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Panel II: Emerging Issues – Part I: International Perspectives

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Introduction

Chairman Norman Bay, Commissioners, and fellow panelists, I deeply thank the opportunity to appear before this Federal Commission as one of the people responsible for developing the electric reliability regulation in Mexico. I have worked at the Energy Regulatory Commission for the past 7 years and I have witnessed one of the major transformations in the Electricity Sector in my country.

Mexico is undergoing a sweeping Energy Reform away from a power system centered on a vertically integrated state-owned enterprise into a restructured market that can accommodate the call for market competition and political commitments on clean energy transition. The Reform emphasized a two-pronged strategy of structural transformation: 1. improving productivity through market

competition and restructuring, and 2. reducing power production costs and emission through the increase of natural gas and clean energy supply in the market against the share of heavy fuel oil. Power sector legislation in Mexico mandates that 35% of electricity generation is sourced from clean energy (including nuclear, efficient co-generation, and hydropower) by 2024.

How is the Mexican grid and regulatory framework changing?

Based on the constitutional amendment of December 2013, the government, under the leadership of the Ministry of Energy (SENER), proposed a legal framework that was presented to the Congress and approved in August 2014. The cornerstone of the new power market structure was the Electric Industry Act (LIE by the Spanish acronym), which established the new market structure, created an ISO, established the new responsibilities between authorities, and established the guidelines for the transition period, including the rules applicable to incumbent private stakeholders. These rules became fundamental to avoid undermining investors' confidence. The ISO under the acronym CENACE gained independence from its previous role as the Control and Dispatch Department within CFE.

During the subsequent 18 months, the implementation work focused on meeting two goals: firstly to have the Wholesale Electricity Market operating by January 2016 and secondly to complete a full transition period by 2018. To meet the first goal, SENER developed the body of regulation for the wholesale market, which included first and foremost the Market Rules. Various Business Practice Manuals were also published on topics like long-term auctions, grandfathered

interconnection contracts, bilateral transactions for market participants, and several more covering various topics concerning the operation of the market.

As for CRE, we grew stronger with more authority and responsible for issuing a suitable and predictable regulatory framework that encourages certainty for the former and new players in the sector. Since its creation in 1993, CRE has worked in both the hydrocarbons and power sectors, in which its main role was permit issuance. In terms of electricity, CRE has been responsible for issuing all generation permits in Mexico under six different schemes (self-supply, IPP, import, export, cogeneration, and small production). As a result of the Energy reform, CRE's responsibilities have expanded not only in generation sector, but also in transmission, distribution, the Wholesale Electricity Market. Within this context, I want to explain 3 key Restructuring Design Elements of the Energy Reform of the Electricity Sector in Mexico:

1. Grid Planning and Interconnection Rules

Before the reform, many private developers expressed that a clear and transparent process for interconnection would be critical for new projects to be competitive. In particular, developers identified two primary barriers: (1) the ability to access transmission infrastructure, and (2) the lack of an administrative process for project interconnection approval. A new process was designed based on the principles required by law and put CENACE in charge of the interconnection studies. As compared to the original process which was free, CENACE would now be able to

collect specific fees for each application, and be able to adequately respond to the volume of applications they might receive.

On the other hand, grid expansion planning primarily focused on the interests of CFE. In practice this meant that it was difficult for private developers to have their projects included in grid expansion planning efforts, and CFE could not legally include an assessment of the potential growth of private sector projects. This resulted in limited spare capacity in transmission networks for the integration of large renewable energy projects, therefore making them uncompetitive because of required upgrades to the grid, or delaying their interconnection. If not reformed, these processes would have deepened administrative bottlenecks, prevented renewable competitive projects from going forward, and further complicated transmission and operational planning by CFE.

The new planning and interconnection rules are meant to enhance the development of a competitive market, reduce the regional differences on marginal cost of energy and prepare for rapidly rising share of variable renewable energy. A new 15-year planning document PRODESEN is issued by SENER in the first half of every year. Several components are developed by CENACE particularly those regarding grid expansion and includes significant detail for a 5-year period. In addition to the economics of improving regional grid interconnection, the planning document incorporates all interconnection applications within a 12-month period. And as the legal regime unfolds, it will also take into account the new High-

Potential Renewable Energy Zones, similar to the Competitive Renewable Energy Zones in Texas.

2. New Electric Reliability Framework: The Grid Code

The Mexican Grid Code (MGC) is the foundation of the Electric Reliability Regulation in Mexico. This is the first formal regulatory instrument issued by CRE in exercise of its new powers given by the Constitutional Energy Reform. It was published last April and intends to be a dynamic document receiving permanent feedback from all stakeholders through a transparent and fair process.

The MGC is the set of minimum technical requirements that will be used to efficiently develop the activities of planning, operation, access and use of electricity infrastructure. The MGC consists of rules addressing how generators must connect to the electric power grid in order to maintain system reliability. The MGC also includes additional technical requirements related to transmission and distribution planning, system operation, interoperability and cybersecurity as part of the smart grid and those related to the interconnection between Mexico and the United States. In terms of planning, the MGC includes general guidelines for CENACE and CFE to design expansion strategies for the transmission and distribution networks respectively. These guidelines include the n-1 criterion, the cost-benefit analysis and the approaches to assess the inclusion of renewable energy. With respect to system operation, it includes the technical limits for operating the transmission lines, the rules for economic dispatch, and the coordination between CENACE and the transmission and distribution companies. According to the LIE,

smart grid implementation will support the efficient and reliable operation of the system. Therefore, the MGC establishes the general criteria for interoperability and cybersecurity to consider the integration of information and communication technologies while maintaining security and minimizing threats. Finally, it is also important to highlight that the international interconnection between Mexico and the United States is considered in the MGC, and ten reliability NERC-like standards are adopted to maintain coordination and safe operation between both electric systems.

3. Long term Auctions

One of the cornerstones of the renewable energy expansion is the development of the auction system for long-term contracts. Regulated power supply, referred to as basic service, requires CFE to sign power and capacity supply contracts. These contracts are auctioned by CENACE, with short-, mid- and long- term contracts. But only the long-term contracts are intended for the supply of clean energy. Auctions are called three years in advance of contract execution, allowing projects at an early stage to start.

The regulation was ultimately published with contracts including commitments for 15-years for capacity and energy, and of 20-years for Renwable Energy Certificates (REC's). This measure will facilitate the transition to more liquid markets in the shortest time, but would also maintain the benefits of an equivalent to the windfall profits of additional five years of REC's. Mexico called for the first auction in November 2015, and the first round of contracts were awarded on March

30, 2016. This first auction was issued to purchase a total of 6.3 TWh of energy, 6.3 million REC's, and only 500 MW of capacity. Before economic offerings, a total of 352 proposals were deemed technically feasible and paid warranties were requested. There were up to eight times more offers than originally expected.

The final outcome of the auction was finally run by CENACE on March 29, 2016. In total 227 offers from 69 bidders were evaluated, resulting in total 18 winning bids from 11 companies. Among the bidding companies, seven presented solar PV projects and four wind energy project. In total solar PV will provide over 74% of the energy and, while wind will provide only 26%, with no other technology having won a contract. There was a significant price range, from offers below 40 USD per megawatt-hour plus REC's and above 60 USD, with both solar PV projects as the most and least price competitive. The range in prices is a result of the rules regarding nodal pricing which allowed for projects with higher cost per MWh to win contracts when located within the higher nodal pricing. No bidder offered capacity due to low payments offered for this concept by CFE. We can think of this first Auction as a successful one since more than 2,000 MW were assigned to PV and Wind technologies representing more than 2 billion USD of new investment in clean energy.

Finally, I have been asked to answer a very important question: **What are the implications for the United States?**

I am strongly convinced of saying that those implications do exist, and are significant. Two days ago, just before I arrived here before you, the Under

Secretary of Electricity presented the new planning document that I explained before called PRODESEN. The 2016 version of such document includes various projects to get United States and Mexico interconnected using HVDC lines such as the one in Sonora and Arizona. But what is truly remarkable is that Mexico is thinking about a huge project to build the interconnection corridor along the border with the United States. This emblematic project will have profound implications for both countries since it will foster the exchange of electric energy and the possibility of having more competitive prices in the Mexican Wholesale Electricity Market.

With these interconnections already under study, the integration of more clean energy could be feasible helping Mexico to achieve our national clean policy target of having 35% of the energy consumed coming from clean resources by 2024. But not only Mexico would benefit from the integration of more clean energy since this could help some states in the US to meet with their Renewable Portfolio Standard targets such as California.

We have considered in our new regulation giving CENACE the opportunity to sign international agreements with other ISO's to improve reliability in our system, especially in emergency situations in which other Power Systems could help as back-up. We came with this idea of course thinking about the ISO's in the United States such as CAISO and ERCOT.

Last but not least, I want to deliver the message that Mexico is undergoing through a major transformation in its Energy Sector, the new regulation developed already includes the possibility of having imports and exports across the border, the option

for the Mexican ISO of entering into international agreements, and of course the inclusion of NERC-like reliability regulation in the Grid Code. I want to take this opportunity to thank FERC, NERC, NARUC, WECC and all US entities that have helped not only CRE but other Mexican Entities in moving forward with the implementation of this ambitious Reform which I am sure will pave the way for the fully energy integration in North America.