

Energy Briefing

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MEXICO

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- **SUPPLY** | Production Goals at Risk as Output Slips; Petroleum Block Auctions Serve as Bellwether
- **TRADE** | Crude Exports Fall as Production Slips; US-Mexico Swap Agreement to Improve Efficiency

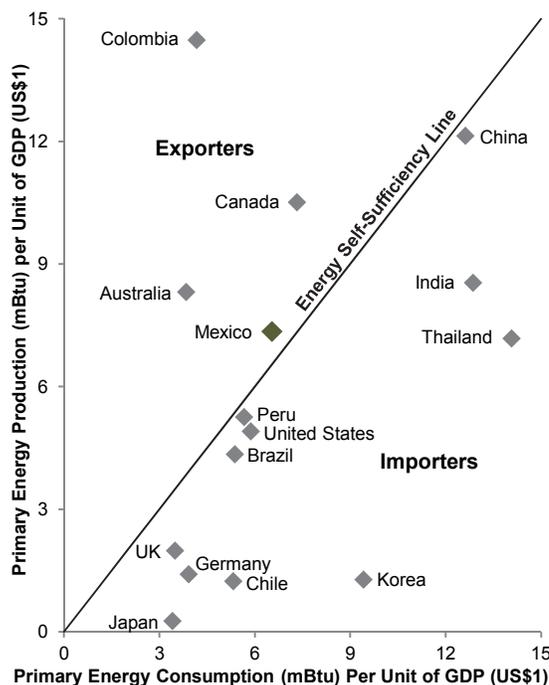
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Figure 1: Mexican Energy Intensity in Context



Note: 2012 figures, the last year of reliable data availability.
 Source: IMF, EIA, Scotiabank Economics.

Figure 2: Key Energy Indicators

	2011	2012	2013	2014
Crude Oil (kbpd)				
Production	2,552	2,548	2,522	2,429
Refinery Inputs	1,166	1,199	1,224	1,155
Exports	1,337	1,256	1,189	1,143
Petroleum Products (kbpd)				
Refinery Output	1,379	1,405	1,456	1,385
Demand	1,788	1,840	1,786	1,709
Gasoline	800	804	787	777
Diesel	384	400	392	389
Imports	677	670	603	640
Exports	185	147	181	201
Dry Natural Gas (bcm)				
Domestic Supply	50	48	46	45
Imports	18	22	26	30
Pipeline	14	17	18	21
LNG	4	5	8	9
Demand	68	69	72	75
Pemex Consumption	23	23	23	24
Power Generation	32	32	34	36
Industrial	12	12	13	14
Other	1	1	1	1
Electricity (TWh)				
Generation	258	260	258	258
Demand	201	206	206	208
Industry	117	121	120	121
Residential	52	52	52	54
Other	33	33	33	33
Losses	57	54	52	50

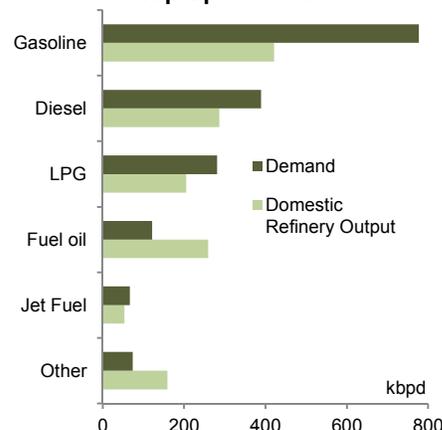
Source: SENER, IMP, Pemex, Scotiabank Economics.

PETROLEUM

Demand | Higher Value Product Gains Masked by Falling Power Plant Fuel Oil Consumption

Mexican petroleum demand fell by 4.3% y/y in 2014 to 1.7 million barrels per day (Mbpd), down from a recent peak of 1.8 Mbpd in 2012. Declining fuel oil consumption has accounted for roughly 70% of the drop in overall petroleum product demand over the past three years as domestic power plants have continued rationalizing their feedstock away from expensive fuel oil toward cheaper natural gas. As recently as 2012, Mexican power plants burned 74 million barrels of fuel oil. In 2014, that volume was down to 40 million and 2015 volumes are on track to fall further to 32 million. This reduction in power plant inputs is a positive development for Mexico's power sector as countries tend to diversify away from oil feedstock as economies develop; in 2012, oil accounted for almost 20% of Mexican electricity generation compared to less than 5% across the OECD. Through the first three quarters of 2015, both gasoline (+2% y/y) and jet fuel (+6% y/y) segments have seen healthy growth.

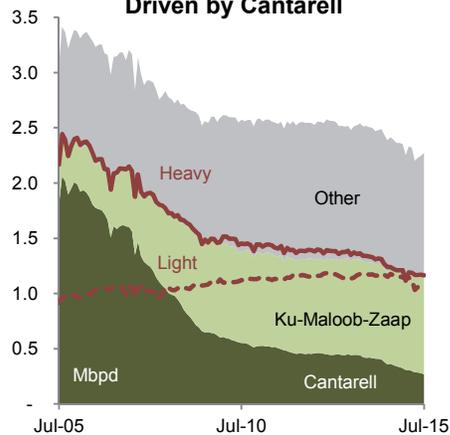
Mexican product demand has outstripped the capacity of the country's refineries (see Figure 3), which are old and have difficulty competing with US refineries due to higher natural gas and electricity input costs. No new refineries have been built in the country since 1979. The aging fleet is underutilized (80% year-to-date vs 92% in the US) and unsophisticated relative to US peers, with fuel oil being the only major product segment where refinery runs exceed domestic demand.

Figure 3: Mexican Refineries Unable To Keep Up With Demand

Note: 2014 sales and refinery output.
Source: SENER, Pemex, Scotiabank Economics.

Supply | Production Goals at Risk as Output Slips; Petroleum Block Auctions Serve as Bellwether

Mexican crude oil production contracted by 3.7% y/y in 2014 to 2.4 Mbpd, down 1 Mbpd over the past decade. Falling output has been led by the precipitous decline of the supergiant Cantarell Complex (2.1 Mbpd in 2004 to less than 0.4 Mbpd) but has been softened by production gains in the neighbouring Ku-Maloob-Zaap Complex (0.3 Mbpd in 2004 to 0.9 Mbpd) — see Figure 4. Mexico's oil-producing assets are old and the country depends on mature fields for over 80% of its production. However, the country's resource base is promising — with combined proven, probable, and possible (3P) reserves of 37.4 billion barrels — and its geology familiar to companies operating north of the border. The government originally forecast that crude oil production would increase to 3.0 Mbpd in 2018 on the back of energy sector reforms. However, year-to-date production has slipped further to roughly 2.2 Mbpd and recent comments from government officials indicate that getting production volumes back to 2.5 Mbpd by 2018 is a more realistic target.

Figure 4: Mexico's Falling Oil Output Driven by Cantarell

Source: SENER, Pemex, Scotiabank Economics.

Constitutional reforms (December 2013) and secondary legislation (August 2014) ended Petróleos Mexicanos' (Pemex, Mexico's national oil company) upstream monopoly, although it was able to maintain 83% of its proved and probable reserves.

For the first time since the nationalization of 1938, the government is welcoming private and international energy firms back into the Mexican oil patch, auctioning a suite of licenses, production-sharing, service, and joint venture contracts. Round 1 of these auctions is currently underway and aims to award 109 exploration and 60 production blocks — including shallow water, deepwater, onshore, heavy oil, and unconventional resources. While the first tender of round 1 disappointed (only 2 of 14 exploration blocks awarded), the second tender was more successful (3 of 5 production blocks awarded).

Mexico's oil patch remains relatively underexplored — with fewer than 30 deepwater wells drilled in Mexico's portion of the Gulf compared to more than 1,000 north of the border — and the entrance of new actors will bring much-needed capital and expertise. However, it will take years for this flurry of activity to translate into tangible production gains, particularly in deepwater, and eventual logjams are almost certain as reform outpaces the evolution of regulatory frameworks and the experience of regulators.

Trade | Crude Exports Fall as Production Slips; US-Mexico Swap Agreement to Improve Efficiency

Mexican crude oil exports stood at 1.1 Mbpd in 2014, down from 1.9 Mbpd in 2004, and the country recorded net petroleum product imports of 439 kbpd (primarily gasoline and diesel). The majority of Mexico's crude oil exports are destined for US Gulf Coast refineries, arriving by tanker due to Mexico's lack of international crude oil pipelines. A recently announced license will allow Pemex to swap 75 kbpd of heavier sour crude oil for light sweet US crude better suited to Mexico's refineries.

NATURAL GAS

Demand | Domestic Power Sector in the Driver's Seat as Inputs Rise

Mexican dry natural gas demand grew by 4% y/y to 75 billion cubic meters (bcm) in 2014 on the back of continued expansion in natural gas-fueled electricity generation. Headline natural gas demand has recorded an annual cumulative average growth rate (CAGR) of 3.5% over the past decade, with most of the growth concentrated in the power sector (5.7% CAGR) as natural gas displaced more expensive fuel oil in thermal power plants (see Figure 5). In 2014, the power sector accounted for 49% of aggregate natural gas demand, followed by consumption in Pemex operations (32%) and the industrial sector (18%). Mexican households account for only 1% of total demand compared to 21% in the US.

The Instituto Mexicano del Petroleo, an in-house Ministry of Energy (SENER) think tank, projects that natural gas demand will continue to rise by roughly 4% per year over the next decade. This forecast depends on continued growth in natural gas-fired electricity capacity, which in turn depends on successful execution of power and natural gas market liberalization associated with the energy reform agenda.

Supply | Prospects Linked to Petroleum Block Auctions; Upside from Large Shale Resources

Mexico produced 80 bcm of raw natural gas in 2014, of which only 35 bcm made its way into sweetening plants. The rest of the raw gas was consumed directly in operations (20 bcm), refined in cryogenic plants (11 bcm), used to power pipelines (7 bcm), or vented (3 bcm). The majority of natural gas produced in Mexico is associated with the production of crude oil, but that may shift in the future as unconventional gas resources such as shale are exploited.

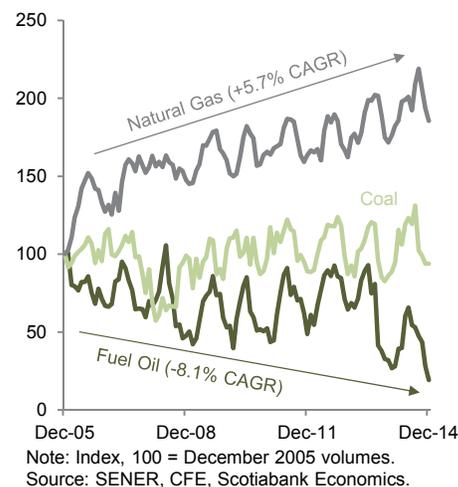
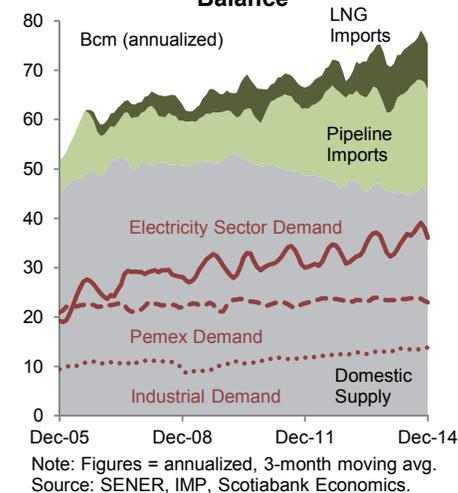
While domestic sweetening plant output has remained relatively stable over the past decade (38 bcm in 2014), natural gas coming directly from the field has fallen by roughly half relative to 2010 levels (from 14 bcm to 7 bcm). This gap has been filled primarily through imports (see trade section). Preliminary government estimates see domestic production increasing by upwards of 20% by 2018, but the tepid results of the first two oil tenders indicate that these forecasts may be missed.

While near-term production growth is expected to be modest, Mexico's natural gas resources are too large to be ignored in the long term. The US Department of Energy's Global Shale Resource Assessment estimates that Mexico's shale gas resource base stands at more than 15 trillion cubic meters—the sixth largest shale gas holdings in the world. The majority of these resources are located in the Burgos Basin (bordering Texas), which is likely to be the primary focus of future natural gas supply development. Shale gas production began, albeit slowly, in 2011; in total, roughly 175 shale test wells have been drilled as of late 2014, significantly fewer than the 27,000 wells drilled in Texas in 2014 alone.

Independently operated transmission and distribution infrastructure, more receptive to market signals, has been shown to better facilitate a diverse array of producers. To this end, the energy reforms created the National Center for Control on Natural Gas (Cenegas) as an independent system operator (ISO) to assume control of natural gas distribution from Pemex and ensure that all distribution decisions are made objectively based on prevailing technical and economic conditions.

Trade | US Pipeline Import Prospects Bolstered by Infrastructure Plan, Displacing Expensive LNG

Mexico imported 30 bcm of natural gas in 2014, up 14% y/y, with 21 bcm from US pipelines and 9 bcm from seaborne liquefied natural gas (LNG), mostly sourced from Qatar, Nigeria, and Peru. Mexico has three LNG import terminals (two Pacific, one Atlantic) and has increasingly relied on LNG imports for marginal demand due to insufficient US pipeline capacity; this has come at a price, however, as LNG prices reached \$12.50 per thousand cubic foot in 2014 compared to \$4.65 for pipeline imports. Mexico recently unveiled a 5-year, US\$10 billion plan to expand natural gas pipeline linkages between the US and Mexico. The plan includes 12 new pipelines and a compression station, and may increase natural gas import capacity to over 90 bcm by 2019, replacing the need to import expensive seaborne natural gas except in the case of emergencies. With the addition of new US pipeline capacity, LNG import volumes are expected to decline over the coming years.

Figure 5: Electricity Generation Fossil Fuel Feedstock Consumption**Figure 6: Mexican Natural Gas Balance**

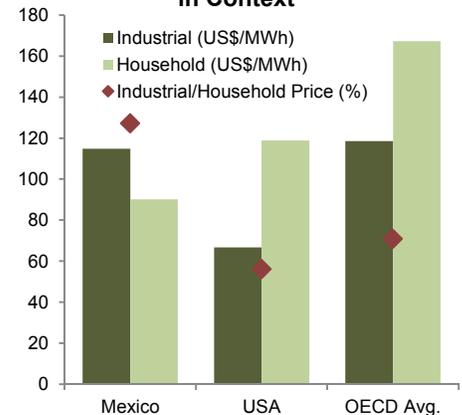
ELECTRICITY

Demand | High Industrial Power Prices Hinder Competitiveness; Ongoing Reforms to Lower Rates

Mexico consumed 208 terawatt hours (TWh) of electricity in 2014, up 1% y/y. The largest consumers of electricity were medium-sized businesses (38%), followed by residential households (26%), heavy industry (21%), commercial (7%), agriculture (5%), and the service sector (4%). The government subsidizes electricity for politically sensitive users like agriculture and households, while charging a higher rate to industrial consumers. Mexican industries pay 27% more than residential consumers, diverging from the trend for industry to receive a relative discount (see Figure 7).

The fact that Mexican industry pays roughly 70% more for electricity than US peers presents a major competitiveness challenge. Indeed, some large consumers have already begun producing their own power in order to avoid high industrial rates. However, this trend is unsustainable and fails to capitalize on the benefits of scale that can be realized on a national level. While lower labour costs bolster Mexico's competitive edge, narrowing the gap between Mexican and US industrial electricity rates would provide further steam to Mexican industrial growth. Coupled with the recent fall in global oil prices, Mexican industry has already seen power prices fall almost 20% in the first half of 2015. While competition is likely to further reduce rates paid by industry, it is unlikely that the majority of Mexicans will notice any difference in their electricity bills in the near term, given that most customers already enjoy subsidized rates.

Figure 7: Mexican Electricity Prices in Context



Note: 2012 Data.

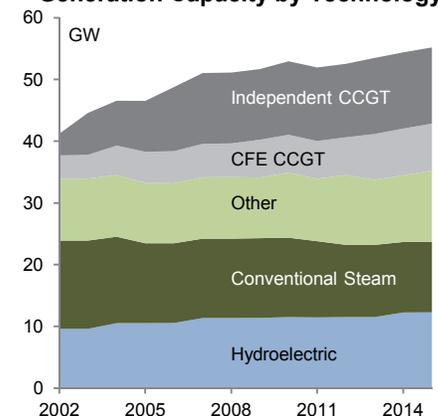
Source: IEA, Scotiabank Economics.

Supply | Electricity Sector Restructuring Likely to Increase Efficiency and Decrease Costs

Mexico generated 258 TWh of electricity in 2014, virtually flat over the past four years. Almost 80% of Mexican electricity is generated from fossil fuels, of which natural gas is increasingly dominant. The volume of fuel oil burned in thermal electricity generation continued to trend lower, with 40 million barrels burned in 2014 compared to 74 million barrels in 2012 while natural gas inputs increased to 36 bcm from 32 bcm. Transmission and distribution loss remains a key area of weakness at roughly one-fifth of total generation, almost twice the OECD average. This can be seen as a result of archaic transmission infrastructure; almost half of Mexico's transmission lines are over 20 years old and less than 10% have been built in the last five years.

Supply remains dominated by the Comisión Federal de Electricidad (CFE), Mexico's state-owned utility, which until the energy reforms held a monopoly on the transmission, distribution, and sale of electricity. While independent power plants existed prior to the reforms, they were required to sell their power to the CFE for retail distribution. Of the 55 gigawatts (GW) of generation capacity in 2015, roughly three-quarters was held by the CFE and the remainder by a variety of independent producers. Almost all of the 14 GW of capacity additions since 2002 were in the form of combined cycle gas turbines (CCGT), with 63% of that capacity growth from independent CCGT and the remainder from CFE CCGT (see Figure 8).

Figure 8: Mexican Electricity Generation Capacity by Technology



Source: SENER, CFE, Scotiabank Economics.

The energy reforms accomplish a number of policy changes aimed at increasing the efficiency of and competition within the electricity sector. Private generators will be allowed to sell directly to "qualified users" (large consumers that reach a SENER threshold), while the CFE will continue "basic service" to households and smaller consumers. The CFE's various business lines (generation, transmission, distribution, and retail) will be spun off into subsidiaries to limit its market control. The CFE's National Energy Control Center (Cenace) will be recreated as an independent system operator, in charge of the impartial management of the national electricity system and the eventual development of a wholesale electricity market. Cenace will also require that the CFE's transmission subsidiary connect to all generation facilities without discrimination. The Comisión Reguladora de Energía (CRE) will be tasked with setting transmission and distribution tariffs as well as the rates paid by "basic service" customers.

Trade | Cross-Border Sales will Continue at the Margin, but are Unlikely to be Major Factor for Grid

The US remains Mexico's primary trading partner in the power sector, exchanging small volumes at the margin in line with local conditions. Electricity is also traded between Mexico, Belize, and Guatemala. Future linkage expansion between the US and Mexican grids may provide a degree of flexibility in local markets, but is unlikely to have a material impact on the overall market.

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