I. Introduction

In 2014, Mexico embarked on a total transformation of its entire energy sector, on a scale unmatched in the world. The reform of the energy sector, under President Enrique Peña Nieto, involved not only the state-owned monopoly leviathan PEMEX, but also the equally powerful vertically integrated electric utility, Comisión Federal de Electricidad (CFE). Mexico had unsuccessfully attempted reform of the electric power sector nearly 20 years previously, in the administration of President Ernesto Zedillo. The current reform built on and substantially improved upon the ideas first developed in the Zedillo administration.

While President Zedillo started late and ran out of time (the Mexican President is elected for a single six-year term), President Peña Nieto obtained concurrence on the central tenets of his energy reform before taking office. The enabling constitutional amendment was passed in December 2013 and the energy reform legislative package of eight bills and amendments to 13 other laws was signed Aug. 17, 2014. Mexico moved quickly to implement the reforms and the first set of regulations was issued Nov. 1, 2014.

II. Problems Addressed by Reform in the Power Sector

According to official projections, Mexico will need about 60 gigawatts of new generation capacity in the next 15 years, as well as considerable investments in transmission and distribution. Mexico's per capita electricity consumption in 2013 was only 2,057 kilowatt-hours—far below that for advanced countries such as the U.S. (12,953 kilowatt-hours) and Japan (7,836 kilowatt-hours), but also below other countries of Latin America, such as Chile (3,879 kilowatt-hours) and Argentina (3,093 kilowatt-hours). Apart from the need to respond to current low consumption, new power infrastructure also will be required to meet projected growth.

Mexico also needs to reduce the price of electricity. A report on energy reform that the Mexican government issued in 2014
reported that the country’s electricity tariffs at the time were, on average, 25 percent higher than those in the U.S., even with subsidies, and would have been 73 percent higher without subsidies.

Finally, Mexico must deal with energy theft and inefficient operations. Theft and operational weaknesses have led to non-technical losses that are excessive by international standards and have deprived CFE of needed revenue. In 2015, CFE losses reached $6.8 billion.

Although there was some liberalization prior to 2014, including relaxing CFE’s monopoly on owning generation and permitting limited self-supply, the state-owned utility has limped along with government subsidies and under-investment, falling further and further behind in satisfying Mexico’s power needs.

III. Objectives of the Reform

A key objective of Mexico’s reform of its power sector was to attract private investment for the expansion and modernization of electricity infrastructure, because CFE as a state monopoly could not keep up. Such investment would increase Mexico’s energy security by expanding and diversifying generation capacity, improve the quality of the electricity supply and reduce prices. Diverse generation would include producing clean energy to reduce greenhouse gas emissions and other contaminants.

The reform also contemplated a continuing strong role for the central government. Transmission and distribution would remain owned exclusively by the state, although the private sector could provide support for these activities through contract relationships. The government also would continue to have responsibility for planning and control of the national electricity system to establish fair rules of access and ensure that the benefits of the reform would benefit the Mexican people.

IV. The Role of SENER and the Redesigned CRE

Mexico’s Ministry of Energy (Secretaría de Energía, or SENER) acts for the federal executive in implementing the objectives of energy reform as it applies to the power sector. Its specific duties, generally related to policy matters, coordination and supervision, are set forth in the Law of the Electric Industry (Ley de la Industria Eléctrica, or LIE). They include:

- establishing, leading and coordinating Mexico’s energy policy and formulating programs for the development of the electric industry;
- ensuring coordination of the governmental bodies regulating the power sector;
- establishing and monitoring the terms for strict legal separation of the participants in the power sector with the aim of promoting open access to and efficient operation of the national electric system; and
- coordinating the execution of strategic infrastructure projects needed to meet national energy policy.

A key agency regulating the power sector is a newly redesigned Energy Regulatory Commission (Comisión Reguladora de Energía, or CRE). CRE’s charter includes the regulation and granting of generation permits; regulating and setting tariffs for the public service of transmission and distribution; regulating generally the supply of electricity, including basic service to be provided by CFE and setting tariffs for end-users to the extent not set by the federal executive; setting tariffs for CENACE, described below; and supervising the wholesale electricity market.

V. Creation of CENACE as Independent System and Market Operator

The legislation designated the National Center for Energy Control (Centro Nacional de Control de Energía, or CENACE) to operate the wholesale electricity market and the transmission system, an arrangement similar to that of an independent system operator in the U.S. The empowerment of CENACE was particularly important, given the entrenched position of CFE as a vertically integrated monopoly. Transparent market operation by CENACE would curb the power of CFE by providing nondiscriminatory access to the transmission system and permitting new generators, not just CFE, to sell into the spot market for energy and ancillary services and to bid into the long-term auctions for capacity, energy and clean energy certificates.

VI. Cheap or Green?

President Peña Nieto promised that the energy reform would reduce the price of electricity in Mexico. A key element of the plan was to replace CFE’s generation facilities that used high-cost fuel oil or diesel—more than 20 percent of CFE’s generating capacity in 2014—with new, highly efficient gas-fired generation. Mexico also embraced ambitious climate goals,
however, including a goal of 35 percent energy from clean generation by 2024. Although the cost of renewable generation is decreasing, clean generation and cheap generation are often conflicting goals, and Mexico has chosen cheap over clean in the short run.

Under the energy reform, the tradable Clean Energy Certificate (Certificado de Energía Limpia), corresponding to 1 megawatt-hour of clean energy, is the only mechanism for encouraging clean and renewable energy. SENER rejected attempts to introduce technology-specific set-asides urged by the renewable power trade associations. The clean energy certificate program fosters clean energy by requiring load-serving entities (CFE initially) to buy or generate clean energy certificates equivalent to a percentage of the energy supplied. The percentage is set by SENER. In a draft notice on 2018 requirements, SENER proposed 8 percent as a starting point but the final notice reduced the number to 5 percent. Similarly, for 2019, the requirement was reduced from 6.9 percent in the draft notice to 5.8 percent in the final decision. At least at the outset of the reform, SENER is choosing cheap over green.

SENER issued guidelines for the operation of the clean energy certificates program in October 2014. The certificates are granted by CRE. The energy regulator also confirms compliance with the requirements for the issuance of clean energy certificates and registers their ownership and liquidation, i.e. the retirement of a clean energy certificate when it is used to meet clean energy supply obligations. The guidelines differ from comparable programs in the U.S. (such as renewable portfolio standards and renewable energy certificates) in that the definition of clean energy includes, in addition to renewables, hydroelectric and nuclear power, as well as the incremental efficiency of co-generation.

CENACE held an auction in March for sales of energy and clean energy certificates to CFE—to be implemented through energy contracts of 15 years and CELs contracts of 20 years. The auction and resulting contracts were designed to provide a basis for developers to finance the construction of clean energy generation. CFE indicated that it would not pay more than 1332 pesos per megawatt-hour for bundled energy and clean energy certificates (equal to $71.37, $47.51 and $23.86, respectively). Despite early concern that renewable energy projects could not be built and financed at that price, 336 bidders qualified for the auction and 227 presented economic offers. On March 31, CENACE announced 18 awards to projects with a total 2085 megawatts in capacity at an average bundled price of 827.67 pesos ($48) per megawatt-hour. This included three awards to affiliates of ENEL SpA, an energy multinational in the electricity and gas industries, at an average bundled price of 670.32 pesos ($38.89) per megawatt-hour. Apart from the ENEL awards, the average bundled price for the other projects was 940.60 pesos ($54.57) per megawatt-hour. On April 29, CENACE announced a second long-term auction to be held later this year, with bid bases published on May 13.

VII. Bases del Mercado

The “Bases del Mercado Eléctrico” (“Electricity Market Bases”) that SENER published in September 2015 establish the principles for the design and operation of the wholesale electricity market. The document is divided in 19 chapters or guidelines, named bases, which will be further developed in market manuals, operational guidelines and operating criteria and procedures (collectively, known as market operational provisions). The market bases and the market operational provisions will together form the market rules, which will be roughly equivalent to the tariffs that U.S. independent system operators and regional transmission organizations issued.

The electricity market bases explain how the wholesale electricity market should work. The bases describe the general rules for the purchase and sale of electricity, ancillary services, capacity, clean energy certificates, financial transmission rights and other products in the wholesale energy market, as well as for the auctions of these products. It also establishes the registration and accreditation of market participants, guarantees to be provided to CENACE regarding the obligations assumed in the wholesale energy market, market participants’ rights and obligations, principles for measurement, settlement, billing and payment, market surveillance, and dispute resolution.

The wholesale energy market is currently limited to a cost-based short-term energy market, consisting in the initial phase of a day-ahead market and a real-time market, with specified constraints. To date, CFE and, on a much smaller scale private energy companies Fisterra and Fenix, are participating in the short-term energy market. It is expected that as private sector generation is built, particularly gas-fired generation, there will be additional participants. The second phase of the short-term energy market, which add an hour-ahead market and remove constraints, will become operational between 2017 and 2018, depending on the market component involved. A capacity balancing market will become operational in February 2017. The initial phase of the market for clean energy certificates will become operational in 2018 or 2019 as determined by SENER.

VIII. The Disaggregation of CFE

CFE is in the process of disaggregation both vertically and horizontally. CENACE, the system operator and operator of the
wholesale electricity market, is already totally separate from CFE. SENER published the terms for the legal separation of CFE in January. Although there is still a single corporate entity heading all the subsidiaries, in March, in compliance with the terms published by SENER, CFE created nine subsidiary companies: six for generation, one for transmission, one for distribution and one for basic service supply. Among the six generating companies, one will hold all the IPP contracts. Additionally, CFE owns affiliates, including CFE Internacional and CFE Energía, to trade electricity and fuels internationally. Through another affiliate, CFE will compete for large customers (qualified supply).

The directors of all the new subsidiaries, as well as the members of each of the boards, shall be appointed no later than June 30. By June 2017, all these companies are supposed to be independent from each other, and by July 2017 the necessary employees must be assigned to the new entities to ensure proper operation and compliance with the strict legal separation ordered in the Law of the Electric Industry.

IX. Gas-Electric Coordination and Market Power

Given that the success of the reform is predicated on reducing the cost of electricity, Mexico will have to build 27 gigawatts of gas-fired generation in the next 14 years, both to replace CFE’s existing fleet and to meet increased demand. This will require building a vast new network of gas pipelines. In addition, since gas supply and transportation have traditionally been tied to the duopoly of CFE and PEMEX, market power issues need to be addressed. The reforms created the National Center for the Control of Natural Gas (Centro Nacional de Control de Gas Natural, or CENAGAS), an independent system operator for nondiscriminatory access to the gas transportation network. New pipeline projects to import shale gas from the U.S. and to serve new gas-fired generation have been tendered.

X. Grandfathering in Projects Under the Prior Energy Regime

The LIE provided that if a permit application for self-supply, co-generation, independent power production, small production, importation or exportation were submitted to the CRE prior to the effective date of the LIE (Aug. 12, 2014), the prior law would be applicable. CRE received 515 applications for new projects or revisions to projects (“grandfathered projects”) from the time that the constitutional amendment passed in December 2013 through mid-August, 2014, a majority of which were renewable energy projects.

One benefit to these “grandfathered projects” was that the applicant would be permitted to enter into the interconnection agreements governed by the prior law (legacy interconnection agreements) if the applicant notified CRE that it was continuing the project and provided proof by Dec. 31 that financing for the entire project had been arranged, commitments to acquire all the principal equipment had been made, and the applicant had disbursed 30 percent of the anticipated total investment. Additional benefits of the prior law include recognition of capacity provided by self-supply projects; the “postage stamp” transmission charges for renewable energy projects, i.e. low charges based solely on voltage; and the “energy bank” for intermittent renewable energy projects. Also, where a legacy interconnection agreement provides for back-up power from CFE, that back-up service is to be administered by CENACE, under tariffs set by CRE. In practice, there is still uncertainty on how these terms will be implemented.

XI. Interconnection Rules

In developing the rules on interconnection, Mexico reaped the benefit of best practices developed during the past 30 years. The interconnection rules promulgated by CENACE on June 2, 2015, were transparent and fair, with short deadlines and lead times. Whether CENACE and CFE, in practice, will be able to meet the very tight deadlines for completing studies remains to be seen, however.

There are two types of interconnection applications: an individual application and an application to be considered as part of the national planning process for transmission and distribution. An individual applicant has to pay for necessary system upgrades in addition to the actual interconnection costs. Applicants that are part of the planning process do not have to pay for system upgrades, but instead pay only the interconnection costs.

Under this cost allocation scheme, many applicants will elect to submit an application to be considered as part of the national planning process (or in the case of individual applicants, to convert to an application under the national planning process). The applications in the national planning process will then be considered in groups, similar to the cluster analysis used in some U.S. interconnection procedures. To the extent that system upgrades are needed for interconnection, the interconnection applicants under the national planning process will succeed only to the extent that the state builds the necessary transmission and/or distribution.
Applicants who have rights to enter into legacy interconnection agreements are required to go through the same interconnection process as for other interconnection applicants. Such applicants who elect to go through the individual application process, however, are not required to pay the fees for the corresponding studies. Applicants who elect to be considered as part of the national planning process do have to pay the study fees.

XII. Transmission and Distribution Under Energy Reform

Under the Mexican Constitution, the state operates and retains ownership of the transmission and distribution systems.

The state, acting through SENER, also is responsible for planning transmission and distribution. This is done through the Program for Development of the National Electric System (Programa de Desarrollo del Sistema Eléctrico Nacional, or PRODESEN), whereby SENER presents its plans for the expansion and modernization of the national transmission grid and the general distribution networks, as well as indicative programs for the installation and retirement of power plants.

On July 31, 2015, SENER issued the PRODESEN for 2015–2029. This document stated that to meet the demands of growth, Mexico would have to expand its transmission grid over the 15-year period by 24,600 kilometers, from 52,816 kilometers up to 77,416 kilometers, and add complementary transformers and reactive power sources, at a total cost of approximately $12.6 billion. Mexico also would have to expand and modernize its distribution networks, at a total cost of approximately $14.7 billion over the 2015–2029 period.

The Mexican federal government can use its own budget capabilities to pay for necessary expansion and modernization. This funding is limited, however, particularly considering Mexico's loss of revenue arising from the drop in oil prices. Mexico also is looking to the private sector for support.

In this regard, the LIE provides that the state, acting through SENER, or a transmission provider or distribution provider (both required to be state owned), can enter into associations (public-private partnerships) or contracts with private parties in order for such private parties to carry out the financing, installation, maintenance, management, operation and expansion of transmission and distribution infrastructure. The associations or contracts with private parties are subject to specific conditions, including among others, that the associations or contracts are subject to regulation by the CRE with respect to tariffs and the terms for providing service; the associations or contracts will be awarded on the basis of competitive bidding; and in granting security interests in the rights derived from an association or contract, the collateral cannot include the transportation or distribution infrastructure (which will be publicly owned) to which the association or contract pertains.

XIII. Challenges in Implementation

1. Financing

Power plants require long term power purchase agreements (PPAs) to be financeable. In markets in the U.S. where long term PPAs are not readily available, such as the New England and PJM independent system operators, which heavily influenced the Mexican market model, capacity auctions have substituted for full PPAs. In addition, given the current decline in the value of the peso, in all probability power plants will seek financing in dollars and will expect to be paid in dollars or dollar equivalents (i.e. a peso amount that is the equivalent to the amount due in dollars on the payment date).

While the recent clean power auction demonstrated a willingness to pay generators in dollar equivalents, Mexican consumers will pay their bills in pesos. This could present a challenge to the credit-worthiness of CFE as a counter party unless CFE raises its prices to consumers in the event of further peso devaluations. Accordingly, a dollar-based wholesale market may make it difficult to lower electricity prices unless reductions in the cost of electricity overcome currency issues.

2. Will the Wholesale Electricity Market Work? Will It Encourage or Discourage Qualified Supplier Sales to Qualified Users?

The wholesale energy market should work in the long term as long as the market rules are clear and guarantee a level playing field for all market participants, including all CFE companies. Today, the wholesale electricity market is operating with incomplete market rules: the approved market bases and four market manuals. There are many details that have to be established in the market manuals that remain to be published.

To date, SENER has released 15 market manuals for public consultation, which can be located at the Web page for the Federal Commission on Regulatory Improvement (Comisión Federal de Mejora Regulatoria, or COFEMER); however, only four of them have been published. Accordingly, the market is operating without detailed rules on such important matters as the short-term energy market or the registration and certification of market participants.
An important challenge to encourage qualified supplier (QS) sales to qualified users (QUs) is the CFE tariffs and the local marginal prices at which energy traded in the short-term market is settled. A qualified user could decide it is more convenient to participate directly in the market if the qualified suppliers do not have a clear purchase advantage. If CFE's tariffs keep descending or remain at low levels as they have been in the past months, then there will be no incentive for qualified users to look for a qualified supplier or even to participate in the market.

3. Can CENACE and CRE Ensure Market Independence From CFE?

Even with the CFE split and the separation of functions legally enacted, it will be challenging for the authorities to ensure independence of the wholesale energy market from CFE, given that all the newly created CFE generation subsidiaries will still report to the same parent company and together they will have an overwhelming share of total generation capacity, at least for some time.

Furthermore, natural gas will likely be centrally purchased and transported through pipelines in which CFE is the main capacity owner; this could become a clear barrier of entry for natural gas imports needed by other generating companies, as well as for the supply and transport of natural gas within the country, with a direct impact on electricity market competition. Nonetheless, existing institutions have the tools to ensure competition and create a level playing field, if they are willing to use those tools.

4. Issues With Interconnection and Transmission Expansion

A major issue with the interconnection rules is the financial guarantee requirement for an interconnection application. In practice, the financial guarantee will be a stand-by letter of credit. In the case of an individual application, the financial guarantee must be provided only upon the signing of an interconnection agreement in an amount equal to the greater of $40,000 per megawatt, or the total estimated cost of the interconnection and any system upgrades.

For inclusion in the national planning process, the financial guarantee must be provided at the time the application is submitted in the amount of $130,000 per megawatt. For a large gas-fired power plant of 500 megawatts, the financial guarantee would be for $65 million, a substantial sum. The required guarantees are very high, particularly for inclusion in the national planning process. Also, there are no clear rules on when the guarantee can be withdrawn or terminated, other than upon completion of the interconnection and any system upgrades.

It remains to be seen whether the ambitious goals for expansion and modernization of Mexico's transmission grid and distribution networks as set forth in the PRODESEN 2015–2029 can be attained. Funding is the problem. The financial model for building new transmission in Mexico is untested. Further, there is no clear path to merchant transmission.

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