Executive Summary

Driven primarily by increased demand in the electricity sector, Mexico’s natural gas market has grown at an average annual rate of 3.5 percent over the past decade. Industrial users, such as basic metals and chemicals, have also contributed to the growth. Declining domestic supply has led Mexico to significantly increase natural gas imports to meet this increasing demand.

Mexico is at a pivotal point in the evolution of its energy markets. In the last few years it has passed reforms to liberalize its oil, gas, and electricity markets with the intent of attracting private investment to build out its energy infrastructure.

Even after accounting for increased Mexican natural gas production due to reforms, FTI Consulting forecasts a large need for imports from U.S. producers, pipelines, and liquefied natural gas (LNG) exporters. We project that Mexico's natural gas demand will grow to 9.2 Bcf/d or 22 percent above 2015 levels by 2030 and that imports will rise 53 percent to 5.4 Bcf/d.

We also forecast that the electricity market will continue to be the principal driver of natural gas import growth. With electricity load expected to grow 3.1 percent annually through 2030, FTI projects natural gas demand in the electricity sector will increase 46 percent above 2015 levels. Mexico will install approximately 28,000 MWs of new combined cycle plants by 2030.

Mexico is poised to invest significant resources to enhance its infrastructure across the entire natural gas value chain – from exploration and production to pipelines, LNG terminals, combined cycle plants and industrial facilities. As this dynamic market unfolds, it will be critical for investors to understand not only expected return on investments but also expected supply and demand balances, competitors’ actions, and risks.

Introduction

Mexico has quickly become one of the world’s top natural gas markets. From 2005 to 2015, Mexico’s demand for natural gas increased from 5.1 billion cubic feet per day (Bcf/d) to 7.5 Bcf/d, representing an annual average growth rate of 3.5 percent. Since domestic supply has not kept pace with increasing demand, Mexico has had to rely upon 3.5 Bcf/d of natural gas imports, which in 2015 made up half of its total supply. This is nearly four times the import levels of 0.9 Bcf/d in 2005.

The combination of consumption and imports growth has made Mexico one of the most attractive destination markets for natural gas. Among net importing countries with positive growth rates, Mexico ranks third in overall natural gas consumption as illustrated in Figure 1.

The electricity sector has been the principal driver of Mexico’s soaring natural gas demand growth, jumping by 1.8 Bcf/d or 89 percent from 2005 to 2015. The sector accounted for nearly three-quarters of the overall increase in Mexico’s gas demand.

The industrial sector is the next largest driver in natural gas demand with a 0.4 Bcf/d or 47 percent increase over the same time period. Most of the demand growth was driven by the basic metals and chemicals industries.

Going forward, Mexico seems bound to remain a top natural gas market for investors throughout the natural gas value chain – exploration and production, pipelines and processing, and electric and industrial sectors. Some of the key indicators that point in this direction include:

- Steady GDP growth
- Strong electricity demand growth
- Liberalization of the electricity and oil & gas markets
- Anticipated downstream investments in petrochemicals and other manufacturing
- Targeted reductions in greenhouse gas (GHG) emissions

Using our energy forecasting model and market research, FTI has projected future gas demand through 2030. Our results show that Mexico’s natural gas demand will grow to 9.2 Bcf/d or 22 percent above 2015 levels by 2030.

Given Mexico’s market size and growth rate, we believe investors should consider Mexico as a key part of their investment portfolio.
Electricity sector consumption has been the primary driver of demand, growing 89 percent or 1.8 Bcf/d since 2005, as shown in Figure 2. This growth accounts for 51 percent or 3.8 Bcf/d of total demand.

Three main factors have driven this significant growth:

- Overall electricity demand growth as incomes have risen
- Progressive liberalization of Mexico’s electricity market since 1992
- Attractive natural gas prices relative to fuel oil

Electricity demand has grown 2.3 percent annually over the last decade, compared with only 0.1 percent annual growth in the U.S. This growth in Mexico has been spurred by real incomes increasing 3.5 percent annually from 2005 to 2015.

Concurrent with high electricity sector demand growth from 2005 to 2015 has been the increased liberalization of Mexico’s electricity market. In 1992, a statutory amendment allowed for private investors to generate power.

Private investment did not pick up until 2000 when further reforms were enacted to clarify the roles of state-owned Comisión Federal de Electricidad (CFE) and Luz y Fuerza del Centro (LyFC) and its relationship to independent power producers (IPPs), which would sell their power to CFE for public distribution. In addition, the reforms enabled the development of industrial self-supply and cogeneration.

By 2015, CFE’s near monopoly had dropped to 63 percent of Mexico’s 66.6 GW of total installed capacity. IPPs’ share had grown to 19 percent, and self-supply and cogeneration represented 16 percent. Most of this privately-owned capacity uses natural gas as the primary fuel.

Mexico has taken further steps to liberalize the electricity sector. Following the energy reform packet of 2013 and 2014, the Ministry of Energy (SENER) and the Energy Regulatory Commission (CRE) created a wholesale electricity market with the first phase of the market allowing only cost-based bids in both a day-ahead and real-time market.

The second phase of implementation, which is expected sometime in 2017 or 2018, will allow for an hour-ahead market as well as market-based bids instead of cost-based bids. Additional private sector providers, particularly those building gas-fired generation, are expected to participate.

Lastly, delivered natural gas prices have been considerably more attractive than delivered fuel oil prices from 2005 to 2015. Along with installing highly efficient turbines, new generators have taken advantage of the oil-gas price arbitrage to generate power at competitive costs. Based on cost reduction goals, as well as environmental concerns, CFE has championed the transition away from fuel oil towards the cleaner-burning natural gas, through an ambitious power plant reconversion program. As a result, fuel oil’s share of electricity generation fell to just 9 percent, down from 27 percent a decade earlier.

These three factors have created a dramatic shift in Mexico’s electricity generation portfolio. As shown in Table 1, 6.7 GW of natural gas capacity was added to the public electricity grid, primarily by IPPs, between 2005 and 2015.

An additional 7.9 GW of natural gas capacity is planned to come online by 2018. This capacity expansion is expected to coincide with investments in Mexico’s gas pipeline system.

The industrial sector overall has grown 47 percent since 2005 and is responsible for nearly 1.4 Bcf/d or 20 percent of natural gas demand.

The biggest industrial consumer is the basic metals industry, which consumes a quarter of all industrial natural gas and has increased its consumption by 15 percent in the past decade.

The next biggest consumer was the chemicals industry which depends on natural gas as a raw feedstock. Chemicals consumption was just over 0.2 Bcf/d or 15 percent of all industrial natural gas in 2015. Its consumption grew by 73 percent since 2005.

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2 EIA – http://www.eia.gov/electricity/data/browser/#/topic/07agg=1
3 OECD.org – Net National Income Mexico
4 SENER, Prospectiva del Sector Eléctrico 2016-2030. There is an additional 2 percent of small private capacity.

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Table 1: Grid Capacity Additions by Type

<table>
<thead>
<tr>
<th>Source: Comisión Reguladora de Energía (CRE) June 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2000-2015</strong></td>
</tr>
<tr>
<td>Natural Gas</td>
</tr>
<tr>
<td>Solar</td>
</tr>
<tr>
<td>Wind</td>
</tr>
<tr>
<td>Hydro</td>
</tr>
<tr>
<td>Other</td>
</tr>
</tbody>
</table>

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6 SENER, Prospectiva del Sector Eléctrico 2016-2030
7 Table excludes cogeneration and self-generation capacity additions.
8 Section 2.1.2. - Prospectiva de Gas Natural 2016-2030
Natural Gas Supply – Past Drivers

Prior to recent reforms, PEMEX was taxed at very high rates, paying a majority of its profits back to the government. These high tax rates, combined with a restriction on private sector partnerships, limited PEMEX financially and technologically. As a result, PEMEX chose to invest in less risky and less rewarding projects, creating a downward production spiral.

By 2015, Mexican gas production had declined 20 percent to 4 Bcf/d from 5 Bcf/d in 2010, as shown in Figure 3. Meanwhile the U.S. gas industry, which is completely privatized, grew production by 50 percent over the same period.

Figure 3: Mexico Natural Gas – Domestic Production and Imports

Sources: SENER Prospectiva de Gas Natural y Gas 2016, EIA, FTI Analysis

Mexico’s declining production had much to do with poor policy design and little to do with its resource potential, as the country shares the Eagle Ford shale play with the U.S., holds the promising Tampico-Misantla basin, and has tremendous offshore deposits that have gone untapped.

In 2014, the government enacted reforms to liberalize the country’s oil and gas market to bolster upstream, midstream, and downstream investment. These reforms included transforming PEMEX from a state-owned monopoly into a productive state enterprise with more autonomy and a lower tax burden, allowing private investment in refining, transport, storage, processing, and ending PEMEX’s monopoly on retail gas and diesel sales.

These reforms are showing signs of initial success. Round One successfully concluded, having awarded a total of 38 blocks, in which more than 30 different companies have acquired stakes. The Mexican government has estimated that total investments could amount to $49 billion.

Conversion of these investments into producing assets will take years to develop, which implies that imports will continue to be an important part of Mexico’s gas supply portfolio.

Imports currently represent approximately half of Mexico’s gas supply. While domestic production was in decline, natural gas imports more than tripled from 0.9 Bcf/d in 2005 to 3.5 Bcf/d in 2015 as shown in Figure 3.

U.S. pipelines have been the main source of imports. As shown in Figure 4, U.S. pipeline imports composed 82 percent of total imports. Pipeline capacity between the U.S. and Mexico has grown from just over 4.0 Bcf/d in 2013 to 7.3 Bcf/d.

Mexico also has three LNG regasification facilities with import capacity of 2.2 Bcf/d. LNG imports at the Altamira terminal, located on the Gulf coast, plummeted 72 percent from January 2016 to November 2016 as they have been replaced by imports from Texas. The Baja California terminal also has been drastically underutilized with recent reports showing that in 2015 it only received about 5 percent of its capacity and recent news indicates that this terminal will be the site of Mexico’s first LNG export facility. Meanwhile, LNG imports at the Manzanillo terminal, located on the central Pacific coast, have grown as insufficient domestic pipeline infrastructure has prevented Texas imports from reaching consumers in central Mexico.

Figure 4: 2015 Mexico Natural Gas Imports (3.5 Bcf/d)

Sources: SENER Prospectiva de Gas Natural y Gas 2016

Outlook for Future Demand and Supply

We believe the outlook for gas demand in Mexico is robust and that supply from imports will continue to grow even with future increases in Mexican gas production.

The electricity sector will continue to be the principal driver of natural gas demand growth. Electricity load is expected to increase to an annual rate of 3.1 percent through 2030, up from 2.3 percent annually over the last decade. As a comparison, U.S. electricity demand is expected to grow by only 0.6 percent annually over the same period.

Mexico’s per capita electricity usage represents only 16 percent of U.S. per capita usage. Notably, its usage per capita is expected to grow significantly over the next 15 years as personal incomes rise, explaining the dramatic growth in electricity sector demand.

Electricity demand will translate into higher natural gas consumption in the electricity sector as other baseload power generation options are limited. The cost of building new nuclear plants is prohibitive in today’s low natural gas price environment. Also, new coal generation capacity is unlikely to be developed in Mexico due to limited domestic supply, its high installed cost per unit of capacity and the country’s commitment to generating 35 percent of its electricity from zero-carbon sources by 2024.

12 https://www.eia.gov/naturalgas/weekly/archivenew_ngwu/2016/12_08/
16 SENER, Prospectiva del Sector Eléctrico 2015-2029.
18 World Bank - Electric Power Consumption per capita
To further explore the future role of natural gas in the electricity sector, FTI applied its PLEXOS electricity market model, forecasting the Mexican electricity sector’s demand for natural gas over the next 15 years. PLEXOS is a capacity expansion and chronological load model that optimizes generation dispatch, unit commitment, and power flow under a range of future fuel price, load growth, regulatory, and technology advancement scenarios. Our Mexico electricity market model includes all existing generating units, planned capacity expansions, transmission lines and limits between regions, regional load forecasts, and differing fuel prices by region.

We assumed in our model that Mexico would adjust its fuel mix to meet its zero-carbon targets. We find that natural gas capacity will continue to develop, with an additional 7.5 GW of combined cycle capacity built between 2019 and 2030. We also project that 16.3 GW of renewables will be added over the same period. Despite the build-out of renewables to meet zero-carbon targets, natural gas will still represent 55 percent of total generation in 2030.

According to SENER, the industrial sector’s natural gas demand will continue to grow, from 1.4 Bcf/d in 2015 to 2.1 Bcf/d in 2030—a growth of more than 46 percent, as shown in Figure 5. Much of this increase is driven by the construction of new gas pipelines, particularly to serve industrial users. The industry will also continue to shift away from fuel oil to cheaper natural gas, and the lower costs are expected to further increase demand.20

Figure 5: Projected Mexican Natural Gas Demand by Sector

<table>
<thead>
<tr>
<th>Sector</th>
<th>2016 Bcf/d</th>
<th>2030 Bcf/d</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>3.7</td>
<td>5.3</td>
<td>+46%</td>
</tr>
<tr>
<td>Electricity</td>
<td>1.4</td>
<td>2.1</td>
<td>+46%</td>
</tr>
<tr>
<td>Industrial</td>
<td>2.3</td>
<td>1.5</td>
<td>-36%</td>
</tr>
<tr>
<td>Petroleum</td>
<td>0.1</td>
<td>0.1</td>
<td>0%</td>
</tr>
<tr>
<td>Resid. &amp; Comm.</td>
<td>0.1</td>
<td>0.1</td>
<td>0%</td>
</tr>
</tbody>
</table>

Sources: SENER Prospectiva de Gas Natural, FTI Analysis
Note: Resid. & Comm in 2016 is 0.1 Bcf/d and in 2030 is 0.2 Bcf/d

It is estimated that by 2030 the chemical sector will become the largest industrial consumer, with 19 percent of the total demand, followed by basic metals at 17 percent.20

The continued construction of new natural gas capacity in the electricity sector and sustained growth in the industrial sector will drive overall demand growth for natural gas over the next 15 years. The electricity sector has the largest expected growth in the natural gas market, with a 46 percent, or 1.7 Bcf/d, increase by 2030.20 The gains in electricity and industrial demand will be somewhat offset by decreases in the petroleum sector.

This growing natural gas demand will need to be met by a combination of increased domestic production and imports. Figure 6 shows that we forecast imports to rise to 5.4 Bcf/d by 2030 from 3.7 Bcf/d in 2016, which is a 46 percent increase.

Our projections represent a reasonable 50/50 scenario and that considerable upside exists for even higher gas demand. The following factors would drive this potential outcome:

- A failure to meet the GHG reduction goal in the electricity sector. Imports could increase by 0.8 Bcf/d by 2030 without GHG targets.
- Higher than expected growth in manufacturing sectors such as chemical, metals, automotive manufacturing drive industrial demand.
- Strong economic growth, which would drive higher load growth

Figure 6: Mexico Natural Gas: Domestic Production and Imports

Sources: SENER Prospectiva de Gas Natural, FTI Analysis

Conclusion

Mexico has experienced significant growth in natural gas demand, principally from electricity and industrial sectors. These two sectors will drive the majority of future natural gas demand, which is expected to grow by 22 percent over the next 15 years. The outcome is an ideal market for investment.

While overall demand is expected to increase by 20 percent from 2016 to 2030, domestic natural gas production is expected to be unable to decrease reliance on imports over the long term. Recent reforms to liberalize the oil and gas sector and encourage private investment have been passed and its impacts on domestic production remain to be seen. If forecasted production levels prove to be accurate, we expect import levels to increase by 46 percent by 2030.

The combination of its consumption, imports, and growth will continue to make Mexico one of the most attractive destination markets for natural gas investments. The country is poised to invest significant resources to enhance its infrastructure across the entire natural gas value chain – from exploration and production to pipelines to combined cycle plants and industrial facilities. As this dynamic market unfolds, it will be critical for investors to understand not only return on investments but also expected supply and demand balances, competitors’ actions, and risks.

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20 Section 3.1.2 - Prospectiva de Gas Natural 2016-2030
About FTI Consulting

GLOBAL REACH
With over 4,600 employees and offices in 29 countries on six continents, our breadth and depth extends across every major social, political, and economic hub across the globe.

EXPERIENCED PROFESSIONALS
We are trusted advisors with diverse expertise and exceptional credentials serving clients globally.

DEEP INDUSTRY EXPERTISE
We combine unparalleled expertise and industry knowledge to address critical challenges for clients. Our largest industry groups are:
- Construction
- Energy, Power & Products
- Financial Institutions & Insurance
- Healthcare & Life Sciences
- Real Estate
- Retail & Consumer Products
- Telecom, Media & Technology

About FTI's Energy, Power & Products Segment

- FTI’s Energy, Power, and Products segment is comprised of more than 300 professionals focused on the unique challenges impacting the complex energy sector. The group includes many of the energy industry’s most respected names in consulting, energy economics, restructuring, and corporate finance.
- In today’s increasingly challenging energy industry, companies must contend with significant oil and gas market volatility with prices falling from historic highs to recent market lows, escalating development costs, declining traditional growth prospects, global climate change and national security concerns.
- At the same time, the industry continues to cope with conflicting regulatory frameworks, power industry restructuring, pervasive contractual disputes and costly litigation. To assist our clients in these demanding times, FTI professionals provide a wide array of economic and business consulting services that address the strategic, financial, regulatory and legal needs of the industry.
- Our intimate knowledge of the energy industry allows us to ask the right questions, pursue the appropriate analyses and develop solid conclusions/recommendations that address the challenges and opportunities facing our clients. We have helped clients operating in all aspects of the energy industry, including crude oil, natural gas, coal, refined products, chemicals, renewables, and biofuels.

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