

Developing LNG in North America: Impact on prices of natural gas

Sophie MERITET*
Alberto ELIZALDE BALTIERRA**

* Assistant Professor, CGEMP, Université Paris Dauphine (sophie.meritet@dauphine.fr)
** Petróleos Mexicanos-PEMEX (aelizalde@dco.pemex.com)

The views presented in this paper can be referred only to authors who are sole responsible for them.

ABSTRACT

Natural gas market in North America is changing. In the next few years, domestic production will not keep in with the consumption because of the expected growth of gas demand for electric power generation plants. The solution on the supply side seems to be LNG. In the United States, while there are some society oppositions, key issues in the development of LNG in the US include recent market changes that increase LNG flexibility, the decreasing LNG costs along the value chain, and the access to new markets with the diversity of LNG suppliers from all over the world. LNG could be an answer for the United States. Now, it can be more attractive economically to import LNG than buying from pipes in certain areas. With LNG costs decreasing and high volatile domestic natural gas, this energy becomes to compete successfully with domestic gas. LNG could be quickly a price maker as soon as it will be more used in the US. A possible source of new LNG supplies for the US could be the Mexican coasts. Some projects are currently under evaluation in Baja California, Lazaro Cardenas and Altamira. These projects will be able to alleviate pressures not only on the US markets but also in the high demand market in Mexico. The reinjection of LNG to the national transport system and the possibility of exporting LNG to the US will be a basic issue to be into account for maintaining current methodology of pricing or for adopting a new pricing approach convenient for all producers and consumers.

INTRODUCTION

The United States are progressively feeling upward gas price pressure with an increasing number of projected natural gas-fired electricity generation plants, relatively small amount of natural gas storage, increasing demand from users, demand-driven transportation capacity constraints, and higher marginal cost of procuring reliable natural gas supply. One solution is Liquefied Natural Gas (LNG), which appears as a new natural gas supply with reliable transportation to consuming areas. Historically, the cost of producing, shipping and re-gasifying LNG has been prohibitive and uncompetitive with any United States gas market prices. In the 1970's and 1980's, physical gas prices had spiked in North America, allowing the construction of 4 major LNG import re-gasification terminals. However gas price deregulation allowed gas producers to explore and develop new and easy access gas reserves, flooding the market with excess gas. The result was very low prices in the United States. Today the gas market fundamentals have changed and the total cost of LNG production has been quite streamlined and reduced thanks to competition and technological progress. LNG appears as an economical source of natural gas supply for the United States.

The American continent is self-sufficient with respect to natural gas. About 30 trillion cubic feet (Tcf) of gas were produced and consumed in the continent during 2000 (EIA, 2004b). The United States accounts for 75% of natural gas consumption in the hemisphere; with Canada supplying 15% of the US gas requirements. The US-DOE reference forecast for U.S. gas consumption and production as of 2020 is 33.8 Tcf and 28.5 Tcf, respectively (deficit equivalent to 5.3 Tcf). Due to the deficit forecasted for the U.S. natural gas market, imports of LNG are expected to increase through 2020, from which an important part could be supplied by Trinidad and Tobago, Bolivia, and from gasification facilities planned in the northern parts of Mexico.

This paper discusses the main issues of the impact of the LNG development in North America and more precisely on the prices of natural gas in Mexico and United States: what is the impact of LNG development? This paper is divided in four parts:

1. Section 1 presents the opportunities for LNG in the US with new gas market fundamentals, and with new costs for LNG.
2. Section 2 shows the fundamentals of the natural gas market in Mexico.
3. In section 3, the future of LNG in the US is analyzed and specifically with its role in the emergence of a global market and evolution of prices.
4. In section 4, the development of LNG facilities and natural gas pricing in Mexico is studied for three regions where it is expected to receive this liquid fuel.

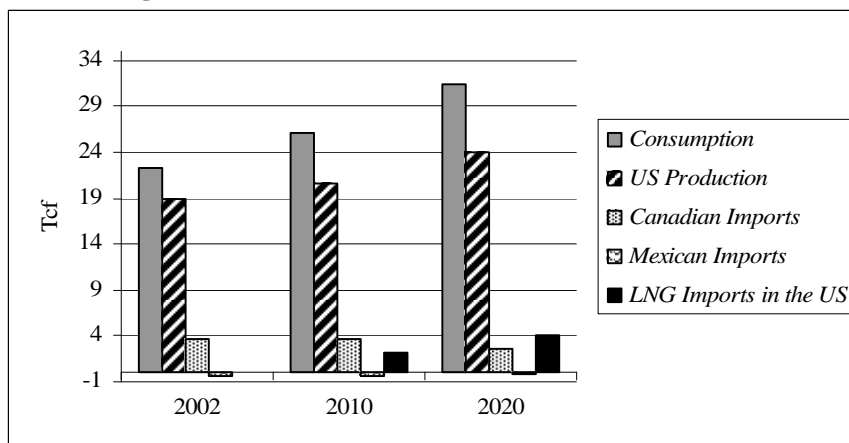
SECTION 1: Natural Gas Market in the United States

A number of factors have contributed to stimulate the new interest in LNG in the United States¹: higher natural gas prices, development of gas-fired combined cycle electricity generation, weakness of the traditional sources of supplies like Canada, discovery of new natural gas sources overseas, lower costs for producing and shipping LNG ... For some analysts, “the LNG ship could be coming into port right on schedule” in North America.

1. 1 Situation of the US Market²

Based on Energy Information Administration (EIA), long term forecasts (until 2025), US national gas consumption is projected to increase from 22.5 Tcf in 2002 to 26.2 Tcf in 2010 and 31.4 Tcf by 2025. US natural gas demand is expected to grow by almost 50% between 2000-2020. While the consumption for natural gas will increase in all sectors, and most of it will come from electricity generation. Industry analysts say that the power plants are expected to triple their demand by 2020. Natural gas is now the fuel of choice for generating electricity, as well as for space and water heating in new buildings. These projections will be reviewed if the price of natural gas goes up.

Figure 1 : Natural Gas Market Fundamentals in the United States



Source : EIA (2004a)

Domestic gas production is expected to increase more slowly than consumption over 2025, rising from 19.0 Tcf in 2002 to 20.5 Tcf in 2010 and 24.0 Tcf by 2025 (EIA, 2004a). Despite the boost in drilling from higher gas prices, natural gas production is not keeping up with demand. In production, while some old gas fields are declining, some new fields are exploited as in Alaska or in Gulf of Mexico. The lack of supply response to recent drilling, an accelerated depletion of reserves, and the belief that there are no more large fields to find, make decline the production of natural gas in United States.

¹ We only consider Continental United States.

² This section is based on the projections of EIA.

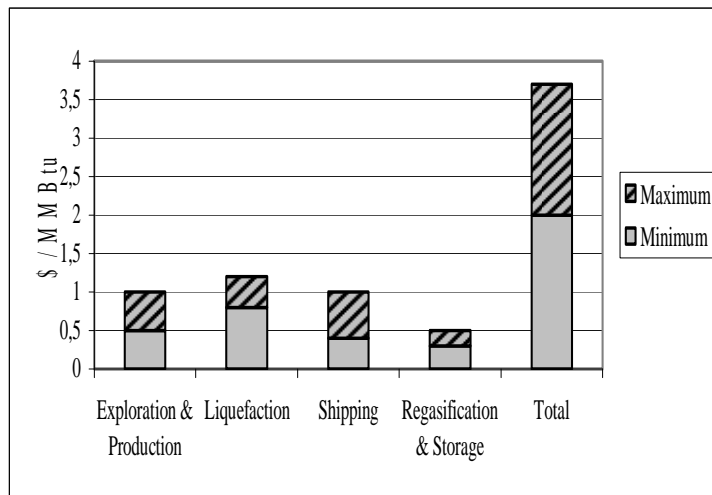
Even if domestic production and Canadian imports are likely to increase, they will not meet the increased demand. Canada which contributes about 94% of all US gas imports will probably be unable to boost its exports enough to keep up with increasing North America demand. Over the forecast period of 2000-2025, net pipeline imports from Canada are expected to reach 3.7 Tcf in 2010 and then decline as Canadian fields mature and Canadian demand increases. The other privileged partner of the United States is Mexico: this country is currently a net importer of US natural gas is expected to remain so throughout the period mainly to supply industry located on the US Mexican border.

1.2 The Solution of Liquefied Natural Gas

Increasing demand for natural gas and slowly declining natural gas production are causing analyst, including Federal Reserve Bank chairman A. Greenspan, to look to LNG imports as the answer to North America’s supply issues. At a hearing, Greenspan stated “*our inability to increase imports of LNG to close a modest gap between North America demand and production... is largely responsible for the marked rise in natural gas prices over the past year*”. The growing gap between US gas production and demand suggests that the natural gas industry could be on the threshold of entering the rank of major long term LNG importers such as South Korea and Japan. LNG appears to be the only option that can produce substantial results in the medium term.

Natural gas takes up so much room that it is costly to store and transport. Until the first commercial liquefaction plants were built for British Gas in Algeria in the mid 1960s, gas had to be piped to the nearest market (important cost of transport). Since 1995, LNG imports have swelled from 5 Bcf per year to almost 155 Bcf in 2002. The US has been importing small quantities of LNG for over 30 years mostly to supply peak gas demand (“peak shaving”): local electric producers and gas companies store gas for peak demand that cannot be met via their typical pipelines source. Currently LNG imports accounts for less than 1% of total US consumption of natural gas. More than half that volume is originating in Trinidad and Tobago and was based on only long term contracts. That is changing. According to EIA forecast (EIA, 2004a), LNG imports are projected to increase to more than 2.2 Tcf in 2010 to 4.1 Tcf in 2020 that will be 8% of the US natural gas consumption³. LNG will become the largest source of net US imports by 2015 as Canadian imports decrease. It should represent 20% of the imports in 2020 (it is only 5% nowadays). Nearly all the increase in net natural gas imports from 2003-2010 is expected to come from LNG.

Figure 2 : LNG Value Chain



Source: IELE (2003)

The future of LNG imports depends on the price of natural gas and cost of the LNG value chain: gas prices will have to be consistent and high enough to make LNG imports profitable to its producers. Shipping costs which vary with distance, add to the cost of LNG. Tankers must offload their cargo within a certain period of time, which means that imports from closed countries are preferable. As LNG breakeven cash costs for new projects have fallen to about \$3

³ LNG’s share of each importing country’s gas supply ranges from 2% in the US to 100% in Japan.

per Tcf in 2003, and less for expansion projects, a report published by Standard and Poor's rating services explores the possibility of LNG imports finding a potentially powerful market in the US. In 2000, the cost of liquefaction, shipping and regasification push the cost of LNG between \$2.75 and \$4.00 per MBtu. That means that LNG importers have to be able to sell their LNG for around \$3.00 per MBtu on the East coast and around \$3.5 on the West coast to make a profit. Sometimes LNG can be cheaper than domestic gas as we will explain in the third part of this paper.

Since few years, annual reopening of LNG terminals signal renewed interest in this energy. The US has currently four LNG imports terminals with a combined total regasification capacity of more than 1200 Bcf per year: Cove point MD, Elba Island GA, Everett MA and Lack Charles LA. These 4 US LNG import terminals have an estimated combined peak capacity of around 1.2 Tcf per year and an estimated base load capacity of 880 Bcf per year. In the mid term, new terminals are needed. All 4 terminals either have completed an expansion or plan to expand their regasification capacity by 2006. There are at least two dozen proposals to build new LNG regasification terminals in North America over the next several years. The first new US LNG terminals in more than 20 years are projected to open on the Gulf coast in 2007. Almost 60% of the increase in LNG imports would be served by expanded capacity at existing terminals (EIA, 2002). Not all the LNG import terminal may be built...

The question of the supply is in the centre of all the discussions. The US is both importer and exporter of LNG. LNG has been produced in and exported from Kenai, Alaska to Japan for the last 30 years (exports of 63 Bcf in 2002). While historically Algeria was the US's largest suppliers of LNG since 2000 it has been far surpassed by Trinidad and Tobago. The role of imports from Mexico is now in debate.

SECTION 2: Supply and Demand of Natural Gas in Mexico

The Mexican government adopted in the early 1990's a policy encouraging natural gas use thanks to its environmental qualities (clean combustion), its suitability for use in more efficient technologies such as combined cycle plants and the presence of relatively abundant gas sources. This energy policy seeks to promote a change in the pattern of use of industrial fuels through a reduction in the use of fuel oil and an increase in the use of natural gas. The policy consists of four main strategies (Sener, 1997):

1. Construction of the new combined cycle electric power plants.
2. Reconversion of several electric power plants, substituting the use of fuel oil with natural gas as the basic element.
3. Greater industrial use resulting from the environmental measures instituted in 1998.
4. Promoting greater use of natural gas in industry and households.

As a result of these policies, natural gas is a product with an enormous potential for utilization in Mexico. The program to substitute fuel oil with natural gas in power plants, investment plans for building new combined cycle plants that will use this product, and the environmental regulations that went into effect in 1998 for all industries, ensure a strong demand for natural gas in Mexico for the next years.

On the supply side, Mexico today has a considerable natural gas resource base. Approximately 190 Tcf of natural gas resources remain in Mexico, 30 Tcf of which are proved reserves (Pemex, 2003). Compared to the U.S. and Canada, Mexico is an immature gas region, but one with considerable up-side potential. Producing 1.5 Tcf per year, Mexico is thus considered as a "sleeping giant" with respect to gas production potential. Petróleos Mexicanos (PEMEX-the National Oil Company) maintains a monopoly on domestic gas exploration and production and a strong market power in transport systems (National Gas Pipelines System NGPS). Private companies have been allowed since 1995 to participate in downstream projects.

The Mexican Secretary of Energy publishes every year a study that analyses the future of the natural gas market for the following ten years. The most recent version for the period 2003-2012 (Sener, 2003b) considers six scenarios that combine three demand cases and two supply cases, as follows:

- E1. Base Demand - Average Supply (Reference case); E2. Base Demand - High Supply
- E3. High Demand - Average Supply; E4. Low Demand - Average Supply
- E5. High Demand - High Supply and E6. Low Demand - High Supply

Table 1 presents the results of the reference scenario (E1). This picture forecasts a growth in gas demand from 4,863 mmcf/d in 2002 to 9,389 mmcf/d in 2012 (average annual growth of 6.8%). Power generation will be the most dynamic and biggest consumer sector and its participation in total demand would rise from 31% to 45% in 2012. However, it is expected that the national supply will not be able to satisfy the whole consumption because of PEMEX's strong budgetary constraints limit the adequate development of gas fields. Therefore, imports would progress from 729 mmcf/d in 2002 to 2,566 mmcf/d in 2012. These imports vary from 2,044 mmcf/d under scenarios E4 and E6 to 3,040 mmcf/d under E3 in 2012 (Figure 1). It is worth to mention that all cases consider LNG imports to reach 500 mmcf/d in 2012 (15-25% of total imports), additionally to imports coming by pipeline from the US. In this context, four LNG terminal projects have received approval to be built in Mexico by the *Comisión Reguladora de Energía* (CRE-the Mexican Energy Regulatory Commission). Three of them would be installed in Baja California and the other one in Altamira, in the State of Tamaulipas. However, one of them to be developed by Marathon Oil Corp. has been called off in March 2004 after the State of Baja California seized land the company had planned to buy. Dependency on foreign supply will increase since the rate of imports/demand would reach 31% for E3 and 27% for the reference case in 2012. Showing another panorama, the scenario E6 considers exports to be higher than imports. These forecasts clearly underline the uncertainties as to whether the indigenous production can be increased sufficiently to satisfy rising demand and eventually to export gas to the US.

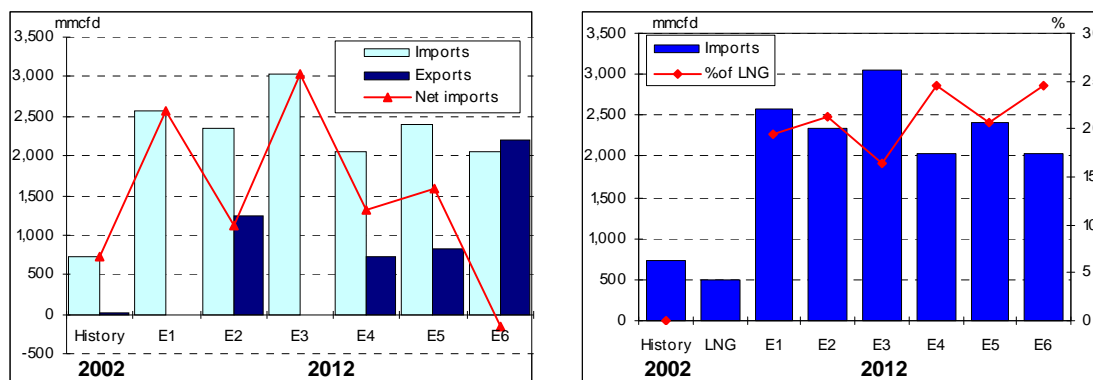
**Table 1 : Mexico's Natural Gas Supply and Demand 2002-2012:
Estimations of the Mexican Secretary of Energy (reference case).**

Millions of cubic feet daily (mmcf/d)	2002 ^a	2012	aag ¹ (%)
	History	Estimations	
Supply	4,863	9,389	6.8
National	4,134	6,823	5.1
Pemex's processing plants	2,916	4,292	
Direct from fields and others	1,218	2,531	
Imports	729	2,566	13.4
Demand	4,863	9,389	6.8
National	4854	9,389	6.8
Oil sector	1,994	2,683	3.3
Industrial sector	1,260	2,110	5.3
Power generation sector	1,505	4,180	10.8
Households and commercial	93	361	14.5
Transport	2	55	39.6
Exports	9	0	

1/ average annual growth.

Source: Sener (2003b).

**Figure 3 : Mexico's Natural Gas Imports and Exports 2002-2012
Net imports and participation of LNG.**



Source: Sener (2003b).

Natural gas market fundamentals in North America will depend on the evolution of prices and the methodology of pricing.

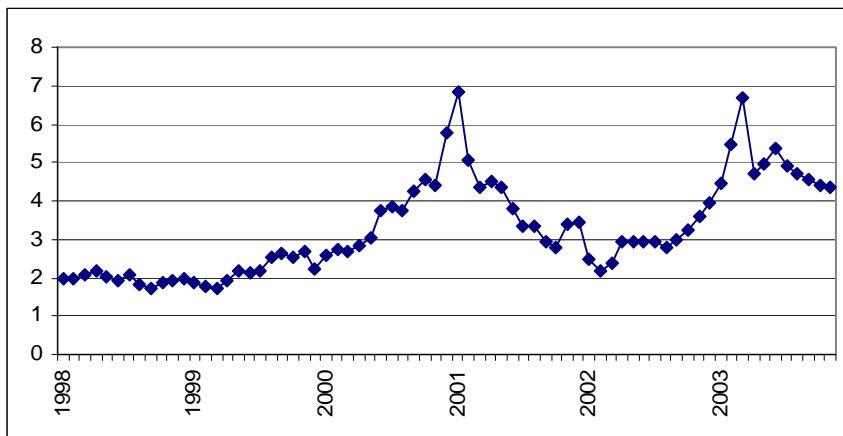
SECTION 3: LNG Facilities and Pricing Natural Gas in the United States

In the evolution of natural gas market, several elements have to be taken in account to analyse the role of LNG in the United States.

3.1 Domestic Natural Gas Prices and LNG Costs

In the US, domestic gas prices have doubled since the second half of the 1990s, the fear of a shortage is present. The amount of natural gas currently being stored for winter is behind historical levels, creating the possibility (depending on the weather) of another price spikes or even a supply shortage. High prices have forced some domestic petrochemical producers to shut down in the face of cheaper imports and many are considering offshore locations where gas is cheaper. Since the late summer of 2002, natural gas prices have risen steadily, peaking briefly in February 2003 at 19 MMBtu with the average price for 6.67 in 2003. This represents an increase of around 50% relative to prices in 2000. The market is still exceedingly tight in part because the storage build up in 2003 started from a very low base.

Figure 4 : U.S. Total Natural Gas Price (\$/MMBtu)



Source : EIA (2004a)

Thanks to technical innovations, costs along the LNG value chain have been reduced: they have fallen significantly over the past 20 years. For example, since 1983, tanker capacities have increased 16% and tanker construction costs have decreased of 32%. All the technological improvements have allowed a decrease of around 30%. More and more projects are becoming economically viable. LNG into the US becomes much cheaper than pipeline gas in the US. Natural gas can be economically produced and delivered to the US as LNG in a price range of about \$2.50 to \$3.50 per MMBtu (depending on shipping cost). As the distance over which natural gas must be transported increases, usage of LNG has economic advantages over usage of pipelines. For instance, importing LNG is more attractive economically than piping gas from Texas to New England.

The combination of natural gas prices, lower LNG costs, and the desire of gas producers to monetize their gas reserves is setting the stage for increased LNG trade in the years ahead.

3.2 Development of LNG Facilities

The discussion over LNG facilities is driven by 2 factors: society considerations and potential returns for investors. One major issue is to see how many terminals get really built to serve North America. According to EIA and firms it would be 4 more and not 20 as announced. It will be around \$ 100 billions of investments required over the next 10 years to deliver LNG in the US. In the meantime, supplies will remain tight and prices volatile.

1. The difference between the number of projects announced and the reality can be explained in part by the citizens' opposition. LNG has been safe for many years. However, local communities are against the construction of new LNG facilities. In the news, the explosion in Algeria frightened American community. The terrorist threat is still in people's mind: citizen fear that liquefied natural gas ship could be targets. The NIMBY (not in my back yard) position is still present and accentuated by terrorist threat.
2. If regulators are able to overcome public doubts, then the extents to which it will be used as a fuel source depends on the returns that producer earn. Will firms take the risk of building a large number of LNG terminals only for some of them to become uneconomic to run (if the price of gas drops or alternative cheaper sources of gas are available)? Apart from local opposition and federal regulatory approval, price and supply technical difficulties seem to be posing significant problems for some projects. Equally, securing financing will be crucial. Who will take the risk and how to finance such investments? Too little investment invites competitors to step in and reap potential profits. Too much investment, if it increases supplies and drives prices down, may make any particular investment unprofitable. It takes around \$3.5 to \$4.0 per MMBtu natural gas market price to support development of LNG assets. Current gas market prices exceed \$5 / MMBtu. Because the costs tied to LNG are high, it will take long term contracts to ensure that LNG facilities get built.

The first consequence is that in reality not so many LNG terminals are going to be built: some projects have been rejected by regulators, some local communities are opposed to some new LNG facilities, technical difficulties appeared, some project have been cancelled....It means that if authorities want to develop LNG part in the energy mix, they need to find other ways to obtain LNG. The possibility of obtaining LNG from borders countries is also possible as increasing the capacity of existing American facilities.

3.3 Global LNG Market

In the long term, the real question in our analysis is how much LNG is going to have an impact on natural gas market in the United States. In North America, it seems that in the comparison in unit cost, domestic gas has a higher price and it represents the majority of the supplies. LNG still makes up a small portion of the natural gas market in the US and competes with domestic supplies and pipelines imports. J. Gass, Chevron Texaco Global Gas President, *"Through 2020 on the way to replacing coal as world's second most important primary fuel, gas is expected to grow twice as fast as oil"*. According to him lower cost of LNG is *"the global enabler for natural gas"*. LNG can become a price maker. As soon as it will not be anymore a peaking fuel, and it will gain in importance in the total gas consumption in North America, LNG could become a price setter. The historical cost of producing natural gas in the US could be a lower limit below which prices cannot fall. The US will be competing for LNG supplies in the global market place as it does for crude oil, where the price may exceed the cost of production. The market price of such commodities is determined by the cost of production only where there is a surplus of supply and producers compete for sale. Some analysts are even asking if we are going to have a cartel in the US as we do in oil. Right now, the answer appears to be no.

The US is a central element in an emerging global LNG market which becomes inevitable. How will the global market look like? New producers and consumers are making LNG markets more diverse. In 1990, Japan represented 66% of world LNG imports, and now it is only 48% (EIA, 2002). In addition to expansions by current exporters, Egypt, Norway and Russia became exporters with their new liquefaction plants. Some LNG cargoes are now being redirected in mid ocean from one customer to another. The LNG market is driven by long term contracts but they have been growing increasingly flexible in recent years. Some newer long term contracts are designed to provide only a base supply of LNG which can be supplemented by short term contracts during periods of high demand. Contracts have loosened terms on both price and volume and can be negotiated for shorter term. Flexibility in shipping has also led to increase short term contracts.

Today most new contracts are FOB (free on board) since buyers see this giving them more control over the landed price and allowing them to trade surplus LNG cargoes. LNG prices are benchmarked to competing fuels. In the US, the competing fuel is pipeline natural gas, and the benchmark price is either a specified market in long term contracts or the Henry Hub price for short term sales. That is why in the US, LNG actors are exposed to a significant level of risk given the high level degree of price volatility. The situation is different in others areas in the world.

In North America, wholesale natural gas pricing is determined by Demand – Supply confrontation in Canada and in the United States whereas in Mexico it is regulated by the State and follows the evolution of its north neighbours.

SECTION 4: LNG Facilities and Pricing Natural Gas in Mexico

4.1 Methodology of Pricing Natural Gas

Since 1996, Pemex are able to charge a maximum regulated price for sales of domestic gas at the point of exit from any processing plants, or any other point or points determined by the purchaser. This first-hand sales price is set by a netback methodology that takes as its benchmark a South Texas price and adds costs of net transportation from this region to Ciudad Pemex, in the Southeast of Mexico, where most of the associated gas is produced (CRE, 1996)⁴. The methodology consists of three components:

1. The base price, to reflect the conditions for first-hand sales on the effective date of the establishment of the methodology.
2. The changes in the Houston Ship Channel, that reflect the international evolution of gas prices in a relevant market for Mexican gas; and provide appropriate liquidity and the development of financial hedging instruments, and
3. The change in transportation rates from the border to Ciudad Pemex-the current delivery point for most gas produced in Mexico- to reflect the evolving conditions of the transportation markets.

The formula for setting the maximum first-hand sales price (VPM_i) at Ciudad Pemex will be expressed in dollars per unit as defined below:

$$VPM_i = B_0 + (HSC_i - HSC_0) + (TP_i - TP_0)$$

Where:

VPM_i is the maximum first-hand sale price on month i;

B₀ is the base price of first-hand sales at Ciudad Pemex on March 1, 1996 as derived from PEMEX's methodology on that date;

HSC_i is the Houston Ship Channel index as reported in *Inside FERC's Gas Market Report* for month i;

HSC₀ is the Houston Ship Channel index for March 1996 as reported in *Inside FERC's Gas Market Report* of March 4, 1996. This value is equal to the average of the indices of Texas Eastern Transmission and Valero for March 1996, plus the historic price differential with respect to the Houston Ship Channel of seven cents of dollar/mmBTU.

TP_i is the PEMEX's net transportation rate from the border at Reynosa to Ciudad Pemex for period i;

TP₀ is the PEMEX's net transportation rate from the border at Reynosa to Ciudad Pemex for March 1, 1996.

In the netback methodology, the last point in the national PEMEX's transport system where imported gas is consumed, and where import⁵ and domestic flows and price coincide, is defined as the arbitration point (Los Ramones in Figure 2). The price of Mexican natural gas is therefore defined as the sum of the Texas benchmark price plus the transport cost from the border to the arbitration point less the transport cost from this point to Ciudad Pemex (Rosellón and Brito, 1997). The arbitration point moves as the balance between imports and domestic production of natural gas changes. This point moves north (south) as imports decrease (increase). In practice, due to administrative reasons, the arbitration point moves discretely (rather than continuously) every time there is a change in the commercial balance (Rosellón and Brito, 1997).

4.2 Impact on Prices of LNG Facilities

For this analysis, we suppose that the approach used by the current methodology of natural gas pricing will remain in the following years when proposed LNG facilities will start operations. It is also considered that these plants will be constructed in Baja California and Lázaro Cárdenas in the Pacific and Altamira in the Gulf of Mexico.

The formula of the methodology can however suffer modifications. According to the Directive on the Determination of Prices and Rates for Natural Gas Regulated Activities (CRE, 1996, pp. 11) changes to the methodology for calculating maximum first-hand sales price may be initiated by the CRE itself or at the request of Petróleos Mexicanos or the purchasers. Any modification to the formula for calculating the maximum first-hand sales price will require the CRE's approval and any change in the following will be considered to be a modification to the formula for first-hand sales:

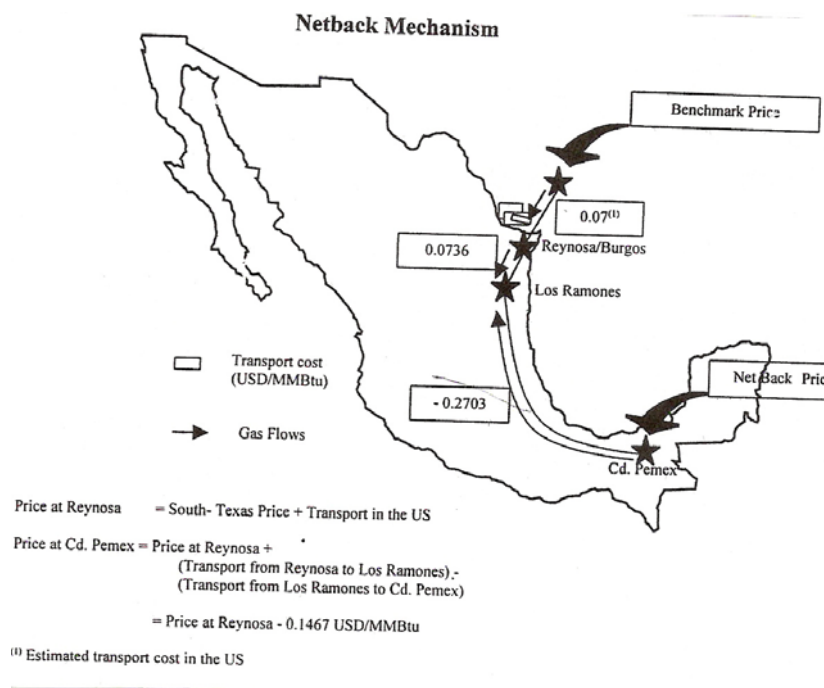
⁴ Imports of gas purchased directly by customers are not subject to the first-hand sales methodology.

⁵ Currently, the import flow in this concept includes domestic production from the Burgos Basin near to the US border.

1. Reference market (Houston Ship Channel);
2. Publication used for the reference prices (Gas Daily and Inside FERC's Gas Market Report);
3. Arbitration point of the system (Los Ramones);
4. Position of Mexico in the international gas market (net importer)
5. Methodology for calculating TP_i ;
6. Base values (B_0 , HSC_0 , and TP_0);
7. Route used to calculated TP_i (Reynosa-Ciudad Pemex), and
8. Other which the CRE deems significant.

We believe that the arrival of LNG in Mexico can induce changes in the arbitration point of the system and the position of Mexico in the international gas market.

Figure 2. Netback Mechanism in Mexico's Natural Gas Pricing Methodology.



Source: Rosellón and Brito (1997, pp. 4)

4.2.1 Arbitration Point of the System

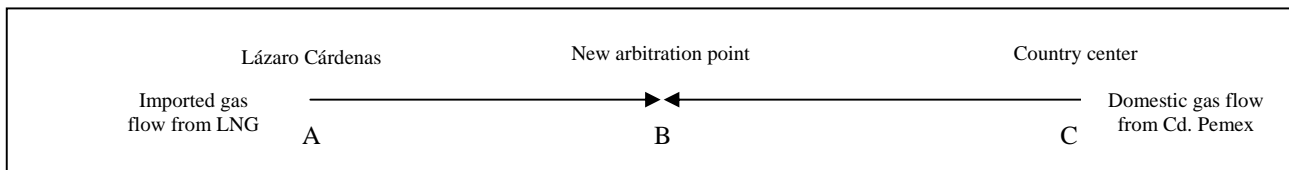
The current arbitration point employed in the formula was defined in Los Ramones 1996, since then no modification has been made. With a new imports/domestic production equilibrium, its current position has changed to the south between Poza Rica and Cempoala in the State of Veracruz. It seems that no changes have been made to the formula for this point because the main result would be an increase in prices and no consumer in the country (mainly industrials) are willing to pay higher prices.

LNG in Altamira and Lázaro Cárdenas can modify the balance between imports and domestic production of natural gas since the regasification plants will be interconnected in the middle to the National Gas Pipelines System⁶. LNG injected to the system from Altamira will move to the south the arbitration point. As a result, gas prices would grow because this point will be farther to Reynosa (transport costs added in the formula) and closer to Ciudad Pemex (transport costs subtracted). The gas from LNG in Lázaro Cárdenas will be injected to a local end-users and one of the edges of the NGPS. Therefore, a new arbitration point will be created in the NGPS due to the coincidence of imports of

⁶ The LNG system in Baja California is isolated from the NGPS and does not affect the position of the arbitration point.

LNG and domestic production (Figure 3). This point will be situated between Lázaro Cárdenas and the center of the country, depending on the volumes of LNG injected to the NGPS (more volume-farer from Lázaro Cárdenas). If the same reference market is maintained, the price in the new arbitration point will be equal to: Price at Ciudad Pemex + transport costs from Ciudad Pemex to the new arbitration point. The price of gas in Lázaro Cárdenas will reduce to: Price of new arbitration point – transport costs from the New arbitration point to Lázaro Cárdenas, against current prices that are the most expensive in the NGPS (Price Ciudad Pemex plus transport costs from Ciudad Pemex to Lázaro Cárdenas). In fact, all consumers situated between Lázaro Cárdenas (point A, Figure 3) and the new arbitration point (point B, Figure 3) will profit of lower prices of gas. This is the case for end-users acquiring directly gas from the NGPS (PEMEX) at the first-hand sales price or consumers purchasing imported gas directly to the LNG terminal that, in order to attract customers, should offer prices lower than the offered by the NGPS.

Figure 3. LNG Terminal in Lázaro Cárdenas and the New Arbitration Point.



4.2.2 Position of Mexico in the International Gas Market

Natural gas regasified in Baja California's Terminals will be used by local Mexican end-users and also for exporting to the US (most of them). This part of the country will be in an exporter position. Given the opportunity cost of the GNL in this zone, the new price of gas for consumers in Mexico can be: the reference price in California – transport cost from the reference market to the consumer position (position of net exporter). This price will be lower than the previous one since it was defined in a net importer position (transport cost was added). Current LNG proposed projects in Altamira and Lázaro Cárdenas will not create a position of net exporter in Mexico.

CONCLUSION

Natural gas market in North America (Canada, Mexico and United States) is changing. In the next few years, domestic production will not keep in with the consumption because of the expected growth of gas demand for electric power generation plants. The solution on the supply side seems to be LNG.

For United States, LNG would not be anymore just a peaking fuel but will be a more and more important part in the natural gas consumption. Several LNG facilities are planned to be built to answer to this new offer, but nobody is sure how many facilities would be built in reality. In the meantime, supplies remain tight and natural gas prices volatile. While there are some society oppositions, key issues in the development of LNG in the US include recent market changes that increase LNG flexibility, the decreasing LNG costs along the value chain, and the access to new markets with the diversity of LNG suppliers from all over the world. LNG could be an answer for the United States, but two main questions still remain: what would be the price of natural gas with the increase of LNG in the natural gas market and who would be the suppliers. Now, it can be more attractive economically to import LNG than buying from pipes in certain areas, for instance buying LNG from Baja California (Mexico) than from West Canada through long pipelines. With LNG costs decreasing and high volatile domestic natural gas, this energy becomes to compete successfully with domestic gas. LNG could be quickly a price maker as soon as it will be more used in the US.

A possible source of new LNG supplies for the US could be the Mexican coasts. Some projects are currently under evaluation in Baja California, Lazaro Cardenas and Altamira. These projects will be able to alleviate pressures not only on the US markets but also in the high demand market in Mexico. This additional supply will compete with domestic production undertaken completely by PEMEX, and it will represent new opportunities for reducing prices for consumers situated near to the regasification plants. The reinjection of LNG to the national transport system and the possibility of exporting LNG to the US will be a basic issue to be into account for maintaining current methodology of pricing or for adopting a new pricing approach convenient for all producers and consumers.

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