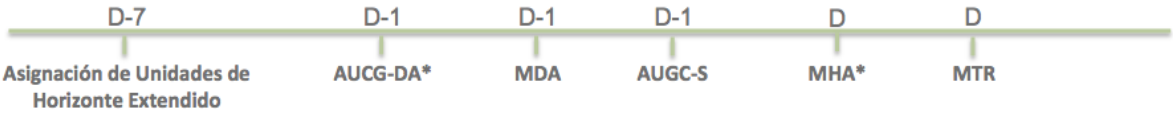

Image 20. Schedule of the Short Term Market (IBERDROLA, 2015)

Now, we are going to introduce some characteristics related with the selling offers:

- Each central must submit bids based in start-up costs, incremental energy and dry running. When the offers are not valid, CENACE will use offers by default.
- There is a record of cost benchmarks, which can be indexed to fuel components, reflecting only variable costs. CENACE calcule the reference price for each plant based on these parameters.
- The Market Surveillance Authority set floors and caps in the offers of purchase and sale. Negative bids are allowed till the floor limit.
- Selling offers are based in fuel-based units and the reference price will be the variable operating costs plus the product of the heat rate curve of the unit per the reference prices of fuel determined by the Market Surveillance Authority. The fuel price could be based on price indexes or prices according to contractual terms of fuel supply.
- Limited energy resources: they are generation or controllable demand with an operation restricted by some parameter. Its operation requires an optimisation of the scarce resource. This happens in hydropower plants with reservoir and in thermal plants with limits of emission or limits of fuel availability. They must submit bids equal to the opportunity cost to be calculated by CENACE
- External legated central: The Market Surveillance Authority will establish

parameters based on their contractual reference costs.

- Legated Interconnection agreements: The intermediate generator will offer to CENACE fixed energy program.

And now some characteristics regarded the buying offers:

- In this 1st Stage the demand will be price takers while in the 2nd Stage deals will be price sensitive.
- Location, area or node must be specified.
- They only will present bids on MDA, not in MTR. The differences between MDA and the assignments in real demand will be settled at the price of MTR

Other kind of deals will be the import/export offers presented in the MDA and the bilateral contracts of energy and ancillary services, which can be informed or not to CENACE. If they are informed, the financial risks are lower as there is a Bilateral Financial Transaction.

As mentioned before, this market offers energy and ancillary services. There are 2 types of ancillary services:

- Ancillary services which price is included in the market prices as: secondary regulation reserve, spinning reserve (activation in 10 min), operating reserve and supplementary reserves (activated in 30 min). The marginal prices are the opportunity cost of not producing or the cost for available reserve.
- Ancillary services are not included in the market like: reactive reserve, reactive power, emergency start, island operation and connexion at death bus and their prices are regulated and determined by CRE.

In the process of offering ancillary services, the generators offer a bid price of availability per MWh that reflects their estimated costs of operation,

maintenance and supply of fuel for each type of reserves. On the other side, CENACE makes the offers using curves of demand of reserve. The curves will be the same for MDA and MTR. They will be charged to Qualified Suppliers and Qualified and Basic Users in proportion to the energy consumed by their load centres.

Transmission and distribution are not participant members of the market but CENACE must consider them in order to maintain the reliability of the electricity grid. CENACE plans and controls the operation of the power grid in coordination with transporters and distributors. Transporters should: guaranty the reliable functioning of the National Transmission Network, ensure the emergency systems, control and monitor the net, report and obey CENACE. Similar functions for the distributors. CENACE must sign contracts with transporters and distributor to achieve these objectives.

5.1.2 Long Term markets

The Wholesale market is based on the variable cost of the generation plants so to recover the fix costs of the plants are necessary the Long Term Markets. There are LT Markets of CEC´s and Power. Depending on the type of technology used to generate electricity, the generators are subject to provide power or CEC´s, which can be sold on the market. Similarly, electricity consumers, or their representatives participating in the Wholesale Market, are forced to buy power and CEC´s proportionally to their consumption. Supply and demand are both instruments, which can be exchanged through contracts or in specific markets for each product.

5.1.2.1 Power market balance (PMB)

The electricity market has a market for the power balance to ensure the installation of sufficient capacity to meet the requirements established by CRE. Power refers to an associate product that generators can offer for sale, through which acquire the obligation to ensure the availability of energy production to be offered Short Term Market. The amount of power available for each generator depends on the type of technology, depending on whether it is firm or interruptible, and the plant capacity of the power plant.

Qualified Users and Qualified and Basic Suppliers are required to purchase an amount of power, which is determined by the CRE. Power can be purchased at auctions of medium and long term, contracts or market power balance.

The PMB has 2 objectives:

- Facilitate transactions between the Responsible Entities of Charge (ERC) (suppliers, qualified users and intermediary generators) whose contracts of Contracts of Electric Coverage were insufficient to meet the requirements of power established by the CRE, and market participants who have not committed power in such contracts.
- Establish a power demand curve in excess of the minimum requirements established by CRE, and buy the portion of the available power on behalf of the ERC to promote the efficient operation of the Wholesale Market.

CENACE calculates the gross power obligation of each ERC based on the observed demand and minimum power required by CRE. The availability will be calculated considering the 100 critical hours of the System or Power zone. The critical hours will be the ones with maximum power in 2016-2017 and the minimum reserves from 2018.

CENACE calculates the net obligation of power for each ERC (gross obligation of the ERC less power acquired) and generators (missing power) to construct the mandatory demand curve. CENACE build a demand curve into two segments: mandatory demand and efficient demand.

Regarding the offer of power, it is based on the delivered capacity in the previous year, CENACE calculate the amount of gross supply power for each generator and the net supply of power (vertical line) for each generator that is the gross supply offer minus the power in bilateral transactions.

Here we can see how this market balances works to determine the price of the power:

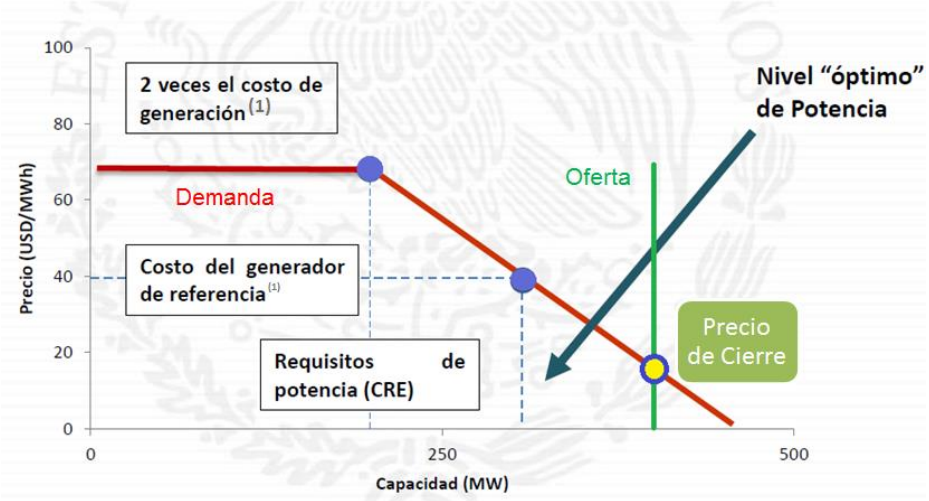

Image 21. Power Market Balance (IBERDROLA, 2015)

When there is a specific need for local generation, power zones are defined and the generator charges would be the highest closing price between zone and system. So, CRE can set a % of its power requirement to be satisfied with zone power and the generator receives its power at a maximum price between closing price zone and closing price system.

The closing of the market will take place two months after the end of each year, when annual data of demand, generation and availability are confirmed. The closing price auction is adjusted based on the income earned in the market by a reference technology, CENACE determines the variable costs of the reference technology and, from this, it calculates the income (positive net margin) in the market for the generator of reference.

The Power Market Balance will start in February 2017.

5.1.2.2 Middle and Long term tenders

Investment decisions of power generation assets require a rigorous analysis and projection of electricity prices in the long term (5 to 20 years). Obviously, the evolution of the prices depends on how progress the regulation, the economic activity and the international fuel markets. The objective of the Long Term Markets is to reduce the exposure to those variances, closing prices years or months before in order to know and control the expenses and design a strategy according to this.

The participant of the tenders will be similar for the Medium and Long term tenders. In the consumers' side, we have 4 ERC but till now only the Suppliers of Basic Services can participate (until the introduction of instructions for the other 3 in the Manual Market). These 4 ERC`s are:

- Supplier of Basic Services
- Supplier of Qualified Services
- Supplier of Last Resort
- Qualified user who takes place in the market.

The generators represent the offers. Virtual position to sell energy is only

allowed in the MT Tender.

Depending of the activity in each zone there will be more participation over one tender rather than the other as in load zones there is more participation in MT Tender, in generation zones in LT Tender and in the Power zones both are equivalents.

LONG TERM TENDER

Long term tenders offer Power, CEC's and Storage Energy (energy accumulated in a year) and its objective is to promote competitiveness and price stability in the purchase of Power and CEC's by the Suppliers of Basic Services. With this, they want to ensure a stable source of payments to support the financing required to develop new and efficient power plants and keep the existing ones. Generators depend strongly of the cost of fuel (gas natural, fuel oil , diesel , coal, etc.) in their investments and that is why they are interested in selling energy in the auction without taking a huge risk. The auction is designed especially for renewable energy plants, which the cost of fuel is practically zero and generates CEC's. So, in this auction there will be renewable generators, offering energy and CELS but rarely power, and the rest of generators will offer power.

This kind of tenders must be done years before in order to build new power plants.

The validity of the contracts will be 15 years for Power an Energy and 20 years for CEC`s and the participation in the tender should be 3 years before the construction.

Image 22. Year of validity of the LT Tender (IBERDROLA, 2015)

Price is formed with a Pay-as-bid system and could be considerate an iterative process of decreased prices.

In the Tender, the ERC presents its offers considering its necessities in:

- Power: Demand a quantity (MW/year in 15 years) and at a maximum price.
- Storage Energy: Demanding max. quantity (MWh/Year for 15 years) and at a maximum price.
- CEC's: They ask for the quantity of CEC's (CEC's/Year for 20 years) at a max. price.

Meanwhile, generators' offer is a package with a fix price that includes:

- Fix quantity of Power per each zone of Power and for each year of the 15 years of the offer
- Fix quantity of electric storage energy in each generation zone for each year of the 15 years of the contract
- Fix quantity of CEC's for each year of the 20 years considered.

The result of the auction is determined under an iterative process based on economic optimisation with geographic adjustments to empower the construction of plants in isolated areas, which will receive higher prices for its

production.

The Suppliers of Basic Users will determine its quantities according to the CRE requirements and the Coverage Contracts already signed and CRE can fix maximum prices for each product of the tender. The rest of the ERC will present quantities that will be a % of the one presented by the Suppliers to Basic Users and the similar prices than theirs.

The 1st Long Term Tender took place in March 2016 and the unique buyer agent was CFE as supplier of basic users. The selling of Power was null, because too low prices, and the selling of energy and CEC's was essentially profitable for photovoltaic central. The result is 468 deals to prequalify, 11 companies with 16 plants and 18 deals won. This implies 3.8% of the bids submitted, which gives an idea of the competitiveness of the process. The winners are presented in the next picture:

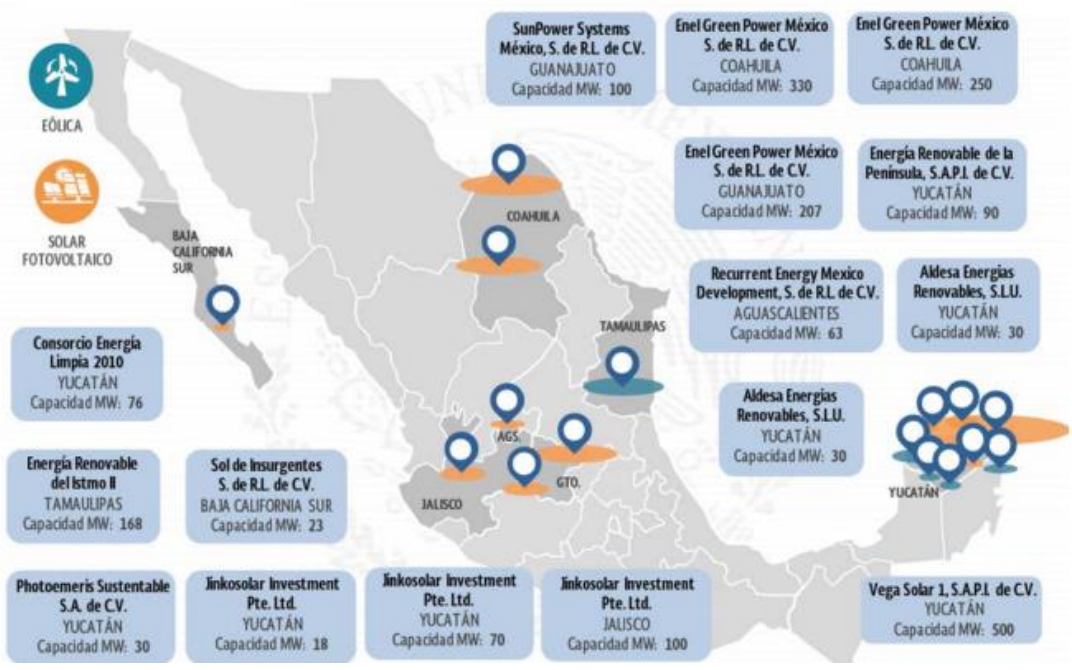

Image 23. Result of the 1st LT Tender (CUADERNOS DE ENERGÍA , 2016)

MEDIUM TERM TENDER

The offer in these tenders is based in energy and Power. Energy is defined in "Time blocks" presenting blocks of base, medium and peak loads.

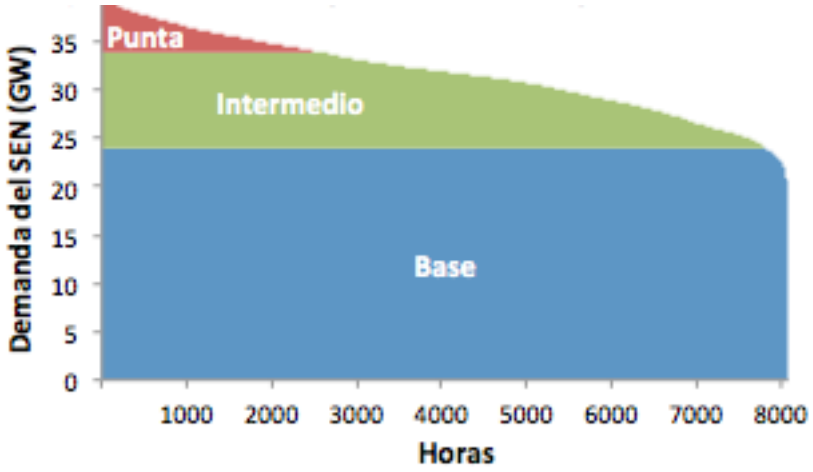

Image 24. Time blocks in the MT Tender (IBERDROLA, 2015)

The objective is to purchase in advance Power and electricity for the basic supply, to reduce or eliminate their exposure to commodity prices variations in the short term. Other Responsible Entities of charge (ERC) may participate in these auctions for other purposes. Terms cannot be very longer as in this case the price should depend on commodities curves and it would generate an evaluation problem.

The validity of the contracts is for 3 years and the participation in the tender should be 4 months before.

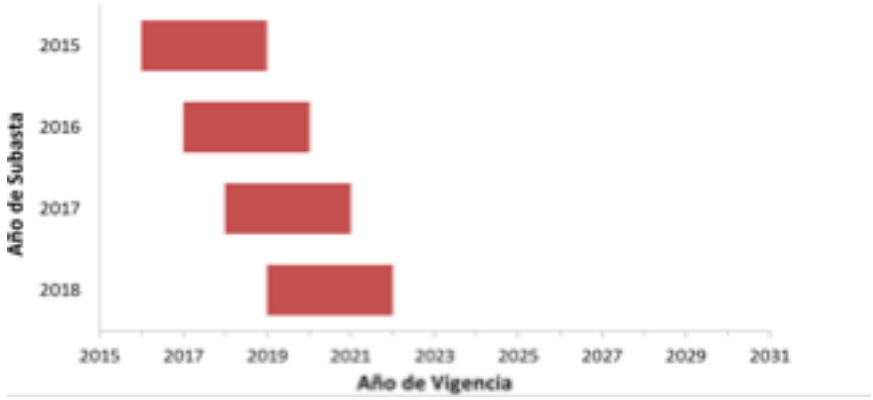

Image 25. Year of validity of the MT Tender (IBERDROLA, 2015)

Price is considered as marginal price.

The ERC's offers includes for:

- A curve of offer of price – quantity of Power
- A % of each load block at a max. price

On the other side, generator includes in its offer:

- MW at a fix price
- A % of each load block at a fix price

The Suppliers of Basic Users will determine its quantities according to the CRE requirements and the Coverage Contracts already signed and CRE can fix maximum prices for each product of the tender. The rest of the ERC will be able to demand the quantity and the price that they prefer.

The 1st Medium Term Tender will take place in October 2016.

5.1.2.3 Financial Transmission Rights Market (DFT's)

Financial Transmission Rights are price hedging on different nodes of the

system, forcing and giving to their holders the right to pay or collect the price difference that results in the origin and destination of the electricity node. These rights do not grant the right to use physical transmission network. DFT's are expressed in marginal prices per unit of energy.

Financial transmission rights are financial instruments that provide compensation for the costs that market participants can incur in the spot market when there is congestion in the transmission network. In order to reduce such congestion, power from generators in low-price areas is dispatched to high-price areas. As a result, generators in the low-price area are paid less through the wholesale market than the amount collected from purchasers in the high-price area, and end users in the high-price area likewise are paid more than the price in effect at the low-price area. Financial transmission rights give the holder thereof the right to receive the amount of such price difference in the Marginal Congestion Components (MCC) between two nodes.

Financial transmission rights will be sold and traded among market participants and will have a validity equivalent to the higher period among the contract of interconnection and the life of the corresponding power station.

This tender will be instituted in 2 stages: 1st phase where annual products will be sold and a 2nd phase that there will be sold three-year (75 % of total capacity), seasonal, monthly and balance of the year products.

The purchase offers will contain a list of prices according the quantity of DFT´s between nodes. To make the allocation, it will be used a net model similar to the one use in the despatch. The idea is to maximise the social wellness with feasible offers. In order to achieve this, the participants of the market will have to pay for the network projects not included in the Expansion and Modernisation Program. The objective of these projects is to improve the

interconnectivity and the delivery.

Besides the market, the participants will be able to sign bilateral contracts without the CENACE intervention.

5.1.3 MACEX POWER Strategy in 2016-2018

In 2016, the market starts and all the considerations taking into account in the previous period is the moment to put in practice. The idea of the company is to continue with the same strategy as before but it will be adapted to the changes of the moment.

MODULE 1

The module 1 continue under the same system with the IPP contract for 25 years what provides to the company a fix amount of money and an stable situation.

MODULE 2

In the initial situation, MP provides energy to the 7 clients that we have under the Reference CFE contract, with the same conditions as before and with the backup of CFE.

MP had decided to continue as a legated external central and maintain all the conditions that it had in the previous period but it can change according to the new events.

The beginning of the market implies that clients can compare between the

Reference CFE tariff and the market price and it can provoke 2 reactions in the clients:

- Clients remain with MP as they prefer the security of a known system, with regulated prices rather than the fear to the unknown.
- Clients prefer to finalise the contract and to go to the market to buy its consume. If the client is a company and have more than 3MW of consume they will can go directly to the market as a qualified user and if not they will contract a supplier that will act as intermediary in the market.

  To finalise the contract, clients have to take into consideration the cancellation clause of the contract. According to this, the client will have to pay 240000-120000 $/MW to MP approximately.

  Other aspect to consider is the cost of transporting the energy. Actually clients are paying the portage and if they decide to go out of the market they will have to pay the network tolling that should be higher.

On the other side, MP can compare the tariff too and decide:

- If the market price is higher than reference CFE tariff, the company can prefer to sell its energy to the market considering a generator of intermediation. In spite of the tariff, to keep its safety situation, MP could prefer not to go to the market and continue with the 7 clients.

  MP have to take into account the cancellation clause of the contract with its clients that could be 40000-20000 $/MW.

- If the market price is lower, MP could prefer to maintain its clients and ensure the situation.

Nowadays, reference CFE tariff is expecting a change. Actually, this is an

integral tariff that combines the CFE costs and the variation of the commodities and the inflation. This tariff is expecting to change to an additive tariff that should be lower and it integrates the market price. So, MP has to take a decision but it is difficult to compare tariffs when the actual one could change in any moment.

In order to provide all the alternatives, in our supposed we have decided that 3 out of 7 clients decide to cancel the contract and to go to the market to buy its consumption. With this situation, what can MP do with its extra capacity?

1- Look for new clients offering them competitive discounts and a stability that may not have buying the electricity in the market.
2- Sell the extra-capacity to CFE as a surplus of energy receiving the 85% of the CTCP as tariff. Depending of the moment the CTCP tariff could be higher than the reference CFE tariff and in this case it would be profitable for our company. Till now it has been the CTCP, but it is not clear if it going to continue like that or it is going to change., this is transitory.
3- Sell the extra-capacity to the market using a generator of intermediation (CFE) and receiving the market price that could be higher or lower depending on the moment.

So these decisions should be taken in the moment and it is necessary to make a provision of the evolution of the tariffs.

MP must study other aspects in this period:

- If the company wants to go to the market and take advantage of all its possibilities, it would be profitable that MP creates a MP Supplier. It would be able to sell energy, by means of a generator of intermediation, buy it through the supplier and sell it to the clients.
- In 2016 took place the 1st LT Tender with the objective to hedge the risk of energy, power and CEC´s and help for the investment of new plants. In

2018, MP will have to acquire CEC´s to follow the clean energies principles . So, maybe it would be a good option to take part of the LT tenders and think about the construction of a renewable plant. This plant could be paid 50% with the amount received in the tender which production will be to CFE and 50% on their own. With this attitude MP will face the % needed of CEC´s due to its consumption and the rest will be to CFE.

After analysing these possible hypothesis, and considering the experience provided by the study of the behaviour of the clients once the market has started, the option that avoid the risk is to maintain everything as usual and seems that it is going to happen. Till now there are not mechanisms in the market to mitigate the risk and clients prefer to stay safe rather than innovate. Nowadays, they are not worried about the market.

But the option that would be very interesting for my company is the diversification. IPP contract, reference CFE contracts and some capacity sell in the market would be a perfect combination that will show us how we will have to deal with a completely liberalised market in 2018. And on the other side, the construction of a renewable plant will open the path for the acquisition of CEC´s of 2018 or 2019.

6

6.1- 4th Period: 2018 - …

2018 is the year in which the market should be completely liberalized and when every step of the process of implantation should be running. Companies can chose if they prefer to continue under the same conditions of the previous law (Law of the Public Service and the Electric Energy) or to move to the new law (Law of electric industry) with a competitive wholesale market, long and medium term tenders, systems to hedge the risk, options to invest in new plants, etc. One thing to point out, at the end of the legated contracts, companies will have to change to the new situation but they can do it when they want.

In this period, everything should be done but continue existing some points to deal with like the conclusion of all the planned measures of the Wholesale Market, included in the Manual of the Wholesale Market, or the beginning of the CEC's market. Regarding organizations or regulation, everything continues following the path as in the previous period. So changes in this period are only tinny things to close the circle of the Electric Reform.

6.1.1 2nd Stage of the short term market

The short term market started in January 2016 but some of its elements should start working in 2018. Everything continues in the same situation as I have explained before it is necessary to add some more items to be considered from now on. The main ones:

- Assignment of power plant for reliability (AUGC): It is the allocation process made by CENACE to ensure that the electric power and the adequate reserves are available to maintain the reliability in the operation of the National Electrical System in real time. This is done by the assigning of units for the reliability. In the 1st stage, only AUGC-S was assigned after the MDA, while in 2018, AUGD-DA starts so that the allocation will be done before the MDA too.

- One hour ahead Market (MHA): In the 1st Stage of the Short Term Market there were the MDA and the MTR. In 2018, it will start operating a market where bids for buying and selling energy will be presented with one hour in advance. Also in this market, there will be ancillary services in addition to power and energy.

- In the 1st Stage of the ST Market the top price was the higher variable cost of an electric plant. In this 2nd Stage there will not be ceiling price and the prices will be a function of the penalty to operate with a level of reserves close to the minimum required.

- In the ST Market, the purchase offers were price taker while in the 2nd Stage, the market participants may express its intention to buy energy at specific prices but submitting the offers to conditions: the max. price willing to pay for MW , time of the offer, location, etc.

- In the 2nd Stage, virtual transactions appear in the market as financial elements. Prior to the start of operations of virtual transactions, validation is required by the Market Surveillance Unit, to confirm that these instruments are compatible with the efficient operation of the Wholesale market. It is generally used by market participants to hedge against changes in the local marginal price between MDA and MTR. There are two types of virtual transactions: virtual offering and virtual buyer.

  Virtual transactions have a price to which market participants intend to sell or buy energy on the MDA. The position taken in the MDA is settled in the MTR. Virtual Transactions are financial because they do not require physical removal or injection of energy.

- Transactions of Import and Export. In the market for first stage only they were accepted Import and Export Transactions for energy product, fixed schedule type in the MDA. In the 2nd Stage, in the market may be accepted transactions of import and export of energy, reserves (rolling reserves and operating reserves), fix (fix amount of MW/hour) and dispatched (MW/hour dispatched by CENACE in MHA)

- Offers of resources of Controllable Demand: This kind of resources has the ability to respond to instructions to reduce load, end users or their representatives offer being reduced at a certain time by CENACE in order to maintain the reliability of the National Electric System and to meet the requirements of power. They may only bid in the secondary market stage. Telemetry systems must indicate the amount of charge consumed by each resource in real time.

- The prices of the ancillary services are calculated in the MDA and in the MTR. In the 2nd Stage, the reserves of the Secundary regulation will be divided into 2 products: up and down

- Plant Units that were assigned in the MDA may be instructed to cancel such assignments in the Assignment units for Power Plant Reliability.

- It will allow price offers in MTR vary from the MDA

- CENACE will send weekly bills.

6.1.2 CEC´s Market

A CEC is a title that accredits the production of clean electricity and it will enter into operation in 2018 or 2019, depending on SENER.

In the new regulatory framework each MW generated with clean energy receives a Certificate of Clean Energy (CEC), regardless of the technology that was generated, to sell on the market. We should take into account that in the case of clean technologies that use fossil fuels, CEC only will be granted by the % of energy generated without fuel and this % will be determined by the CRE for each type of technology. Similarly, in the case of clean distributed generation, CEC will be granted only by the proportion of energy delivered.

The market participants which has to buy CEC's are:

- Suppliers of Basic Services (including CFE)
- Suppliers of Qualified Service (including CFE)
- Qualified Users directly involved in the Wholesale Market
- End users supplied by isolated self-supply to cover personal necessities
- Holders with Legacies Interconnection Contracts that include load centres or loading points whose power does not come entirely from a clean power plant.

The acquisition of CEC´s should be equivalent to 5% of the total electrical energy consumed at all load centres. During the first quarter of each year,

SENER will establish the requirements for acquisition of CEC´s that will be applicable for the following three years, and such requirements for future years cannot subsequently be reduced. Those who do not comply with the obligation to purchase CEC's will have to pay a fine and will continue to have the obligation to buy the CEC's that were not settled on time.

CEC's are market instruments and market participants may submit offers to sell CEC's at any price or to buy CEC´s at any price. So, its price is not fixed but depends on supply and demand. This system generates a supply and demand of CEC's while buying and selling can be done through: the market CEC (organized at least once a year by CENACE), bilateral contracts or long-term auctions. The purchase of CEC's may be deferred up to 25 % of its obligations for each period, up to two years. The deferred portion will increase by 5% each year until settlement. It should be notified to CRE.

CEC will be granted within the System of Management of Certificates and Compliance of Obligations of Clean Energy that is a platform through which carried out the management and recording of information associated with the consumption and generation of electricity, issuance, transactions, liquidation and voluntary cancellation of the CEC. System participants must be registered within it to be subject to receive the CEC or to liquidate or cancel their obligations. The process to achieve the CEC's is represented in the next picture:

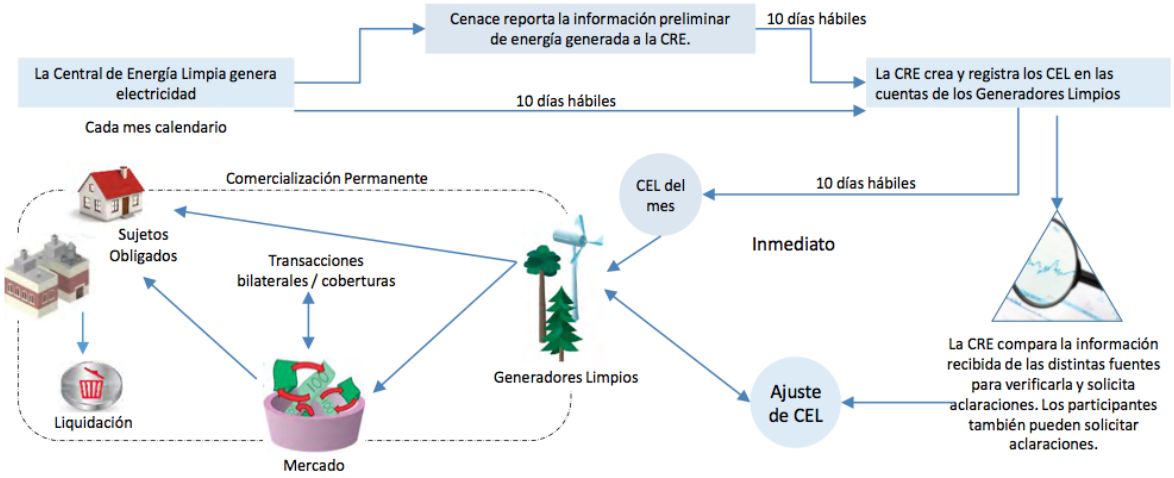

Image 26. Process to provide CEC's to the clean producers (CRE)

And the process to calculate the obligations and liquidations of CEC's of the participants is:

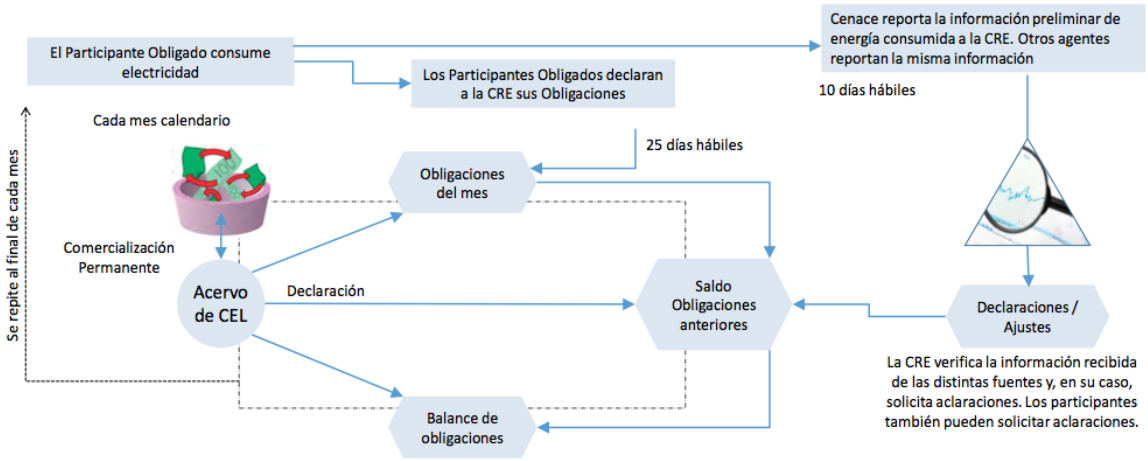

Image 27. Process to calculi the obligations of CEC's (CRE)

Seeing this, the function of the organisations according with this is:

- CRE: Accreditation of the CEC's awarded to each generator and determine the obligations of each ERC
- Participant of the market: Bid for buying and selling in the market and hold bilateral transactions
- CENACE: Calculate the market price based on the offers made by the participants and notify the CRE transferences accorded.

The generation systems under legated contracts have other incentives to generate from clean sources so they continue to receive those other products. To receive CEC's, it is necessary to emigrate to the new regulatory scheme. If they increase its capacity of generation, this new capacity would be under the new scheme and they will receive CEC's in case they produce with clean technologies.

6.1.3 MACEX POWER Strategy in 2018-…

Finally in 2018, the market is completely mature, liberalised, with long/medium term tenders that helps to hedge the prices, the CFE reference tariff will be similar to the market price as it is supposed that the alternative tariff will be used in that time. With this situation the strategy of MP should be:

MODULE 1

The module 1 continue under the same system with the IPP contract for 25 years what provides to the company a fix amount of money and an stable situation. This picture should last till 2037 if anything bad happens before.

MODULE 2

In 2018, the 6 year contract under Reference CFE finish and MP will stop being an external legated company to start being under the Law of Electric Industry. Till this moment it will have to go to the market to sell and buy electricity.

One option is that the same clients, whom we had before, want to continue

with us and they would sign contracts for differences. MP will have to go to the market to inform CENACE about its activity but its activity will be secured.

At the same time, MP can find new clients and increase its business portfolio. Clients will be more informed about the market and they will be able to choose between the insecurity of the market or fix conditions as they would have signing contracts with the generators or the suppliers.

If MP has decided to create MP Supplier, it is the moment to get use of it and buy the necessary energy to supply to our clients.

Other aspect to consider, if we have decided to build a new renewable plant, MP will use the CEC´s to cover its requirements and the surplus could be sent to other participants in the CEC´s market and at the same time the surplus of energy could be sent in the Wholesale market.

The best option for our company in this moment is to keep the profitability with the IPP contract and to sign long term contracts with clients, the same as before or others, to minimise the risk. Furthermore, the supplier will help to increase our action ratio and to diversify our business. And the same happens with the construction of a renewable plant, it will solve the procurement of CEC´s for our company and even it will allow us to negotiate with them.

So, to conclude, this is the period in which the preparation of all these years must finish and we must continue working under the new rules. In this period, all the planned steps proposed in the Energetic Reform should be running and our company, after a previous period of preparation, should be ready to compete in this completely liberalised market.

CONCLUSION

The Energetic Reform has provoked a deep change in the electric industry, moving from a centralised and vertical integrated system to a horizontal organisation, with new organisms and a new wholesale market that allows the participation of all generators and consumers. With this new system, the State wanted to increase the private investment to improve the Mexican electric system and to renew the mix of production of the country. These objectives, among others, have been achieved, being demonstrated in the 1st Long Term Tender whit a participation very elevated and all the winners have been wind farms and photovoltaic projects. Seeing this, the incentives proposed by the State to increase the investment in clean technologies are working.

What is clear is that we are in a changeable moment in the Mexican industry and it can provide lots of benefits for the investors. With the previous system everything was regulated and there was no risk and with this new system, companies should demonstrate its competitiveness and being more efficient in order to compete with the new centrals of the country. CFE, that with the previous system was the centre, in this new paradigm will be competing with the rest of the companies but maintaining its public character and being a productive enterprise of the State.

With such quantity of changes, there are a lot of new information, laws, regulations, decision taking into account, etc. All they need time to start running correctly and all the processes need more transparency and explanations of the results to help to understand what is succeeding to the participants. Some of the information was written quickly at the beginning of the process and some of them should be review and adapt.

Nowadays, the running of a company, installed before the Reform, has not changed a lot, unless the company has decided to take part of the market. The normal situation is to continue with its normal activity but analysing and studying the new system and the possible consequences and advantages that it can have in the company. In 2016, generators and clients go to the market to learn how to operate on it, rather than considering that it is the best option, because in 2018 the market will be completely liberalised and companies will need to know how to move on it. Mexico has design a complicated electric system and it will take time to have everything in its place. Meanwhile, companies should train their workers and prepare the tools and mechanism to deal with the new items.

It is risky to say if it has been or not a correct decision, everything has advantages and disadvantages, but it is true that this system is closer to the reforms done in other countries before as Spain, Chile, UK, etc.in order to modernise and improve the electric system. Step by step the investment will be noticed and there will be more efficient plants, more clean energy sources, more competitiveness and better processes. It will help to decrease the tariff of the light that is the main objective off the consumers and to improve the Mexican electric system, which is the general objective of all the participants of the market.

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