Mexico's Energy Reforms: Status of the Hydrocarbons Sector & Development/Export Prospects

- Mexico will need to open and reform its oil & gas markets to grow production; will the ambitious reforms announced support this trend?

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Summary

This report examines the significant reforms underway in Mexico's energy sector and their potential impact on the country as well as global markets. Declining reserves/production, rising investment costs and limitations of the current industry structure to address these challenges have underpinned reform efforts initiated by the constitutional changes of December, 2013. If successful, Mexico's reforms could draw the international funding and expertise needed to exploit the technically challenging prospective resources in its deep water, shale oil/gas and Chicontepec fields. Finally, as global markets adjust to the US shale revolution and increased competition in the US Gulf Coast, Mexican crudes may seek and find new markets in Asia.

Introduction

Mexico is a major hydrocarbons producer, as the 9th largest crude producer in the world its energy sector is a staple of the country's economy, and its exports, primarily of heavy oil, provide a key base supply for refineries in the US and abroad.[i] But challenges have emerged over the last decade, with production declining, particularly in traditional offshore fields and natural gas production not able to keep pace with rapid domestic demand growth, in part due to fuel switching in electricity generation. These factors are driving the country to develop complex and challenging new fields including deepwater offshore, as well as shale oil and gas. At the same time, the country's state monopoly in the energy sector has faced difficulties in keeping pace with the significant changes underway, emphasizing the importance of vigorous reforms to prospects for boosting output. For these reasons energy reforms were initiated through constitutional changes passed in December 2013 by Mexican President, Enrique Peña Nieto and partners. If these reforms are successful it would see Mexico's energy sector open opportunities for foreign investment, operatorship and partnering in developing the country's hydrocarbons. As a result, "big and small oil and gas companies alike are waiting to see exactly what the government is going to do to create a level and fair playing field in the [energy] sector in Mexico, and to allow them to maximize the profits from their participation."[ii]

This paper will examine the key elements shaping Mexico's energy sector today and will aim to shed light on what resource-, industry-, and governance-level factors are driving the unprecedented level of energy reforms. With shrinking reserves/production and rising development costs, the energy sector's current trajectory will not be sustainable over the long-term, particularly since production in the shallow offshore fields that have served as the backbone of Mexican production have greatly declined, and future sources of production will likely prove to be more technically and financially challenging to exploit. Furthermore, the current structure of Mexico's energy sector will be examined to highlight why opening the sector to foreign funding and expertise will be vitally important to reversing production trends. With this in mind, Mexico's package of energy reforms will be detailed and analyzed to understand how the country's regulatory frameworks as well as the operations and strategy of state firm, Petróleos Mexicanos (Pemex) are shifting and adjusting to deal with the new resource reality. Finally, an overview of the steps ahead, potential interest from international players and the impact of reforms on Asian energy markets will be provided.

About Mexico's Oil & Gas Sector

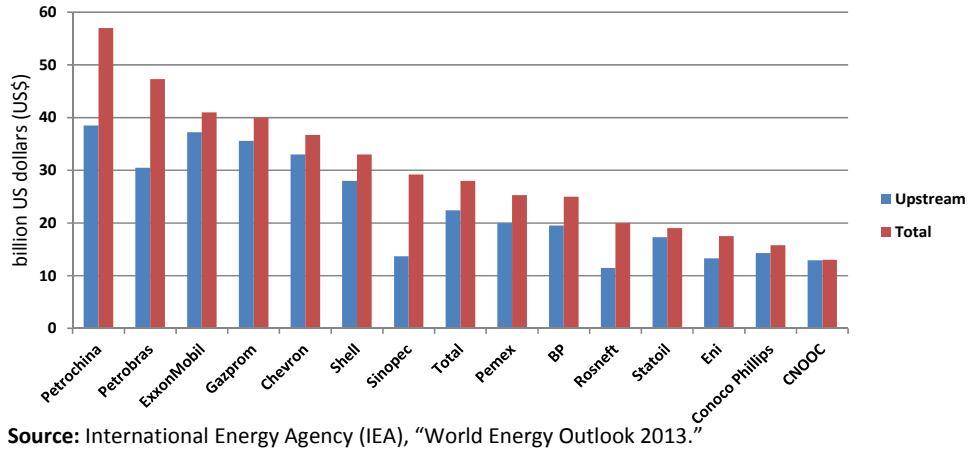
Before exploring key trends in Mexico's energy sector, it is important to have a baseline understanding of the country's energy supply and demand dynamics as well how the energy sector is organized. As of 2013, Mexico has 10.3 billion barrels (bbls) of proven crude reserves and 17.2 trillion cubic feet (Tcf) of proven gas reserves.[iii] The country is a net-exporter of crude and in 2012, produced 2.55 million barrels per day (bbl/d), of which it exported 1.26m bbl/d.[iv] Mexico also imports significant quantities of gasoline, diesel and liquefied petroleum gas (LPG) among its imports of other refined products.[v] It is a net-importer of natural gas; in 2012 it produced 1.68 Tcf, and imported 779 Bcf primarily via pipeline from the United States but also through liquefied natural gas (LNG) from abroad.[1vi]

Mexico's energy sector has historically been closely tied to the country's politics and governance, embodied in President Lázaro Cárdenas' 1938 expropriation of foreign energy company assets, the constitutional and legislative invocation of state ownership and control over resources and creation of state energy companies, Pemex and Comisión Federal de Electricidad (CFE).[vii] But it is Pemex, which, as the seventh largest crude producer, and eleventh largest integrated oil and gas company in the world that holds a commanding presence in the hydrocarbons sector.[viii] Pemex is currently the country's sole producer of oil, gas and refined products, and owns most of the country's natural gas transmission

[1] According to the International Gas Union (IGU), in 2013, Mexico imported LNG from Indonesia, Nigeria, Norway, Peru, Qatar, Trinidad & Tobago, and Yemen.

infrastructure.[ix] Pemex plays a significant role in Mexico's economy and governance, employing as many as 160,000 staff (making it Mexico's single largest employer) and contributing around one third of all government income from its revenue stream.[x]

Figure 1: Oil & Gas Industry Investment (2013)



Source: International Energy Agency (IEA), "World Energy Outlook 2013."

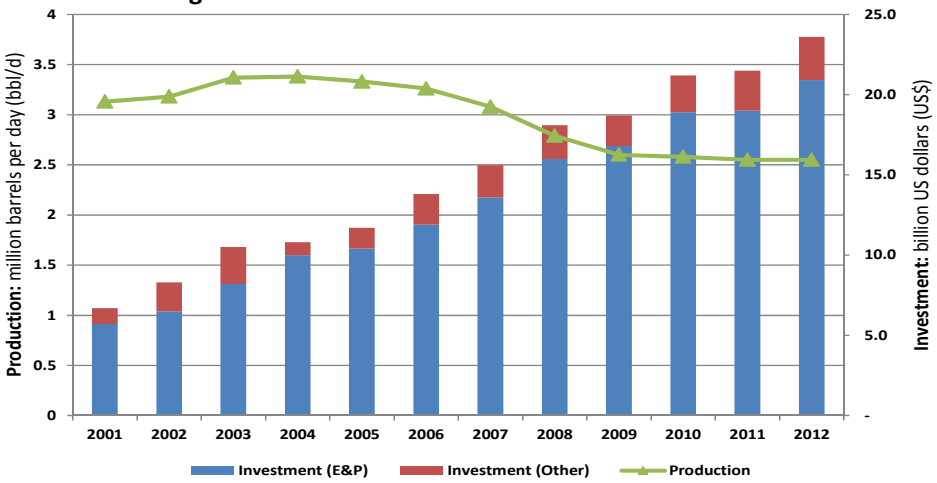
Overall Challenge: Rising Investment & Decreasing Output

The overall challenge facing Mexico's energy sector is best explained through the relationship between the results of upstream activity and overall investment. While Mexico has significant hydrocarbon potential with approximately 43.8 billion barrels of oil equivalent (Bboe) in proved plus potential and possible (3P) resources, the proved reserves (1P) portion of this has dropped from a high of more than 23.5 Bboe to only 13.8 Bboe in 2012.[2] [xi] Furthermore, it was announced in May 2014 that Pemex's overall reserves replacement ratio has fallen from 104.3 to 67.8 percent, meaning annual production outpaced reserves replenishment by about one third, registering an overall decline in reserves for the year.[xii] Mexico's crude and liquids production has also declined from a 2004 high of 3.83 million bbl/d to 2.88 million bbl/d in 2013.[xiii] At the same time as reserves and production have moderated or declined, Pemex investment in its upstream subsidiary, Pemex Exploration and Production (PEP) has grown by almost four times, from US$5.7 billion in 2001 to US$20.9 billion in 2012.[xiv] This highlights the key challenge facing the Mexican energy sector: Over time industry has needed to spend more to discover and develop the same amount or fewer hydrocarbon resources—a process that is

[2] Pemex reported resources/reserve estimates vary from those reported by Oil and Gas Journal and BP.
Pemex employs a generally accepted system of hydrocarbons reserves classification based on the probability of hydrocarbons being present in an estimated volume in a reservoir. **Proved reserves (1P)** are estimated volumes with reasonable certainty that they can be economically produced from known reservoirs under current conditions. **Probable reserves** are additional reserves with 50 percent probability or more that the amount recovered will be equal to or greater than the amount of **Proved plus Probable reserves (2P)**. **Possible reserves** refer to those less likely to be recovered, and have 10 percent or more probability that the amount to be recovered will be equal to or greater than the sum of **Proved plus Probable and Possible reserves (3P)**. For further reading, please refer to: Link

unsustainable over the medium- to long-term.[3] Recent comments by Pemex CEO Emilio Lozoya Austín suggest the company will invest close to US$28 billion in 2014, with approximately 85 percent (or US$23.4 billion), earmarked for PEP's upstream activities, but with an acknowledgement the company would require more than US$ 60 billion to reach its maximum resource development goals in the future.[xv]

Figure 2: Pemex Investment & Crude Production



Source: Pemex, "Statistical Yearbook 2012," "Pemex Factsheet, April 2013," Investment figures author's calculation, foreign exchange rates from "International Financial Statistics Yearbook"

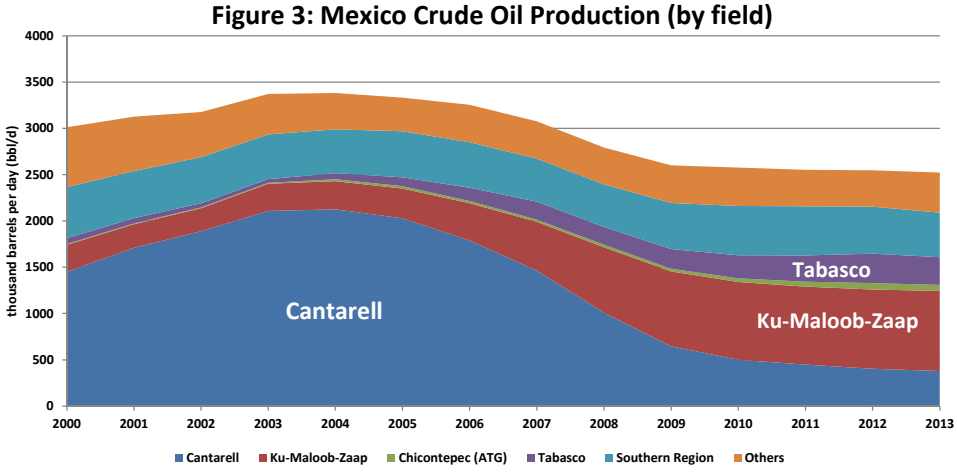
Resource Challenges: Crude Oil—End of an Era & Challenging New Frontiers

The source of Mexico's increased E&P costs is closely tied to the development profile of the country's hydrocarbon fields nationwide, as traditional reserves are depleted and new resources arise. Mexican crude production has been in decline over the last decade. The country's main source of production has been large fields offshore in the Bay of Campeche, which in the past accounted for approximately three quarters of total Mexican production.[xvi] The super-giant shallow water Cantarell field, discovered in 1976 in the Gulf of Mexico is the country's largest historical source of production. At its height in 2004, Cantarell accounted for 62.8 percent (or 2.13 million bbl/d) of the country's total production before declining to its current level of 15.1 percent (or 380 thousand bbl/d).[xvii] Production declines are mostly due to the fact that Cantarell is a mature field nearing the end of its lifecycle. Mexico will need replacement fields to maintain and grow its crude supply, and the corresponding resource revenue stream for the country. Mexican production has stabilized recently, in large part due to increases in output at the country's Ku-Maloob-Zaap (KMZ)

[3] For further reading and similar/related analysis, see: Assad Atala, Rashide, "Energy Reform in Mexico: Implications for the United States," Wilson Center: Mexico Institute, 2013, Link & Melgar Palacios, María de Lourdes (SENER), "Mexico's Energy Reform," University of Texas Austin, Latin America & Caribbean Program – Energy, Environment & Sustainability, February 2014, Link

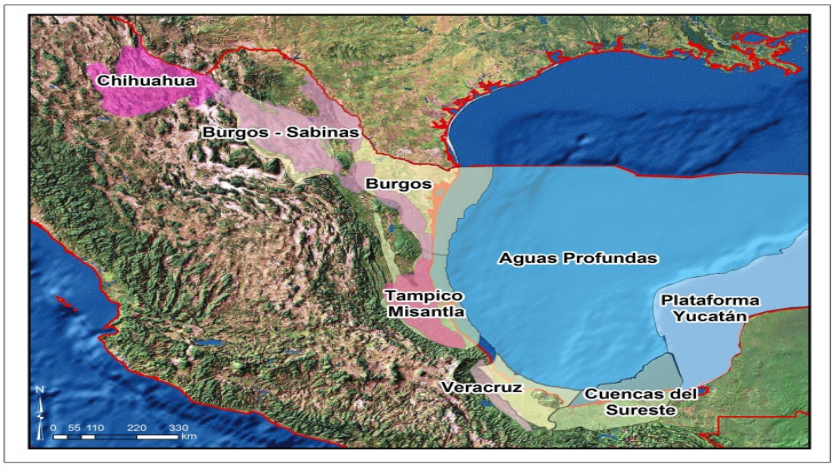
and Tabasco offshore fields, which supplied up to 1.16 million bbl/d of production in 2013; however, these are only expected to maintain current levels over the short- to medium-term, as approximately eighty percent of the country's oil fields are estimated to be in advanced or declining stages of production and ninety percent of oil production comes from fields discovered more than 20 years ago.[xviii]

Figure 3: Mexico Crude Oil Production (by field)



Source: Comisión Nacional de Hidrocarburos (CNH), "Reporte de Indicadores de Explotación – Al 06 de Abril de 2014."

Figure 4: Major Mexican Hydrocarbon Basins



Source: SENER, "Reservas y Recursos de México," 2014, 'aguas profundas' refers to deep water fields.

New exploration and production (E&P) activity will be vital to reversing overall declines in reserves and production, but the fields that will replace much of Cantarell and KMZ carry with them unique circumstances that lend further insight into the importance of the country's energy reform efforts.

The main new fields on the development horizon include:

Deep Water: While much of Mexico's historical production has come from the country's offshore basins, E&P activity has been concentrated primarily in shallow waters close to the coast. In the same time that the US has been very active in deep water exploitation on its side of the border, where deep water production surpassed that of shallow water in 1999, Mexico has yet to significantly develop its deep water fields.[xix] Recent figures provided by Mexico's energy ministry (SENER) suggest the country may have as much as 26.6 Bboe of prospective deep water resources available for future exploitation.[xx] As of January 2013, though, Pemex reports only 1.7 Bboe of 3P deep water reserves and no discernible cumulative production, figures that suggest that it is still very early days for the country's deep water ambitions.[xxi] According to Pemex, between 2006 and 2012, the company drilled 25 deep water exploratory wells, of which 14 have showed signs of hydrocarbons.[xxii] The company's most significant finds have been in the country's Perdido Fold Belt straddling its maritime border with the United States, where in 2012, the two countries established a Transboundary Hydrocarbon Agreement (THA) to address development of offshore resources in the vicinity that will end a moratorium on exploration and production in an area where water depths can reach beyond 2,000 metres.[xxiii] The agreement will be a vital first step to unlocking the resource potential in these deep waters, which will be key to the sustainability of Mexican energy production, but the technical know-how and capital to undertake this exploration will be just as important. Companies with the expertise and experience in developing deep water resources could prove to be an important ingredient in efforts to encourage production.

Chicontepec Basin: The Chicontepec Basin refers to a collection of onshore fields north east of Mexico City in the regions of Puebla and Veracruz, which Pemex believes hold 17 Bboe of total reserves (or 40 percent of Mexico's total resources).[4][xxiv] However, Mexico has faced difficulties producing in Chicontepec, which only reached a production level of 66.2 thousand bbl/d in 2013 as the basin is comprised mainly of extra-heavy oil and tight oil, which Pemex has had challenges effectively exploiting.[xxv] In July 2013, Pemex concluded its third licensing round offer under a performance-based contract model authorized under energy reforms enacted in 2008; but, of six blocks totaling about 3.2 Bboe in 3P reserves, only three areas were awarded.[xxvi] According to the EIA, Chicontepec's resource pools are geographically dispersed across hundreds of square miles, and many fields are highly fractured and have low pressure, increasing the cost of development wells, decreasing resource recovery levels and increasing decline rates.[xxvii] These fields could benefit from the application of outside technology and expertise to more effectively unlock

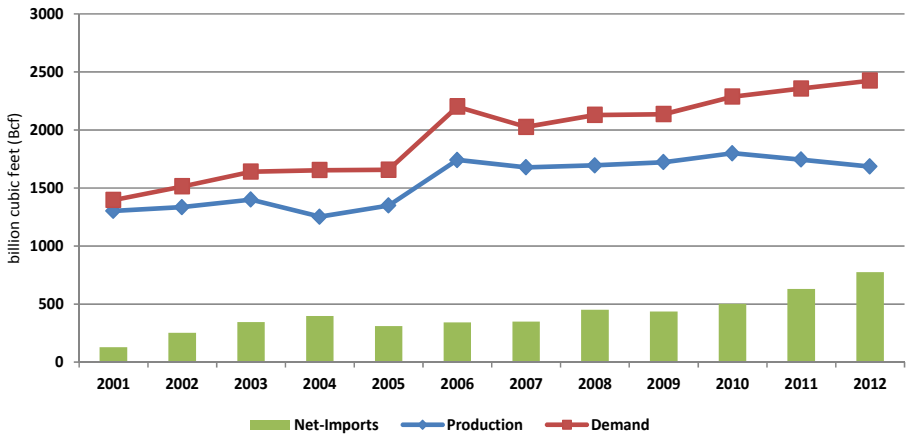
[4] The Chicontepec Basin is also referred to as Aceite Terciario del Golfo (ATG)

their full potential, and attraction of foreign investment will play an important part in their future success.

Shale/Tight Oil: Mexico is also believed to hold significant potential for shale oil development, with the EIA ranking its technically recoverable resources (TRR) as the 8th largest in the world at 13 billion bbls.[xxviii] The country's Eagle Ford Shale extension in the Burgos Basin, a field that abuts the one of the same name in the United States, is believed to hold the single largest share of this resource with 6.3 billion bbls of risked technically recoverable shale oil, while the Tampico, Tuxpan and Veracruz basins also hold a significant 6.8 billion bbls of aggregate resource potential.[xxix] According to the EIA, "Pemex has drilled at least 6 shale wells in Eagle Ford which have not yielded economic production volumes… [but has] plans to drill up to 75 shale [oil and gas] exploration wells in the Burgos Basin through 2015."[xxx] In order to successfully develop the full potential of its unconventional resources, "bringing in the experts and technology transfer are certainly key components, but Mexico must also establish adequate horizontal services, supply chain and downstream infrastructure to support an increase of 200 unconventional wells per year to meet Pemex production volume goals."[xxxi]

Resource Challenges: Natural Gas—Fast-Paced Demand & Setting Sail with Shale

Figure 5: Mexico Gas Supply, Demand & Net-Imports



Source: EIA, "International Energy Statistics," 2014.

While a significant producer of natural gas, Mexican production has plateaued and begun to decline since 2010, while demand has continued to increase briskly over the same period, largely in part due to fuel-switching in electricity generation from crude/fuel oil- to gas-fired generation. To meet growing demand, Mexico has increased imports of natural gas via pipeline from the United States (77.5 percent of its imports in 2011), as well as from LNG (22.5 percent of imports).[xxxii] Furthermore, the country's proven reserves of natural gas have declined over time, standing at 17.2 Tcf (61.6 Tcf of 3P reserves according to Pemex),

or about 10 years of production at 2012 levels.[xxxiii] But declining production and increasing imports come in spite of the fact Mexico is forecast to hold significant shale gas potential with the EIA suggesting the country could have as much as 545 Tcf of technically recoverable resources, the 6th largest pool of shale gas in the world and on the same scale as Canada and the United States, the world's two leading producers of shale gas.[xxxiv]

Mexico has begun to plan for strategic development of these shale resources, for example, "Pemex has started a US$ 200 million three-year program to explore potential shale gas in Mexico. Production of shale gas is expected to start in five to eight years, and [SENER] has estimated an additional annual need of US$10 billion in investment to reach a substantial production level during the next ten years."[xxxv] The significant investment required to realize large scale shale gas production in the country could be a barrier to resource development if appropriate channels to increase the funding base are not opened. The IEA points out that among other factors, lack of opportunity for foreign investment, a tendency for Pemex capital investments to flow to more lucrative export revenue-generating oil projects, and competitiveness of Mexican gas production against US gas could place constraints on development prospects.[xxxvi] The expertise to exploit this immense new resource exists right across the border in the producers who have driven Texas's Eagle Ford formation to lead shale production in the US, and in part, the US to top gas producer position globally.[xxxvii]

Above Ground Challenges – Structural Factors in Mexico's Energy Sector

The rising cost of production and need for new sources of expertise and technology to unlock future hydrocarbon sources mentioned above have been compounded by the challenges that the structure of Mexico's existing energy sector pose to achieving these goals.

First, due to the historical legal restrictions on foreign involvement in Mexico's energy sector, Pemex was the only company permitted to operate in the country. Samples and Vittor point out that "legal protections [have] constrain[ed] the operational abilities of Pemex. Pemex [has been] prohibited from entering into horizontal arrangements… [such as] joint ventures and partnerships with other companies."[xxxviii] While Mexico has taken gradual steps to promote reform it had never pursued comprehensive reforms, in part due to possibility of resistance from groups that see Mexican nationhood or sovereignty as closely entwined with its energy sector and are opposed to opening of the sector.[xxxix] The country's most recent reforms in 2008 did allow foreign companies to enter into service contracts with Pemex for resource development and opened areas of electricity generation and

refining for investment as well, but upstream companies were still not able to book reserves associated with the projects in which they participate. [xl]

Without the ability to offer competitive enough terms of participation for foreign companies, Mexico has not been able to attract enough interest in its energy sector to boost production. The financial, technical and human capital requirements to meet the needs of expanded and increasingly complex resource development have fallen primarily to Pemex, who may face budgetary constraints and does not have prior experience to develop challenging new fields in the short- to medium-term. One way to more evenly distribute risk and cost exposure proposed by reforms would be to allow new market entrants to undertake projects independently or to allow Pemex to partner with companies wishing to take equity or operator stakes in projects, allowing project costs and risks to be borne by a larger base and attract foreign expertise and capital to develop new resources.[xli]

Second, as María de Lourdes Melgar Palacios points out "the government currently relies on extracting revenue from petroleum production and sales rather than taxation to finance the public budget. As a result, Pemex's financial condition is determined not only by the market but by the policies of the Secretariat of Finance and Public Credit (SHCP)—where, even under the latest fiscal regime, 70 percent of Pemex net-income goes to paying taxes and duties."[xlii] This limits Pemex's ability to allocate more investment to steer production in new areas of resource growth. Speaking at a recent conference, a Pemex lawyer suggested that changes to the company's fiscal regime will be a prerequisite for successful energy reforms as private investment is introduced, and points out that change to the country's hydrocarbon revenue laws would allow for a lower Pemex tax burden freeing up capital for greater E&P investment.[xliii]

As such, while it is one of the largest producers in the world, Pemex is often constrained in which ventures and projects it can finance to maintain and grow production and may need greater flexibility in planning and prioritizing its upstream operations. The result of this has been reduced capacity to tackle the looming resource challenges for the country due to restrictions on Pemex's operation as a function of its role directly supplementing the state budget.

Driving Factors for Energy Reform

The scale of these challenges has added fresh impetus and motivation for Mexico to pursue reforms in a greater way than it has in the past. Soon after taking office, Mexican President Enrique Peña Nieto gathered the leaders from the main opposition parties, the National Action Party (PAN) and the Party of the Democratic Revolution (PRD), to form a "Pact for Mexico," to pursue major reforms to energy, education and telecommunications among

other topics and for parties to consult and negotiate to ensure passage of legislation through Congress.[xliv] But, as Isidro Morales points out, "[while] there is already a consensus in Mexico, both in the main political parties and in civil society, that the status quo in energy is unsustainable… there is no consensus… about the best way to implement such a reform." [xlv] The governing Institutional Revolutionary Party (PRI) and PAN have generally supported a more comprehensive approach encompassing constitutional reforms, but PRD has voiced opposition to any actions that will open resource development to increased private or foreign investment, and instead proposed more limited reforms that included reorganizing Pemex, increasing its autonomy and decreasing its budgetary burden, among other changes.[xlvi] Thus far, energy reforms have moved forward by way of cooperation and negotiation between PRI and PAN, while PRD has announced it is working to propose a referendum to repeal reforms.[xlvii] Lingering opposition to reform as details are finalized remain potential barriers to structural reform required to boost production in the future.

Outline of Energy Reform Agenda

In December 2013, as part of the Mexican government's energy reform effort (Reforma Energética), the country's Congress passed constitutional changes that will among other factors open the country's oil and gas sector to greater foreign investment.[xlviii] Mexico's energy reforms are comprised of several key features:

- *E&P Contract Models:* Reforms will allow for use of licenses, production sharing contracts, profit sharing contracts or service contracts to be issued to public or private companies to develop resources. Contracts for resource development will be awarded through an open bidding process. The new model will allow companies to report resource volumes in financial statements subject to statement of the premise that all subsoil hydrocarbons remain the property of the Mexican state. [xlix]

- *Permit Schemes for Mid/Downstream:* Reforms will also allow for a permitting system enabling private companies to invest in Mexico's mid- and downstream energy sectors.[l]

- *Round Zero:* Pemex was requested to submit an initial bid ("Round Zero") prior to the first official bid round to be orchestrated, on which assets and fields it would like to maintain from its portfolio of fields currently under exploration and production and from its future development plans. SENER worked with the Comisión Nacional de Hidrocarburos (CNH) to assess Pemex's application and provide a ruling on which assets the company may keep. (See below for more details on the results of Round Zero).

- *Pemex Reform:* Pemex will be transformed into a "State Productive Enterprise" with greater autonomy from government, and will compete with or be allowed to partner with

private companies in the resource sector. The company's board structure will be subject to reform as well. A more flexible fiscal regime will also be created to increase capital available for reinvestment by the company. [li]

- *Institutional Arrangements:*[lii] Under the energy reforms, various ministries and agencies will have current functions and capacity reinforced and new roles granted to aid the functioning of the new fiscal and regulatory framework, and will be given greater independence:
  - *Energy Ministry (SENER)* – Will continue to set energy policy for the country, and work with CNH to determine what fields will be part of bidding rounds. It will also award permits for investment in the mid- and downstream hydrocarbon sectors.
  - *National Hydrocarbons Commission (CNH)* – Serves as regulator of upstream activities including determination of bid round winners.
  - *Energy Regulatory Commission (CRE)* – Mexico's mid/downstream regulator for the hydrocarbons and electricity markets.
  - *Finance Ministry (SHCP)* – Will determine the fiscal terms of future oil and gas contracts.

- *New Agencies:* Reforms will create an agency tasked with overseeing independent operation of the natural gas pipeline and storage system[5] ("National Centre for Control of Natural Gas", CENAGAS) and electricity sector ("National Energy Control Centre", CENACE), as well as one to oversee safety and the environment, ("National Agency of Industrial Safety and Environmental Protection").[liii]

- *Mexican Petroleum Fund:* A sovereign wealth fund will be created to manage cash flow generated by Mexico's hydrocarbons sector. The "Mexican Petroleum Fund for Stabilization and Development" will be overseen by Mexico's Central Bank. [liv]

- *Transparency Measures:* According to SENER, in order to ensure transparency, all bid rounds and guidelines will be made public, transparency clauses will be included in oil and gas contracts, disclosure of all payments related to oil and gas contracts will be made and external audits will be undertaken. [lv]

Secondary legislation will implement reforms and seek to address important topics including:[lvi]

[5] Pemex currently owns the majority of Mexico's natural gas transportation system. This organization will work to enforce open access to and operation of the country's pipeline and storage system.

- Providing detail on the four new types of contracts (licenses, production-sharing, profit-sharing and service) that will be available to companies who will participate in future bid rounds.
- Working out issues related to eminent domain.
- Laying out the applicable taxation and royalty system to be used.
- Providing more details surrounding transparency and financial reporting.
- Clarifying function and interaction of the country's regulatory entities.
- Specifying rules and guidelines on local content requirements.

In August 2014, Mexico's Congress successfully passed this Implementing Legislation which contains many of the key details companies will consider when assessing potential investments in Mexico's post-reform energy sector. In order to attract the capital and expertise needed to boost production, Mexico will need to ensure the terms inherent in this legislation are globally competitive.

Round Zero Layout, Results & Pemex Strategy

Pemex has taken steps to move forward in tandem with the Mexican government on energy reforms as they progress. On March 21st, 2014, the company provided SENER with a list of fields and resources it would like to maintain under the new regulatory regime. SENER and CNH's review of Pemex's "Round Zero" submission took into account the company's financial, technical and operational capacity to undertake proposed projects and rendered a decision on which assets Pemex will be awarded and which will be made open for public tender. In August 2014, SENER issued a ruling on Round Zero, ahead of its original intended date in September 2014.[lvii]

Pemex states that its request to SENER/CNH for Round Zero "has maintained a balanced position between the sustainability of the company and growth of the national oil industry, according to the principles of the Energy Reform."[lviii] Pemex laid out the broad strategy the company intends to take based on the following principles. To paraphrase—

- *"Strengthen Pemex and maximize long-term value for the Mexican State"*[lix] – Pemex seeks to establish itself in places where it has undertaken significant exploration and has a current production presence. Furthermore, it wishes to ensure it has sufficient opportunities for exploration to serve as a base for growth in future production. Special

mention is made of the importance of holding deep water and unconventional plays that it sees as vital to future production in Mexico.

- *"Leave space [for] private investment which [will] contribute to the growth of the oil and gas sector [and have] positive impacts [on] the Mexican economy"*[lx] — Pemex intends to identify areas where partnership with other companies could speed up E&P while building its base of skills and expertise through knowledge transfer. The company does not intend to request resources in areas that have seen limited activity but could be productive for private investment—it lists most unconventional areas as falling in this category.

Regarding what strategy to undertake in exploration versus production areas, Pemex has proposed the following:

- *Exploration Areas*—[lxi] Pemex wishes to ensure it has adequate resources to support organic growth and increase capital expenditure in exploration as a basis for future production. Maintaining exploration in the high-value Southeastern basins, onshore and offshore, is an important short-term priority. The company's medium- to long-term strategy involves deep water on its own or in partnerships where strategically advantageous. It will also seek partnerships to develop areas of concentrated unconventional resources.

- *Fields in Production*—[lxii] For Pemex, maintaining ownership of its most profitable fields is important to its financial sustainability. The company will seek out strategic partnerships to develop more complex fields that require greater investment, such as extra-heavy oil and deepwater production. For Chicontepec, Pemex will seek to use innovative methods to improve well productivity and recovery factors by developing strategic areas through partnerships. Fields that have limited profitability or that are far from infrastructure were not requested.

Reflecting this overall strategy, Pemex requested the following reserves and prospective resources are granted/maintained for current and future development:

Figure 6: Pemex Round Zero Reserves/Resources Request

	Requested by Pemex	Total Listed
2P Reserves	20.6 Bboe (83% of total)	24.8 Bboe
3P Reserves	31.3 Bboe (71% of total)	43.8 Bboe
Prospective Resources	34.5 Bboe (31% of total)	112.8 Bboe
	- Conventional: 25.6 Bboe (48.7%)	- Conventional: 52.6 Bboe
	- Unconventional: 8.9 Bboe (14.8%)	- Unconventional: 60.2 Bboe

Source: Pemex, "Newsletter No. 1: Round Zero", April 2014.

Pemex requested the majority of 2P and 3P reserves currently available to the company, as part of its goal to maintain a strong E&P base around conventional areas where the company has background and expertise, and in which it has done significant exploratory work to reinforce reserves. This could include areas such as shallow water offshore and productive onshore fields. In a recent visit to Washington, DC Pemex's CEO emphasized the importance of developing the company's "low-hanging fruit" at home as a part of the company's short-term strategy.[lxiii] In prospective areas where the company has made limited progress in developing unconventional resources like deep water and shale oil/gas, the company has left a larger proportion of resources out of its request, asking for just less than half of prospective conventional resources and 14.8 percent of prospective unconventional resources, for a total of 31 percent. The company has also left space for use of synergistic partnerships and joint ventures to increase the likelihood of successful development in technically or financially challenging fields—likely in deep water, shale oil/gas plays and Chicontepec.[6]

Overall, Pemex's strategy follows a certain trajectory: By yielding a larger proportion of complex resources for private investment, Pemex have effectively prioritized development of resources in its traditional area of operation as core to the company's future in the short- to medium-term, while seeking to build the relationships and knowledge base that will enhance its capacity to exploit more challenging fields in the longer timeframe. For Pemex, "the challenge… is to increase reserves and oil and gas production in areas that are not part of its traditional zone of expertise."[lxiv]

On August 13, 2014, SENER/CNH released its Round Zero determination, which awarded Pemex 100 percent of its requested 2P reserves (20.6 Bboe), but opted to award a smaller 21 percent proportion (22.1 Bboe) in prospective resources versus Pemex's original request for 31 percent (34.5 Bboe).[lxv] The assets awarded to Pemex "include its traditional onshore areas of southeastern Mexico and the shallower waters of the Sound of Campeche. In addition, they include some areas of non-conventional resources and the deep waters of the Perdido region on the Mexican side of the maritime border with the US in the Gulf of Mexico."[lxvi] Pemex has identified ten fields totaling almost 1.6 Bboe in 2P reserves, for which it will seek to farm out stakes.[lxvii] According to Mexico's Energy Minister, the fields granted to Pemex will provide the company with more than 20 years of production at current levels of 2.5 million bbl/d.[lxviii]

As it released results of Round Zero, Mexico also provided preliminary details on fields that will be up for bidding in its forthcoming Round One session next year. Round One is

[6] It should be noted, the Mexican government will require Pemex to take a mandatory stake of at least 20 percent in any deposits and projects that straddle the country's borders, which could include both shale gas and deep water basins (Reuters).

expected to include 169 blocks encompassing 28,500 square kilometres, 109 blocks of which will be in areas for exploration, with a further 60 in currently producing areas.[lxix] Details from SENER suggest 3.78 Bboe in 2P reserves and 14.61 Bboe of prospective resources will be made available as part of Round One.[lxx] The bid round will include reserves and resources in areas such as conventional on- and offshore, as well as heavy oil, Chicontepec region, deepwater and unconventional resources.[lxxi]

Figure 7: Preliminary Round One Field Details

	Type	Reserve/Resource	Size
Perdido	Deep Water	Prospective	1.591 Bboe
Southern Region	Deep Water	Prospective	3.222 Bboe
Chicontepec	Unconventional	2P	2.671 Bboe
		Prospective	8.927 Bboe
Onshore & Shallow Water	Conventional & Heavy Oil	2P	1.204 Bboe
		Prospective	0.724 Bboe
Onshore	Unconventional	Prospective	0.124 Bboe

Source: Argus Media, "Mexico Zeroes in on 2015 Auction," Petroleum Argus, August 15, 2014, Note: amounts vary due to rounding.

Next Steps for Energy Reforms

In December 2013 constitutional reforms were passed and ratified by Congress and the required number of state governments. As of the week of August 11, 2014, Mexico has signed Implementing Legislation into law, released the results of its Round Zero determination and provided some further detail on what resources will be included in the forthcoming first bid round.[lxxii] Other upcoming steps include the creation of CENAGAS and CENACE and nominations for members of various regulatory agencies scheduled for late August; creation of new funds including the Mexican Petroleum Fund planned for September; and announcement of forthcoming regulations governing operation of the energy sector with a goal for October 2014.[lxxiii] Mexico aims for the first bid round to take place at a point in May to September, 2015.

Foreign Interest in Mexico & Potential Strategy

Mexico's energy reforms are still in the process of implementation, and foreign investment interest in the country's post-reform energy sector will be closely related to the results of ongoing reform efforts. Rig Zone suggests the names of major companies with expertise in deep water and the Gulf of Mexico that would be well placed to invest includes ExxonMobil, BP, Chevron, Hess and Anadarko.[7][lxxiv] Other firms Rig Zone suggest may be

[7] Many of these companies with deepwater Mexican Gulf experience currently have or had non-commercial science and technology cooperation agreements with Pemex in the past, including ExxonMobil, BP, Shell and Chevron, which could support development of relations with the Mexican state-owned company. See IHS CERA, "Pemex Renews Cooperation Accord with Shell," June 9, 2010.

well placed to support growth in Mexico's shale gas sector include EOG Resources, ConocoPhillips and Chesapeake Energy.[lxxv] Another area of potential interest that could draw further short-term production growth would be encouragement for foreign companies to deploy technology aimed at enhanced oil recovery (EOR) at existing mature fields, or to tap "'bitten apples'—producing wells that are short of investment."[lxxvi]

Mexico's Economy Minister, Ildefonso Guajardo has said that companies from several countries including Singapore, China, Europe, Norway and the Americas may be interested in Mexico's energy sector, but declined to discuss specifics on the entities to which he was referring.[lxxvii] A media scan does provide further detail into prospective interest from some companies:

- *Chevron:* A company with active deep water Gulf of Mexico and Latin American operations, including Brazil offshore, has voiced its interest in post-reform investment opportunities. Chevron's head of E&P for Latin America and Africa has stated, "there is tremendous opportunity here… as soon as secondary laws pass… then we can basically take that information and then look for the opportunity that meets our economic requirements."[lxxviii] Overall, the company emphasized its capacity to participate in any of the new commercial opportunities that may emerge in Mexico if the company determines there is economic benefit.[lxxix]

- *China National Petroleum Corp (CNPC):* The Chinese state firm's Vice President of its Americas Division has also reportedly indicated the company intends to participate in future bid rounds in Mexico, but has not specified the extent to which or which sectors the company might target under the forthcoming regime.[lxxx] In April, 2013 on a state visit to China by President Peña Nieto, Pemex's CEO, Emilio Lozoya Austín signed a Memorandum of Understanding (MOU) with CNPC President Zhou Jiping on cooperation in the oil and gas sector, which included a promise from CNPC to make enhanced oil recovery (EOR) technology available to Mexico.[lxxxi]

- *Statoil:* Has had an office in Mexico City since 2001, and in 2013 signed a five year non-commercial agreement to encourage research and technology collaboration between itself and Pemex.[lxxxii] Statoil is a significant offshore producer and is active in US Gulf of Mexico as well as shale and tight rock formations in Eagle Ford, Bakken and Marcellus plays. Regarding Mexico's potential, the company's website states: "Statoil is positive to Mexico possibly opening up. Should Mexico offer globally competitive terms and material opportunities, Statoil would be interested in participating both onshore and offshore."[lxxxiii]

- *BHP Billiton:* Has indicated it is examining potential for operations in Mexico's Eagle Ford shale fields, which if undertaken would supplement its current US Eagle Ford oil and liquids operations in Texas. The company's President of shale operations recently stated that geology and energy reform details would be important factors in decision making.[lxxxiv]

- *Mitsui:* The Japanese trading house has signed an MOU with Pemex to explore opportunities for cooperation in Mexico's upstream, natural gas and byproducts sectors and infrastructure development associated with these types of resources. Mitsui and Pemex have a prior agreement to construct a natural gas pipeline in the US to connect to Mexico, and Mitsui is also a partner in Mexico's Manzanillo LNG regasification terminal.[lxxxv]

- *JX Nippon:* In an August 2014 interview, JX Nippon Oil & Gas Exploration's CEO, Shunsaku Miyake indicated the company is interested in examining E&P opportunities in Mexico and Brazil. Deepwater Gulf of Mexico was mentioned as an area of potential interest to the company.[lxxxvi]

- *Pacific Rubiales:* In August 2014, the Canadian company with established heavy oil operations in Colombia announced its prospective interest in post-reform investments in Mexico's energy sector, including potential for joint ventures with Pemex.[lxxxvii]

- *Lukoil:* In January 2014, Pemex signed an MOU and cooperation agreement with Russian oil company, Lukoil, which could provide the basis for joint upstream development for the companies in the areas of deepwater and natural gas and sets a goal of sharing knowledge on environmental protection.[lxxxviii]

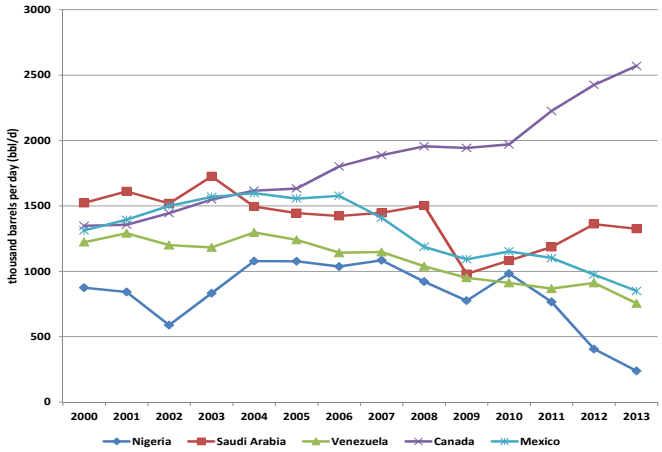
- *Singapore Government Investment Corp (GIC):* One of Singapore's sovereign wealth funds may be interested in investing in Mexico across several sectors which could include energy.[lxxxix]

Potential Impacts for Asian Markets

Mexico's primary crude export destination has long been the US, as steady demand, geographic proximity and complex refining capacity able to process its plentiful heavy Maya crude (more than 75 percent of exports) made it the most logical destination. [xc] However, exports to the US have declined due to the drop in domestic Mexican production, as well as increases of Canadian oil sands and other rival heavy imports, while the shale revolution has boosted US domestic production of light crudes. In 2013, Mexican crude exports reached their lowest level since 1993, with an average of 850 thousand bbl/d, a

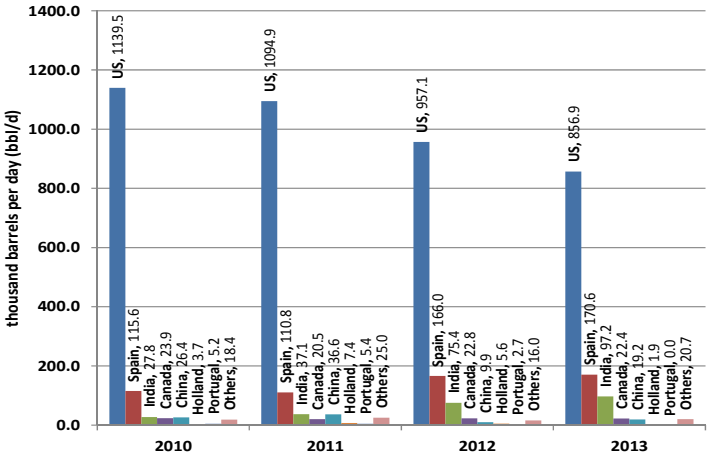
drop of 47 percent in the last decade.[xci] If Mexico is able to boost production and its own export potential, its Maya crude will likely have to compete with Canadian and other Latin American heavies in the US and abroad, while its medium and light crudes such as Isthmus and Olmeca will compete with US domestic production and West African crudes from countries like Nigeria that have already found themselves increasingly backed out of US markets.[xcii] Platts points out that as a result of rising light tight oil production, Isthmus and Olmeca are being squeezed out of the US Gulf, with Isthmus finding a new home on the US west coast and in Asia, while Olmeca shipments to Europe are on the rise.[xciii]

Figure 8: Select US Crude Imports



Source: EIA, "US Crude Imports by Country of Origin," 2014.

Figure 9: Mexico Crude Exports



Source: SENER, "Sistema de Información Energética," 2014

In recognition of these growing trends, Mexico has begun to build relationships and increase its exports to other countries around the world including in Asia. Pemex data suggests the company exported 116 thousand bbl/d of crude to the Far East in 2013, a

figure that has grown significantly from 35 thousand bbl/d in 2009.[8][xciv] As global crude prices remain high and energy supply security plays a significant role in the policymaking of Asian consumer markets, trends suggest increased interest in testing the viability of Mexican heavy and light crude as a future source of supply.

- *India:* Exports have climbed from 27.8 thousand bbl/d in 2010 to over 97.2 thousand bbl/d in 2013.[xcv] Reuters suggests all Mexican exports to India have been of the heavier Maya blend; however, in February 2014, it was announced that Mexico would export its first 500 thousand barrel order of light Olmeca crude to India in addition to a planned 1.5 million barrel heavy Maya crude cargo.[xcvi]

- *China:* Exports have remained relatively steady with 2013 seeing a level of 19.2 thousand bbl/d.[xcvii] In April 2013, Pemex signed a two year agreement with Chinese state company, Sinopec to supply 30 thousand bbl/d of crude to China, a move that may lay the foundation for longer term supply arrangements between the countries, as historically Pemex's sales to China have been arranged on a spot basis.[xcviii]

- *Japan:* has imported Mexican oil in the past, having purchased crudes such as Isthmus, Mexican Blend and Maya at different points dating back to the late 1970s, before imports ceased in 2003.[xcix] In In the first half of 2014, reports suggest Japan imported approximately 2 million barrels of medium-light Isthmus crude, suggesting potential for renewed Japanese interest in Mexican crude.[9][c]

With crude increasingly displaced from US markets, it is possible that the trade patterns with Asia will continue to grow in the future. Platts suggests "the passage of energy reforms is expected to flood the market with Mexican crude from untapped shale plays and deepwater reserves, but it is still some time off from that happening."[ci] Prospects for Asia will depend most on future production levels, the amount of crude displaced from US markets and the content and timing of ongoing energy reforms. Nonetheless, given its geographic location, the dominant position of Mexican imports in the US crude mix, and US refining configuration, the US will continue to be an important destination for Mexican crude exports in the future.

Analysis/Conclusions

Mexico is a significant contributor to the global energy map, but the decline of traditional fields that were the foundation of production and emergence of challenging new fields has necessitated a rethinking and retooling of the country's energy sector to improve production

[8] Pemex specifies this category could include other countries possibly outside the Far East.
[9] Based on conversion factor of 1 KL = 6.289 bbls provided by Petroleum Association of Japan (PAJ)

prospects for the future. The government and industry have begun a process of reorienting and expanding participation in the sector to more effectively capture the knowledge, expertise and investment needed to drive growth in fields like deep water, shale oil and gas, and complex reservoirs in the Chicontepec region. If successful, noted energy intellectual, Daniel Yergin argues these "reforms will rejuvenate Mexico's energy sector, stimulate economic growth and job creation, and in time bring substantial new resources to the world oil market."[cii]

With constitutional reforms and secondary legislation enacted, Mexico is now in the implementation stage of legislation and reforms that will address the detail-oriented aspects making up the future structure of the country's energy sector—something potential investors are watching closely for impacts on competitiveness. As part of the shift towards becoming a state productive enterprise, Pemex has begun the process of evaluating its resource holdings, and transforming its lines of operation in an effort to effectively compete in the post-reform sector. In addition, there have been early signs of interest from companies from around the world, including from North America, China, Japan and Singapore in taking part in the evolving energy sector. And as the US shale revolution continues and competition in the heavy and light crude markets of the US Gulf Coast increases, Asia could see increasing flows of Mexican crude seeking new markets. Overall, as Energy Intelligence has argued "the energy sector reforms being introduced in Mexico have rightly been greeted as a landmark event for the oil industry… But the momentous nature of these developments should not disguise the challenge that remains to reverse a slide in production."[ciii] The IEA estimates that the results of Mexico's energy reforms will become most evident after the end of the decade, but will begin to show results in 2018/19 as EOR at existing fields and accessible new fields are brought online.[civ] There are still some risks and barriers as implementation of reforms continues, some public opposition remains. It is still too early to tell for sure if reform efforts will bear fruit; however, key steps required to be successful have been made, the results may depend on how the pieces come together.

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