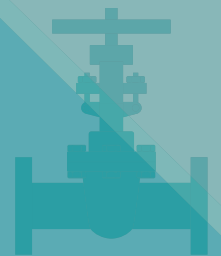




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Mexico Energy Reform

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Introduction and Background

In 2013, Mexico embarked on an ambitious reform of its energy industry. For nearly 80 years – since Mexico nationalized its oil industry in 1938 – the energy sector had been a nearly exclusive preserve of the Mexican state. Mexico’s state owned oil-company, Petróleos Mexicano (“PEMEX”), maintained a monopoly over hydrocarbon exploration, production, refining, and sale, while the state-owned Federal Electricity Commission (“CFE”) handled electricity generation and transmission (with limited avenues available for private sector contracting in the downstream gas sector since 1995).¹ The grip of the Mexican state on the energy industry was so tight that its exclusive right to own, produce, and sell hydrocarbons had been enshrined in the Mexican constitution since 1938.²

By 2013, Mexico’s position as a top global producer of oil had begun to falter under the weight of weak investment and declining natural production. Despite total domestic energy demand growing by a quarter since 2000, and electricity consumption increasing by half, production slackened.³ Since 2004 Mexico’s oil production has fallen by 1 million barrels per day (“mb/d”) from 3.4 mb/d to 2.5 mb/d.⁴ Natural gas production peaked in 2010 at 5.1 billion cubic feet per day (“bcf/d”) and was estimated to decline to 3.2 bcf/d in 2017, against a total demand of 8.0 bcf/d.⁵ Refinery capacity likewise remained low, with Mexico exporting crude to foreign refineries, largely in the U.S, and then reimporting many refined products. Growing demand and declining production saw Mexico, one of the world’s largest energy producers, become increasingly dependent on imported gas and refined petroleum products.⁶

To reverse this trend, the Mexican energy industry desperately needed an influx of investment and technology to explore and develop new fields. In 2013, President Enrique Peña Nieto set out to make this a reality. On December 11, 2013 Mr. Peña Nieto published a proposed constitutional amendment that, while preserving

¹ OECD (2017), Driving Performance of Mexico’s Energy Regulators, The Governance of Regulators, OECD Publishing, Paris. <http://dx.doi.org/10.1787/9789264267848-en>, page 51

² OECD (2017), Driving Performance of Mexico’s Energy Regulators, The Governance of Regulators, OECD Publishing, Paris. <http://dx.doi.org/10.1787/9789264267848-en>, page 50

³ OECD (2017), Driving Performance of Mexico’s Energy Regulators, The Governance of Regulators, OECD Publishing, Paris. <http://dx.doi.org/10.1787/9789264267848-en>, page 51

⁴ Ibid; Mexico’s Energy Reform Makes Progress, but Challenges Remain: Executives, Platts (Oct. 4, 2017).

⁵ Mexico’s Energy Reform Makes Progress, but Challenges Remain: Executives, Platts (Oct. 4, 2017).

⁶ OECD (2017), Driving Performance of Mexico’s Energy Regulators, The Governance of Regulators, OECD Publishing, Paris. <http://dx.doi.org/10.1787/9789264267848-en>, page 50-52

the Mexican state's ownership of hydrocarbon resources in the ground, greatly opened up Mexico to private sector participation in every level of the hydrocarbon industry from exploration to production, refinement, and sale.⁷ By December 18, 2013, Pena Nieto secured the necessary approval from a majority of Mexican states, and on December 20, he signed the constitutional amendment into law.⁸

With breathtaking speed and skill, Pena Nieto followed the constitutional amendment with a package of 21 federal laws and 24 secondary laws to achieve a transformation of the energy sector and establish a rigorous institutional and regulatory framework.⁹ By the passage into law of a final set of reforms in August 2014, Mexico had effectively opened the oil and gas market (other than gas transmission) to private foreign and local investors for the first time since 1938. PEMEX would continue as a state-owned company, but was now oriented to compete against private entities. In a country where the oil industry accounted for 30% of government revenue and 11% of export earnings in 2014 and constituted 8% of GDP in 2013, the amendment amounted to one of the most significant economic reforms of the last several decades.¹⁰

By 2017, Mexico had begun to bear the first fruit of its reforms. On July 22, 2017, a consortium led by U.S.-based Talos Energy announced the discovery of one of the largest shallow water fields in the last 20 years. Fittingly, this find came from the first exploratory well drilled by a company other than PEMEX since the reforms. On the same day, the Italian major Eni also struck oil. Combined, the two finds are estimated to hold as much as 3.3 billion barrels of oil equivalent.¹¹ The U.S. International Energy Agency ("IEA") estimates that oil production will reach an inflection point in 2020 and again begin growing. By 2040 production is projected to rise to 3.4 mb/d by 2040, up almost 1 mb/d, and equal to Mexico's 2004 production levels.¹²

⁷ <http://reformas.gob.mx/en/>

⁸ Ibid

⁹ OECD (2017), Driving Performance of Mexico's Energy Regulators, The Governance of Regulators, OECD Publishing, Paris. <http://dx.doi.org/10.1787/9789264267848-en>, page 52

¹⁰ OECD (2017), Driving Performance of Mexico's Energy Regulators, The Governance of Regulators, OECD Publishing, Paris. <http://dx.doi.org/10.1787/9789264267848-en>, page 50

¹¹ Naki Mendoza, Mexico's Energy Reforms: Bearing Fruit at Last, Financial Times (Aug. 16, 2017).

¹² International Energy Agency, Mexico Energy Outlook (2016).

Energy Reform and Institutions

Before the 2013-2014 reforms, two state-owned companies were responsible for all activities at every level of Mexico's hydrocarbon value chain. PEMEX held exclusive responsibility for the exploration, production, transportation, refinement, and retail sale of hydrocarbons. CFE controlled the supply and sale of electricity and clean energy. Accordingly, the state bore all risks and conducted all investments. Prior to the reforms, there was essentially no private investment in Mexico's hydrocarbon industry.¹³

Post reform, private investment is permitted – and encouraged – throughout the value chains of the hydrocarbon, electricity, and clean energy industries. According to the director of investment relations for Mexico's Secretaría de Energía ("SENER") Nicole David Palau: "Clear rules and competition are the goal of the reform and there was a huge emphasis on research and talent development."¹⁴

Critical to the success of Mexico's reform was the creation of a series of new institutions to regulate and manage the industry, and the expansion, clarification, or strengthening of the roles of existing agencies. Previously, overall energy policy fell under the purview of SENER, while the National Hydrocarbon's Commission ("CNH") and CRE regulated gas and electricity. In some cases, states assumed regulatory roles and in various areas PEMEX even regulated itself.¹⁵ While post-reform, SENER retains responsibility for setting high level energy policy, the reform package introduced substantial changes to the regulatory framework and to the state-owned productive system.

The reforms included three major key changes to regulatory institutions. First, existing regulators, CNH and CRE, were given new autonomy and authority and strengthened into ministry-level independent agencies with a broad mandate to regulate both private and public participants in the energy industry.¹⁶ Within CNH, Mexico established a groundbreaking agency, the National Center for Hydrocarbon Information ("CNIH"), tasked with managing national data and information on hydrocarbons and making data widely available to interested parties and the public.¹⁷ Second, the reforms established the Agency for Safety, Energy, and Environment ("ASEA"), an entirely new agency tasked with overseeing and regulating industrial safety and environmental practices at every level of the oil and gas production process. Third, the Ministry of the Environment and Natural Resources ("MENR") assumed new responsibilities linked to the hydrocarbons sector. ASEA was attached to the MENR as an autonomous agency.¹⁸

¹³ OECD (2017), Driving Performance of Mexico's Energy Regulators, The Governance of Regulators, OECD Publishing, Paris. <http://dx.doi.org/10.1787/9789264267848-en>, page 52

¹⁴ Discussions with Nicole David Palau, Director General for Investment Relations at SENER, SENER office, Mexico City (14th March 2018).

¹⁵ OECD (2017), Driving Performance of Mexico's Energy Regulators, The Governance of Regulators, OECD Publishing, Paris. <http://dx.doi.org/10.1787/9789264267848-en>, page 61

¹⁶ OECD (2017), Driving Performance of Mexico's Energy Regulators, The Governance of Regulators, OECD Publishing, Paris. <http://dx.doi.org/10.1787/9789264267848-en>, Page 52

¹⁷ OECD (2017), Driving Performance of Mexico's Energy Regulators, The Governance of Regulators, OECD Publishing, Paris. <http://dx.doi.org/10.1787/9789264267848-en>, page 52

¹⁸ OECD (2017), Driving Performance of Mexico's Energy Regulators, The Governance of Regulators, OECD Publishing, Paris. <http://dx.doi.org/10.1787/9789264267848-en>, page 53

On the production side, two major institutional reforms were enacted. Most significantly, PEMEX was stripped of its monopoly over all aspects of oil production and sale. Remaining state-owned, PEMEX was reconstituted as a productive enterprise empowered to both compete against and partner with private entities. In the electricity sector, CFE was restructured as a competitive state-owned company that would compete against private companies in the electricity sector, similar to PEMEX's role in the oil sector. Second, Mexico established new decentralized agencies to supervise the gas and electricity markets: National Center for the Control of Energy ("CENACE") and National Center for the Control of Natural Gas ("CENAGAS"). Additionally, the reforms created a federal fund to manage, distribute, and invest government revenue generated from the hydrocarbon sector.¹⁹

¹⁹ OECD (2017), Driving Performance of Mexico's Energy Regulators, The Governance of Regulators, OECD Publishing, Paris. <http://dx.doi.org/10.1787/9789264267848-en>, page 53

Safety and Environmental Protection Model (ASEA)

The National Agency for Industrial Safety and Environmental Protection (ASEA) was established by the ASEA Act in August 2014 and formed in March 2015 to serve as an important pillar of Mexico's energy reform. The Mexican Congress granted the new institution a broad mandate to ensure that Mexico's oil and gas industry develops safely and with appropriate environmental safeguards.²⁰ The statutorily mandated mission of ASEA is to guarantee individual safety and environmental integrity with legal, procedural, and cost-effectiveness certainty in the hydrocarbons sector.²¹

ASEA's purview covers designing and implementing standards and regulations, processing permits, and authorizing and supervising projects in all aspects of the hydrocarbon value chain from exploration and production to refining, processing, storing, transporting, distributing, and retailing oil and gas.²² 30,000 onshore wells, over 300 offshore platforms, 6 refineries, 9 gas processing facilities, 60,000 km of pipeline, 520 storage tanks, and 111 terminals all fall under the supervision ASEA.²³ ASEA also enforces technical rules for a safe and environmentally sound development of the oil and gas industry in Mexico. It is authorized to conduct inspections, formulate corrective actions, and impose sanctions.²⁴

Since its creation on March 2015, ASEA has focused on filling regulatory gaps to provide legal, regulatory, and procedural certainty.²⁵ Its regulatory scheme is based on a "risk management" model, comprising its Safety and Environmental Management System ("SEMS"). Its risk management approach for mining oil and gas risks operates at six levels:²⁶

1. Systematic Management of Industrial Safety and Environmental Protection: ASEA requires that every operator in Mexico operate under a Safety and Environmental Management System. Enforcement of these rules ensures that all operators adequately recognize and prepare for all foreseeable risks. This first level of risk management is a critical preventative tool.²⁷

²⁰ ASEA, How Was ASEA Created?, <http://www.asea.gob.mx/cms/wp-content/uploads/2014/11/ASEA-ENGLISH-1.2.pdf>; SENER, page 61

²¹ ASEA, How Was ASEA Created?, <http://www.asea.gob.mx/cms/wp-content/uploads/2014/11/ASEA-ENGLISH-1.2.pdf>.

²² OECD (2017), Driving Performance of Mexico's Energy Regulators, The Governance of Regulators, OECD Publishing, Paris. <http://dx.doi.org/10.1787/9789264267848-en>, page 61

²³ Discussions with Carlos De Regules, Executive Director of ASEA, ASEA office, Mexico City (14 March 2018).

²⁴ OECD (2017), Driving Performance of Mexico's Energy Regulators, The Governance of Regulators, OECD Publishing, Paris. <http://dx.doi.org/10.1787/9789264267848-en>, pages 61-62

²⁵ OECD (2017), Driving Performance of Mexico's Energy Regulators, The Governance of Regulators, OECD Publishing, Paris. <http://dx.doi.org/10.1787/9789264267848-en>, page 61

²⁶ Discussions with Carlos De Regules, Executive Director of ASEA, ASEA office, Mexico City (14 March 2018).

²⁷ Ibid.

2. Sufficient Financial Responsibility (Insurance): ASEA requires that all operators have sufficient resources and levels of insurance to appropriately respond, take corrective action, and provide indemnity for any incident that may occur. This requirement ensures that any operator is able to take immediate action to minimize human and environmental damage after an incident and is able to provide any required restitution for any fault that it may bear.²⁸
3. Performance Oriented Technical Regulation: ASEA's third risk management tool is performance-oriented regulations. ASEA has published 30 regulatory instruments across the energy industry to fill regulatory gaps, assessed 25,000 permits, and conducted 2,500 inspections across the hydrocarbons value chain. Today," says ASEA's executive director Carlos De Regules, "there are no regulatory gaps for safety and environmental protection in the oil and gas sector." This comprehensive regulatory system was completed over the last three years.²⁹
4. Risk-Based Inspection: "for corrective enforcement and inspection, we had to be strategic because we never can have sufficient people to go and check, for instance, 60,000 km of pipeline or the rest of the facilities." Accordingly, ASEA implemented a "risk-based inspection strategy." "We have the intelligence, knowledge, and experience to know where the big challenges and risks of accidents and incidents are, and we dedicate our staff to where the big challenges are." To complement its own capacity to identify risk gaps, ASEA uses third parties' support. Third parties that obtain ASEA's authorization supervise and inspect operations annually to verify that projects and facilities are meeting performance standards. In the past three years, ASEA has conducted 2,500 inspections across the hydrocarbons value chain.³⁰
5. Corrective Enforcement: ASEA has adopted a corrective rather than punitive approach to enforcement action. "We don't want to catch people," says Mr. De Regules "we want to improve performance. The mission of our inspectors is to identify gaps and obtain a plan to close the gaps. That plans becomes mandatory. Hence instead of accusing people in [the] industry we establish different types of conversations and we share common objectives to improve performance". ASEA's approach has yielded impressive results. It implemented its corrective enforcement approach in the upstream oil and gas sector in 2015 and conducted 266 observations and identified 245 risk gaps in collaboration with the industry. Corrective plans were formulated, and today, ASEA and the industry have achieved 92% progress in resolving the identified risks in the upstream sector. In 2016, the accident Frequency Index reached a historic low of 0.25, the best year on record for Mexico's upstream industry. Performance was even better in 2017, with the FI index falling to 0.13. In the downstream industry, ASEA conducted 244 observations, identified 21 risk gaps, and has achieved 8.61% progress towards curing the risks. The FI index of Mexico's downstream sector was 0.39 in 2016. Paralleling the success in the upstream sector, the downstream FI index fell to 0.20 in 2017.³¹

²⁸ Ibid.

²⁹ Ibid.

³⁰ Ibid.

³¹ Ibid.

6. Evaluating Projects: ASEA evaluates proposed projects to ensure that they meet safety and environmental standards. “Evaluating projects was a big challenge for us,” according to Mr. De Regules. Ensuring the projects were safe and environmentally sound without delaying the projects presented a particularly difficult problem. “We didn’t want to be a bottleneck for the projects.” ASEA has largely been successful at navigating these competing demands. Over the past three years, ASEA has evaluated 25,000 projects across the energy industry. “We haven’t produced any significant bottleneck for any single project we evaluated.” Projects are up and running, investment is flowing, and so far accidents and incidents remain low. Key to ASEA’s success was a well-founded mission and a diverse team with ample input from and cooperation with industry actors.³²

With ASREA having “implemented the model” and becoming “now 100% operational,” it still has more work to do. The next step and challenge for ASEA is to “strengthen the institution” and give the agency more “independence and autonomy,” says Mr. De Regules. To make ASEA fully independent will require the creation of a board of commissioners to discuss and jointly make decisions. Running the agency through a board of commissioners will make it “hard to have political, biased decision.” Commissioners would be insulated from politics by serving fixed 5 to 7-year terms, and by being nominated by Mexico’s President but confirmed by Congress. The lengthy, stable terms and joint appointment process are crucial, as this continuity and broad buy-in would give the agency’s regulators the autonomy to make bold decisions. “Today,” explains Mr. De Regules, “the decision-making process is all dependent on one person, the Executive Director. We need to create a board of regulators to take decisions jointly to attain sufficient independence. This initiative is being discussed in the Congress currently.”³³

In addition to securing the agency’s independence, ASEA needs to summarize and optimize into one single document all of the legal instruments and obligations that detail its authority to implement its mandate. Collating all regulations into one comprehensive Industrial Safety and Environmental Protection authority for the whole hydrocarbon industry would significantly reduce the timing of initial permitting for oil and gas projects. Mr. De Regules estimates that the current permitting process can be reduced from up to 600 days down to 120 days. This change can be signed and approved by the President without the need for Congressional approval. De Regules is “optimistic that both initiatives,” establishing a board of commissioners and creating a single regulatory guide, “could be achieved this year.”³⁴

³² Ibid.

³³ Ibid.

³⁴ Ibid.

Nationalization of Energy Data (CNH)

CNH has existed since 2009, before Mexico's energy reforms, but it underwent a complete transformation in the 2013-2014 reforms.³⁵ CNH's rapid expansion after 2013 taxed the agency. Oscar Roland, head of the National Data Repository of CNH, identified growing too fast, rapidly staffing, recruiting, and learning how to perform its new responsibilities as its biggest challenge.³⁶ In the span of just a few years, CNH grew from 30 employees to over 400, and its budget expanded from 50 million pesos per year to one billion pesos. Navigating this expansion required an immensely difficult organizational execution on a large scale. Rules requiring certain methods of implementation, particularly in regard to hiring and acquisitions, added further complexity and difficulty to the expansion. The reason CNH was able to succeed, Mr. Roland explains, was because of its strong leadership, which greatly eased the transition. Despite its rapid expansion, CNH had an easier experience than, for example, PEMEX.³⁷

Aiding CNH's success was its commitment to total transparency. It was the only government agency to publicize all of its work and expenses. Indeed, transparency is CNH's main goal and mission. As Mr. Roland explains: "Our mandate is not to award blocks to companies," rather it is to achieve total transparency. Its success as an institution is measured in its ability "to be as transparent as possible." Its purpose is to "generate transparency, trust, and accountability to the public and predictability for investors." CNH is mandated with ensuring that all awarded contracts "are fully transparent and accountable." Its goal is not to award as many blocks as it can in a short period of term but to "award transparent and accountable contracts."³⁸

Initially, CNH's commitment to full transparency generated pushback from the industry. Companies were leery to handover data and to have their activities exposed to public scrutiny and the eyes of competitors. But companies have since come around. "This was our biggest weakness at the beginning but then it turned into our strength and [became] key to attract[ing] investment."³⁹ CNH publishes all information and requirements it offers to any company. This total transparency assures all stakeholders that no competitor is receiving preferential treatment or benefiting from corruption. Standardizing and making publicly clear all data, tasks, processes, qualification, and requirements has created a stable and predictable framework for companies and investors and reduced the timeline of the contracting process. "This was our biggest achievement," Mr. Roland states. And it has attracted international attention. Currently Peru and Ecuador are looking to learn from CNH as a potential model for their own industries.⁴⁰

³⁵ OECD (2017), Driving Performance of Mexico's Energy Regulators, The Governance of Regulators, OECD Publishing, Paris. <http://dx.doi.org/10.1787/9789264267848-en>, pages 61-62

³⁶ Discussions with Oscar Jamie Roldan, head of the National Data Repository of the National Hydrocarbons Commission, CNH office, Mexico City (14 March 2018).

³⁷ Ibid.

³⁸ Ibid.

³⁹ Ibid.

⁴⁰ Ibid.

CNH has acquired a vast trove of useful data and made it readily available to the public and interested parties. For example, CNH's oldest physical data sample is from 1904 from the first commercial discovery in Mexico. It has secured the transfer of 100 years of geological data from PEMEX's private databases to a public portal.⁴¹ Over two years, from 2014-2016, CNH has obtained all of PEMEX's industry data and made it publicly available. CNH's public portal now has statistical production data from 1930 on a monthly basis well by well.⁴²

Under the energy reform framework, CNH's leadership doesn't view data on Mexico's hydrocarbon reserves and production as top-secret information that should be hidden for national security reasons. Rather, CNH sees the public exposure of this data as key to attracting investment. Just as the energy reform denationalized Mexico's hydrocarbon industry, it has effectively nationalized Mexico's hydrocarbon data, establishing a firm public right to access and control hydrocarbon data. Although CNH existed prior to the energy reform, it was not empowered by law to pursue this total commitment to data transparency until the energy reform laws passed.⁴³

In 2010, no one other than PEMEX knew Mexico's field by field production data. At first, PEMEX was reluctant to give up its exclusive control of this data. When the data was first transferred to CNH, Mr. Roland recounts that PEMEX sued CNH for publicizing the confidential data and information. To avoid a replay of this conflict, the energy reform explicitly mandated CNH with clear legal authority to collect, collate, and make public hydrocarbon industry data. The experiences of 2010 led CNH's leadership to very carefully and deliberately assess precisely what elements they needed to include in the reform laws.⁴⁴

"We were very careful to include two significant things in the law based on our 2010 experience: 1 – 'the data belongs to the nation.'" Just as hydrocarbons in the ground belong to the nation, the new law specifies that energy data also belongs to the nation. The reform laws empower CNH to force companies to share all of their technical data with CNH. The law treats data as an asset and spells out the ownership of that asset. "We defined the property rights of the assets. We give companies a license to use the data for their domestic use," but the data is publicly owned.⁴⁵

⁴¹ <https://portal.cnih.cnh.gob.mx/dashboards.php>

⁴² Ibid.

⁴³ Ibid.

⁴⁴ Ibid.

⁴⁵ Ibid.

Second, CNH “has the right to decide how to manage and disclose the data.” CNH’s right to transparently collect, manage, and disclose data as it sees fit provides many advantages. It has become a key marketing strategy for Mexico to attract investors. CNH broke the data monopoly of PEMEX, making previously confidential data accessible to the public and ultimately investors. The reform invited third parties and private companies to acquire geological information in Mexico’s hydrocarbon blocks. These companies later started promoting that data, and ultimately the Mexico’s hydrocarbon resources, to international investors. With the data published, the public can monitor and control processes and projects across the entire hydrocarbon value chain. All Mexican universities have free access to the CNH data, enabling research and innovation. Accordingly, the reform allows the nation to monitor, control, and contribute to the hydrocarbon extraction and production process.⁴⁶

Public access to data has eliminated a data gap, prevented a data black-market, and reduced costs associated with information asymmetry. So complete is the commitment to transparency and data access, that the public even has the right to access to any hydrocarbon information that has been acquired and produced by third parties and private companies. To avoid discouraging investment in private data collection, however, CNH only publicizes data developed by third parties after certain periods of time. By reserving the data property rights, CNH is also able to generate revenue from data production. CNH receives a commission from any profits any third party makes from Mexican hydrocarbon data. Even when a third party acquires data through its own technical capacity it still owes a surcharge to CNH.⁴⁷

Roland sums up CNH’s approach under the reforms: “We believe a country with good data attracts investment and we look at our data as an asset and a key element to our success. Our mission from the beginning was to develop an ‘information industry’ that is transparent and simple.”⁴⁸

⁴⁶ Ibid.

⁴⁷ Ibid.

⁴⁸ Ibid.

Institutions and Regulatory Framework of the Mexico Energy Sector

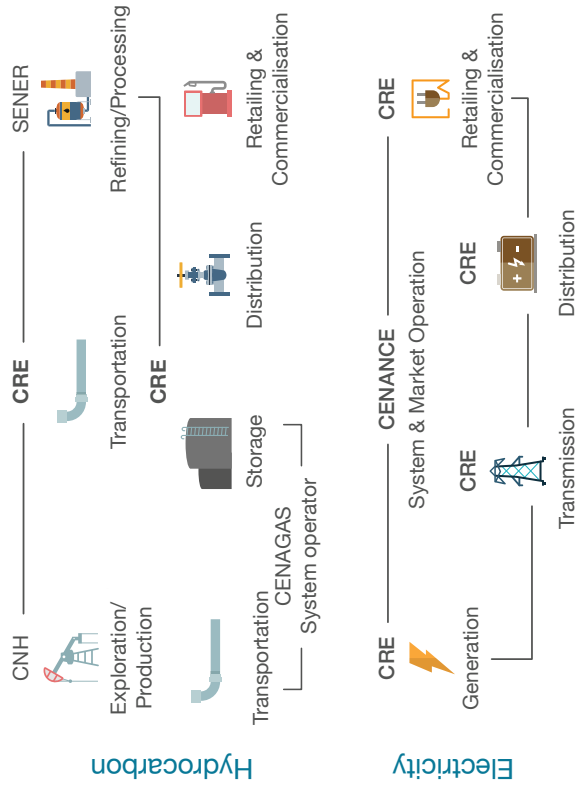


CNH, ASEA and CRE: Scope of Functions

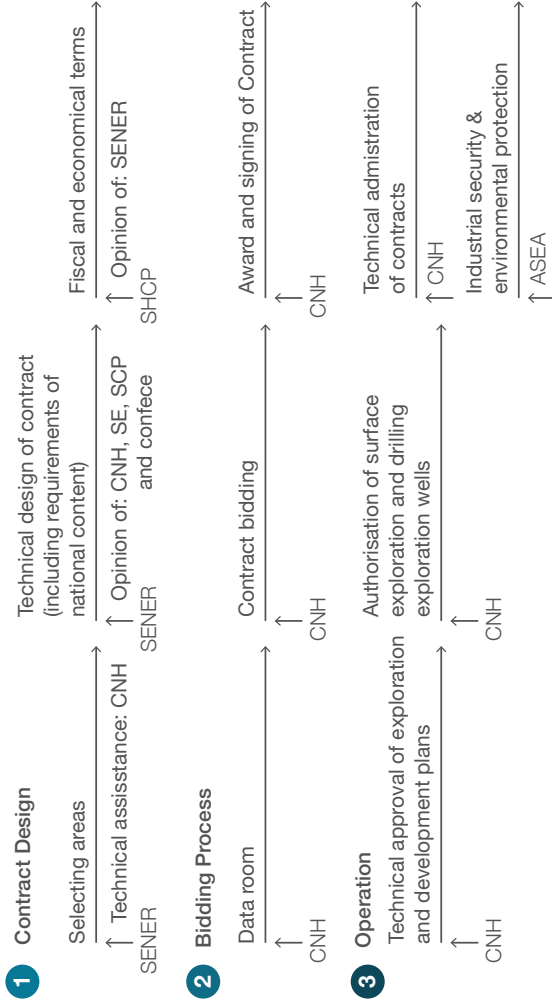
Agency for Safety, Energy and Environment (ASEA)

Exploration	Drilling	Productions	Industrial Transformation
+2900 km seismic 2D +6100 km ² seismic 3D	+9300 onshore wells +250 offshore platforms	1.98 mb/d of oil 5.25 bcf/d of natural oil	6 refineries 9 gas processing facilities
Distribution and Retail	Transportation	Storage	
+12000 service stations +3300 gas distribution and carburation centers	+60 000 km of pipelines 485 Trucks 520 Tanks	111 terminals	

Energy Regulatory Commission (CRE)



National Hydrocarbons Commission (CNH)



Source: CNH, ASEA, CRE, PEMEX

Oil and Gas Industry (Upstream, Midstream, Downstream)

Mexico stands to benefit enormously from the energy reforms. It has undergone a unique transformation. Mexico is one of the most geologically attractive locations in the industry across the world; it hosts 123 million citizens with rising incomes, and it boasts a highly diversified economy that ranks 12th in the world in size, contrary to popular perception. Yet for all this potential, the energy industry had remained closed to investors until 2013. The reforms have now completely changed the industry's prospects. Its geological capacity, and large and growing purchasing power and reputed institutions had made it a very attractive destination for industry investments.

Within only three years, Mexico's upstream sector has attracted companies from over 20 countries with investment commitments of \$150 billion. Private investment in the midstream sector will double natural gas transport capacity and pipeline length by the end of the current administration.⁴⁹ Expanded natural gas network will pay dividends for the broader economy, as it will provide more regions the access to energy required to developed manufacturing capacity. It will also improve the capacity for importing natural gas from the U.S., which sell the cheapest gas available in the market.

In the downstream sector, Mexico now has a competitive retail gasoline market which didn't exist just two years ago. 36 brands of gasoline are now sold in the country. Now, private brands account for 20 percent of the gasoline retail market. Just two years ago, only one company sold gasoline.⁵⁰ Ultimately, growth in the private retail gas market will lead to an expansion of Mexico's fuel logistics and infrastructure, particularly storage capacity, which Mexico desperately needs.

⁴⁹ Discussions with Dr. Aldo Flores Quiroga, Deputy Energy Secretary for Hydrocarbons, SENER Office, Mexico City (Mar. 15, 2018).

⁵⁰ Ibid.

Upstream

By 2013, Mexico's position as a top global producer of oil had begun to falter under the weight of weak investment and declining natural production. Despite total domestic energy demand growing by a quarter since 2000 and electricity consumption increasing by half, production slackened. Since 2004, Mexico's oil production has fallen by 1 mb/d from 3.4 mb/d to 2.5 mb/d.⁵¹ Natural Gas production peaked in 2010 at 5.1 bcf/d and was estimated to decline to 3.2 bcf/d in 2017, against a demand of 8.0 bcf/d.⁵² Mexico's energy reform is poised to reverse its declining oil and gas production through substantial new investment. EIA estimates that oil production will reach an inflection point in 2020 and begin growing again. It is projected to rise to 3.4 mb/d by 2040, up almost 1 mb/d, and marking a return to 2004 production levels.⁵³

Since the reforms of 2013-2014, Mexico has completed 12 rounds of oil and gas exploration and production bidding. These bidding rounds have resulted in 91 new contracts with a 70 percent success rate and has attracted an estimated investment of 152 billion dollars of investment. Five years ago, before the reforms, only one company, PEMEX, was handling all aspects of oil and gas exploration and production. PEMEX relied solely on its own capacity, capital, and technology. Today, 69 private companies are active in Mexico's upstream oil and gas sector. Out of these companies, 65% are from North America (US, Canada, and Mexico), 16% are from Europe (Germany, Spain, France, Netherlands, Italy, Norway, UK, and Russia), 9% are from Asia (China, Japan, Malaysia, and Thailand), 7% are from South America (Argentina and Columbia), and 1.5% are from the Middle East and North Africa (Egypt and Qatar) and 1.5% from Australia.⁵⁴ In round zero, PEMEX sought to develop very few blocks. It realized that it lacked the requisite technology and capital, particularly in the face of competition. PEMEX understood that it needed to partner with foreign and private sector entities.

⁵¹ SENER, page 51; Mexico's Energy Reform Makes Progress, but Challenges Remain: Executives, Platts (Oct. 4, 2017).

⁵² Mexico's Energy Reform Makes Progress, but Challenges Remain: Executives, Platts (Oct. 4, 2017).

⁵³ International Energy Agency, Mexico Energy Outlook (2016).

⁵⁴ <http://rondasmexico.gob.mx> and www.gob.mx.sener

Bidding Round One and Trion

In round one and the Trion round, 48 new companies from 14 countries signed contracts with an estimated investment of 49 billion dollars. These investments were slated to increase Mexican crude oil production capacity by 1.1 million barrels per day (mb/d).

Phase	Date	Contract Awarded	Investment*
1	July 2015	2	2.7
2	September 2015	3	3.1
3	December 2015	25	1.1
4	December 2016	8	34.3
Trion	December 2016	Trion Block in association with PEMEX	7.4 40% PEMEX 60% BHP Billiton

*Billion USD

Source: SENER

Bidding Round Two

In round two, companies from 19 countries signed contracts with an estimated investment amount of 104 billion dollars to add a further 1.74 mb/d of crude oil production capacity.

Phase	Date	Contract Awarded	Investment*
2.1 (E&P in Shallow Waters)	March 2017	10	8.2
2.2 (Onshore E&P)	July 2017	7	1.1
2.3 (Onshore E&P)	July	14	0.950
2.4 (Deep Waters E&P)	January 2018	19	93

*Billion USD

Source: SENER

On October 4, 2017, two onshore fields, Ogarrio and Cardenas-Mora, were awarded to private companies as part of the PEMEX farm-outs. The contract for the Ogarrio field, which is located in Tabasco (Sunset Basin), was awarded to German DEA Group for an estimated 403 million dollars. Located in the same area, Cardenas-Mora, was awarded to Cheiron Holdings from Egypt with an estimated value of 166.5 million dollars.

Round 3.1 is expected to occur in 2018, putting out for bid 35 exploration areas in shallow waters with an estimated combined investment of 3.8 billion dollars. In this round SENER is offering 30 year Production Sharing Agreements (“PSAs”) to international companies.

Round 3.2 is expected to occur on July 25, 2018, involving 37 exploration areas in onshore fields. The estimated investment for each of these areas is 89 million dollars. The types of agreements to be offered in this bidding round are 30 to 40 year PSAs.

Round 3.3 will award an estimated 2.3 billion dollars of license agreement contracts for 30 to 40 year terms. It is expected to happen on September 6, 2018. These contracts will be for 9 onshore unconventional exploration areas located in the northern state of Tamaulipas. Round 3.3 will be the first ever bidding round for unconventional resources in Mexico.

Mexican officials have expressed cautious optimism for these unconventional resources: “We always hope to get the best companies, but we never expect 100% success in any of our bidding rounds. We are very optimistic about our unconventional blocks as they border the Eagle Forth [fields] in the US and geologically we could have the same formation and potential.” SENER “received a lot of interest from international investors” when it announced the unconventional blocks.⁵⁵

⁵⁵ Discussions with Nicole David Palau, Director General for Investment Relations at SENER, SENER office, Mexico City, (Mar. 14, 2008).

Midstream and Downstream

Mexico's midstream and downstream sectors have been open for private investment since the beginning of the energy reform. However, due to nature of the midstream market, it has not yet drawn much investment. It is inherently difficult to attract midstream investment before upstream investments have been made and have matured. New refineries could be built today, but it is unlikely to happen until upstream projects near the production stage or unless PEMEX offers viable contracts to upgrade refineries. The Mexican government is committed, however, to ultimately attracting midstream investment. "Upgrading our refineries and increasing our refinery capacity is a priority."⁵⁶

Pipeline

The expansion of the natural gas pipeline network in Mexico in the recent years has been unprecedented. "The major focus of SENER in the past few years was to transform its isolated natural gas pipeline into an interconnected pipeline system, which is very crucial for the country's energy security," said Ms. David Palau. "By the end of this administration, an additional 7,000 km will be added to our pipeline network."⁵⁷ This expansion will double the length of the current natural gas pipeline network in Mexico to a total of 18,000 km. The estimated investment in natural gas pipeline network amounts to 12 billion USD.⁵⁸ This included a new land-based pipeline coming from the United States and a marine pipeline coming from Texas to a central part of the Gulf of Mexico, within Mexico's territorial waters. Mexico dependence on US natural gas is high – the US supplies 60% of Mexico's gas.

⁵⁶ Discussions with Dr. Aldo Flores Quiroga, Deputy Energy Secretary for Hydrocarbons, SENER office Mexico City (Mar. 15, 2018).

⁵⁷ Ibid

⁵⁸ Plan Quinquenal de Gas Natural 2015-2019, <https://www.gob.mx/sener/acciones-y-programas/plan-quinquenal-de-gas-natural-2015-2019>
<http://www.gob.mx/sener/acciones-y-programas/plan-quinquenal-de-gas-natural-2015-2019>

As mentioned earlier, CENAGAS was established by the energy reform to manage natural gas transportation and storage. In 2015 all gas transportation assets owned by PEMEX were handed over to CENEGAS. The new entity also took over the role of Transition System Operations (“TSO”) from PEMEX. By January 2016, the transfer of all assets was complete and CENAGAS began assessing tariffs and generating income for the first time. However, virtually all operation and maintenance of the pipeline system continues to be done by PEMEX. David Madero, Executive Director of CENAGAS estimates that about 90% of the operation and maintenance of the natural gas pipelines will remain in PEMEX’s hands in the mid-term. “We believe that one day we should break away all of the contracts from Pemex, but as of now they successfully won the contracts by lower prices.”⁵⁹ CENAGAS’s natural gas pipeline capacity network (SISTRAN) has a total capacity of 6.47 million Gigajoules (“MMGJ”), and currently CENAGAS has assigned about 6.29 MMGJ of this capacity for different consumers. “About 1.31 MMGJ is assigned to people with acquired rights, 1.03 to public, 0.69 to CFE and 1.46 to PEM EX [for exploration and production activities and petrochemical processing) and 1.79 to private generators.”⁶⁰

Fuel Storage Capacity

Mexico requires a huge expansion of its storage capacity, especially for its downstream sector and fuel. Increasing storage capacity is a crucial need for Mexico’s energy security. Mexico’s current fuel storage capacity is about 2 to 3 days, which is well below international standards. SENER’s Public Policy Project for Fuels Storage aims to establish a minimum storage capacity of 13 days. Its plan aims to increase capacity to 5 days by 2019, to 10 days by 2021, and ultimately to 13 days by 2025. Achieving these goals for the downstream sector will require significant investment, estimated to be 2.42 billion USD.

Refinery Sector

Prior to the energy reforms, the state held exclusive control of refining activities in Mexico. Through a subsidiary, PEMEX carried out all downstream activities including refining, producing petroleum products and oil derivatives, and storing, transporting, distributing, and trading petroleum products.

⁵⁹ Discussions with David Madero, Executive Director of CENAGAS, CENAGAS office, Mexico City (Mar. 15, 2018,

⁶⁰ Ibid

On October 6, 2016, all PEMEX subsidiaries involved in the downstream sector, including PEMEX-Refining, PEMEX-Gas and Basic Petrochemistry, and PEMEX Petrochemistry, formed PEMEX Industrial Transformation (PEMEX TRI) to be in charge of its downstream activities. Mexico currently has six refineries that together constitute the National Refining System (SNR) with nominal capacity of 1.54 mb/d.⁶¹ However in 2015, SNR output was 1.267 b/d, which was 9% less than its output of 1.385 in 2014.⁶² Pemex refineries currently have the nominal capacity to process about 1.6 million bpd, but in 2017 they only refined about 770,000 bpd.⁶³

Mexico Downstream Infrastructure



This decrease was mainly due to decreased crude oil production, which led to the less available feedstock, and to lower processing capacity at the refineries. The quality of crude oil feedstock also declined, causing operational problems at refineries.

⁶¹ Oil & Gas Journal, Worldwide Refining Survey 2015; PEMEX also controls 50% of Deer Park refinery in Texas which processing capacity of 334,000 b/d.

⁶² Mexico Oil and oil product outlook 2016-2030, SENER, https://www.gob.mx/cms/uploads/attachment/file/236864/Oil_and_Oil_Products_Outlook_2016_2030_P.compressed.pdf

⁶³ Ibid

In 2015, 33.3% of refinery production was gasolines, 29.8% was diesel, 27.8% was fuel oil, 5.0% was jet fuel, and 4.2% was petroleum coke.⁶⁴ That year SNR produced 306,800 b/d of gasolines which was 9.5% less than in 2014. 60.2% of the production of refineries of Tula, Salina Cruz, and Cadereyta was gasoline. Salamanca, Madero, and Minatitlan produced the least gasoline. The production of middle distillates, like diesel and jet fuel, had a reduction of 4.2% and 10.4%, respectively, dropping to 274,400 b/d of diesel and 46,300 b/d of jet fuel.⁶⁵ The refineries of Cadereyta, Minatitlan, and Salina Cruz account for 57.8% of diesel production, while the largest production of jet fuel was recorded in Tula, Salina Cruz, and Salamanca, which together constituted 90.3% of the domestic production.

Cadereyta, Madero, and Minatitlan refineries have been reconfigured to produce less heavy distilled and more light distillates like gasoline. PEMEX's current strategic priorities are to improve the quality of its gasoline and refined petroleum products, rather than building new refineries.⁶⁶ Mexico hopes to reduce its imports of refined products by improving domestic refining capacity and output quality. Hence, it has been trying to reconfigure the three remaining refineries that haven't been reconfigured yet. In February 2012, PEMEX awarded a contract for the design of a new refinery at Tula, but in December 2014 the company opted for a \$4.6 billion expansion of the existing facility instead. Gasoline and diesel production will increase from 140,000 b/d to 300,000 b/d at Tula when it is completed in 2018.⁶⁷

Despite this and other expansions, Mexico does not have a natural competitive advantage in refining, given the country's close proximity to a sophisticated U.S. refining center. The low oil prices exacerbate this competitive disadvantage. Still, revamping and expanding its refinery sector remains a priority at SENER. The key question is how to get there.⁶⁸ Unlike with the upstream sector, no-one is rushing to invest in Mexico's refinery sector post-reform. The main question is how to incentivize investment in the sector.⁶⁹ In order to create incentives, PEMEX searching for partners to invest and upgrade the refineries. Some are pushing for government investment in the sector, but in the current low oil price environment and with currently minimal price differences between light and heavy crude, it is difficult to make profitable investments. Accordingly, government investment would likely only burden the state with a low or negative return and increase its debt. Meanwhile, buyers would continue to import the lower priced U.S. gasoline.

⁶⁴ Ibid

⁶⁵ Ibid

⁶⁶ Mexican Candidate's Plan to Build Refineries Raises Eyebrows, Bloomberg, 27 February 2018, <https://www.bloomberg.com/news/articles/2018-02-27/mexican-candidate-s-plan-to-build-refineries-raises-eyebrows>

⁶⁷ Wall Street Journal, "Pemex Opts for Refinery Upgrade Over Building a New One" December 3, 2014. <https://www.wsj.com/articles/pemex-opts-for-4-6-billion-refinery-upgrade-over-building-a-new-one-1417649394>

⁶⁸ Discussion with Dr. Aldo Flores Quiroga, Deputy Energy Secretary for Hydrocarbons, 15 March 2018, SENER office, Mexico City

⁶⁹ Discussion with Dr. Aldo Flores Quiroga, Deputy Energy Secretary for Hydrocarbons, 15 March 2018, SENER office, Mexico City

CRUDE PROCESSING BY REFINERY, 2014 AND 2015

(thousand barrels per day)

Type of Crude	Cadereyta		Madero		Minatitlan		Salamanca		Salina Cruz		Tula		SNR	
	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015
Heavy	95	87.4	101.6	122	129.8	115.3	28.8	24.9	86.4	80.3	55.9	52.4	497.5	482.3
Light	85.8	71.2	9.8	7.4	37.7	36.4	139.5	123.1	183.3	159.4	195.8	183.7	651.9	581.2
Reconstituted*	-	-	-	-	-	-	2.7	0.9	-	-	3.1	0	5.8	1
Total	180.7	158.5	111.5	129.4	167.7	151.7	171	149	269.6	239.7	254.7	236.2	1,155.1	1,064.5

*Includes topped oil, pentanes, light naphtha from Cangrejera, light naphtha from Cactus, gasoline from Poza Rica and Madero.

Source: PEMEX, Institutional Database

Fuel Market Opening and Trade

The most tangible impact of the energy reform for the Mexican public is the opening of fuel markets and private gasoline retail. Mexico is the fourth largest consumer of gasoline in the world, and before the energy reform PEMEX was the only provider of gasoline and fuel in Mexico. Over the past two years, the fuel market has opened up, and private companies have entered the fuel market. Mexicans have begun seeing competing gas stations open in their towns. In 2017, the gasoline and diesel market evolved from a single supplier to an open and competitive market with 2,178 new gas stations of 30 different international brands that had never before operated in Mexico. New competitive entrants already hold a combined 19% share of total gas stations in Mexico.

Aside from creating a competitive market, the opening of the fuel market could have another strategic benefit for the country. An open fuel and market could ultimately encourage international companies to invest in midstream capacity to improve fuel transportation infrastructure and establish new fuel storage capacity to support their fuel retail supply in the country in the mid to long term. This would pay dividends by helping to increase fuel storage capacity throughout the country.

The Mexican public has greeted this potential with encouragement, as PEMEX gasoline retail stations had already lost the trust of much of the public. The prevailing consumer perception is that consumers don't receive what they pay for in terms of gasoline quality and quantity. Indeed a common expression, "litros de a litro" refers to the lower quantity of gasoline they receive than for what they pay at PEMEX stations. Now that PEMEX is forced to compete with other companies, it needs to re-gain consumer confidence and trust. Consumers have increasingly more choices to purchase different brands of retail gasoline of different quality, at different stations, and at different prices. A promise of getting a full gallon of gasoline has become a very important element of the reform to the public.

In sum, the opening of the fuel market in the short-term has created competition in the market and has given consumers a broad array of new choices. In the mid to long-term, it could lead to improvements of ports and infrastructure and the expansion of fuel storage capacity. The improvement of infrastructure could reduce transportation cost and ultimately provide positive downwards pressure on the fuel prices.

Power Sector

Mexico's energy reform has also opened up huge opportunities in the power sector, ranging from power generation to transmission, distribution, and wholesaling. The National Electric System ("PRODESEN") has set new goals to improve and expand the power sector's generation capacity. The energy reform has emphasized generating power from clean and renewable sources and ultimately reducing the share of oil and natural gas used in power generation. As with other areas, the electricity market is now open to private sector completion. CFE previously held a state-sanctioned monopoly over electricity generation, but now must compete against private producers to generate and distribute power. To facilitate the introduction of private sector entities into the electricity market, Mexico established a clearing house, the National Center for the Control of Energy ("CENACE") to manage contracts to buy and sell electricity. CENACE enables the market participation of players other than CFE.

Mexico aims to attract about 81 billion dollars of investment to add 56 Gigawatts of additional generation capacity by 2031. This additional capacity would come from the construction of 487 new plants. Under the plan, 63% of this new capacity would come from clean energy. Mexico is also attracting investment in its transmission, distribution and end-use systems. In 2017, about 485,000 homes were electrified. In order to improve the transmission network, 23,772 km-c of new transmission line will be added to the current lines. This included two new HVDC lines. The estimated investment in transmission sectors amounts to about 11 billion USD.⁷⁰

Three rounds of long-term auctions have occurred for the power sector since 2014, held on March 31, 2016, September 28, 2016 and November 2017. The three auctions were open to all technologies for power generation and offered maximum three-year development contracts after which the assets will be transferred to the state.

⁷⁰ Discussions with Nicole David Palau, Director General for Investment Relations at SENER, SENER office, Mexico City, (Mar. 14, 2018)

Long-Term Electricity Auctions

Auction	Winning Offers	Winning Companies	Investment Billion USD (in 3 years)	Clean Energy Certificates (CEC) (Million Certificates)	Installed Capacity (MW)	Generated Power (MW/Y)	Average Price USD/MWH
1st Auction (Mar 2016)	18	11	2.6	5.4	2,085	Not Allocated	47.78
2nd Auction (Sept 2016)	56	23	4	9.3	2,871	1,187	33.47
3rd Auction (Nov 2017)	16	9	2.4	5.96	2,562	593	20.57

Source: CFE, SENER

It is important to note that the purchase price for long-term electricity contract in the last auction was \$20.5 per megawatt hour (MWH) (2 cents/ kilowatt hour) which was historically low.⁷¹ Between the first and third long-term electricity auction in Mexico, the prices for long-term electricity contracts dropped about 50%. In the first auction the average price was \$47.78 per MWH. The price fell to \$33.47 per MWH in the second auction, and as mentioned, the long-term electricity prices in the third auction was \$20.57 per MWH.

Clean Energy in the Power Sector

Aside from hydrocarbons, Mexico is also host to other natural capital that could be converted to electricity production: solar, wind, and geothermal. Mexico has twice the solar radiation as Germany, yet Germany has the largest installed solar capacity in the world: Mexico has substantial opportunity for investment. The private sector has begun showing interest in participating in Mexico's solar sector. In terms of wind resources, Mexico has similar onshore wind speeds and consistency as Europe does offshore. Mexico is currently focused on developing onshore wind resources. Lying in "the ring of fire," Mexico has excellent potential for geothermal energy production. Already it has the fourth largest installed capacity for geothermal in the world.⁷² To capitalize on its renewable resources, Mexico passed the "Energy Transition Act" as part of the energy reform. The act mandates a transition towards a low carbon power industry and establishes a transition strategy to reduce the share of fossil fuels.⁷³

⁷¹ Ibid

⁷² Discussions with Leonardo Beltran Rodriguez, Deputy Energy Secretary for Planning and Energy Transmission, at SENER, office, Mexico City, (March 15, 2018)

⁷³ Ibid.

Clean energy has featured prominently in Mexico's recent energy auctions. Once the contracts are fulfilled and the projects completed, these three auctions alone will nearly triple the annual electricity generation from solar and wind power plants. In the first auction, 74.4% of awarded clean energy offers were solar and 25.6% were wind. In the second round the share of solar was 54.3%, wind was 43.5%, and geothermal was 2.2%. The share of clean energy awards in the third auction was 55.35% solar and 44.65% wind. Mr. Palau stated: "The energy reform model of power generation reduces the share of hydrocarbons in our power generation and increases the share of clean energy." Over the long term, increasing the share of clean energy in power generation will reduce Mexico's dependency on imported gas. "The goal of the administration is to increase the share of the clean energy in Mexico power generation to 35% by 2024."⁷⁴ The reforms have also enabled consumer to produce and use their own solar energy, which can be resold to CFE. From 2016 to 2017, installed capacity of off grid solar and contracts for selling got CFE grew 200%.⁷⁵

⁷⁴ Discussions with Nicole David Palau, Director General for Investment Relations at SENER, SENER office, Mexico City, (Mar. 14, 2018)

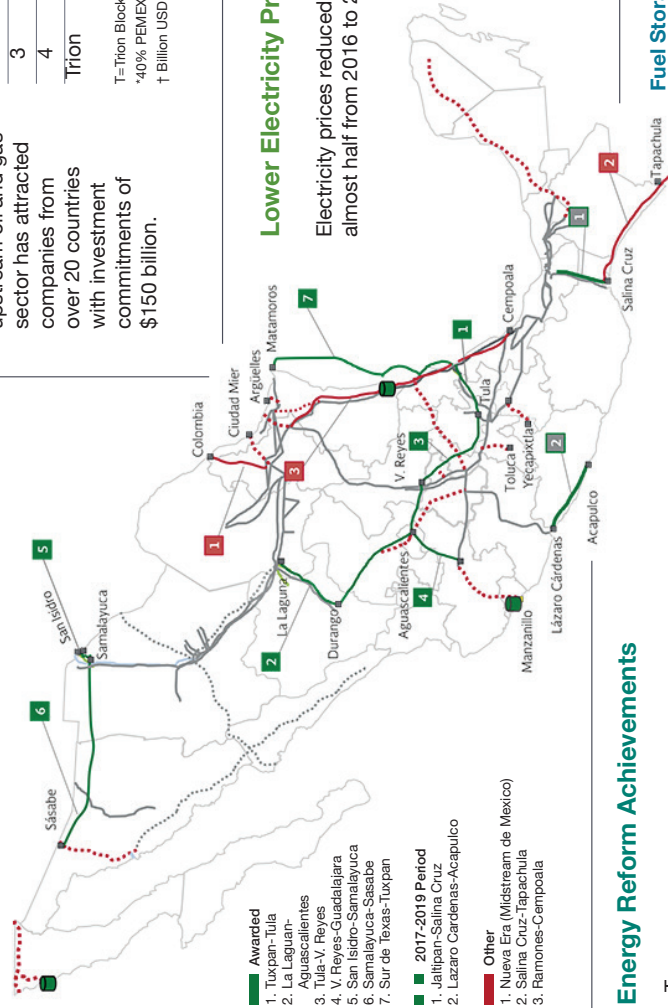
⁷⁵ Ibid.

Mexico Energy Reform (2013-2018)



Five Year Natural Gas Pipeline Expansion Plan

Pipelines: ■ CENAGAS ■ Under Construction ■ Privately Owned Operational
 ■ LNG Storage Terminals



- Awarded**
1. Tuxpan-Tula
 2. La Lagunilla
 3. Tula-V. Reyes
 4. V. Reyes-Guadalupe
 5. San Isidro-Samalayuca
 6. Samalayuca-Sasabe
 7. Sur de Texas-Tuxpan
- 2017-2019 Period**
1. Jalilipan-Salina Cruz
 2. Lazaro Cardenas-Acapulco
- Other**
1. Nueva Era (Midstream de Mexico)
 2. Salina Cruz-Irapachula
 3. Palmones-Cempoala

Upstream Investment

Within 3 years, upstream oil and gas sector has attracted companies from over 20 countries with investment commitments of \$150 billion.

First Bidding Round

Phase	Date	Awarded	Investment†
1	7/15	2	2.7
2	9/15	3	3.1
3	12/15	25	1.1
4	12/16	8	34.3
Trillion	12/16	1	7.4*

T=Trilon Block in association with PEMEX
 *40% PEMEX, 60% BHP Billiton
 † Billion USD

Second Bidding Round

Phase	Date	Awarded	Investment†
2.1 ¹	3/17	10	8.2
2.2 ²	7/17	7	1.1
2.3 ²	7/17	14	0.95
2.4 ³	1/18	19	93

¹E&P in Shallow Waters
² Onshore E&P
³ Deep Waters E&P

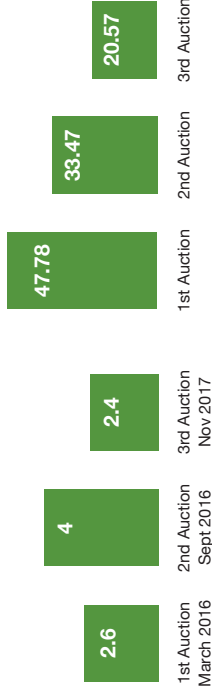
Lower Electricity Prices

Electricity prices reduced by almost half from 2016 to 2017

Long-Term Electricity Auctions

Upstream Investment Billion USD

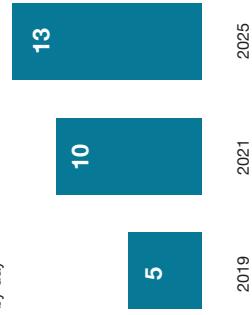
Average Price USD/MWh



Energy Reform Achievements

- Transparency
 - Nationalized Energy Data
 - Market Competition
 - Foreign Direct Investment (\$200 Billion by end of 2018)
 - Private Retail Gasoline Market
 - Lower Electricity Tariffs
 - Increased Share of Clean Energy
 - Off Grid Power Generation
 - Job Creation
 - International Energy Player (Member of IEA & IRENA)
- **> 30** New Brands in 2,178 Gasoline Stations
 - **19%** of Total Retail Gasoline Market is Occupied by Private Sector
 - **\$170 Billion** Foreign Direct Investment (\$200 Billion by end of 2018)
 - **~300K** of New Jobs

Fuel Storage Capacity by day



Power Generation

487 new generation plants additional by 2031
56 GW additional by 2031
\$81 Billion required investment

Transmission

23,772 km-c of new transmission lines
2 new HVDC lines
485K homes electrified in 2017

Source: SENER, CNH, ASEA, CRE, PEMEX, CENAGAS

Energy Reform in the Context of Upcoming Elections

Speculation has been rife about how Mexico's upcoming presidential elections in July 2018 could impact energy reform. Predictably, different parties and candidates have struck different positions. The most radical position has been taken by Andrés Manuel López Obrador (known as "AMLO"), who has advocated for a more energy independent Mexico.

There has unfortunately been a wide communication gap between the current administration and Mexican public about how the reforms will impact lifestyles in the mid to long-term. Communicating the benefits of the reform to the public has been a challenge for the Mexican government. The whole government system has been so busy implementing the reform in such a fast and efficient way in the past three years, that they failed to focus on educating the public. Accordingly, comprehension of the reform and its impacts among the public is low. For the same reason, the current president, Peña Nieto has lost popularity.⁷⁶ Lourdes Melgar, former Mexico undersecretary of energy now with the Massachusetts Institute of Technology's Center for Collective Intelligence, said, "Inside Mexico, the energy reform is seen as a completely failed energy reform."⁷⁷ Mexican officials understand that they need to communicate the benefits of the reform, particularly in regards to improvements in gasoline retail, which is the most immediate and tangible impact of the reform on people's daily life.⁷⁸

Election and the Future of the Reform

The notion that the reform could be reversed after the election is far-fetched. The reforms have been enormously successful in terms of establishing a stable, meritocratic legal and institutional framework that enforces transparency, flexibility, and competition throughout the system. Unraveling the legal framework and the many contracts, regulations, institutions, and investments that have arisen would be an immensely slow and laborious process requiring huge support through Mexican government and the public. Such support does not exist. Core aspects of the reform are enshrined in the Mexican constitution. Amending the constitution requires approval of two-thirds of Congress and a majority of state legislatures. It would be very difficult to gather the support to amend the constitution again. Additionally, 22 secondary laws and 24 regulations give the reforms a strong legal framework.

⁷⁶ "Voter impatience threatens energy reform in Mexico", Oil and Gas Journal, 16 February 2018, <https://www.ogj.com/articles/2018/02/voter-impatience-threatens-energy-reform-in-mexico.html>

The new and/or strengthened institutions – such as CNEGAS, CENACE, ASEA, CNH, CRE, CFE, and PEMEX – give the reforms additional strength. These institutions are largely insulated from politics and political timelines. For instance, in ASEA's case, its 30 regulatory pieces underwent a robust process of public consultation and validation. In order to undo the regulations, the next administration would have to go through a similar proposed rulemaking process. It would be very complex and time consuming and likely to face backlash. “For ASEA this is a point of no return having published those regulations. When we have evaluated and authorized those projects, we have settled a legal precedence and background that can be used by future projects. Hence this is point of no return. Our enforcement actions like where we had to sanction an operator or closed down an operation, etc, or when we issued recommendations for the industry, have all gone through tribunals to defend themselves and argue their cases. These tribunals have confirmed our criteria.”⁷⁹

Looking at another fundamental institution, CNH, a similar story applies. CNH's framework is designed to stay above politics and elections. Its seven commissioners are introduced by President but appointed by Congress. The president has to introduce three commissioners to the congress for each open position. The timing of appointments and the expiration of their terms are also different and may span multiple presidencies. CNH's has a mandate that cannot be changed by the executive: oil and gas data belong to the nation and CNH has the right to decide how to disclose and manage the data.

The reforms were successfully designed to persist beyond change in the administration and to allow institutional independence from politics. However, a new administration could still alter the priorities and implementation of the reform. For instance, the next president could slow progress and alter import/export policies. In the case of ALMO, he is looking to significantly reduce imports of US gasoline within the next three years. The current administration supports the export of crude to the US and the import of US gasoline because of the low cost and high efficiency. While a new administration could seek changes to Mexico's constitution and laws, the most likely outcome would be a modest shift in priorities within the existing framework.

⁷⁷ “Voter impatience threatens energy reform in Mexico”, Oil and Gas Journal, 16 February 2018, <https://www.ogj.com/articles/2018/02/voter-impatience-threatens-energy-reform-in-mexico.html>

⁷⁸ Discussion with Dr. Aldo Flores Quiroga, Deputy Energy Secretary for Hydrocarbons, 15 March 2018, SENER office, | Mexico City

⁷⁹ Discussions with Carlos De Regules, Executive Director of ASEA, ASEA office, Mexico City (14 March 2018).

Election and North America Energy Integrity

Mexico currently benefits from the North American energy trade system. Although it is a large crude exporter, it is a major net importer of refined petroleum products. In 2015, Mexico imported 740,000 b/d of refined petroleum products, of which 58% was gasoline. The remainder was mostly diesel and liquefied petroleum gases (“LPG”).⁸⁰ Mexico was the destination for 50% of U.S. exports of motor gasoline in 2015.⁸¹ Mexico does export a modest amount of refined petroleum products (195,000 b/d in 2015, of which 70,000 b/d went to the US, mostly in the form of fuel oil). As with crude oil, however, Mexico’s exports to the US have declined in recent years, from a high of 132,000 b/d in 2010.

Mexico is also a net importer of natural gas and its natural gas demand is rising because of expanding power generation capacity. Natural gas is an affordable and relatively clean feedstock for power plants and refineries. Demand for imported natural gas is increasing as its domestic production has stagnated. Mexico demand for natural gas is expected to grow about half billion cubic feet per year, which will require increased.⁸² The domestic use of natural gas is projected to increase 31% from 2015 to 2030.⁸³ Although Mexico has considerable natural gas resources, production is low and the development of the shale industry is proceeding slowly. In 2015, natural gas production was 6,401,000 cubic feet a day, a decrease of 2.0% from 2014’s rate of 6,531.9 cubic feet a day.⁸⁴ Consequently, Mexico will rely on increased pipeline imports of natural gas from the United States and liquefied natural gas (LNG) imports from other countries.

Currently, Mexico is importing about 60% of its domestic natural gas demand.⁸⁵ Most of Mexico natural gas demand is imported via pipeline from the United States, particularly from southern and western Texas. One of the biggest motivators of Mexico’s energy reform declining gas production and the lack of technology and execution capacity to compete with US gas production prices. Mexico also imports LNG to plants in Altamira and Manzanillo, but the prices are significantly higher (\$3 million per btu for natural gas compared to \$8 million per btu for LNG). Mexico is exploring expanding LNG import facilities by installing LNG Floating Storage Units (“FSUs”), but so far LNG cannot compete on price with natural gas imported by pipeline from Texas.⁸⁶ Mexico is also considering installing liquefaction units to re-export Texas gas. The Enxada LNG terminal may eventually re-export gas that is imported from Waha, Texas.⁸⁷

⁸⁰ PEMEX: Monthly Petroleum Statistics: http://www.pemex.com/en/investors/publications/Indicadores%20Petroleros%20Archivos/eimporpetro_ing.pdf

⁸¹ EIA, Petroleum and other Liquids: https://www.eia.gov/dnav/pet/pet_move_expc_dc_NUS-NMX_mbbldpd_a.htm

⁸² CENAGAS

⁸³ SENER, Natural Gas Outlook 2016-2030, https://www.gob.mx/cms/uploads/attachment/file/236863/NG_Outlook_2016-2030_P.compressed.pdf

⁸⁴ SENER, Natural Gas Outlook 2016-2030, https://www.gob.mx/cms/uploads/attachment/file/236863/NG_Outlook_2016-2030_P.compressed.pdf

⁸⁵ Discussions with Nicole David Palau, Director General for Investment Relations at SENER, SENER office, Mexico City, 14th March 2018

⁸⁶ Discussion with Dr. David Madero, Executive Director of CENAGAS, 15 March 2018, CENAGAS office, Mexico City

⁸⁷ Discussion with Dr. David Madero, Executive Director of CENAGAS, 15 March 2018, CENAGAS office, Mexico City

In the short term, Mexico's energy security relies on maintain efficient flow of oil, gas, and refined products to and from the US. Most U.S. refineries are configured to process the heavy crudes that are produced in Canada and Mexico. Currently, Canada is the largest source of imported crude for the US, and imports from Canada have increased 61% over the last five years.⁸⁸ US refineries that import Mexican crude supply refined products to the US market, as well as exports back to Mexico.⁸⁹ The continuation of this trade ecosystem has strategic importance for the energy security the entire region. Importing crude oil from Mexico and Canada has reduced US dependency on the oil supplies from Persian Gulf. This reduces the threat of supply interruption and guarantees the safe flow of oil with much lower transportation cost and shipping timelines.

Importing refined petroleum products and natural gas from US has increased efficiency, offset production declines and reduced prices for end users in Mexico. EIA estimates that the production of petroleum and other liquids by the U.S., Canada and Mexico soon will outpace their consumption. The free trade between the three countries has made Mexico the number one export market for U.S. natural gas and refined products and the fourth largest export market for its upstream oil and gas equipment.⁹⁰

The North America energy trade ecosystem not only strengthens the energy security of US, Mexico and Canada, but also positively impacts on global energy security. With its domestic crude oil needs met with Mexican and Canadian imports, the US will have large spare capacity for export to the global market. This means will improve the stability of the global oil market by making it less susceptible to supply interruption. It also increases the market's resiliency against the use of energy as a political weapon as has occurred in the past.

The election of AMLO could disrupt the North American trade ecosystem. Although not opposed to foreign investment, AMLO seeks to reduce US gasoline imports and expand domestic refinery capacity. Mexican Congresswoman Rocio Nahle, top energy advisor to AMLO and whom could be the energy minister in Obrador's cabinet, back in February 21, 2018 told Reuters in Mexico City that if Obrador wins the July 1 election, "Mexico would seek to end decades of exporting crude in three years". Instead, Mexico should turn its focus to value-added fuels, processing crude domestically to produce more gasoline and diesel at refineries owned by state oil company Pemex. "In a three-year period, at the latest, we need to try to consume our own fuels and not depend on foreign gasoline".⁹¹ Nahle is petrochemical engineer who represents the Gulf coast state of Veracruz, also a major oil producer, in Congress.

⁸⁸ Energy Benefits of NAFTA, American Petroleum Institute (API): <http://www.api.org/~media/Files/Policy/Trade/Energy-Benefits-of-NAFTA.pdf>

⁸⁹ Ibid

⁹⁰ Energy Benefits of NAFTA, American Petroleum Institute (API): <http://www.api.org/~media/Files/Policy/Trade/Energy-Benefits-of-NAFTA.pdf>

⁹¹ "Mexican oil shake-up likely if frontrunner wins presidency, says adviser", Reuters, 22 February 2018, <https://www.reuters.com/article/us-mexico-oil-election/mexican-oil-shake-up-likely-if-frontrunner-wins-presidency-says-adviser-idUSKCN1G630H>

It is unlikely that Mexico could be able to achieve AMLO's goals so quickly. Replacing Mexico's imports of about 808,000 b/d of gasoline and diesel, which constitutes two thirds of domestic use would be practically impossible within three years. However, under AMLO the government would likely make some progress towards that goal. Fuel independence is the core of AMLO's energy platform and should be taken seriously despite the technical limits. It seems the candidate has adopted a variation of US President Trumps "America First" rhetoric and is advocating for a protectionist policy of "Mexico First."

As of now and under the current administration, Mexico is determined to sustain it's the unity of the North American trade ecosystem and its economic partnerships with the US and Canada. There is a true spirit of cooperation among the three countries, this is very important for the energy security of the three countries.⁹² In March 2018, the energy ministers of Mexico, US, and Canada, met and reaffirmed their commitment to North American energy integration

⁹² Discussion with Dr. Aldo Flores Quiroga, Deputy Energy Secretary for Hydrocarbons, 15 March 2018, SENER office, Mexico City

Conclusion

The reform of Mexico's energy system in 2013 and 2015 was driven by a need to reverse declining production in the face of rising demand. The state-directed system had stagnated and was in desperate need of investment, technology, innovation, and competition. So far, from a technical and economic perspective, the reforms have been successful. They have established a predictable, reliable, and efficient institutional framework. The reforms have attracted hundreds of billions of dollars of private investment, lowered electricity prices, expanded consumer choices for gasoline, and ushered in a greater focus on renewable energy. The reforms are now moving from the transition phase to the innovation phase where the benefits could further flourish. Although a failure to convince the public of the benefits has raised the risk that a new administration will curtail the reforms, it is highly unlikely that they could ever be completely unraveled. With the reforms, Mexico's energy industry is fully integrated within the North American energy ecosystem, and this integration has paid dividends to consumers throughout Mexico, the US, and Canada, and has benefited regional and global energy security.



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