Mexico’s energy transformation takes hold

Platts special report
August 2017
Executive summary

- Mexico is in the process of liberalizing its energy industry, which is key to the country’s long-term economic growth. Production and investment declines over the last several years have had a major impact on GDP and government revenues. Just five years ago, oil-related fiscal revenue through transfers from PEMEX accounted for about 40% of total government revenue. Today it accounts for just over 15%.

- Mexico’s oil and gas production remains down about 40% from peak levels, and the country’s effort to stop declines and return to growth has not yet had an impact. Crude oil production at 2.0 million b/d in June was far below a peak of 3.4 million b/d in 2004. Mexico’s dry natural gas production peaked in 2010 at 5.1 Bcf/d, but is down to only 3.2 Bcf/d this year, forcing the country to rely heavily on US pipeline gas and LNG imports.

- Through a series of upstream oil and gas auctions, Mexico has awarded dozens of E&P contracts to a number of companies and consortia, which has already led to some significant finds by US independent Talos Energy and Italy’s Eni.

- Unable to meet growing demand with local production, Mexico is opening its refined products markets to competition. Imports of US petroleum products over the first four months of 2017 were up over 125% year-on-year. Mexico is in the process of expanding its refined products pipelines and terminals, and allowing outside access to existing assets.

- Pipeline imports of US natural gas make up nearly 60% of total Mexican natural gas supply, compared to just 22% in 2010. Platts Analytics expects that US natural gas imports will rise to nearly 70% of total supply by 2022.

- Natural gas pipeline import capacity has grown 145% since 2010 to 10.8 Bcf/d. By 2022, import capacity is expected to reach 14.2 Bcf/d. Mexico’s natural gas market is in a massive state of flux. Gas trading is still in a nascent stage of development after getting off the ground in July. Gas buyers are hesitant to leave Pemex. Current supply/demand conditions suggest that areas of supply shortage and/or transportation constraints could experience premium prices. Industrial customers have expressed concern about the recent lifting of natural gas price caps on first-hand sales and the possibility of price spikes in some regions. Prices in constrained areas theoretically could increase a level near fuel oil at roughly $9/MMBtu.

- Breaking the Mexican gas market up into 10 Cell Regions™, Platts Analytics expects that the strongest natural gas price premiums will form in the Peninsula, Western, and Central gas regions, with large differentials expected between Baja California and Baja California Sur.

- Mexico’s wholesale power prices sustained healthy margins over US power prices in 2016, but prices have climbed even higher in 2017 as the natural gas market has tightened pushing more expensive fuels into the power generation supply stack to meet growing demand. Mainland Mexico prices jumped $24.48/MWh, or 56%, on average across all control regions to average $67.62/MWh during the first half of 2017.

REVENUES EXPECTED FROM MEXICO’S ENERGY REFORM TO DATE ($ million)

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Note: The calculation for the oil sector’s contribution to GDP growth does not include indirect effects such as those stemming from oil-related fiscal revenues.
The devil’s in the details

Massive free-market changes are taking place across a broad spectrum of Mexico’s energy industry, transforming the upstream, midstream and downstream areas of the natural gas, power and petroleum sectors. It’s been three- and-a-half years since the Mexican government, under the mandate of President Enrique Peña Nieto, proclaimed a constitutional reform that modified three articles of the country’s constitution, but the next year may end up being the most critical in determining how successful Mexico has been in dismantling its government monopolies and creating open market conditions.

The president signed energy reform into law on December 20, 2013, and eight months later in August 2014 signed secondary legislation, consisting of nine new laws and amendments to 12 existing laws to implement the constitutional changes. Significant regulatory changes followed, allowing private investments, by both foreign and domestic companies, across the oil, gas and power value chains, and an end the 76-year monopoly of Petróleos Mexicanos (Pemex), which had sole rights to engage in exploration, production, processing, refining and commercialization of hydrocarbons since President Lazaro Cardenas nationalized the oil industry in 1938.

To date, seven upstream oil and gas resource auctions have taken place, including three covering areas in the shallow waters of the Gulf of Mexico, one in the deepwater Gulf and three onshore. There also have been farm-out agreements between private companies and Pemex in an effort to develop deepwater plays and other areas.

The country also has been in the process of opening up its refined petroleum products sector, allowing competition to import and market gasoline and diesel fuels, and has begun phasing out retail price caps. Mexico’s Energy Regulatory Commission (CRE) expects the number of gasoline service stations in Mexico to reach 23,000 in 2022 from the current 11,500, representing investments of $12 billion.

“There is no Soviet-style plan leading investment in this new capacity,” CRE member Guillermo Zuniga said in May. “It is the market deciding where and how to invest.”

In the upstream midstream sector, Pemex has started to auction off the use of refined products pipelines and storage so that outside companies can compete. But more capacity is needed to meet growing demand, and as much as $4 billion in new fuel pipelines, rail terminals and storage projects have been proposed.

In the natural gas market, recent changes have included the separation of gas supply and transportation contracts on July 1 and the removal of a maximum (VPM) natural gas price cap on Pemex gas sales, allowing the free market to set the price of natural gas across the country. This price liberalization step followed auctions of some natural gas pipeline capacity within Mexico and across the border into the US, as well as the raffling of a portion of Pemex’s gas sales contracts, more of which will be sold later this year.

The assignment of Pemex natural gas contracts is expected to take place in three phases over a maximum period of four years. Pemex will make available to third parties about 70% of its total volume of natural gas associated with its current marketing activities. Customers, however, have the option of remaining with Pemex as their gas supplier, which may lead to a slow migration to the marketplace given supply constraints and market uncertainty in some areas of the country.

There are some important challenges ahead in the gas market. The absence of a secondary market for transportation capacity is seen as a stumbling block that may hinder gas market development. Anecdotal evidence also indicates that customers may be reluctant to switch their gas supply to companies other than Pemex in the short term. Meanwhile, industrial customers are concerned that the lifting of the VPM price cap could allow price spikes in areas of the country with limited supply access.

In the power sector, state-owned power utility Federal Electricity Commission (in Spanish, the Comisión Federal de Electricidad or CFE) was broken up into six independent generation companies, along with individual transmission, distribution and marketing companies in 2016. Day-ahead wholesale and ancillary services markets also were launched last year. Independent power producers can now sell electricity under the same terms and conditions as the government utilities in a new wholesale market. The reforms also have included the country’s first Independent System Operator (ISO), that can economically dispatch power plants until demand is satisfied, setting the spot price for electricity. However, the market is still undergoing adjustments.

The real-time market is operating retroactively and further changes are needed. And prices are on the rise, increasing scrutiny on the new market and the liberalization process. The new CFE entities and IPPs have proposed a large number of new gas-fired and renewable power projects and gas conversions of existing fuel oil plants. In an effort to provide fuel for these plants, Mexico also is in the middle of one of the largest natural gas pipeline construction periods. Some project delays, however, have limited supply access, which could continue to impact prices in the short term. Power prices already show multiple areas of limited supply availability.
Crude oil

UPSTREAM

Reversing a declining oil production trend and fostering lasting growth have been key goals behind Mexico's energy market liberalization. The country's production has been in decline for many years. Crude oil production at 2 million b/d in May was far below the peak of 3.4 million b/d in 2004 because of a decline in exploration activity by Pemex.

The weak financial position of Pemex prevented it from making the investments needed to grow crude production, or at the very least to slow the decline in output.

The decline in production can be explained mainly by the maturing of Mexico's largest oil field, the "Cantarell Complex," which accounted for 60% of the country's total output in 2004, but now produces just above 100,000 b/d, barely 6% of the total.

Mexico's proven oil reserves have dropped nearly 50% over the last five years to 7 billion barrels as of January 1, according to National Hydrocarbons Commission (CNH) data. Pemex was drilling an average of 72 exploratory wells each year from 2002 through 2009, but this fell to only 31 wells annually from 2010 through 2016. Only 30 exploratory wells are planned this year.

Source: Mexico's Energy Secretariat (SENER)
The International Energy Agency estimates that, assuming the liberalization of Mexico's oil sector goes as planned, crude output will hit bottom close to current levels around 2018 and then start to tick up. But it will not reach 2004 peak levels until 2040.

A challenge to Mexican GDP growth and government coffers
Effective implementation of Mexico's energy sector reform is key to improving the long-term growth prospects of its economy. Mexico has been a major crude exporter for decades, but following years of underinvestment the loss of export revenues has reduced the sector's share of Mexico's GDP to less than 5% today from nearly 10% in 2004, when production peaked.

This decline in oil output alone, excluding the impact of lower oil-related government revenue on fiscal accounts, has subtracted 0.3 percentage points from real GDP growth on average every year over the last three years. This is a mirror image of the 0.3 percentage points the sector was contributing to real GDP growth when output was peaking, according to S&P Global Ratings.

From a trade perspective, Mexico's energy sector also has had important negative ramifications over the last few years. In 2015, Mexico flipped from being a net exporter to becoming a net importer of petroleum products. While Mexico does not import crude, the combination of lower crude exports and greater gasoline and natural gas imports from the US, in light of cheap prices and easy access through cross-border pipelines, explain a widening of Mexico's trade deficit.

The petroleum products trade deficit was 1.2% of GDP in 2016, while the overall trade deficit was 1.3% of GDP. The energy trade shortfall accounted for the majority of the 2.1% of GDP current account deficit last year, which has increased external borrowing requirements at a time when the net debt to GDP ratio has risen by about five percentage points over the last three years to more than 45%.

The decline in Mexico's oil output has also had a significant direct impact on public finances. Just five years ago, oil-related fiscal revenue through transfers from PEMEX accounted for about 40% of total government revenue. Today it accounts for just over 15%. The government has reacted to the decline in oil-related fiscal by cutting public investment, which has fallen by a cumulative 30% over the last five years.

Several major infrastructure projects, mainly transportation-related, have been cancelled as a result. The cut in public investment alone has directly subtracted 0.3 percentage points on average to annual real GDP growth over the last three years.

If we assume that half of the cut in public investment is due to the decline in oil-related revenue, and that the multiplier effect of infrastructure investment in Mexico is 1.3 (calculated for a January 2015 S&P Ratings report; see: S&P Global Ratings’ “Global Infrastructure Investment: Timing Is Everything (And Now Is The Time)), and then add the 0.3 percentage points lost directly from the decline in crude production, then we can roughly estimate the total impact of the decline in Mexico's oil sector on real GDP growth. This adds up to about half a percentage point on average annually over the last three years.

In other words, without the deterioration in the oil sector, Mexico's average real GDP growth, which was 2.3% over the last three years, could have been 2.8%.
**Tightening heavy and medium sour crude supplies**
The drop in Mexican crude output also has had an important impact on the global crude oil market by tightening heavy and medium sour crude supplies. Mexico exports primarily heavy Maya crude, keeping the lighter grades for its own refineries, which are not geared to run heavier grades.

The bulk of Mexican crude exports historically have gone to US Gulf Coast refineries, which have invested heavily in coking capacity to run heavier grades. Mexican exports to the USGC have slided with the decline in Mexico's production. Gulf Coast refineries imported an average 565,000 b/d of Mexican crude in 2016, down from 1.514 million b/d in 2006, US Energy Information Administration data shows.

Mexican heavy sour crude imports have been displaced by Canadian crude imports on the USGC. Imports of lighter Mexican crude have all been displaced by the rise in US shale production. The USGC refineries also have recently been running more light sweet crude as the price discounts for heavy medium sours have tightened.

**Auctions**
In an effort to turn around declining exploration and production, Mexico has held seven upstream auctions and one upstream farm-out auction.

- **Round 1, First Call** – 14 shallow-water Gulf of Mexico areas within the oil province Cuencas del Sureste, offshore Veracruz, Tabasco and Campeche.
- **Round 1, Second Call** – Nine fields in five areas located in shallow waters of the Gulf of Mexico, within the Cuencas del Sureste oil province.
- **Round 1, Third Call** – Oil extraction fields onshore grouped into three geographic areas identified as Campos Burgos, Campos Norte and Campos Sur.
- **Round 1, Fourth Call** – 10 Deepwater areas in the Gulf of Mexico within the Lost Belt and Salt Basin oil provinces.
- **Round 2, First Call** – 15 contractual areas located in shallow waters of the Gulf of Mexico, within the Tampico-Misantla, Veracruz and Cuencas del Sureste oil provinces.
- **Round 2, Second Call** – 10 contractual onshore areas under the modality of license agreement. Nine of these areas are located in the Burgos Basin and one is in the Southeast Basins.
- **Round 2, Third Call** – 14 contractual onshore areas in the Burgos Basin and the Southeast Basins.

See page 25 for a full summary of auction results.

While only two blocks were awarded in the first auction and three in the second, subsequent auctions were considered more successful. Blocks have been awarded to a wide range of companies and consortia, including ExxonMobil, Chevron and BP, as well as smaller Mexican companies. For example, the two most recent rounds were largely awarded to Jaguar Exploration and Production, a company owned by Mexican investment firm Grupo Topaz.

The awarded petroleum blocks have largely gone to areas with lighter oils.

The winners of Block 7 from Round 1.1 – US independent Talos Energy and its partners Sierra Oil and Gas and Premier Oil – scored a home run offshore Mexico, unveiling what they called a “world class” oil discovery holding more than 1 billion barrels of resource with their first exploration well. The Zama-1 well on Block 7 found up to 650 feet of net oil bearing reservoir holding light crude of 28 to 30 API gravity.

Italy's Eni, which won Block 1 from Round 1.2, is fast-tracking development of its Amoca Field in the shallow waters of Compeche Bay and increasing its reserve estimate there to 1 billion boe. Eni expects to produce 30,000-50,000 b/d of 25-27 API crude from Amoca, starting operations in early 2019.
Analysts at PIRA Energy Group, a unit of S&P Global Platts, estimate that these discoveries will add a combined 200,000 b/d of Mexican crude production by 2030, and that both discoveries should be economic at around $50/b Brent. But looking further out, PIRA expects Mexico's deepwater oil, and to a lesser extent shale oil, will be the biggest contributor to production growth. Mexico's deepwater resources have been assessed at 27 billion barrels, but will take longer to develop. PIRA forecasts deepwater Mexico production will reach 500,000 to 600,000 b/d by 2035, with shale crude and condensate reaching 300,000 b/d.

Mexican President Enrique Peña Nieto's administration plans to hold three additional auctions before the end of his term in 2018.

“There are 509 exploration and extraction blocks and 82 fields for private companies to nominate in the coming rounds.”

Mexico will auction 30 deepwater oil and gas blocks at its upstream Round 2.4 auction on January 31, 2018. It will be the first time Mexico will auction blocks requested by oil companies. In addition, it will be the first time Mexico will offer deepwater blocks in the Cordilleras Mexicanas Basin and the Yucatan Platform, areas seen by the oil industry as prospective areas of untapped resources. The cumulative prospective resources for Round 2.4 are 4.28 billion barrels of oil equivalent.

The winners of Round 3.1 for shallow-water and conventional onshore resources will be announced February 2018 and of Round 3.2 for deepwater and unconventional onshore resources in the following October.

Farm-out auctions
Last December, Mexico's Energy Secretariat (SENER) and CNH also auctioned off a joint development farm-out agreement with Pemex for the Trion deepwater block, the first of four expected farm-out development blocks to be offered over the next few years. Australia's BHP Billiton won the farm-out block for an upfront cash payment of $62.4 million.

Mexico's deepwater – which has barely been tapped by Pemex and not at all by foreign operators – is one of the global bright spots for offshore exploration. Pemex expects to start oil production from the Trion Block in 2021. With 485 million barrels of oil equivalent of 3P reserves, Trion is expected to reach peak production of 118,000 b/d of light crude.

There are more such opportunities to come. For example, CNH approved the auction rules to farm out two of Pemex's onshore mature fields, Cardenas-Mora and Ogarrio in the southeastern state of Tabasco. Cardenas-Mora is producing 7,600 b/d of 39 API crude, while Ogarrio is producing 7,100 b/d of 37 API crude and 23.5 Mcf/d of gas.

Results of that auction will be released on October 4 along the results for the farm-out of the shallow-water Ayin-Batsil Block. Pemex expects production of Ayin-Batsil, which has reserves (3P) of 359 million boe, to start in 2019.

Also, Pemex is likely to launch a farm-out this summer to find a partner to develop the deepwater Gulf of Mexico Maximino-Nobilis Block. Nobilis-Maximino has an estimated 500 million boe, most of it super light crude. It has a water depth of 2,900-3,100 meters and a total area of 1.5 sq km, according to Pemex data. Pemex expects Maximino-Nobilis to reach a peak production of 174,000 b/d in 2026-2027.

Pemex's E&P General Director Juan Javier Hinojosa Puebla said the company would offer 74 clusters comprising 155 prospective production and 66 exploration areas. The idea was to create enough critical mass in the area to make the clusters attractive enough to potential partners.

Pemex approved 11 farm-out clusters of oil fields in July, and hopes to offer them to the market before the end of the year. The clusters are composed of 34 production and eight exploration areas.

Contract migrations
Mexico also has been migrating its pre-reform oil production contracts with companies to new production sharing contracts. Multiple companies holding pre-reform contracts had delayed development plans until their contracts are migrated, so the migrations are a positive sign for Mexican crude production.

The government and Pemex recently concluded the first migration of a pre-reform production enhanced contract to a production-sharing contract under the new regulation. The migrated contract is for the Santuario-Golpe Block in the state of Tabasco between Pemex and UK's Petrofac Facilities Management. The original contract was signed in 2011.

Pemex's data shows the state company holds six integral exploration and production contracts and 16 publicly financed works contracts. SENER's data shows that production from blocks under pre-reform contracts could grow to 255,000-377,000 b/d in 2021 from 206,000 b/d in 2016, according to a minimum and maximum production forecast.

Among the companies that have delayed their development plans while they wait for their pre-reform contracts to be migrated are Switzerland's Vitol and a joint venture of Russia's Lukoil and Canada's Renaissance Oil. These companies have plans to develop for the first time Mexico's prolific shale resources in the Tampico-Misantla Basin's Pimienta Jurassic layer.
Pemex has 60 billion boe of shale resources in its portfolio and is looking to develop it in tandem with other players. Pemex was waiting for the arrival of the regulations before it began drilling five exploratory wells in shale plays, with two of them in the Pimienta formation, which the company estimates holds 20 billion boe.

As Mexico's shale resources have not been developed commercially, Pemex has to prove the resources, their productivity and profitability with CNH. Pemex has contracts with companies for six blocks in the Chicontepec region, and those companies have access to the Pimienta formation. The companies are Lukoil, Baker Hughes, Haliburton, Diavaz, Vitol and Perfolatina.

**MIDSTREAM AND DOWNSTREAM**

Mexico also has taken a number of important steps to open its midstream and downstream petroleum sectors, including allowing competition to import and market gasoline and diesel fuels, holding open seasons for pipeline and storage capacity, and encouraging new pipeline and storage development projects by the private sector.

Mexico has increasingly relied on imports of refined products to meet its growing internal demand, as Pemex's refineries have been operating under capacity. Those imports up to now have been exclusively brought in by Pemex.

US refiners exported 883,000 b/d of refined products to Mexico in April, near the record high 1.2 million b/d in December, the bulk of which was gasoline and distillates, according to the US Energy Information Administration.

Several companies have announced plans to enter Mexico's retail and midstream sector, including BP, Glencore, Shell and ExxonMobil.

ExxonMobil sees Mexico as an expanding market in which fuel demand is expected to grow above 40% over the next 25 years, a period when the US demand is expected to fall 17%.

Mexican refined product consumption has been rising, although gasoline consumption fell during the first quarter because of a rise in retail prices in some regions last December. Mexico consumed 772,200 b/d of gasoline in the first quarter of this year, down from a record 842,200 b/d in Q4 2017 and the lowest level since Q1 2015's 768,000 b/d.

Mexico's gasoline consumption was affected by gasoline price increases of up to 20%, depending on the region, enacted by the Pena Nieto administration in December.

Diesel consumption in the first quarter was 375,400 b/d, down 16,350 b/d from Q4 2016, but 5,000 b/d higher than the year-ago quarter. Mexico has gradually been removing the retail price caps for refined products, although this has had little impact on retail prices.

SENER expects gasoline consumption to rise to 1.065 million b/d by 2030.

The CRE expects to soon take the first step in opening to competition the country's last energy monopoly: jet fuel. While relatively small compared to Mexico's gasoline and diesel markets, jet fuel liberalization will allow foreign companies to enter a growing market.

The Airport and Auxiliary Services agency, the government-owned corporation that oversees the operation of Mexico's
airs, has the distribution monopoly of jet fuel across the country’s ‘s largest. The commission is currently reviewing the scheme to assign ASA’s storage capacity and its operational rules.

SENER forecasts that Mexico’s fuel jet demand will grow 2.4% annually and reach 100,300 b/d in 2030 from 76,000 b/d in 2017. Mexico imports roughly half of its jet fuel imports. In May, the country imported 36,645 b/d of jet fuel and produced 44,937 b/d, while consumption was 78,837 b/d.

**Pipeline, storage auctions**

Since Pemex owns the refined products midstream assets in Mexico, it has started to auction off the use of pipelines and storage so outside companies can compete. Pemex is auctioning off the use of those assets in five regional phases as well, following the price liberalization scheme.

Pemex has 13 million barrels of capacity across 78 terminal points. A number of private companies also have their own plans for pipeline, terminal and storage development.

Tesoro Mexico Supply & Marketing was the first company to win a Pemex auction for midstream assets.

The US refiner won Pemex’s auction for the use of refined products storage and pipeline facilities in the northwestern states of Baja California and Sonora for a three-year period.

Tesoro, along with many other companies, has permits from the CRE to import refined products into the country. Tesoro has refining assets in the western US, in close proximity to Baja California and has exported refined products to the west coast of Mexico. Tesoro owns refineries in Martinez and Los Angeles, California, and in Anacortes, Washington.

The second phase of Pemex’s logistic open season will offer midstream assets in the northern states of Chihuahua, Coahuila, Tamaulipas and Nuevo Leon, Mexico’s industrial heartland. The second phase has yet to be announced, which could be delaying investment decisions in the midstream. Tesoro could be interested in participating in the second auction, as could Howard Energy, which is working on a fuel pipeline project into Nuevo Laredo from Texas.

ExxonMobil is also looking at participating in Mexico’s open seasons to auction capacity usage in Pemex’s pipelines and storage.
Storage, terminal projects

Mexican Energy Secretary Pedro Joaquin Coldwell said the country only has enough gasoline storage capacity to cover two to three days of supply. According to the International Energy Agency, the recommended storage capacity is 30 days. Coldwell said Mexico has implemented the goal of gradually increasing its fuel storage capacity to at least 15 days of fuel storage by 2025.

State power utility CFE could provide gasoline storage services this year as it switches away from fuel oil to less expensive natural gas. Between 2012 and 2015, CFE reduced its fuel oil consumption by 48%, to 104,000 b/d from 201,000 b/d, as it switched seven power plants to gas, according to the company’s most recent annual report. CFE Energía, the state utility’s trading affiliate, will offer 1.1 million barrels of former fuel oil storage for diesel and gasoline storage.

CFE released its draft participation rules for potential partners for its refined products storage pilot project in the states of Baja California and Sonora. It will announce the winning proposals in August, and winners will hold 30- year contracts to operate and maintain the facilities.

“The CFE would provide the storage infrastructure and the physical space while CFE’s partners would provide the financing, permits, engineering, procurements, and construction as well the operation and maintenance of the facilities,” the state utility company said.

In Baja California, CFE will retrofit 496,000 barrels of storage capacity in Rosarito and Mexicali. In Sonora, it will modify 656,000 barrels of storage tanks in Piquito.

Over the next decade, CFE expects to make available 10.7 million barrels of gasoline and diesel storage capacity as it switches away from using fuel oil to less expensive gas.

IEnova, the Mexican subsidiary of Sempra Energy, is looking to develop fuel infrastructure in Baja California, Baja California Sur, Sonora and Sinaloa, as well as adding fuel infrastructure for its LPG storage and distribution terminals in Guadalajara and Monterrey states.

IEnova won a contract with the Mexican government-run Integral Port Administration of Veracruz to build a new refined products terminal there. The agreement is a 20- year contract to build and operate a marine terminal at the port of Veracruz for the receipt, storage and delivery of gasoline, diesel and jet fuel.

The fuel terminal is part of a larger 122,818-square- meter expansion being undertaken by the Veracruz port authority. Other companies bidding included Vitol, Avant Energy Midstream and HST.

Valero also is jumping into Mexico’s retail fuels market with a $200 million midstream investment to enable Mexican service station owners to sell its gasoline. Valero will offer its own brand and the Ultramar brand to Mexican retailers. The backbone of Valero’s strategy is the development of terminal in the port of Altamira in the northern border state of Tamaulipas and fuel train terminals in the industrial hubs of Monterrey and San Luis de Potosi. The port facility will have a depth of 12.8 meters.

The terminal will have six fuel storage tanks with a combined gasoline and diesel capacity of 950,000 barrels. Valero plans to ship its first gasoline by rail from Altamira in 2019. The terminal will have 14 loading points and a storage capacity for 422 fuel train cars.

Valero would be able to load 100-car trains to Monterrey, with enough capacity to move 60,000 barrels of fuel, and plans to be able to load 45-car trains, with a total 27,000 barrels, to ship to San Luis de Potosi. Valero expects to send out one loaded train daily to each city and to increase the frequency of shipments as it signs up more customers.

Valero will have three storage tanks in Monterrey with a combined gasoline and diesel capacity of 325,000 barrels. In San Luis de Potosi, Valero will have three tanks with a combined capacity of 325,000 barrels.

Hydrocarbon Storage Terminal (HST) said it plans to expand the size of its proposed HST-1 Valle de Mexico fuel storage facility and terminal to 875,000 barrels from 330,000 barrels due to the large number of requests received in the project’s ongoing open season. Construction should begin in October and the facility is to begin operating in December 2018.

The $70 million HST-1 terminal will be located in Acolman in the state of Mexico and have the capacity to distribute between 50,000-55,000 b/d of gasoline. This distribution capacity is enough to supply up to 24% of the 230,000 b/d sold in the region of the Valley of Mexico.

After building its HST-1 Valle de Mexico, HST will distribute 4% of all gasoline sold in Mexico. HST-1 will be the second-largest terminal in the Valley of Mexico after Pemex’s 1.5 million barrel Azcapotzalco terminal, according to Pemex data. With an operational radius of 30 km, the terminal will serve Mexico City and parts of the states of Mexico, Hidalgo, Tlaxcala and Puebla.

According to HST, the terminal will be able to serve 1,400 service stations in the area, of which 1,000 are among the stations with highest gasoline sales in the country. HST expects to provide its clients savings of about 50 cents/b of fuel versus storage services provided by Pemex. The company has the permits required to interconnect the terminal with the Tuxpan-Posa Rica-Azcapotzalco pipeline. HST’s plan is to acquire capacity from this pipeline in a Pemex open season for Mexico’s central region, the result of which are scheduled to be announced.
Mexico's energy transformation takes hold

October 16. It then plans to offer the pipeline capacity directly to its clients. Another option is for whoever wins this pipeline access during the open season to come and request a connection for HST.

Over the next five years, HST plans to invest $400 million to $500 million in new distribution terminals and storage facilities. Of this total, the company plans to invest between $250 million and $300 million in five more large-scale terminals like HST-1 Valle de Mexico. HST is also exploring possibilities of build a large fuel storage terminal in the port of Veracruz or in the port of Manzanillo, Colima. The company also wants to build multiple smaller regional terminals across the country over that period.

The Lazero Cardenas sport commission plans to launch an open season in August for developers interested in building additional storage in that Pacific Coast port for imported gasoline, diesel and fuel oil.

Located in Michoacan state, the port will conduct a feasibility study about adding a 1.5 million-barrel storage terminal. Approval from Mexico's Federal Competitive Commission for the study is pending.

The Lazero Cardenas port, which handles refined products from state Pemex's Salina Cruz refinery, currently has fuel storage with an operational capacity of 635,660 barrels, according to Mexico's Energy Secretariat.

Pemex distributes fuel from the port via Kansas City Southern rail and by truck to Mexico City and to the states of Guerrero, Michoacan, Jalisco, Guanajuato and Queretaro.

Pipeline projects

ExxonMobil is participating in Mexico's investment project Invex Grupo Infraestructura to build a new fuels pipeline in Mexico linking its Gulf Coast to the center of the country. Invex Grupo Infraestructura is leading a project that will include a 174-mile pipeline from the port of Tuxpan to Tula, in the center of Mexico, as well as two storage facilities. Its operation capacity will initially be 100,000 b/d, with a maximum volume of up to 165,000 b/d, the company said last year. US and Canadian companies would participate in the project, it said.

Mexico's heavily populated and urbanized central region is coveted by the companies willing to invest in Mexico's oil sector, and there are two other pipeline projects being developed for that area, although it is uncertain if the three of them will be built. Monterra Energy has said it plans to build a 168-mile pipeline with 100,000 b/d of initial capacity to transport refined products from the port of Tuxpan, Veracruz, into central Mexico near Tula, Hidalgo. TransCanada, Sierra Oil & Gas and Grupo TMM announced they would build a marine terminal near Tuxpan, a 165-mile pipeline from there to Tula and an inland distribution hub in central Mexico.

ExxonMobil is negotiating for capacity from Howard Energy Partners' Frontera-Norte project, a 90,000 b/d, $500 million pipeline that will move gasoline, diesel and jet fuel from Corpus Christi, Texas, to Mexican border city of Nuevo Laredo, an important manufacturing center, and then south to Monterrey, Mexico's largest industrial hub. Nustar has proposed a 108,000 b/d pipeline running from Edinburg, TX to Reynosa, Mexico.

Refining

Pemex also is working to increase its refining production to 1.2 million b/d by year-end from 977,000 b/d in 2015. However, Pemex refineries last December produced just 798,000 b/d, its lowest output in 24 years. Pemex owns six refineries with a total capacity of 1.64 million b/d, and those facilities were operated at 59% of total capacity in 2016.

According to Carlos Murrieta Cummings, president of Pemex Transformacion Industrial division, the company's refinery maintenance and repair plan for 2017 will be the largest in its history – worth over Peso 23 billion,($1.1 billion at the current exchange rate).

Pemex's 2016-2021 business plan shows the company plans to develop eight groups of projects to recover its refining production: It is seeking partners to reconfigure its Tula, Salamanca and Salina Cruz refineries; providing coking services for Tula; installing processing plants to produce ultra-low-sulfur diesel; supplying hydrogen, water and sulfur services; and installing 1946-MW in cogeneration plants.

In February, Pemex signed a 20-year hydrogen supply contract for its Tula refinery with France's Air Liquide for an undisclosed amount. The refinery has a processing capacity of 315,000 b/d. Crude processing grew to 244,700 b/d in April from 88,300 b/d in September 2016.

Natural gas

Mexico's dry natural gas production peaked in 2010 at 5.1 Bcf/d, but is down to only 3.2 Bcf/d this year, forcing the country to rely heavily on US pipeline gas and LNG imports. Mexico's gas market is in a massive state of flux. A series of recent resolutions and public policy announcements published by CRE, SENER and other agencies have set general administrative provisions and regulations for the creation and development of the natural gas market. There have been multiple steps in this rapid-fire liberalization process including a raffle of a portion of Pemex's natural gas contract portfolio, open seasons for domestic and international-border-crossing pipeline capacity, the removal of VPM price caps on gas sales by Pemex and other measures.

However, gas trading is still in a nascent stage of development after basically just getting off the ground in July. Prices have yet to be developed. Gas buyers are still
afraid of change and hesitant to leave Pemex; they have the option of remaining with the state company as their supplier.

Gas pipeline capacity, particularly for US imports, remains largely in the hands of state energy companies at a time when the country is increasingly dependent on US gas. Imports are significantly surpassing domestic production. Demand is poised to rise rapidly, in a large part by gas-fired power generation capacity additions, but there also is a risk it could grow even faster because new pipelines may spawn demand in areas where previously oil and NGls were the only supply options.

**Commercialization of contracts**

There have been a number of important steps recently in this gas market liberalization. One step was a resolution for the planned commercialization of 70% of Pemex’s contracts in three phases. This eventually would result in 2.5 Bcf/d of free-market gas demand (70% of the 3.6 Bcf/d total) being made available to the market. The other 30% will be selected to be retained under contract with Pemex.

Under Phase I of the Pemex contract commercialization, about 111 contracts (totaling 758 MMcf/d) were awarded to the market while 133 contracts (1,104 MMcf/d) were retained by Pemex. Phase II will take place later this year at a date still to be determined, offering another 20%, or 700 MMcf/d of Pemex's contracts to be assigned to marketers. Phase III will include the remaining 30% of the volumes, or 1.1 Bcf/d, to be assigned to marketers.

Other recent steps included open seasons held by Mexico’s national gas control center (CENAGAS) for domestic and international pipeline capacity. In June, the CFE also announced the first annual open season for a substantial portion of its pipeline capacity holdings on a number of domestic and US pipeline systems, but a lack of market participation resulted in plans to repeat the open season in August.

The CENAGAS international pipeline capacity open season attracted only a few bids on the Los Ramones system, connecting South Texas with Central Mexico. Only three companies were awarded contracts, including Glass Container Factory of Potosí, Industria de Alcali (Grupo Vitro) and BP Energía de México. In total, 754 MMcf/d of capacity was auctioned on four routes of the Mexico Pipeline transport system, which is interconnected to the National Integrated Natural Gas System (Sistrangas) at the Border Compression Station (Camargo) and receives gas from Agua Dulce (Texas) to the National Gas Pipeline System and the Los Ramones system.

The departure rate was set at 31 cents/MMBtu. BP received capacity on two Los Ramones pipeline routes: 190 MMcf/d on one and 10 MMcf/d on another. Glass Container Factory of Potosí was awarded 4 MMcf/d and Industria de Alcali was awarded 16.6 MMcf/d.

CENAGAS also awarded domestic pipeline capacity to 24 companies in an open season for capacity on the Sistrangas pipeline system. CENAGAS received 769 applications from 24 companies for 3.5 Bcf/d across 17 of the 24 injection points available, with 722 awarded to those 24 companies for the 2.6 Bcf/d available. About 97% of Sistrangas’ 6.12 Bcf/d total capacity is assigned. Pemex was assigned 1.3 Bcf/d of the capacity in the auction.

The capacity under contract became operationally active July 1, which initiated the beginning of open market conditions.

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**MEXICO-UNITED STATES BORDER CROSSINGS**

Source: Platts
and presumably trading and price transparency. However, trading is expected to begin slowly as many companies chose to continue receiving their gas from Pemex.

**Mexico faces supply shortages**

As the Mexican gas market further develops over the coming years, new trading hubs with transparent pricing are expected to form, defined by their own unique supply and demand fundamentals. Although gas trading is still developing, it appears that some major premium hubs will begin to form in the Central and Western regions and in the Yucatan peninsula.

These premium market locations are likely to include cities such as Mexico City and Guadalajara, which support large populations and are dependent on pipeline inflows for supply. Premium markets in Mexico are likely to operate in a similar fashion to the large population centers in Southern California and the US Northeast, where seasonal demand swings can drive price premiums.

Already this year, Mexico has faced gas supply shortages in some of its largest markets, which may soon be followed by rising gas prices. In the past, supply shortages were primarily balanced by alternative fuels in the power market, with the CFE receiving lower precedence for gas supplies than non-power consumers. Under the previous system, the CFE would switch to fuel oil generation when natural gas supplies were short, but the maximum first-hand-sales price cap would mitigate price spikes for non-CFE buyers. However, under the new liberalized pricing regime, non-power buyers will have to compete for supplies and pay the market price.

The CFE already has reported increased fuel oil consumption for power generation this year, with fuel oil rising to more than 550 million liters per month in January and February, a 58% build over last year. It remains to be seen if suppliers, particularly Pemex, will raise prices in the spirit of liberalized price discovery or refrain from premium pricing to mitigate the public backlash on energy reforms.

Central Mexico, which includes Mexico City, has likely seen rising fuel oil consumption this year due to limited access to pipeline gas and lack of local production. If Pemex chooses to raise supply prices to encourage fuel oil switching in the power markets, it likely would come as a shock to non-CFE gas buyers in Mexico who are accustomed to the legacy fixed VPM price regime.

Prices in some regions will continue to be highly influenced by outside market forces. For example, the Western Region includes the Manzanillo LNG import terminal and will be influenced mainly by global LNG market conditions. Baja California is dependent on US imports and will be influenced by market conditions in the US Southwest.

Conversely, prices in Mexico's southern producing states may remain more stable as new offshore production ramps up and increases the supply of associated gas volumes. Across the country, changing market fundamentals will lead to new pricing dynamics that may or may not fit with preexisting infrastructure development plans. This will create new opportunities and risks for both buyers and suppliers.

**Natural gas demand growing**

Mexico's natural gas demand is growing rapidly, and the industrial and power sectors are leading the charge.

Year to date, total Mexican gas demand has averaged 7.7 Bcf/d, up 1.3 Bcf/d, or 21%, from 2010, indicating average 3.5% annual growth, or 30% faster than total US demand growth over the same period. That puts the Mexican gas market at about one-tenth the size of the total US market and roughly on par with Platts Analytics' US Southwest Region (California, Arizona, New Mexico, and Nevada).

Gas demand from power has increased about 5% per year since 2015 when it averaged 3.4 Bcf/d and represented 45% of total Mexican demand, by far the largest single demand sector. Gas demand in the power sector has exceeded growth in total power generation in Mexico, which only grew by 8% between 2010 and 2015, or about 1.4% annually.

This growth has been driven primarily by a broad national agenda to promote cleaner, more efficient power generation. CFE has been engaged in a vast retooling of its power generation fleet and instituting a major shift from fuel oil generation to cheaper, cleaner and more efficient gas-fired generation. Gas generation now makes up more than 50% of total power generation in Mexico, which only grew by 47% in 2010, while fuel oil has dropped to 15% of the total, down from a high of 23% in 2012.

However, this year to date, CFE fuel oil consumption has actually increased in response to shortfalls in gas supply, driven by a lack of pipeline capacity and falling domestic production. Total CFE fuel oil consumption averaged 550 million liters per month during the first two months of the year, up 58% from last year. Gas-fired generation is expected to all but displace fuel oil in the power sector, which could provide an estimated demand uplift of 1 Bcf/d if all fuel oil generation is replaced by gas.
Pemex's own internal gas demand (enhanced oil recovery, refining, petrochemicals and other operations) as well as demand from the industrial demand make up most of the remaining gas demand in the country, averaging 2.2 Bcf/d and 1.8 Bcf/d in 2015, respectively. While Pemex demand has fallen since 2010, largely due to declines from its PGPB gas subsidiary, industrial gas demand has seen consistent growth since 2010, rising by around 7% per year since 2010.

Of Pemex's annual gas demand, which accounts for 30% of Mexico's total, roughly 1.3 Bcf/d annually (or around 60%) is tied to exploration and production activities, which includes gas re-injected into wells for enhanced oil recovery. Another 30% of Pemex demand is split between refining and petrochemical production (just over 300 MMcf/d each), with the remaining 10% of demand driven by its Petroleo y Petroquimica Basica (Pemex Gas & Basic Petrochemicals) subsidiary. Over the last several years, Pemex total demand has been on the decline, falling by 14% since 2010, largely due to the overall decline in gas production and use within PGPB, which has fallen by 23% over the same time frame.

Pemex demand is heavily concentrated in the southern states, where the majority of oil and gas production resides. Roughly 75% of Pemex demand is split between the states of Tabasco and Veracruz, and their offshore areas.

Industrial demand is the source of Mexico's fastest growing gas demand, rising to roughly 25% of total demand (1.8 Bcf/d) in 2015, up from 21% in 2010. Between 2010 and 2015, Mexican industrial demand grew by an average of 6.5% per year, 3.6% faster than the overall economy over that same time period, with growth actually accelerating to above 8% per year in 2014 and 2015 despite total economic growth falling below 3% per year.

The primary industrial demand drivers are metals production and chemicals. In 2015, basic metals consumed 347 MMcf/d of gas, while chemicals and metal products consumed 200 MMcf/d and 138 MMcf/d, respectively.

Gas represents nearly 60% all combustible fuel demand in Mexico's industrial sectors, followed by coal and petroleum coke, which took 14.6% and 14.1%, respectively.

Industrial demand is heavily concentrated in the country's northeastern and central regions, which house just over 50% and 40% of total industrial demand, respectively.

A closer look at Mexico's industrial demand trends shows roughly 20% of the total is in the state of Nuevo Leon, located in the Northeast). However, industrial demand growth has been rising faster in Coahuila, also in the Northeast and Sonora, in the Northwest. As gas transport infrastructure expands over the coming five years and the price of gas falls in Mexico, further industrial demand growth is expected in these secondary markets.

Dry gas production slides

On the supply side, Mexican dry gas production has been on a long march downward since early-2010, when production peaked at just above 5.1 Bcf/d. Year to date, production has fallen to 3.2 Bcf/d, down 1.9 Bcf/d, 37%, from 2010, a decline of around 5.3% per year. In 2016, dry gas declines picked up speed in response to falling drilling rates, with production declining by 600 MMcf/d, or 16%, year on year. Between 2010 and 2015, non-associated gas production, which primarily consists of the Burgos Basin and fields spread across Tamaulipas and Veracruz states, led most of the Mexican production declines, falling by 880 MMcf/d (40%) over that timeframe.

However, as oil prices began to fall in late 2014 and drilling rates in Mexico began a second period of declines, production declines from associated gas accelerated as well. Between 2015 and 2016, associated gas production fell by 220 MMcf/d, or 8%, year on year, while non-associated gas declines picked up to 280 MMcf/d, or 21%.

While total drilling in Mexico appeared to bottom out this past winter, reaching a low of 17 rigs in February, the recovery in drilling has been slow and has lagged far behind the US upstream. As of April, there were 26 rigs operational in Mexico, up 7.6 rigs, 26%, from lows, while US drilling rates rose back over 900 rigs, more than double lows seen last spring.

Exploratory rigs now make up over 60% of the drilling fleet (up from around 30% a year ago and a mere 18% in 2015), driven by new private participation in Mexico's...
upstream sector, spurred by nearly two years of onshore and offshore auctions beginning to bear fruit. As of May, there were only 11 developmental rigs in operation and eight of those were split between the Northeastern and Southwestern Marine regions. Very few rigs are operational onshore and, with pervasive low gas prices, there's only been one gas well completed year to date, down from 12 last year and 132 in 2010.

This high rate of exploratory drilling is to be expected as new producers become acquainted with recently secured producing acreage. However, these exploration efforts are unlikely to provide much support to total oil and gas production in the near term, suggesting that further natural gas production declines may lie ahead.

Platts Analytics’ Bentek Energy expects total Mexican gas production will continue to decline through the remainder of this year, falling to a low of 2.9 Bcf/d at the end of the year, another 300 MMcf/d below Pemex’s reported production. In the longer term, gas production declines are expected to moderate as new producers begin to bring additional associated gas production online, and by the end of the decade Mexican production could again enter a growth trajectory.

Imports from US fill the gap
As Mexican gas production has declined over the last seven years, US exports have filled in and now make up nearly 60% of total Mexican gas supply, compared to just 22% in 2010. Year to date, pipeline imports from the US have averaged 3.9 Bcf/d, up 500 MMcf/d, or 15%, compared with last year.

MEXICO LNG IMPORTS

US gas exports to Mexico as a percentage of total US demand have increased steadily over the last five years. US exports to Mexico averaged 830 MMcf/d in 2010, representing just 1% of total US demand at the time. By 2016, however, total US exports to Mexico increased to more than 3.7 Bcf/d, representing about 5% of total US demand, and by 2022, US exports to Mexico are expected to reach above 6 Bcf/d, or roughly equal to 7% of total annual US demand.

However, in 2017 to date, constraints on the Mexican side of the border have limited Mexico’s ability to increase US pipeline imports. Since August of last year, US pipeline imports have been capped at around 4.1-4.2 Bcf/d, which has driven an increase in imported LNG and demand for fuel oil for power generation. The limitation on gas pipeline imports has been due largely to pre-existing constraints within the Mexican pipeline system, as well as to unexpected delays on pipeline expansions within Mexico. The pipeline construction delays have affected more than 3 Bcf/d of new proposed pipeline capacity out of West Texas.

The year-on-year increase in LNG imports has been supported a corollary buildout of US LNG export capacity. Mexican LNG imports have risen to over 600 MMcf/d year to date, up 14% from last year. Most of that year-on-year increase was driven by exceptionally high imports in June, with continued high utilizations expected at the Altamira and Manzanillo LNG import terminals through the remainder of the summer driven primarily by CFE tenders for additional supply for power generation.

Over the long term, however, Mexico is expected to largely eliminate its reliance on LNG imports, replacing LNG with US pipeline gas. The timing of this displacement will be dictated largely by the development of new pipeline infrastructure within Mexico, including expansions to the existing pipeline system that have yet to be tendered. While broader supply and demand trends have been well established, there are still a number of developments on the infrastructure side of things that have yet to take form that will materially influence the development of Mexican gas market over the next five years.
Mexican gas infrastructure development

Mexico has undergone massive expansion of its natural gas pipeline infrastructure over the last several years, which has vastly improved the prospects for gas in the country. As of July, pipeline border crossing capacity has increased to 10.8 Bcf/d, a build of over 6.4 Bcf/d, or about 145%, since 2010. Platts Analytics expects that total US-to-Mexico border crossing capacity will expand to over 14.2 Bcf/d by 2022.

Pipeline capacity within Mexico has expanded rapidly as well, with roughly 6.2 Bcf/d added since 2010 and another 7.7 Bcf/d planned over the next five years. The largest of these upcoming expansions will occur this year and in 2018, raising total capacity by 3.05 Bcf/d and 2.6 Bcf/d, respectively. Much of this new pipeline capacity has enabled additional flows from north to south and from east to west, allowing cheap Texas supply to reach new markets across Mexico.

Since its startup in December 2014, the 2.1 Bcf/d NET Mexico pipeline has become Mexico's most heavily utilized import corridor, accounting for 40% of the new border crossing capacity installed and roughly 96% of all import growth over that timeframe. The reason that NET Mexico has emerged as such an important import corridor is largely due to the interconnectivity of its downstream infrastructure, which has allowed for it to directly serve two of Mexico's largest demand regions. NET Mexico connects to the 2.1 Bcf/d Los Ramones pipeline in the Mexican side of the border, which then delivers gas to Mexico's Northeast Region and the Central Regions.

In the Northeast, the Los Ramones I pipeline provides direct access in the Monterrey area, Mexico's primary industrial hub. From there, the 1.4 Bcf/d Los Ramones II pipeline carries gas further south, eventually intersecting the existing Sistrangas system, where supplies can then reach markets in central and western Mexico. With the pipeline now running near capacity, NET Mexico/Los Ramones accounts for roughly half of all pipeline imports from the US and about a quarter of total Mexican gas supply.

However, that dominance is also a source of concern for Mexico's various gas buyers. In July, Mexico's Confederation of Industrial Chambers (CONCAMIN) requested the government open up additional capacity on the NET Mexico pipeline because of concerns that Pemex still has too much control over imports and could raise gas prices considerably without another source of competitive supply.

There is some validity to this concern, considering that NET Mexico pipeline, and in particular the roughly 1.9 Bcf/d capacity controlled by Pemex, is the single largest supply source for northeastern and central Mexico, accounting for over 70% of all South Texas imports. Therefore, without the protection of the VPM maximum firsthand sales price, Pemex could raise gas prices considerably, theoretically pushing prices near the fuel oil-switching price, or roughly $9 on an MMBtu equivalent basis.

Further development of the Mexican gas pipeline network is focused on bolstering north-to-south import capacity. The next major step in import growth is likely to come from the Trans-Pecos's pipeline, which will source gas at the Waha hub in the Permian Basin in West Texas and deliver it as far south as Durango sometime this year, reaching Guadalajara and Villa de Res by early 2018 with the startup of its associated downstream interconnections. However, the Trans-Pecos import corridor has already suffered significant delays within Mexico this year, which have kept flows on the pipeline shut to date. Specifically, both IEnova's Ojinaga-El Encino pipeline and Fermaca's El Encino-Laguna pipeline have faced construction delays, which effectively kept Trans-Pecos gas stuck at the border. While Ojinaga-El Encino reportedly entered service in July, the downstream El Encino-Laguna pipeline remains offline.

These recent delays highlight a trend that has emerged across Mexico over the last couple of years: namely all new Mexican gas pipelines have fallen behind schedule. Therefore, it is reasonable to expect delays on other projects. These could emerge on the remaining downstream components of the Trans-Pecos, north-to-south import corridor. The 600-km, 1.189 Bcf/d La Laguna-Aguascalientes pipeline and the adjoining 389-km, 889 MMcf/d adjoining Villa de Reyes Aguascalientes-Guadalajara pipeline, both being built by Fermaca, have planned in-service dates in January 2018.

Delays on these projects would limit imports along Trans-Pecos, which could otherwise directly serve demand in the growing Guadalajara market. Interestingly, however, the southern terminus of the Villa de Reyes-Aguascalientes-Guadalajara pipeline does not interconnect with the larger Sistrangas system, which will hinder its ability to deliver into the growing Guanajuato area in Central Mexico. While this limitation has been identified as an issue in CENAGAS' second revision to its five-year plan, no interconnection projects have been announced to date. This could indicate that Mexico's Central Region could remain supply constrained until the Sur de Texas-Tuxpan pipeline comes into service late next year.

According to CENAGAS, there are a number of upcoming pipeline projects that do not interconnect with the existing...
Sistrangas system, which could lead to transportation constraints in the future. In addition to the pipelines mentioned above, the Nueva Era pipeline, San Isidro-Samalayuca and Samalayuca-Sasabe also do not have direct interconnections with Sistrangas. Further development of these pipelines may be needed if market demand continues to outpace domestic supply growth. Likely candidates for new interconnections include the Nueva Era pipeline and Villa de Reyes-Guadalajara pipelines since each both offer alternate supply routes into growing demand areas.

The last major planned pipeline expansion in Mexico is the massive Nueces-Brownsville-Sur de Texas-Tuxpan project. The 2.6 Bcf/d pipeline corridor will be the largest constructed to date, sourcing gas from South Texas, moving offshore at Brownsville and traversing the Gulf Coast south, underwater, until it re-emerges onshore at Altamira and Tuxpan, where it will eventually deliver to the soon to be completed 889 MMcf/d Tuxpan-Tula pipeline, which will carry gas to its final destination just north of Mexico City. The project, being constructed by Spectra Energy Corp (Nueces-Brownsville), a joint-venture between TransCanada and IEnova, Sempra Energy's Mexican unit, (Sur de Texas-Tuxpan; 60% and 40%, respectively), and Bonatti (Tuxpan-Tula), has a target in-service date of October 2018.

Once completed, the Sur de Texas-Tuxpan pipeline will likely provide enough import capacity that Mexican gas demand can grow unconstrained through 2019. However, if gas production does not resume growing or remains flat, further supply constraints could be encountered in 2020 and beyond if further expansions are not made to the planned pipeline expansions.

This will potentially offer further opportunities for future infrastructure expansions. Most notable would further north-to-south pipeline expansions, such as increasing the size of the NET Mexico-Los Ramones Corridor to 3.1 Bcf/d or by increasing the capacity on the downstream 889 MMcf/d Tuxpan-Tula pipeline, which brings Sur de Texas-Tuxpan gas onshore into Central Mexico.

On the other hand, if Mexican gas production does recover over the 2020-2025 timeframe, expansions may be needed to transport increased associated volumes from the Gulf, which could require bolstering some of the

**MEXICAN NATURAL GAS PIPELINES**

Source: Platts
existing Sistrangas routes or adding ancillary pipelines. Both examples suggest that while the currently planned infrastructure will provide many opportunities for market growth over the next five years, now may be the time to begin considering further expansions.

**Premium markets emerging**
Over the next several years, as the Mexican gas markets continue to liberalize and current pipeline capacity further opens up to third party shippers, new premium markets are expected to emerge. The areas prone to premium pricing will be farthest from supply sources (imports or production) and will have limited transport optionality. Limitations in pipeline interconnectivity also will exacerbate regional price variations.

Breaking the Mexican gas market up into 10 Cell Regions™, Platts Analytics expects the strongest premiums will form in the Peninsula, Western, and Central gas regions, with large differentials expected between Baja California and Baja California Sur.

While gas prices historically have been managed through the VPM sales price, future premium price areas can be identified through the power markets. The published average day-ahead power prices by the Centro Nacional de Control de Energía (CENACE) can be a leading indicator of where constraints have already formed in the power markets, which could also lead to premium pricing for gas.

The Peninsula and Baja California Sur regions already have shown a tendency for higher power prices, primarily due higher average utilizations of fuel oil for generation. During the first half of 2017, day-ahead power prices in Baja California Sur averaged $93.50/MWh, more than double power price across much of the US, and rising by 23% compared with a year-ago. Power generation in Baja California Sur is primary from fuel oil, which represents 80% (470 MW) of installed capacity, with solar making up the majority of the remaining stack. A proposed transmission line across the Gulf of California is expected to provide Baja California Sur access to gas generation on the Mexican mainland.

Just north, in Baja California, it is a completely different story. Average day-ahead power prices there are consistently the lowest in the country, averaging $29.28/MWh during the first half of this year, less than half the country average and about $1/MWh lower than weighted average wholesale power price in Southern California’s SP-15 hub, year to date. Unlike Baja California Sur, Baja California produces the vast majority of its power with gas, which represents over 75% (3 GW) of its total installed generating capacity. Much of Baja California’s gas is sourced from the Permian Basin along El Paso’s South Mainline, with marginal volumes sending out from the Costa Azul LNG terminal. This outlier state suggests that with ample pipeline capacity and gas-fired generating capacity, it may be possible for many regions to drastically lower their power production costs.

In the Yucatan Peninsula, average day-ahead power prices rose to $86.15/MMBtu over the first half of the year, a 77% jump from the same period last year when the region’s power prices only averaged marginally higher than the Eastern Region. Power generation in the Peninsula region is highly weighted toward gas, which represents more than 75% of the 3.5 GW of generating capacity in the region, with the remainder made up by fuel oil. However, the bulk of this generating capacity, roughly 1.8 GW of gas-fired capacity and 548 MW of fuel oil capacity, is in Yucatan state, which is at the end of the 300 MMcf/d Mayakan gas pipeline.

In 2016, Platts Analytics modeled flows indicate that the Peninsula region may already have been maxing out flows on that corridor. While no official regional breakout of generation sources is available, what has likely occurred there year to date is exceptionally high fuel oil use supported by high power imports, which has driven up the average day-ahead power price to near that in Baja Sur, a region that is almost entirely dependent on fuel oil. This substantial, year-on-year build in day-ahead power prices points to the potential for significant gas price strengthening as well, particularly as Pemex (or any third party supplier) moves away from the VPM sales price.
Looking at the remaining Mexican power regions, day-ahead power prices have risen across the board. However, while Platts Analytics expects further price divergence could be possible in the Central Region, further buildout of the gas pipeline grid is likely to mitigate any structural constraints – at least for the foreseeable future.

The Central region is the fastest growing demand region in Mexico, rising to over 1.6 Bcf/d in 2016, a 5% build compared with 2015. Without any production of its own, Central Mexico is entirely reliant on inflows to meet all of its gas demand. Historically, gas has flowed into the Central region from the South, where a majority of the associated gas production is processed, and from the West, where it is delivered as LNG to the Manzanillo terminal. Additionally, as of last year, the Los Ramones II South pipeline had added a third inflow corridor to the Central Region from the Northeast. However, flows along this pipeline have been limited to date.

As gas production has continued to decline in Southern Mexico, the Central region has become increasingly reliant on inflows from the North along Los Ramones.

Once fully online, Los Ramones should allow up to 1.35 Bcf/d to deliver directly from South Texas into Central Mexico. Further expansions, such as the La Laguna-Aguascalientes-Villa de Reyes and the Sur de Texas-Tuxpan pipelines, should add another 900 MMcf/d, though some of that gas will be diverted toward Guadalajara. By the end of 2018, the planned Sur de Texas-Tuxpan will deliver to the Tuxpan-Tula pipeline, adding another 900 MMcf/d capacity into the region.

All told, Platts Analytics expects that inflow capacity into the Central Region could rise by around 2.5 Bcf/d, more than double current inflow requirements. While in the near term, the Central Region may experience some tightness due to falling inflows from the South, the startup of new inflow corridors should eventually all but alleviate any constraints into the region. And even if gas demand growth in the Central Region were to double, the Central Region would have enough inflow capacity to continue growing through 2025. Though being the farthest away from the supply sources, the Central Region is likely to experience premium prices relative to the surrounding regions.

**SAMPLE US TO MEXICO NATURAL GAS PIPELINE FULLY LOADED TRANSPORTATION TARIFFS**

Hubs and flows are sized by price.

Fully load transportation costs are simple averages of sample pipelines with publicly available reservation and usage costs.

Source: Platts
Prices in parts of Northwestern Mexico also may be at premium levels because of the cost of transportation on new greenfield pipelines, some of which may have to rely on other interconnected systems to bring gas to end users, further stacking transportation rates on downstream customers. Consequently, price spreads from US supply hubs to these areas served by new pipelines may reflect the high reservation costs of new pipelines. The new Northwestern pipelines will reach as far south as Mazatlan, with fully loaded transportation costs (both reservation charges and usage charges) of about $1.85/MMBtu.

Other areas such as the state of Baja California and southern Mexico have had established pipeline systems for some time – most notably Sistrangas – and have lower fully-loaded transportation rates of 34 cents-38 cents/MMBtu. Domestic production can be transported from the Gulf to Mexico City for around 38 cents/MMBtu. In comparison, gas supply from South Texas to Central Mexico could have an average fully loaded cost of $1.11/MMBtu across various systems, with a high side of $1.28/MMBtu.

**Power**

While 2016 marked the beginning of national power reforms, Mexico’s power market has continued a rapid evolution to a competitive marketplace this year, following the passage of the Energy Transition Law at the end of 2015. Over the past 18 months, SENER has taken several important steps in the transition to a competitive wholesale power market administered by the National Center for Energy Control, or CENACE.

In addition to implementation of day-ahead wholesale and ancillary services markets at the beginning of 2016, the breakup of the state-owned power utility, the Federal Electricity Commission (CFE), in mid-2016 was another major step toward creating a competitive marketplace. CFE was split into six independent generation companies along with individual transmission, distribution, basic supply and qualified supply companies and two marketing companies in June 2016. Each company was assigned designated personnel that October. The generation companies took operational control of assigned assets at the beginning of 2017.

CENACE also conducted two long-term auctions for renewable energy and capacity in 2016, while continuing to develop more components of the market in 2017, including the real-time wholesale market and the capacity balancing market.

A few elements of the market have yet to be implemented, but the regulatory manuals for the most critical pieces – mid-term capacity auctions and financial transmission right (DFT) auctions – have been published and those markets are scheduled to open by the end of the year.

<table>
<thead>
<tr>
<th>COMPONENTS OF THE MEXICAN WHOLESALE POWER MARKET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Component</td>
</tr>
<tr>
<td>------------------------------------</td>
</tr>
<tr>
<td>Short-term energy and ancillary services market</td>
</tr>
<tr>
<td>Capacity balancing market</td>
</tr>
<tr>
<td>FTR auctions</td>
</tr>
<tr>
<td>Clean energy certificate market</td>
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<tr>
<td>Long-term auctions</td>
</tr>
<tr>
<td>Energy capacity</td>
</tr>
<tr>
<td>Clean energy certificates</td>
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<tr>
<td>Medium-term auctions</td>
</tr>
<tr>
<td>Energy capacity</td>
</tr>
<tr>
<td>Bilateral transactions</td>
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</table>

The final piece will be the Clean Energy Certificate (CEL) market, which will provide an additional revenue stream for new renewable projects when it begins operation in 2018.

**POWER GENERATION CAPACITY DEVELOPMENT ACCELERATES**

Approximately 5.1 GW of new power generation capacity has come online in Mexico since January 2016, with gas-fired generators claiming 3.4 GW, or 68%, of the additions. Renewables including wind, solar and biomass make up the bulk of the balance, combining for 1.4 GW. As of June, Mexico had a total of 77.7 GW of power generation, including 38.7 GW of gas generation, 11.7 GW of oil generation, 4.8 GW of coal, 12.6 GW of hydropower, 1.6 GW of nuclear power, 3.7 GW of wind, 0.6 GW of solar and 4GW of other types of generation.

While gas-fired generation capacity continues to dominate currently installed capacity and near-term capacity additions, renewable capacities are experiencing more rapid growth. Capacity additions from 2016 to present represent growth rates of 29%, 103%, and 56% for wind, solar, and biomass, respectively. Considering power plants currently under construction to come online in the second half of 2017 and plants either under construction or in advanced development with online dates in 2018, solar capacity is set to jump by 337% from Q2 2017 to the end of 2018 thanks to another 1.9 GW of capacity. Installed wind capacity is adding another 3.7 GW, or 20%, and biomass will add 600 MW, or 14%.

**LONG-TERM GENERATION CAPACITY AUCTIONS**

This rapid growth in renewables has been supported by the long-term auctions CENACE held last year, which were designed to help CFE’s Sumistrador de Servicios Basicos, or Basic Retail Services subsidiary, secure renewable energy
supplies to meet new government mandates requiring it to source 35% of its power from renewable generators by 2024.

The first auction was held in March 2016 securing offers for 5.4 million MWh of energy and 5.4 million Clean Energy Certificates, or CELs, from 10 companies for a combined average price of $45/MWh+CEL.

The second long-term auction held in September 2016 was more competitive than the first, and 12 generation companies sold 1,187 MW of firm capacity at an average price of $88.38/MW per day, while 20 companies also sold 8.9 million MWh of energy and 21 sold 9.2 million CELs, at a weighted average price of $33.47/MWh+CEL, according to data published by SENER.

Mexican energy minister Pedro Joaquín Coldwell said that when combined, the first two long-term auctions resulted in 34 companies pledging to invest $6.6 billion in more than 5 GW of new clean energy projects over the next three years. In total, the new wind and solar projects financed through these auctions represent 171% more capacity than what was installed over the previous 18 years in Mexico.

In advance of the third long-term auction scheduled for November, CENACE also established a credit clearing house for counterparty credit. The clearing house will administer all contracts awarded by CENACE and was required to be in place before load-serving entities that are not utility suppliers can participate as buyers in mid-term and the long term auctions. In the two previous long-term auctions, CFE was the sole buyer.

CENACE has published the bidding rules for its third long-term auction, and purchase offers were published in late July. Participants will have until November 13 to submit sale offers, and the auction will be run November 15, with results announced by November 22.
POWER PRICES ON THE RISE IN 2017

Mexico wholesale power prices sustained healthy margins over US power prices in 2016, but prices have climbed even higher in 2017 as the gas market has tightened on pipeline project delays, which have pushed more expensive fuels into generation to meet growing demand.

Mainland day-ahead prices averaged $46.19/MWh for all of 2016 across all seven control regions on the Interconnected System, while on-peak day-ahead prices at 19 major power hubs throughout the US averaged $29.03/MWh last year. Comparing prices for the first half of the year, US day-ahead prices across all 19 power hubs has climbed $5.50/MWh, or 21%, from 2016 to average $30.47/MWh. Mainland Mexico prices on the other hand have jumped $24.48/MWh, or 56%, on average across all control regions to average $67.62/MWh so far this year. The Peninsular control region has registered the largest year-over-year increase, climbing 77% from 2016.

Platts Analytics estimates that gas demand from power generation in Mexico has fallen 1.5% year over year through June, while average peak loads across the seven mainland control regions have increased 2%-9% year over year.

While the year-over-year power burn decline is small on paper, burn levels have been supported by higher LNG imports which have climbed 14% year over year. Additionally, SENER posted data for the first two months of this year also shows that CFE increased its consumption of fuel oil and diesel by 58% and 191% year over year, respectively, while gas consumption fell 18%.

Reliance on more expensive fuels to meet rising demand will likely continue to put upward pressure on wholesale power prices in Mexico throughout the rest of 2017 and into 2018.

REAL-TIME MARKET DEVELOPS SLOWLY

CENACE also has been publishing real-time wholesale power price since late January. However, the real-time market model is currently being solved ex-post on a seven-day lag and there have been large discrepancies between real-time and day-ahead prices, indicating that further adjustments to the real-time market model will be forthcoming.

During a conference earlier this spring, Jeff Pavlovic, managing director of electric industry coordination at SENER, noted that the day-ahead and real-time models are not converging as expected. While the day-ahead/real-time spread in the Baja California control region has averaged approximately 2% year to date with real-time prices trending 57 cents/MWh lower than day-ahead, other control regions are seeing significant deviations, exceeding $15/MWh in some areas.

On the mainland, year-to-date real-time prices in the Peninsula and Western control regions have averaged $6-$7/MWh higher than day-ahead prices, while the remaining regions have seen real-time prices average over $14/MWh higher than day-ahead. The Northeast control region has registered the largest deviation of $16.81/MWh so far in 2017. These current deviations indicate that further refinement to one or both models may be coming in the future.

MID-TERM AND FTR AUCTIONS SET FOR Q4 2017

Two important market manuals were published CENACE at the tail end of 2016, paving the way for mid-term energy and capacity auctions as well as financial transmission rights auctions – Derechos Financieros de Transmisión (DFT) in Spanish – to be held in the fourth quarter of this year.

The mid-term auctions are designed to allow generators, load serving entities and traders to obtain an energy hedge through a competitive bidding process for distinct
energy and capacity contracts prior to entering the short-term wholesale markets. Contracts will be available for three-year terms and the contracts will be set by auctions four months prior to execution. Participation will be open to basic service suppliers, qualified suppliers, suppliers of last resort and qualified users.

Energy contracts will be defined as a percentage of the total load of retailers in the load block, in a specific load zone, every hour. Three load block designations exist for baseload, intermediate, and peak:

- Baseload: 10th percentile of load hours and below
- Intermediate: up to 90th percentile of load hours
- Peak: 90th percentile of load hours and above

The load zones were developed by CENACE and are defined as load-weighted averages of selected distribution nodes. The definition of these zones is expected to change one time per year to reflect changing system characteristics prior to each mid-term auction.

The first mid-term auction is scheduled to be administered by CENACE in October.

CENACE also has scheduled Phase 1 of the DFT market to open in November with an annual auction for calendar-year 2018. According to the market manual, legacy DFTs will be awarded for transmission contracts owned by the Comisión Federal de Electricidad (CFE) and non-CFE suppliers for existing generation as of 2014. Any remaining transmission capacity across feasible pathways will be available in the DFT auctions. In general, the DFT market in Mexico will have many of the same features of, and operate similarly to, FTR markets in the US with one important distinction. Instead of relying on peak and off-peak designations, DFT contracts will be defined by time blocks and seasons as described in the table below:

<table>
<thead>
<tr>
<th>TABLE 2 DFT TIME BLOCKS AND SEASONS</th>
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</thead>
<tbody>
<tr>
<td>Block 1</td>
</tr>
<tr>
<td>Block 2</td>
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<td>Block 3</td>
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<td>Block 4</td>
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<tr>
<td>Block 5</td>
</tr>
<tr>
<td>Block 6</td>
</tr>
</tbody>
</table>

Note: There is no weekday/weekend differentiation in time blocks

Source: CENACE

CENACE broke the contracts into time blocks and seasons to help facilitate further renewable
development by allowing renewable resources to hedge congestion with contracts more narrowly tailored to match their generation profiles. Future phases will introduce options for other term contracts including balance of year, monthly and seasonal, and long-term (three years).

**POWER MARKET DEVELOPMENT AND CHALLENGES**

CENACE has made relatively quick work implementing market structures that took decades to develop in the US, but there is still a significant amount of progress to be made before the power market is as robust as organized markets in the US.

In addition to issues already discussed including real-time and day-ahead market reconciliation and market reaction to upcoming mid-term and FTR auctions, a critical development will be increasing market participation.

There are now 25 registered entities that are active participants in the wholesale power market in Mexico and there an additional 25 entities that have begun, but have not yet completed, the registration process.

Of the current participants, 20 are generators including seven CFE subsidiaries and five Mitsui & Co. subsidiaries. Four additional participants are registered as qualified suppliers including CFE, Sumex, Iberdrola, and American Light and Power, while CFE is currently registered as the sole basic service provider.

While CFE and its subsidiaries dominate the current participants, the remaining 25 potential participants that have not completed registration represent wholly new market entrants, 21 of which began the registration process in the first half of 2017. Interest in the market is growing, but the total number of players will need to keep growing to build a liquid market.

To that end, CENACE is facing a bit of a chicken-or-the-egg problem. Some companies interested in potentially joining the market are looking for more price discovery, including the development of trading hubs and forward curves to guide their decision making. But CENACE has said it wants to leave hub development in the hands of the market. As the final components of the Mexico power market start in the next six months, market participation and confidence will likely grow, as those now on the sidelines will have more information related to opportunities available in the country.
## MEXICO'S UPSTREAM OIL AND GAS AUCTION RESULTS

<table>
<thead>
<tr>
<th>Round</th>
<th>Blocks</th>
<th>Region</th>
<th>Expected hydrocarbon</th>
<th>Prospective medium resource (MMBoe)</th>
<th>Winners</th>
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Mr. Wyeno is a Senior Energy Analyst at Platts Analytics. During his six years with Platts, he has covered US Southeast Gulf and Texas gas markets, Latin America, and global LNG. Mr. Wyeno focuses on Southeast/Texas fundamentals, LNG exports, and Mexico. Mr. Wyeno leads the Mexico and Latin America gas and power analytics, leads US LNG export analysis, and contributes to Gas Daily, LNG Daily publications, and LNG Navigator. Prior to working at Bentek, Mr. Wyeno held positions as a Financial Analyst as well as an Equities Trader. Mr. Wyeno earned a B.S. in Finance and International Business from the University of Colorado and a M.S. in Political Economics from the Colorado School of Mines.

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James O’Connell joined Platts in 2001 and is the Editorial Director of the Americas Energy News team, based in Denver. He heads up a team of 30 journalists based in New York, Washington DC, Houston and Denver writing for flagship publications like Oilgram News, Gas Daily as well as the Platts Alerts service. Having started his Platts career as a reporter on the Metals desk covering precious and base metals, James managed the Global Coal team from 2007-2015.

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Further reading

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