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By Adrián Lajous

FEBRUARY 2015

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EXECUTIVE SUMMARY

A Pemex affiliate has applied to the US Department of Commerce for a license to export 100,000 barrels per day of light crude and condensate in exchange for Mexican heavy crude. Such application is currently under review. Much of the discussion around the potential exchange has focused on its ability to provide an additional export channel for growing volumes of US oil production threatening to overwhelm the US refining system. This issue brief examines the exchange from the perspective of Mexico, which has traditionally been one of the top oil suppliers to the United States.

Specifically, the paper:

- Articulates the market logic for lightening the crude slate of three Mexican refineries;
- Explains the option of importing crude from the US or using additional quantities of Mexican light crude; and,
- Explores the market conditions in which the proposed transaction makes economic sense.

The main conclusion of this paper is that for the exchange of Eagle Ford crude for Mexican Maya crude to make economic sense for Mexico would require a relatively wide Brent/WTI price spread, noting that this differential narrowed in the second half of 2014 due to greater pipeline capacity from Cushing, Oklahoma to the Gulf Coast. In January and early February 2015, the arbitrage for exports of Eagle Ford crude appears to have closed and it is difficult to forecast when it will open again and for how long. Price differentials between LLS and Eagle Ford crudes are too narrow for the exchange to take place. The paper also concludes that the potential volume of light crude exports to Mexico must be determined through rigorous and frequent optimization exercises of Mexican refineries, which consider Mexican crude streams as well as crude imports. Estimates of light crude imports of up to 300,000 b/d would imply not only the full displacement of heavy crude from Mexican cracking refineries, but also significant quantities of domestic light crude blends. It would be more prudent to first test the refineries with light crude imports of around 100,000 b/d when they become again economically viable.

BACKGROUND

On August 14, 2014 Emilio Lozoya, the Pemex CEO, told Reuters that negotiations with the US government and US companies were taking place for importing light crude oil from the US, and that these could begin in a few months. On December 19 Lozoya added that Pemex was interested in importing up to 100,000 barrels per day (b/d) of light crude from the United States. On January 6, 2015, just hours after a day of bilateral meetings between President Obama and Mexican President Enrique Peña Nieto, Secretary of Commerce Penny Pritzker referred to possible exports of light crude oil to Mexico by saying: "It's an active, open discussion with the Mexican government and something that we are trying to figure out if we can work cooperatively on. There is no resolution yet, but given our close relationship, what we want to be able to do is work constructively together." She hoped to be able to conclude the talks in the near term.

On January 8 Pemex further announced that it had made a proposal to the Bureau of Industry and Security (BIS) of the Department of Commerce to exchange up to 100,000 b/d of light crudes and condensates for heavy crude, stressing that this transaction would not imply an additional commitment of Mexican crude oil exports to the US beyond the average volume realized in 2014. On January 11, Senator Lisa Murkowski, Chair of the Senate Committee on Energy and Natural Resources, issued the following statement regarding news that Pemex had filed an application to exchange different grades of petroleum with the United States: "Secretary Pritzker and the Department of Commerce retain full statutory and regulatory authority to consider oil exchanges and swaps. There is enormous precedent for such transactions involving 'adjacent foreign states.' The Ford, Carter and Reagan administrations all supported a formal exchange program with Canada. Mexico – with which we are developing ever closer energy ties –deserves the same consideration." Apparently, PMI Holdings, a US affiliate of the Pemex trading arm PMI, applied for a license to export crude oil to Mexico under an exchange arrangement. The BIS is currently reviewing this application as well as those of other counterparties.

BIS regulations authorize the issuance of an export license for a crude-for-crude "exchange" with an "adjacent country" where such an export is supported by "transportation efficiency or "convenience." Because direct exports to Canada are allowed, Mexico is the only country to qualify for such exchange export license. The requirements and parameters for the approval of an exchange license can be summarized as follows:[1]

- The exchange must involve the import to the United States of an equivalent quantity of Mexican crude oil. Product imports do not qualify.
- The exchange transaction can allow for financial settlement of value differentials. It is possible, however, that the BIS may require equivalency in value instead of volume (in which case more Mexican crude likely would have to be imported into the United States than the volume exported to Mexico).
- The US crude oil imported into Mexico must be refined in Mexico or consumed there. PEMEX would be prohibited from re-exporting the US crude oil as is or in a blend with Mexican crude.
- The Mexican import into the United States would have to be over and above volumes of Mexican crude already committed to the US market pursuant to long term contracts. These can be associated with firm or evergreen contracts that expired or spot transactions.

Crude can be exported pursuant to a license that can only be used by the exporter to which it is issued that sets the terms and conditions for compliance. License applications and licenses are confidential.

WHY EXCHANGE?

Interest in the possibility of exporting US crude oil to Mexico has been triggered by the energy reforms in that country that, for the first time in decades, allow Mexican refineries to import and process non-Mexican crude oils. Such interest has been heightened in the context of a more general debate on the lifting of long-standing restrictions on US crude oil and condensate exports as well as the fact that US flows to Canada have soared in 2014 (allowed pursuant under a 1986 Presidential finding). Recently, a decision by the US Commerce Department opened the possibility of classifying lightly treated condensates as oil products, which do not require export permits. (A wider discussion on the implications of US oil exports is addressed by Jason Bordoff and Trevor Houser in their "Negotiating the US Export Debate," Center for Global Energy Policy, Columbia University, January 2015.) It is possible that exchanges with Mexico will serve to expand existing exports from the United States. The focus of this paper is the rationale, from a Mexican perspective, for entering into an exchange transaction with the United States. Possible changes in the crude slates and product slates of Mexico's refineries are analyzed and the need for a prompt reconfiguration of three of its refineries is underlined. The paper suggests that optimizing the blending of major crude streams should be part of the scope of optimizing refinery operations and investments. This is required given important changes in the main crude blends produced by Mexico today and the even more important ones that will arise in the medium-term. This complex exercise is required for appraising the economics of lightening crude slates and potential crude exchanges.

A large part of the existing refining capacity, particularly in the US Gulf Coast, was designed to economically run heavy crude.[2] As US production of extra-light crudes and condensates expanded over the past three years and crude imports were replaced, the feed of these refineries has also changed. Growing US crude and condensate production lowered the US domestic price relative to those of internationally traded waterborne crudes, stimulating US refineries to run at very high capacity utilization rates. A growing proportion of the products obtained have been exported, as US law permits the export of refined products. Meanwhile Mexico has been moving in the opposite direction. Crude oil production and exports have declined and its refineries, particularly the less complex plants that lack deep conversion process units, are producing a surplus of low-value fuel oil. This glut partially explains a reduction in capacity utilization in some of these refineries, low margins and heavy losses. In the medium-term, deep conversion plants, such as delayed cokers, must be put in place. Short-term, lighter crude slates are required to reduce fuel oil production. Mexico has not invested in new refineries or in reconfiguring half of the existing ones. Insufficient capacity and the reduction in refinery throughput have resulted in large volumes of oil product imports, particularly gasoline and diesel. Thus, trading surplus crudes could, in principle, benefit both parties.

Table 1: US crude, refined product and natural gas trade with Mexico, January-October, 2014

Oil (1,000 b/d)	
US net liquid imports from Mexico	228
US imports from Mexico	814
Crude oil	748
Oil products	66
US product exports to Mexico	586
Natural gas (bcf/d)	
US net exports to Mexico	2.2

Source: US Energy Information Administration (EIA).

US-Mexico hydrocarbon trade is characterized by significant flows in both directions. Mexico is currently the third largest crude exporter to the United States behind Canada and Saudi Arabia, after having occupied the second place at times over the past 15 years. In the first ten months of 2014 crude oil imports from Mexico averaged 748,000 b/d (Table 1). Mexico is also a supplier of oil products to the United States. At the same time, Mexico is the single largest importer of oil products from the US. It is also the largest net importer of US natural gas. In the medium-term Mexican crude oil exports to

the US will tend to stagnate and possibly decline, but oil product and natural gas imports will continue to expand. In value terms, the current hydrocarbon balance of trade between the two countries is close to equilibrium. However, a basic asymmetry prevails: bilateral trade in crude, oil products and natural gas is economically and strategically more important for Mexico than for the United States. It is within this frame of trade flows that potential exports of crude and condensates to Mexico should be appraised.

THE MEXICAN REFINING SECTOR

The Mexican refining industry faces difficult economic choices regarding crude and oil product slates, as well as desired refinery configurations, all of which affect margins and profitability. These choices are further driven by an increase in the supply of natural gas that is drying up the demand for fuel oil in the power sector. On average, more than 40 percent of the crude processed by Pemex in 2014 was a Maya type heavy sour mix. However, the crude slate varies significantly between high conversion coking refineries (the Cadereyta, Madero and Minatitlán plants) and catalytic cracking refineries (the Salamanca, Tula and Salina Cruz plants). For example, in Salamanca only 17 percent of the crude processed last year was heavy, while in Madero it was 91 percent.

The three cracking refineries produced over 80 percent of the domestic fuel oil supplied in Mexico. Two of the refineries that are land locked in Central Mexico, Tula and Salamanca, pose particularly complex logistical issues. Shipping high sulfur heavy fuel oil from these plants to the coast is costly given infrastructure bottlenecks, insufficient tank car availability and limited storage capacity at both ends of the transport chain. From time to time these refineries have been forced to reduce throughput as fuel oil tankage filled up. The impact of these events on refinery profitability is devastating. The Salina Cruz refinery supplies fuel oil to Federal Power Commission (CFE) plants along the Pacific Coast and exports increasing volumes directed to Singapore and Fujairah, while the Tula and Salamanca refineries supply adjacent and nearby power plants. They also contribute to fuel oil exports on both coasts. For structural reasons, fuel oil export prices are low and inland refinery gate netbacks even lower. Interestingly, Pemex for the first time exported more barrels of fuel oil in 2014 than it sold in the domestic market.

These problems are aggravated as both the domestic and the export markets for high sulfur heavy fuel oil are contracting. The power sector is doing everything it can to switch from fuel oil to natural gas, and to eventually repower its dual-fired electricity plants. This effort is being driven by relative prices, take-or-pay natural gas transport contracts, product specifications and a greater environmental awareness. The overall economic case is compelling even if Pemex were to sell fuel oil at parity with natural gas prices. Also, industrial fuel demand has almost fully converted to gas over the last decade. Domestic fuel oil sales have dropped over 40 percent in the last two years, while fuel oil exports have been increasing rapidly in a shrinking market (Table 2).

Table 2: Pemex fuel oil balances, 2009-2014
1,000 b/d

	2009	2010	2011	2012	2013	2014
Production	319	321	307	273	269	259
Cracking refineries	226	224	224	216	225	210
Coking refineries*	93	97	83	57	44	49
Pemex' own use and re-processing	28	25	30	34	16	21
Domestic sales	209	185	201	214	189	122
Exports	121	122	101	70	95	129
Imports	39	11	25	45	31	13

* The Minatitlan coker began operations in 2012.

Source: Pemex, Base de Datos Institucional (BDI).

Currently, Mexican fuel oil with 4 percent sulfur content or more is sold in international markets at a deep discount with respect to heavy fuel oil in the US Gulf Coast and relative to Maya crude. In 2014, these differentials were $11.34 and $13.79 per barrel, respectively, and may widen further. Bunker fuels are now subject to more rigorous emission regulations by the International Maritime Organization (IMO). As of January 2015, a 0.10 percent sulfur cap has been imposed in emission control areas (ECAs). Since 2012 marine fuel oil used outside of ECAs has to comply with a 3.5 percent sulfur limit, forcing Mexican fuel oil to be diluted with lower sulfur fuels to meet this specification.

Marketable production of natural gas in Mexico saw declines starting in 2009 and has been stagnant more recently. Imports, mostly from the US, have increased significantly. When final data for 2014 is available, it should show total imports at close to 2.7 billion cubic feet per day (bcf/d). Consumption of natural gas has been constrained in the last three years by transport bottlenecks that did not permit an increase in overland imports. New pipeline interconnections have been built to West and South Texas hubs. A new large capacity trunk line to Monterrey, a key industrial center, began operations towards the end of 2014 and will expand to Central Mexico by December 2015. Main pipelines are being built to the Northwest Coast of the country as well as along the Chihuahua corridor. Many other pipelines are at an advanced planning stage and are now close to final investment decisions. This major expansion of the natural gas grid will serve combined cycle power stations that are being built and new ones that are planned. Imports from the US are bound to increase substantially over the coming years, supplying Mexico with low cost natural gas. This should further accelerate the growth of its manufacturing industry.

These structural issues and developments, as well as other infrastructure constraints such as low operational efficiencies along the downstream value chain, poor maintenance practices that result in significant downtimes for processing units, and transfer price distortions in relation to product imports, help explain Pemex Refining losses of close to $10 billion in 2013. These factors place the performance of its refineries at the bottom of the fourth quartile in the Solomon benchmarking exercise. It should be noted that throughput at the cracking refineries dropped in 2014, particularly in the last quarter, so as to reduce fuel oil production. Also, condensate production from the Burgos region in Northern Mexico cannot be sent to the Tula and Salamanca refineries due to transport and security constraints.

Pemex must also resolve internal conflicting objectives. Pemex Refining continues to privilege volumetric targets instead of optimizing economic objectives. It tends to modify crude slates and processing levels only when it has no other option. Pemex Exploration and Production blends crudes in terms of its own interests and gives priority to export requirements, allocating residual crude streams to Pemex Refining. Pemex Gas tries to accommodate the natural gas demand of its clients, particularly those of the power sector, under conditions of severe supply and transport restrictions. At the corporate center, executives responsible for resolving discrepancies and coordinating the main actors are not effectively empowered to arbitrate. Finally, the CFE tends to unilaterally reduce its fuel oil requirements by increasing the use of much cheaper natural gas. The same types of clashes arise with respect to investment decisions and the allocation of capital. This institutional environment is not conducive to maximizing value.

MEXICAN OIL PRODUCTION

It is particularly difficult to sort out the dynamic forces at play that will determine Mexican crude oil supplies toward the end of this decade. There are at present too many moving parts and inflexion points, including the important energy reforms that are being implemented, as well as current market conditions. Government forecasts are not very helpful as they do not make explicit, and discuss, the underlying assumptions. The main discontinuities in institutional arrangements that the energy reform will bring about are not easily modeled and the build up of private investment and production is difficult to forecast. Given the maturity of legacy assets it is probable that in the next five years production will continue to decline. This is particularly true in the case of heavy crude given that the largest producing oil field, Ku-Maloob-Zaap, is now in its plateau phase and the likely decline pattern is still unclear. Uncertainty also prevails with respect to first production of the Ayatsil extra-heavy crude giant field and its satellite fields. Maintaining production of Mexican light crudes and increasing it in the longer term has a higher probability. However, the availability of light crude for domestic processing in Mexico will also depend on their further displacement by US shale production in the Atlantic Basin.

Given the existing configuration of its cracking refineries, the objective of minimizing surplus low value fuel oil and maximizing the production of gasoline and diesel can be attained by running a lighter feed using light domestic or imported crude and condensates from the US or North and West Africa. This would substitute imports of automotive fuels. A rigorous selection of the crudes to be processed by the cracking refineries must be based on a comparative analysis of the economics of Mexico's Olmeca crude and of alternative imported crudes. Pemex must be sure of its own appraisal and might benefit from contrasting it with one performed by an independent third party. It could well be that running Olmeca in these refineries is a better economic option.

Mexico produces and exports three main crude types: Olmeca (38-39º API), Isthmus (32-33ºAPI) and Maya (22-23ºAPI). Changes in the export demand for Olmeca and the composition of the heavy crude streams produced by Pemex have affected its domestic availability and the volume of its exports. More recently, as this crude has been displaced from US markets by domestic production, the share going to European and Asian markets has increased. Until a few years ago, the composition of the main crude types was stable because of the clear dominance of fields where they originated. Isthmus basically came from the Bermudez field complex, Maya from Cantarell and Olmeca from the Cárdenas field. As these rich fields declined, the diversity of crude streams increased, modifying characteristics of the original blends. Some of these were later affected by higher contents of salt, water and sediment due to insufficient crude oil treatment capacity.

Table 3: Pemex realized crude oil exports* by type and destination, 2014

1,000 b/d

	Total	Olmeca	Isthmus	Maya
Total	1,142	91	134	917
United States	792	35	84	673
Other	350	56	50	244

*Volumes measured at 60º F (15.5º C).

Source: Pemex, Base de Datos Institucional (BDI).

Heavy crude oil streams are not only declining, they are also becoming heavier. Pemex has been adding light crude to this blend to maintain the gravity of Maya. In parallel, Olmeca has been blended into Isthmus crude to maintain volume and quality. Given these trends, Mexican refineries stopped processing Olmeca in February of 2010, leaving all available volumes for export, almost exclusively to the US Gulf Coast. The amount being exported declined sharply. In 2010 Pemex was exporting 200,000 b/d of Olmeca to this market and in 2014 exports averaged about 35,000 b/d. An indication of the extent of blending appears clearly in the 2014 Pemex crude oil balances: availability of Olmeca is 197,000 b/d below the level of production and, in the case of Maya, availability is 181,000 b/d greater than production (see difference 1 in table 4). Understanding the economics of stream blending is of fundamental importance. They are particularly relevant for the decision to lighten the feed of the cracking refineries with Olmeca or other imported crudes. In 2017-18, as production of extra-heavy crudes begins, their blending with light crudes will have a substantial impact on the availability of the resulting blends. A significant change in the composition of the feed requires a modification in the design of the internals of refinery distillation columns, in terms of the number of trays they contain and the position of the feed plate, while other processing units might need minor adjustments. Pemex should have performed a detailed analysis of these issue, determined the costs that the changes imply and the time it will effectively take to carry them out. The Tula and Salina Cruz refineries have two distillation units each with an aggregate rated capacity of 315,000 and 330,000 b/d, respectively. At Salamanca there are three such units, which add up to 245,000 b/d, one of which serves the lubes train. Work has to be done on the seven distillation towers in order to run imported crudes and condensates.

Crude and condensates could be imported from Corpus Christi and other US Gulf Coast ports and unloaded at Pajaritos, in Southern Veracruz, and in Dos Bocas, Tabasco. The distance traveled is small, the voyage taking between two and three days. This short logistical chain has the further advantage of greater supply reliability compared to crudes from other international sources. From these ports the crude would be transported by pipeline to Nuevo Teapa, Veracruz, where it would be blended with other Mexican crudes, and the new mix piped to the three cracking refineries. Pemex seldom transports segregated crude batches due to capacity, operational and institutional constraints, and embedded practices.

Table 4: Pemex: crude oil balances, by crude grade, 2014
1,000 b/d

	Total	Extra-light	Light	Heavy
Production	2,429	299	864	1 266
Difference 1	-30	-197	-14	181
Availability	2 399	102	850	1 447
To refineries	1,161	0	668	493
To export terminals	1,148	92	134	922
Difference 2*	90	10	48	32

*Losses, stock variation, measurement errors and omissions. Volumes measured at 20º C (68º F).

Source: Pemex, Base de Datos Institucional (BDI).

IMPORTING CRUDE

Without access to Pemex linear programming tools it is impossible to determine the optimal volume of the additional extra-light crude load. Back of the envelope numbers suggest that imports of 100,000 to 150,000 b/d could be considered. In 2014 171,000 b/d of heavy crude was processed in these three refineries. Thus most, if not all, of the heavy crude load would be displaced and become part of a possible exchange arrangement. Pemex has initially proposed a 100,000 b/d interchange at some point in the first quarter of 2015. However, the volume and timing of potential future imports of light crude and condensates should be determined by the economics of the transaction, including the cost of modifying the internals of the distillation towers, expected Olmeca-US light crude price differentials, low backhaul transport rates and other cost differentials. This would be an important step forward from the traditional Mexican policy ban on crude oil imports. In the short-term, to determine the volume of light crude oil and condensate imports, a wide scope optimization exercise must be carried out that jointly selects optimal crude stream blends and refinery slates, while minimizing fuel oil production. This is necessary because of the changing composition of the main crude oil types now available in Mexico. Pemex has the people and the tools to analyze alternative economic solutions. Longer term –in 4 to 5 years- the cracking refineries must be fully reconfigured and delayed cokers put in place in each one of them. This will tilt Mexico's crude slates to heavier streams, ending the short-term need to lighten the feed of these refineries. Thus, the potential import of light crudes would be limited to the time needed to build and start-up these cokers.

For the exchange to be sound Pemex and its affiliates must show that the delivered price in Mexican ports of an Eagle Ford crude, corrected for quality, would be lower than the export price of Olmeca leaving from the same ports. In value terms Pemex would have to be at least indifferent to running Olmeca and Eagle Ford crudes for the transaction to be economically feasible and sustainable. These price differentials could be the result of export restrictions and light crude refinery saturation. More difficult to explain is the export of US condensates to Mexico, which would have a limited use in its cracking refineries. One possible explanation is the obtention of a license to export untreated condensates for re-export to Asia from Mexico's West Coast.

The economics of an exchange of Eagle Ford crude for Maya is very much determined by the WTI/Brent and WTI/LLS spreads. The price relationships of these three crudes have varied significantly since 2010. In 2014 they were particularly volatile and the WTI/Brent differential contracted significantly as can be seen in Table 5. Olmeca has been priced according to a formula that equally weights two US Gulf Coast crudes –WTS and LLS- and dated Brent. The prices of these two crudes are themselves linked to Brent and not to inland quotations of WTI. The results of this formula reduced the market share of Olmeca in the Gulf Coast, increased sales in Europe and Asia, while at the same time reducing overall exports of this crude blend. Now that the WTI/Brent differential has fallen the possibilities of arbitraging Olmeca and Eagle Ford is more limited. Looking forward to a crude exchange between Mexico and the US, more attention should be given to the difficulties in forecasting price differentials, especially after the price collapse of 2014.

New legislation, and new policies brought about by energy reform in Mexico, allows private investment in cokers built next to existing refineries. Experienced private refiners and engineering and construction companies could shorten the time required for the construction and start-up of these facilities under a tolling arrangement with Pemex. The new cokers would allow for a more accurate benchmarking of the three cokers that are currently operating in Mexican refineries and would offer a better operating time standard for them. They could be part of a utility island that might include a co-generation unit and a hydrogen plant, as well as other process units. The urgency of building these cokers cannot be underestimated. However, structuring such an arrangement would not be easy and its efficient operation would imply more fundamental changes in managerial and operating practices.

Table 5: Brent, WTI and Olmeca differentials and Olmeca exports, 2010-2014
1,000 b/d and $/barrel

	Olmeca exports		Price differentials	
	US	Other	O/WTI*	Brent/WTI
2010	200	12	0.04	0.13
2011	192	11	14.73	16.38
2012	184	9	15.35	17.58
2013	90	8	10.11	10.58
2014	35	56	-1.32	5.51
2014				
January	100	-	-4.52	13.50
February	77	18	1.04	8.08
March	35	-	0.16	6.68
April	0	70	-	5.69
May	0	67	-	7.36
June	18	88	0.11	6.01
July	34	58	-	3.18
August	34	51	0.85	5.07
September	17	59	1.32	3.88
October	51	26	5.81	3.03
November	36	77	2.35	3.65
December	53	64	1.84	3.05

*Olmeca price is for US deliveries, where pricing formula is

O = .33(WTS + LLS + Brent dated) + k, where current k = 0.35.

Source: Pemex and EIA.

CONCLUSION

Swaps and exchanges are archaic and cumbersome commercial instruments. Straightforward bilateral sales can be structured more easily and their terms are more transparent. However, political pressures and restrictions might be accommodated with greater ease, on both sides of the border, by this form of interchange. A successful transaction could be part of a piecemeal strategy that would gradually erode current restrictions. The US would not need to change regulations and Mexico could maintain that the transaction is an interchange and not the import of crude. Ongoing negotiations now refer to some of the specific terms and conditions of the exchange. Reference to a relevant precedent can be useful. Between December 1998 and February 2000 Pemex and the US Strategic Reserve swapped 11 million barrels of Maya for 8.5 million barrels of Isthmus to satisfy the Reserve's quality requirements.

The relatively small change in the composition of the crude feed to three Mexican refineries implies a wide variety of significant effects on a system that faces important infrastructure restrictions. The institutional coordination and the resolution of conflicting interests that are required illustrate some of the problems that are sure to arise as Mexico liberalizes its oil and natural gas markets. Solutions to problems that have been building up in the Mexican energy sector over a number of years require rigorous, evidence-based, economic and market analysis. The outcome of this effort can be full of surprises as well as opportunities. Politics will have to play an important role in structuring the rules of the game but they should not determine specific market transactions.

The eventual export of US crude and condensates to Mexico would be a significant shift of policy in both countries. The US would take an additional step toward easing export restrictions that have been in place for a long time. Mexico would import crude oil for the first time since the first half of the seventies. This decision will be made in the context of a wider discussion with respect to the costs and benefits of liberalizing trade in hydrocarbons, and its implications with respect to North American energy security. Mexico would be signaling in practice its commitment to new patterns of regional energy integration. Both countries must be sure that this change in policy and the proposed transactions are in their national interest.

NOTES

1 An exchange is distinguishable from a "swap" license, where the regulatory criteria is much more rigorous. For example, the exporter in a swap must demonstrate that its crude oil could not be marketed in the United States for reasons unrelated to price. Moreover, crude exported pursuant to a swap could not be transported in the US on any pipeline that crosses federal land.

2 J. Bordoff and T. Houser, "Navigating the US Oil Export Debate," Center on Global Energy Policy, January 2015, http://energypolicy.columbia.edu/on-the-record/navigating-us-oil-export-debate.

3 Maya crude is the heaviest of the three crudes produced in Mexico, and makes up the bulk of the oil the country exports.

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