

MaRS Market Insights



Market Information Report: Mexico

MaRS Advanced Energy Centre

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Executive summary

The Going Global series provides a 360-degree view of the energy systems in international priority markets for export-ready Canadian energy companies. Each report not only examines the energy and electricity landscape of a particular market, but also the business environment, the social, political and legal frameworks, and the country's macroeconomic drivers. The current report is focused on Mexico and aims to help companies answer the following key questions:

Are our Canadian capabilities a good fit for the market?

What are the opportunities and barriers to doing business, and do the former outweigh the latter?

In preparing this report, the authors examined a set of quantitative and qualitative indicators for understanding the challenges and opportunities for energy innovation in Mexico: security of energy supply, quality and efficiency of energy supply focusing on transmission and distribution network efficiency, environmental sustainability and quality of business environment. Along with these drivers, Mexico's energy reform and important local actors and laws are also discussed. To remove any subjectivity or bias in our depiction of the indicators, they are presented as raw data obtained from trusted third-party sources—including the World Bank, International Energy Agency (IEA) and U.S. Energy Information Administration (EIA)—and compared with Canada for reference.

The report focuses on primarily the electricity sector and is intended to serve as an initial resource in understanding whether a market is suitable for Canadian cleantech innovators. The report will prompt more specific questions and should be supplemented by a visit to the market in question.

MEXICO ELECTRICITY SNAPSHOT (2015)

Total electricity generation capacity	65 GW (2014) ¹
Total electricity demand	39 GW (2014) ¹
Electricity coverage	98.7% (2015) ²
Total losses	13.11% (2015) ¹
Percentage of renewables in electricity mix	25%(2015) generation capacity from renewables including hydro and nuclear ³
Targets	35% of electricity generation from clean sources by 2024 ³

Table 1: Mexico power statistics

- https://www.gob.mx/cms/uploads/attachment/file/44328/Prospectiva_del_Sector_Electrico.pdf
- http://www.inegi.org.mx/est/contenidos/proyectos/encuestas/hogares/especiales/ei2015/doc/eic_2015_presentacion.pdf
- https://www.ief.org/_resources/files/events/mexico-energy-day---energy-reform-in-mexico/mexican-president-visit-ief-17-jan-2016.pdf

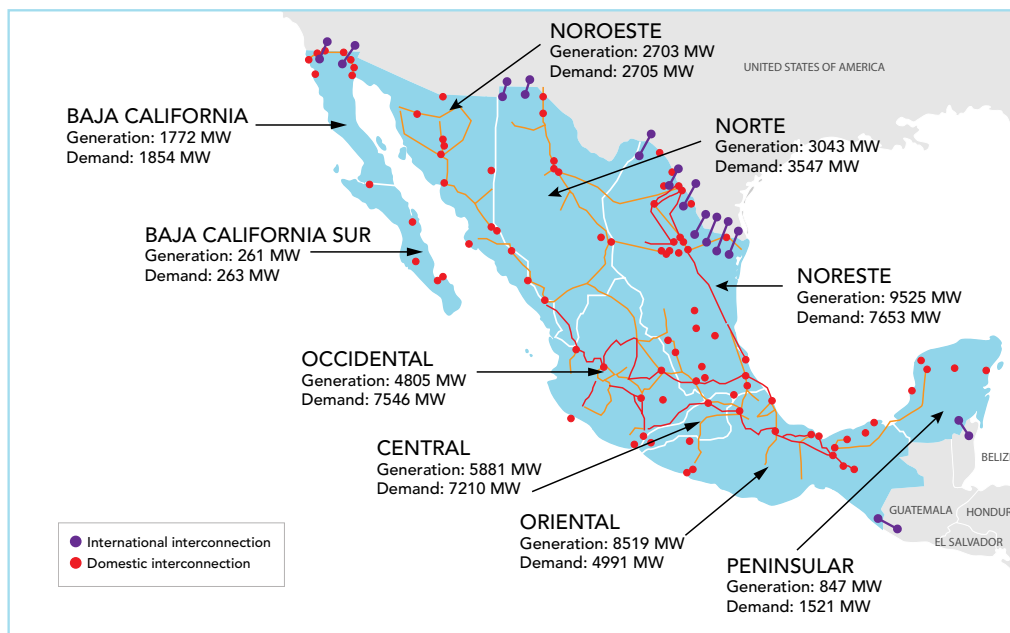


Figure 1: Mexican electricity zones and transmission interconnections^{4,5,6} (generation and demand values as on 11th August, 2016)

4 <http://www.cenace.gob.mx/Paginas/Publicas/Info/DemandaRegional.aspx>
 5 <http://www.transform.ru/articles/pdf/sigre/c1-101.pdf>
 6 https://www.gob.mx/cms/uploads/attachment/file/44328/Prospectiva_del_Sector_Electrico.pdf, p. 80

This paper also details the opportunities and challenges in Mexico’s electricity sector, post 2014 reform. The table below summarizes some of the key points.

OPPORTUNITIES IN CLEANTECH	BARRIERS TO CLEANTECH
<p>As a result of the Energy Reform Act of 2014, foreign investors are looking to harness opportunities of an energy system in transition. Ambitious targets include:</p> <ul style="list-style-type: none"> • Energy mix diversification: 35% of the nation’s electricity will come from clean sources by 2024 • Greenhouse gas reduction: 22% reduction by 2030 and 50% by 2050 • Clean energy certificates (CECs): requires that in 2018, 5% of the country’s power generation must come from clean sources (which include renewables, large hydro, nuclear and efficient cogeneration) <p>These goals will boost clean energy use for electricity generation, particularly in energy-intensive industries Smart grid and smart meter opportunities arising from targets to reduce energy losses to 10% for 2018 Government to invest \$300 million in smart grids by 2018</p>	<ul style="list-style-type: none"> • Historical and continuing reliance on natural gas • Weak transmission links limiting connection of renewable generation • Clean energy definition is broad, which might lead to favoring of cheaper and reliable natural gas plants over renewable technologies • Lack of infrastructure along with complex relationship between tariffs and control of electricity demand might slow down the implementation of smart grids • Weak relationship between players • Resistance to change in the operation of electrical networks • Social license challenges for renewable energy projects can cause delays in energy project development in rural areas (land use challenges can impact most infrastructure development projects)
BUSINESS OPPORTUNITIES	BUSINESS BARRIERS
<ul style="list-style-type: none"> • Attractive destination for foreign direct investment in cleantech due to recent energy reform opening up energy market to foreign investors • No limits on ownership percentages for foreign companies, so companies can be 100% foreign owned • Renewable energy Power Purchasing Agreements (PPA) for 15 years available through government auctions, initiated since the energy reform of 2014. After the two initial auctions in 2016, 1 GW of capacity auctions expected annually • Streamlined and fast process for securing projects 	<ul style="list-style-type: none"> • High degree of competition between foreign firms results in the necessity for companies to have an in-country partner, physical presence, etc. • Open market is supportive of big actors rather than small and medium businesses • Balancing the transition to a deregulated market with managing existing infrastructure can be challenging • Policy uncertainty around cleantech business investments, as the post-reform auction processes, regulations and plans are relatively new and unverified

Table 2: Opportunities and barriers in Mexico



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1 Introduction

According to the International Monetary Fund, Mexico is the 15th largest economy in the world as of 2015, and is expected to be the 5th largest by 2050.⁷ As Mexico grows, so does its demand for energy and electrical power.

⁷ <https://www.gov.uk/government/publications/exporting-to-mexico/>

Population	127 million
GDP	\$1.144 trillion (2015)
Capital city	Mexico City
Official language	Spanish
Currency	Mexican Peso (MXN)
Major exports (worldwide)	Crude oil, Vehicles, electronics
Biggest trade partners	USA (81.2%), Canada (2.8%), China (1.3%)
Major imports	Electronics, machines, vehicles

Table 3: Mexico key country statistics⁸

⁸ <http://data.worldbank.org/country/mexico>

1.1 Mexico energy mix

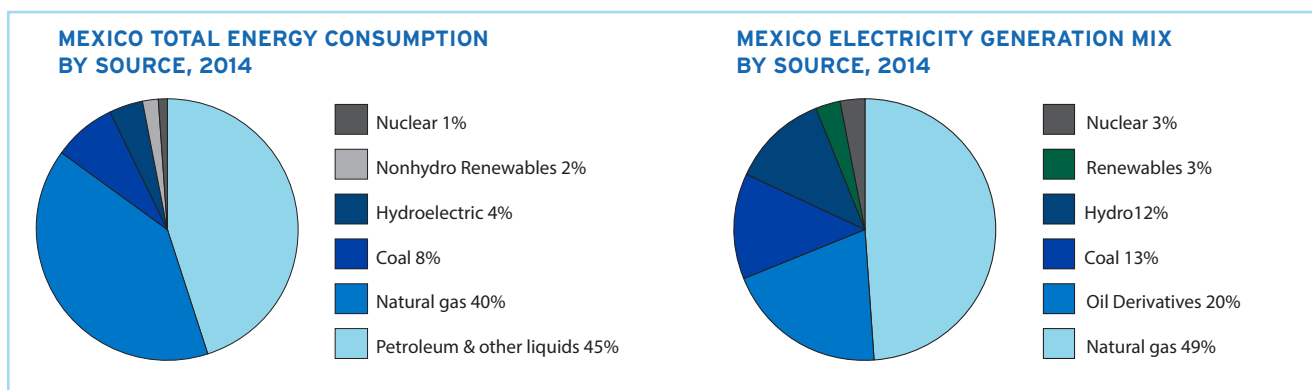


Figure 2a: Mexico's energy mix^{9,10}, Figure 2b: Mexico's electricity generation mix^{9,10}

Mexico's energy mix and electricity mix are both dominated by fossil fuel, as can be seen in figures 2a and 2b. The reliance on oil derivatives for electricity production along with ageing assets has resulted in high prices of electricity in recent years. Hence, increased attention is being given to natural gas and renewable/non-fossil fuels for electricity production.

⁹ <http://data.worldbank.org/country/mexico>

¹⁰ <https://www.eia.gov/beta/international/analysis.cfm?iso=MEX>

2 Policy background and energy reform

In 2014, Mexico started the process of reforming its energy system. The main drivers of the reform were slow GDP growth and a steady drop in oil production over the past 10 years. Along with the fossil fuel industry, the electricity sector was significantly modified. New organisations were created to better manage the deregulated electricity market. **Main government bodies that influence the electricity sector are as follows:**

- **Secretaría de Energía (SENER)** - Ministry of Energy, Government body responsible for the energy policy and planning of the energy sector in Mexico.
- **Comisión Reguladora de Energía (CRE)** - Government entity responsible for regulating the power and natural gas sector, also manages “Codigo de Red”, the minimum technical requirements for the efficient development of electricity sector planning processes and infrastructure development and management, and issues permits for power generation.¹¹
- **Comisión Nacional de Hidrocarburos (CNH)** - Government entity responsible for overall exploration and production of hydrocarbons through regulation, providing technical advice to SENER, conducting tender and contract supervision and evaluating exploration and development plans.
- **Comisión Federal de Electricidad (CFE)** - Government owned vertically integrated utility, which controls over 75% of the generation (including generation by independent power producers, IPPs), and all of transmission and distribution.
- **Petróleos Mexicanos (Pemex)** - State owned petroleum company, that aims to produce electricity from natural gas and cogeneration. Pemex aims to own 10% of power generation by 2020¹²

- **Centro Nacional de Control de la Energía (CENACE)** - The independent operator in the electricity sector, tasked with managing the national electricity system along with creation and operation of the electricity market
- **Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT)** - Ministry of Environment and Natural Resources, Government body responsible for the protection, restoration and conservation of the environment.

Before 2014, the Mexican electricity system was a monopoly, owned and operated by the state, under the Federal Electricity Commission (Comisión Federal de Electricidad, CFE). The CFE created plans and built new generation capacity along with transmission and distribution networks, and then passed along the cost to consumers, following a cost-of-service model. Since the reform, Mexico's CFE has been unbundled into CFE generation and CFE Transmission and CFE Distribution. This step was taken to remove the monopoly, thus fostering competition and innovation.

As of March 2016, the Board of Directors of CFE agreed to the creation of subsidiaries, six generation companies, one transmission, one distribution, one for basic supply, one for for qualified supply and one for overseeing the interconnection of agreements legacies. This process is to ensure open access, efficient separation and competition in the Mexican wholesale electricity market.

In addition, the new regulatory regime includes features that aim to promote private investment in power generation (focusing on clean sources), to improve transmission and distribution networks, and to offer end-users a wider range of options to meet their demand through a wholesale electricity market. The sector now also allows 100% foreign investment in energy generation.¹³

¹¹ http://dof.gob.mx/nota_detalle.php?codigo=5432507&fecha=08/04/2016
¹² <http://www.wsj.com/articles/mexican-oil-firm-pemex-creates-business-to-boost-electricity-production-1411673161>

¹³ <https://www.state.gov/documents/organization/227420.pdf>

Figure 3 provides an overview of the different institutions and their roles in the electricity market.

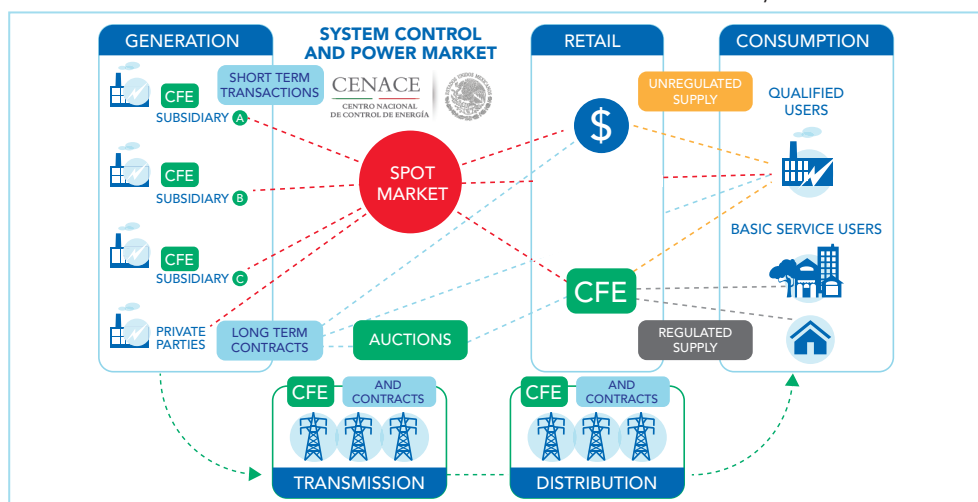


Figure 3: Main actors in Mexico's electricity sector¹⁴

¹⁴ https://www.ief.org/_resources/files/events/mexico-energy-day---energy-reform-in-mexico/mexican-president-visit-ief-17-jan-2016.pdf, p. 27

The electricity law further differentiates between retail customers. Those with aggregate load points under 3 MW are referred to as basic service users, while those with aggregate load points over 3 MW are designated as qualified users. Since the reform, large industrial customers, as qualified users, can purchase power directly from the wholesale market by entering into agreements with and providing performance bonds to CENACE.

After the declaration of reform in 2014, President Peña Nieto also signed secondary laws that impact the energy sector. Some important secondary laws and provisions include¹⁵:

- The Energy Transition Law, which established the Ministry of Energy, and specified the Clean Energy Goals and Energy Efficiency Goals. All companies working in Mexico, whether domestic or foreign are required to comply with these goals.
- The Clean Energy Goals are minimum percentage targets relating to the total generation and consumption of clean energy electricity in Mexico. The Energy Efficiency Goals place new sets of obligations on manufacturers of products (such as household appliances or windows). Participants in the electricity sector, both producers and consumers, are obliged to comply with the Clean Energy Goals.
- The main mechanism for the implementation of the Clean Energy Goals is the Clean Energy Certificate (CEC). One CEC is to be issued per 1 MWh of clean energy generated, with a minimum requirement for energy generation firms to purchase CECs to the value of 5% of the total electricity they generate.
- Another important piece governing the electricity sector is the electricity system plan developed and maintained by SENER, called Programa de Desarrollo del Sistema Eléctrico Nacional (PRODESEN). This plan is for the National Electricity System governing the decommissioning and building of power plants, along with transmission and distribution network plans.
- Geothermal Energy Law: This law redefined what is meant by “geothermal water” and “hydrothermal geothermal reservoir,” thus allowing private actors to utilize these resources for electricity generation.

¹⁵ <https://www.dlapiper.com/en/us/insights/publications/2016/01/mexico-new-energy-transition-law/>

ELECTRICITY CAPACITY AUCTIONS

Mexico has introduced auctions to drive private investment in clean energy and electricity generation. Mexico defines clean energy quite broadly, so the auctions are open to competition from wind, hydro, cogeneration, combined-cycle gas, and geothermal, as well as photo voltaic (PV).

Solar and wind were the clear winners in the 1st capacity auction. Out of a total 5.38 million MWh of energy that was awarded in the first auction, PV won 74% and wind won the remaining 26%, with no contracts being awarded to any of the other technologies. The first auction took place in March 2016, leading to 11 projects being approved for a total of 1,860 MW. One Canadian company, Canadian Solar (subsidiary Recurrent Energy) won a contract for 141 GWh. The average price of power was \$50.7 per MWh with a range of \$35.44 per MWh for a 427 MW project by Enel to \$67.5 per MWh for a 29 MW project by Photoemeris Sustentable. By comparison, PPA prices in other countries are much higher, such as in the US at \$52 per MWh and in India at about \$71 per MWh for solar.¹⁶ The project completion date is ambitious, according to Greentech Media, raising concerns of projects being delayed and not connected by the expected date of 2018.¹⁶

¹⁶ <http://www.greentechmedia.com/articles/read/Solar-Stuns-in-Mexicos-First-Clean-Energy-Auction-1860-MW-Won-at-50.7-P>



3 Demand drivers

3.1 Security of energy supply

Mexico is an energy surplus state. It is a net exporter of oil and the largest source of oil imports to the US. However, with rising domestic consumption and dwindling resources, the exports have been falling, with its highest export levels in the mid-2000s. Apart from oil, Mexico is also a major consumer of natural gas, the demand having more than doubled since 2000. This increase in domestic consumption is a direct reflection of the power sector; electricity generation from natural gas has seen a major boost in the past few years. As of 2016, Mexico can import gas from anywhere in the world, and as of 2018, after 80 years of government-set prices, natural gas will be sold at market price. The current major source of natural gas is the US, with pipelines being developed in collaboration with Mexican and US companies. In the electricity sector, Mexico has surplus generation and generation has managed to keep ahead of demand. However, Mexico's electricity demand is forecast to grow by 4% annually, from 279 TWh in 2012 to 440 TWh by 2024.^{17, 18}

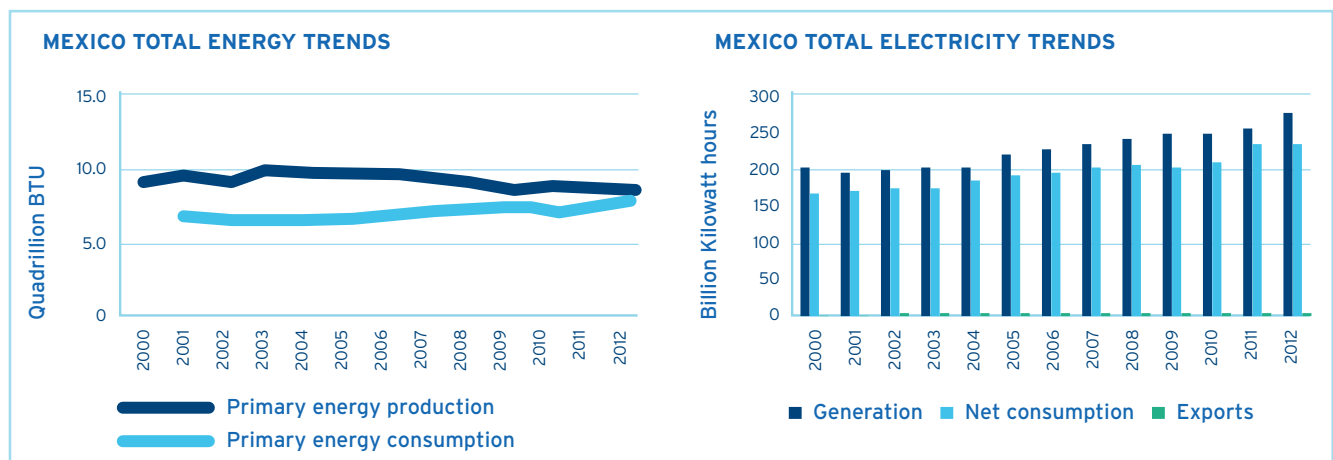


Figure 4a: Mexico total energy trends, Figure 4b: Mexico electricity trends¹⁹

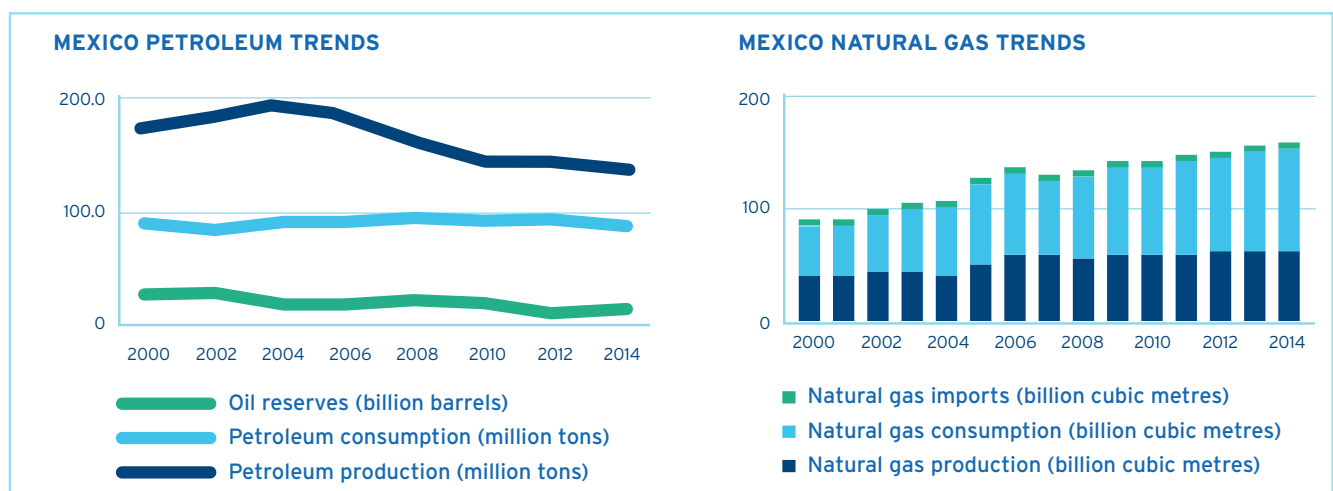


Figure 5a: Mexico petroleum trends, Figure 5b: Mexico natural gas trends¹⁹

¹⁷ <http://www.apricum-group.com/mexico-building-renewable-energy-market-without-conventional-feed-tariffs/>
¹⁸ <http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm>
¹⁹ BP Statistical Review Yearbook 2015

3.1.1 Energy demand

Mexico	Canada	USA
1,588.16 kg of oil equivalent (2012)	7,269.64 kg of oil equivalent (2012)	6,793.96 kg of oil equivalent (2012)

Table 4: Per capita use of energy²⁰

The per-capita energy use has stabilised since 2000. However, there have been some fluctuations, such as when it dipped with the recession in 2008 and reached a peak in 2013, and it has been on a decline since. In contrast, the total energy consumption has been on the rise with increasing population, manufacturing and urbanization. Mexico's total energy consumption and per-capita energy consumption are much lower than that of Canada and the USA. Electricity sales to end users grew at an average annual rate of 2.2% since 2000 and growth is expected to increase further to 4% annually through 2026. Estimates by CFE forecast that the number of retail clients will grow at an annual rate of 1 million new customers in the near future.²¹

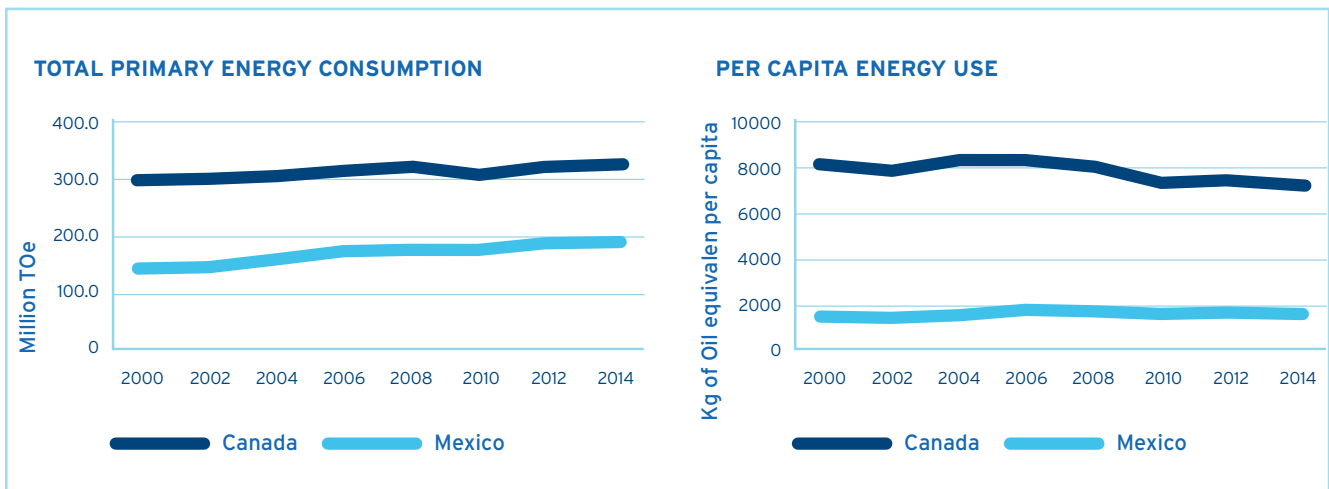


Figure 6a: Total energy consumption in Mexico and Canada, Figure 6b: Per-capita energy consumption in Mexico and Canada¹⁹

ENERGY USE BY SECTOR

In Mexico, industry is the major user of energy, followed by the residential sector. The industrial and residential sectors present opportunities for energy conservation efforts and technologies.

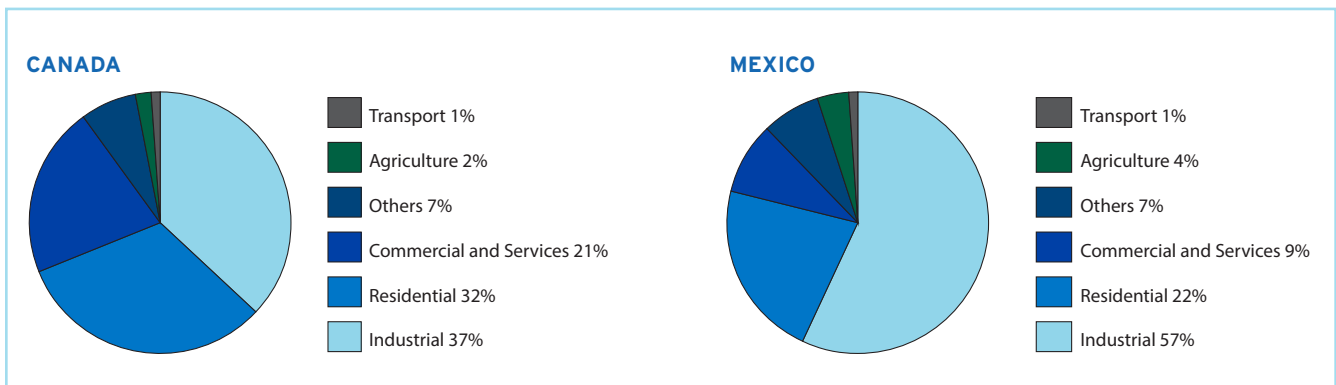


Figure 7a: Energy use by sector in Canada, Figure 7b: Energy use by sector in Mexico²²

²⁰ World Bank Data, <http://data.worldbank.org/indicator/EG.USE.PCAP.KG.OE>
²¹ <http://www.cre.gob.mx/documento/3978.pdf>
²² BP Statistical Review Yearbook 2015

3.1.2 Renewable energy potential

Mexico has high renewable energy potential. There is minihydro potential of about 6,300 MW; solar potential estimated at 5 kWh/m²/day; wind has seen development in the Oaxaca region, with potential in Tamaulipas, Baja California and Zacatecas; whereas geothermal has yet to see development and currently amounts to less than 1,000 MW. However, there is opportunity for development of renewables, as Mexico will require an additional 22 GW of power generation from clean sources in the next 10 years to meet its targets.²³

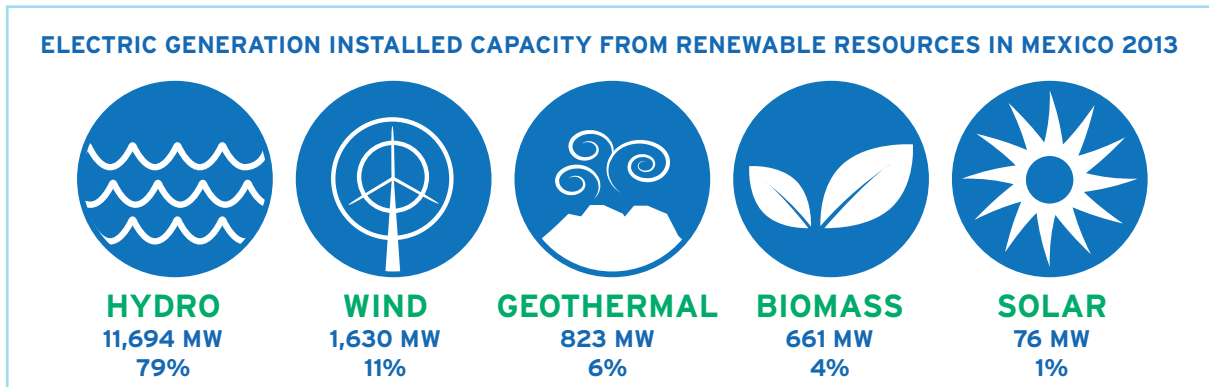


Figure 8: Electricity generation from renewable sources in Mexico²³

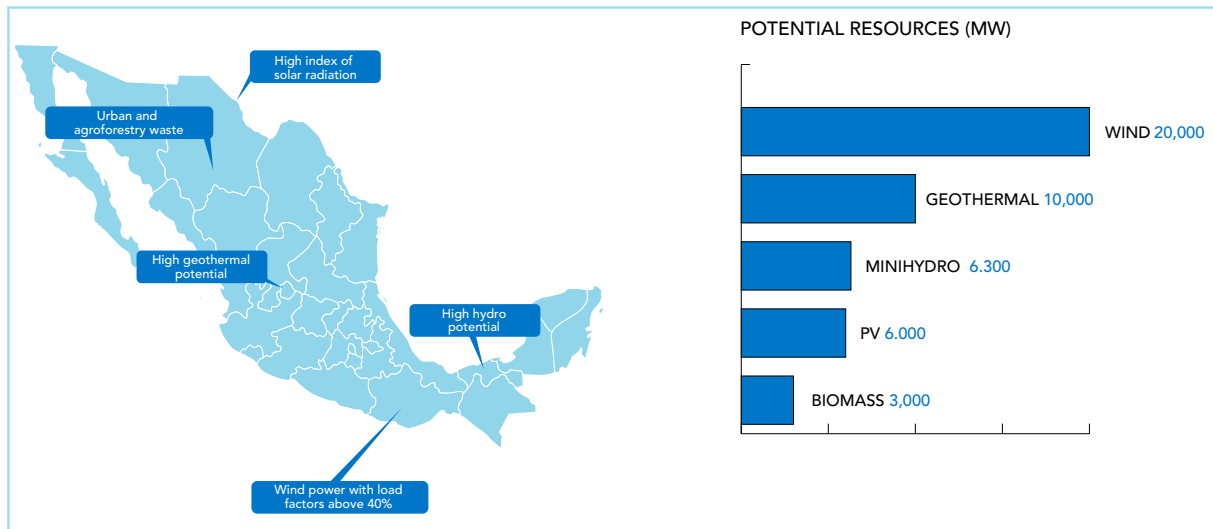


Figure 9: Mexico renewable energy potential²⁴

²³ <http://www.renewableenergyworld.com/articles/2015/08/the-future-of-renewable-power-in-mexico.html>

²⁴ https://www.usea.org/sites/default/files/event-/Mexican_Department_of_Energy_Estrada.pdf

FINDINGS REGARDING MEXICO'S SECURITY OF ENERGY SUPPLY:

Mexico is secure in its energy supply, with more generation than demand; however, it is heavily dependent on fossil fuels. Mexico aims to adopt cleaner sources of energy and has ambitious targets for renewable electricity capacity. This is to remove reliance on fossil fuel generated electricity and replace aging infrastructure. Furthermore, nearly 16 GW of aging generation capacity is expected to be decommissioned by 2030. Therefore, there is a push for more generation, especially from clean sources—not only to meet GHG commitments but also, to reduce prices. Opportunity lies in the generation sector, where foreign companies can bid for projects in the energy capacity auctions. Mexico has a huge potential for renewable generation, and it is important to tap into that resource effectively. Solar and wind are both expected to see substantial development. In future, plans include private contractor involvement in transmission and distribution networks as well. However, there is heavy competition in this sector, especially from US companies. Mexico does not have any subsidies for cleaner sources, thus forcing renewables to compete with fossil fuels. Also, the definition of clean sources includes efficient cogeneration and many fear cheaper natural gas might gain an advantage in comparison to solar, geothermal and wind prices.

3.2 Quality and efficiency of electricity supply

In Mexico, more than 98% of the population has access to electricity. Mexico also has the lowest interruptions of supply to the consumer in Latin America, with 2.19 interruptions per consumer. The value lost due to interruptions has, however, seen an increase from 2.4% of total sales in 2006 to about 3.4% in 2010.²⁵

²⁵ <http://data.worldbank.org/indicator/IC.FRM.OUTG.ZS?locations=MX>

PRICES

Mexican electricity prices are subsidized and regulated for residential and agricultural retail consumers, but not for industrial consumers. One of the aims of the energy reform is to reduce prices, and they have come down since then, making Mexico really attractive for manufacturing. CFE reports indicate that electricity tariffs in Mexico saw a reduction of 21% to 30% for industry and 8% to 18% in the commercial sector, between September 2014 and September 2015. The reduction wasn't as significant for the residential sector, and the prices declined by between 2% for customers with low consumption and 7.8% for the customers with high consumption.²⁶

TRANSMISSION NETWORKS

The demand and generation by energy sectors in Mexico can be seen in Figure 1 (see Executive summary, Mexico Electricity Snapshot) in the beginning of this document. Mexico is divided into nine different regions which are interconnected. Mexico also shares extensive connections with neighboring countries such as USA, Guatemala and Belize, as seen in Figure 1. Some of these regions, despite having high renewable generation potential, don't have enough capacity and need to be supported by other areas. The transmission system in some areas (southeast and north of the country)²⁷ in Mexico is not ready to support increased renewable generation due to high levels of congestion. Mexico's transmission infrastructure is ageing, with about half of the lines having been in operation for at least 20 years. Before the reform, the transmission infrastructure investment trailed demand, raising concerns of an undersized grid. The reforms are expected to increase investment in transmission system and help reduce prices.

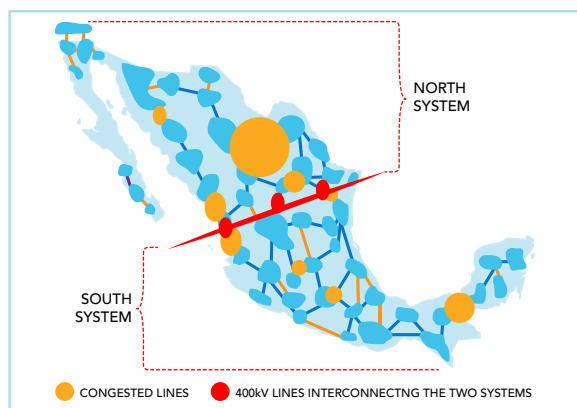


Figure 10: Mexico electricity transmission network²⁸

²⁶ http://www.enerdata.net/enerdatauk/press-and-publication/energy-news-001/electricity-tariffs-dropped-mexico-2015_33880.html

²⁷ http://www.ksg.harvard.edu/m-r/bcg/repsof_yof_ksg_fellows/Papers/Rosellon_TRANSMISSION_MEXICO_prelim_504.pdf

²⁸ https://www.usea.org/sites/default/files/event-/Mexican_Department_of_Energy_Estrada.pdf

LOSSES

Technical as well as non-technical losses are a big problem in Mexico. For distribution, the network suffers losses of more than 13% (2015), nearly twice the measure of the OECD (7%), due to technical and non-technical losses.^{29,30} However, this value is often higher in some specific areas, such as the distribution losses in the Valley of Mexico* area which can be as high as 25%.³⁰

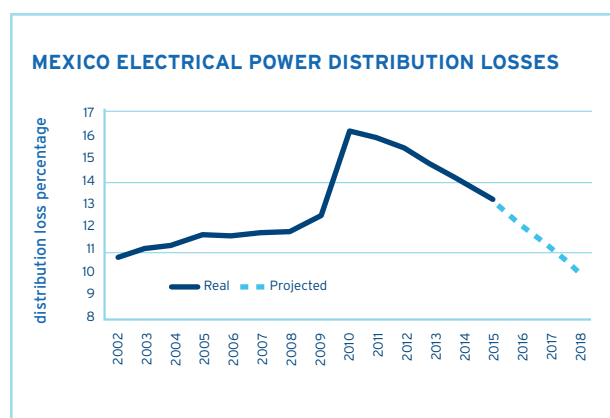


Figure 11: Electricity losses in Mexico³⁰

ENERGY EFFICIENCY

Energy efficiency is of increasing importance in Mexico as energy demand grows with rapid urbanization and forecasts predict that Mexico will become a net energy importer by 2020; big change for a country that has traditionally relied on its energy sector to foster growth. Therefore, SENER is interested in promoting urban energy efficiency and has partnered with the World Bank to create a national municipal energy efficiency program. The program started with creating a Tool for Rapid Assessment of City Energy (TRACE). The pilot TRACE indicated potential energy savings in public lighting of \$2.3 million in León and \$3.2 million in Puebla.³¹

²⁹ <http://www.pwc.com/mx/es/industrias/archivo/2014-01-mexican-energy-reform-implications.pdf>

³⁰ http://www.gob.mx/cms/uploads/attachment/file/90007/Programa_de_Redes_Electricas_Inteligentes_09_05_16.pdf

³¹ <http://www.worldbank.org/en/news/feature/2014/07/03/urban-energy-efficiency-key-to-mexicos-ambitious-goals-for-energy-and-low-carbon-growth>

*Includes Tulancingo, Pachuca and Cuernavaca areas.

3.2.1 Role of smart grid in improving quality of electricity

Mexico is increasingly interested in adopting information and communication technologies to better manage the electricity grid. The main drivers for smart grids are:

- Quality of supply
- Energy efficiency
- Electricity losses, both technical and non-technical
- Increased integration of renewable generation capacity

Non-technical losses are regularly cited as one of the main reasons for installing smart meters. Over the next few years, Mexico intends to roll out smart meters, install SCADA across parts of the distribution system and install automatic switchgear and protective equipment known as EPROSEC,³² for a total investment of more than \$500 million USD. According to Bloomberg New Energy Finance, recent projects include the installation of 700,000 smart meters in 2015, with a total of two million meters to be deployed during 2016. At higher distribution voltages and transmission, CFE will install sensors for power quality analysis, as well as phasor measurement units (synchrophasors). As of now most of the investment in smart grids has been government led.

According to an analysis by the International Trade Administration in the US, the following are the key strengths associated with the smart grid market in Mexico³³:

- Ease of cross-border trade
- Existing grid interconnections with the USA, leading to similar standards between Mexico and USA connections and, thus, with Canadian standards

CUSTOMER ENGAGEMENT

SENER's smart grid development plans include customers' involvement in system management as a driver for smart grids. SENER aims to allow greater interaction with the end customer in the national energy system, but considers that this will happen gradually, so as not to impact rates. Customers will be engaged to better manage their electricity consumption. However, the plans are very nascent and no concrete programs have been announced.

FINDINGS REGARDING QUALITY AND EFFICIENCY OF ELECTRICAL SUPPLY:

The quality of supply of electricity is not great. Getting an electricity connection is often cited as a barrier for setting up business in Mexico. The transmission system is congested and needs upgrades. Rising electrical demand, along with increased renewable energy integration with the grid, is expected to spur smart grid opportunities in Mexico. The following areas have been identified by the CFE for immediate attention:

- Reduction of technical and non-technical losses
- Enterprise IT and communications architecture
- Strengthening of the billing system
- Management of assets
- Implementation of GIS

There are quite a few opportunities in sectors such as smart systems, ancillary services, products and solutions that help deal with issues of losses. The lack of transmission capacity in areas with high renewable energy resource potential has acted as one of the major obstacles to large-scale renewables deployment. The wholesale market is expected to address this problem, and it is expected that investments in transmission and distribution will follow more easily as the deregulated market evolves.

Currently, the CFE owns all transmission and distribution assets. Foreign companies are expected to be able to bid on opportunities in the future. A major barrier is posed by the subsidized retail electricity rates making it harder for smaller renewable projects to attract capital or get into long contracts to provide electricity at low rates.

³² Protection and Sectioning equipment in aerial distribution networks of medium voltage

³³ http://trade.gov/topmarkets/pdf/Smart_Grid_Mexico.pdf

3.3 Environmental sustainability

Mexico, a signatory of the Paris Agreement has pledged a reduction of 25% of its greenhouse gases (GHG) and short-lived climate pollutants emissions by 2030 in its intended nationally determined contributions (INDC) pledge to the United Nations Framework for Climate Change³⁴. These targets if achieved would result in reduction of 22% of GHG emissions and 51% of Black Carbon³⁵. This commitment indicates decoupling of GHG and energy use from economic growth, reducing emissions intensity per unit of GDP by 40% with peak emissions around 2026.³⁶

34 <http://www4.unfccc.int/submissions/INDC/Published%20Documents/Mexico/1/MEXICO%20INDC%2003.30.2015.pdf>

35 <http://pm.gc.ca/eng/news/2016/06/29/leaders-statement-north-american-climate-clean-energy-and-environment-partnership>

36 <http://climateactiontracker.org/countries/mexico.html>

*Black carbon (BC) is the most strongly light-absorbing component of particulate matter (PM), and is formed by the incomplete combustion of fossil fuels, biofuels, and biomass.

Mexico supports its INDC with a robust national climate change policy that includes the following instruments:

- General Climate Change Law, 2012
- National Strategy on Climate Change, 2013
- Carbon tax, 2014
- National Emissions and Emissions Reductions Registry, 2014
- Energy reform, 2014 (see section 2.0 for secondary laws)

At the recent North American Leaders Summit in Ottawa, Canada, the heads of state from Canada, Mexico and the USA decided to create a North American cleantech strategy. The action plan commits to the following:

- Generation of clean and secure power
- Creating 50% clean power generation by 2025 in North America
- Collaborating on cross-border transmission projects, including those for renewable energy
- Reducing short-lived climate pollutants
- Promoting clean and efficient transportation

The climate tracker which analyses a country's commitments and policies to understand future emissions, grades Mexico's climate change efforts as medium. According to Climate Tracker, Mexico's progress in policy planning and institution building has been great as they adopted the General Law on Climate Change (LGCC in Spanish) in 2012. Under this law, Mexico aimed to reduce its emissions by 50% from 2000 levels by 2050. The INDC proposal is consistent with this objective. The INDC is based around a comprehensive accounting of all sources and gases, including land use change and forestry.

However, the implementation of these laws is lacking concrete enforcement measures, thus, making it difficult to quantify future effects. The National Strategy on Climate Change (NSCC), published in June 2013, implements one of the requirements of the General Law. The NSCC is designed towards a long-term strategic development, but only provides very general guidance.

FINDINGS REGARDING ENVIRONMENTAL SUSTAINABILITY:

Mexico has high ambitions when it comes to environmental targets and policy. The success will depend on adopting, implementing and enforcing policies. To meet the environmental goals, Mexico needs to implement and enforce the current policies as well as create more supporting regulation for the transition to a clean energy system. Incentives in areas of clean energy generation, storage systems and smart grid technologies would lead to future opportunities. When compared with other countries, such as Canada Mexico's targets are lower, but Mexico is a developing nation and has different challenges to balance with its climate change mitigation efforts. In comparison to other Latin American countries such as Chile, Colombia, Brazil, Mexico fares better in terms of environmental commitments.

3.4 Quality of business environment

Mexico is considered a good place to do business. Mexico climbed four spots to reach #38 in 2016 from #42 in 2015 in the ease of doing business index, according to the World Bank Group. It is estimated that it takes just six days to start a business in Mexico, which is far less than in China, Brazil, or most of Latin America. However, Mexico still ranks poorly on the corruption index at #95 out of 168 countries, according to Transparency International. In comparison, countries such as Canada and the USA rank at 14 and 7, respectively, in ease of doing business, and 9 and 16 on the corruption index created by Transparency International. The table below details other indicators for Mexico for ease of doing business, as per the World Bank.

Indicator	Rank (2015)
Starting a Business	65
Dealing with Construction Permits	67
Getting Electricity	72
Registering Property	106
Getting Credit	5
Protecting Minority Investors	57
Paying Taxes	92
Trading Across Borders	59
Enforcing Contracts	41

Table 5 Ease of doing business indicators³⁷

Significant barriers include access to and the cost of capital in Mexico. While utility-scale projects have the opportunity to find funding from national and international financial institutions, such as the Inter-American Development Bank, small projects are often considered high risk and fail to attract capital at an affordable price, according to Greentech Media.³⁸

³⁷ <http://www.doingbusiness.org/data/exploreeconomies/mexico>
³⁸ <http://www.greentechmedia.com/articles/read/mexicos-budding-solar-market-is-in-limbo>

FOREIGN DIRECT INVESTMENT (FDI) IN RENEWABLE ENERGY

Mexico has an excellent geographic location and extensive renewable potential, which makes it attractive to foreign investment in renewable energy. In the case of wind and geothermal energy, only 3.2% and 2.1%, respectively, of the country’s potential is in use, which means there are ample investment opportunities for making better use of renewable resources. Mexico has access to cheap natural gas, so the driver for renewable generation is mostly due to the government-set targets. According to Bloomberg New Energy Finance, in the 2003-2012 period, Mexico received approximately \$7,343 million of FDI for the renewable energy industry, which is concentrated in the states of Oaxaca and Baja California. The main investor countries are Spain, the US, Denmark, and France.

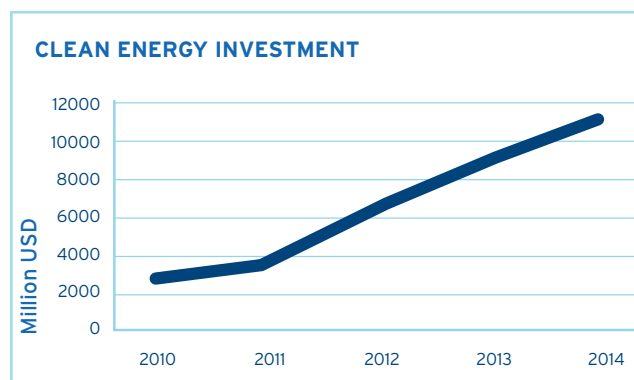


Figure 12: Clean energy investments in Mexico³⁹

³⁹ <http://global-climatescope.org/en/compare/#?compare=mx>, (includes asset finance, corporate finance, venture capital and private equity investment)

FINDINGS REGARDING QUALITY OF BUSINESS ENVIRONMENT IN MEXICO:

Canada and Mexico enjoy good trading relations, especially as signatories of NAFTA. Canadian companies already have a significant presence in Mexico, especially in the mining and manufacturing sectors. The energy reform is creating opportunities for FDI in the electricity generation sector, and the mechanisms around energy auctions are relatively simple. In other business environment factors, such as ease of doing business, Mexico ranks high in Latin America. Applying for construction permits has become easier and faster since the government consolidated internal administrative procedures. Mexico is also emerging as a major location, along with Brazil, for green bonds issued to back renewable energy projects. According to Cleantech Nacional Financiera issued \$500 million worth of five-year bonds in 2015 to contribute toward the development of nine wind farms with a total capacity of 1.6 GW.

4 Conclusion

Since the energy reform, the Mexican energy market and, especially, the electricity sector have opened up to foreign investment and technology opportunities. The legislation passed in Mexico to reform the electricity sector consists of all the required elements:

- An independent operator (CENACE) overseeing a wholesale market;
- Unhindered access to transmission and distribution networks for generators;
- Open participation of private investors in electricity generation, through capacity auctions and contractors supplying to the transmission and distribution networks.

In order to reduce GHG emissions and meet increasing electricity demand, the Mexican government is interested in cleaner as well as smarter technologies and services in the electricity sector. Mexico will need about 22 GW of renewable capacity to meet its targets for 2024. The potential for renewables is high in Mexico, with abundant and under-utilized wind, solar, micro-hydro and geothermal resources. Mexico is one of the leading countries in terms of installed capacity of geothermal energy, and wind and solar are showing strong growth rates.

The high renewable potential; ambitious clean energy targets proposed by the Mexican government along with the energy reform is opening up the Mexican cleantech market to opportunities for foreign actors, such as Canadian companies. In the short term, second auction results will be announced on September 30, 2016, with more capacity auctions expected in the future, estimated around 1 GW annually.

Cogeneration technologies with natural gas are also expected to be favoured in the short term, as Mexico looks to phase out oil-based electricity generation. Mexico does not have a feed-in tariff scheme and is relying on market-oriented schemes, causing renewables to directly compete with fossil fuels. This has raised fears that cheaper and more reliable natural gas plants might gain an advantage.

In the short term companies focusing on renewable generation such as solar, wind and geothermal will see opportunities. Companies focusing on smart systems such as advanced metering systems, smart grid technologies

and energy efficiency and management solutions will see opportunities in the next five years. In the long term, it is expected that there will be additional opportunities to supply to the transmission and distribution projects carried out by the CFE. As more and more renewable generation is connected to the grid, there will also be need for ancillary services.

Some Canadian companies such as Canadian Solar Subsidiary Recurrent Energy (won 141 GWh project in the 1st auction), TransCanada Corp. and ATCO are operating in the Mexican market, with TransCanada and ATCO involved in developing and operating natural gas pipelines. There is definitely an opportunity for clean tech and clean energy companies to gain a foothold in the Mexican energy market.

As with other markets, with the opportunities also come challenges. Developers in Mexico face some of the same challenges that go along with doing business in emerging markets, particularly in Latin America. Major concerns involve issues of complex local laws and rules, proper enforcement of laws and corruption. There has also been local opposition in recent years to some major renewable projects, such as the Mareña wind farm in the State of Oaxaca which was blocked by the local community.⁴⁰ Hence working with local partners can help with navigating regulatory hurdles and obtaining social licence for project development.

It will be interesting to see whether the energy reform brings about the necessary outcomes, such as increased investment in the sector, more renewable generation capacity and lowering of electricity prices. The signs so far have been good and investors are optimistic.

⁴⁰ <http://www.renewableenergyworld.com/articles/2015/08/the-future-of-renewable-power-in-mexico.html>

Annex

WEBSITES FOR KEY MEXICAN GOVERNMENT ORGANIZATIONS

GOVERNMENT BODY	WEBSITE
CENACE	www.cenace.gob.mx
CFE	www.cfe.gob.mx
CNH	www.cnh.gob.mx
CRE	www.cre.gob.mx
Pemex	www.pemex.com
SEMARNAT	www.gob.mx/semarnat
SENER	www.gob.mx/sener

CANADIAN TRADE SUPPORT IN MEXICO

Name	Position
Sean Emmond	Regional Manager, Export Development Canada
Rosalba Cruz	Trade Commissioner
Miguel Gonzalez	Trade Commissioner

Further information can be found at:

Export Development Canada Website, <http://www.edc.ca/EN/About-Us/Contact-Us/Pages/default.aspx>

The Canadian Trade Commissioner Service website, <http://tradecommissioner.gc.ca/mexico-mexique/office-bureau/index.aspx?office=MXICO&lang=eng>

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