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Abstract

This paper discusses the main issues of the impact of the LNG development in the Northwestern Coast of Mexico on the regional prices of natural gas.

Resumen

El documento de trabajo discute los temas centrales del impacto del desarrollo del Gas Natural Licuado (GNL) en la costa Noroeste de México sobre los precios regionales del gas natural.

Introduction

Canada, Mexico and the United States recognize that they have important interrelationships in the natural gas sector. Based on data from the three countries' energy ministries, natural gas demand in North America will continue to increase significantly. The maturity of conventional natural gas supply areas and sources in the United States and Canada, and the lack of capital to develop gas supplies in Mexico, will mean that increasing supply to meet this North American demand growth will be challenging. The United States are progressively feeling upward gas price pressure with an increasing number of projected natural gas-fired electricity generation capacity, 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. This will also create a significant opportunity for unconventional gas supplies and sources, such as gas from shale, from Alaska and Arctic Canada, and via 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. Records levels have been noticed for 2004 in terms of US LNG imports with 22% increase (EIA, 2004). The Liquefied Natural Gas (LNG) is supposed to induce major changes in the North American gas market.

LNG would not be anymore just a peaking fuel but could be a more and more important part in the natural gas consumption. CERA notices "*The incoming tide of LNG in the North American market*". There are at least two dozen proposals to build new LNG terminals in North America over the next several years. Many see the expansion of US LNG imports as a means to lessen US dependence on foreign oil and welcome expansion plans, while other groups oppose any new LNG import terminal developments, citing potential threats by terror groups and environmental disruption. The industry has expressed concern that companies active in the market are running the risk of overbuilding import terminal capacity - creating a potential oversupply in the market that will depress gas prices and impede operating profitability. While there are some society oppositions, key issues in the development of this new natural gas supply 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 natural gas suppliers from all over the world. According to some analysts, a new more flexible natural gas market could appear with more links between regions thanks to LNG development. The role of LNG is usually misunderstood…

This paper focuses on the possible impacts of development of LNG on natural gas prices on both side of the US Mexico border. In California, gas prices are high and the demand is expected to grow. Several projects of LNG facilities have been proposed and have to cope with public opinions against them. In Mexico, some LNG projects are under development or revision in order to complete the domestic gas production, given the rising demand forecasted for the next years. The Mexican Energy Regulatory Commission (CRE) has approved the construction of five LNG terminal projects in Mexico: four of them would be built in Baja California. However, one of the projects, to be developed by Marathon Oil Corp., was rescinded in March 2004 after the State of Baja California seized the land.

The US Mexico border in California is a good example to study the impact of LNG supply on regional prices of natural gas. This paper is divided in two parts:

- Section 1 presents the opportunities for LNG in the California with the natural gas market in this state.
- Section 2 shows the fundamentals of the natural gas market and the LNG developments in Mexico and Baja California.

SECTION 1: Natural Gas and LNG Markets in California

During the 1980s and 1990s, North American natural gas supply exceeded demand and, as a result, prices were stable and low. Today, the situation is different. Natural gas imported to California from the Western states and Canada is more expensive. California's large and increasing demand for natural gas and its dependence on interstate pipelines for imported sources of natural gas supply has been the subject of broad public policy debate. The California Energy Commission is concerned about the impact of recent increases in natural gas prices, which in 2004 were double what they were in 2002 and earlier years, upon consumers and the state's economy. This section will focus on the state of California[i] with the natural gas market fundamentals, LNG projects and an analysis of prices.

1.1. Natural Gas Market Fundamentals

The California's energy system is characterised by two fuels: petroleum and natural gas. In 2004, the state produced about 16% of the natural gas it used, 42% of the petroleum and 81% of the electricity (Table 1). California is the second state in the use of energy after Texas.

Table 1: California's energy sources and consumption in 2004

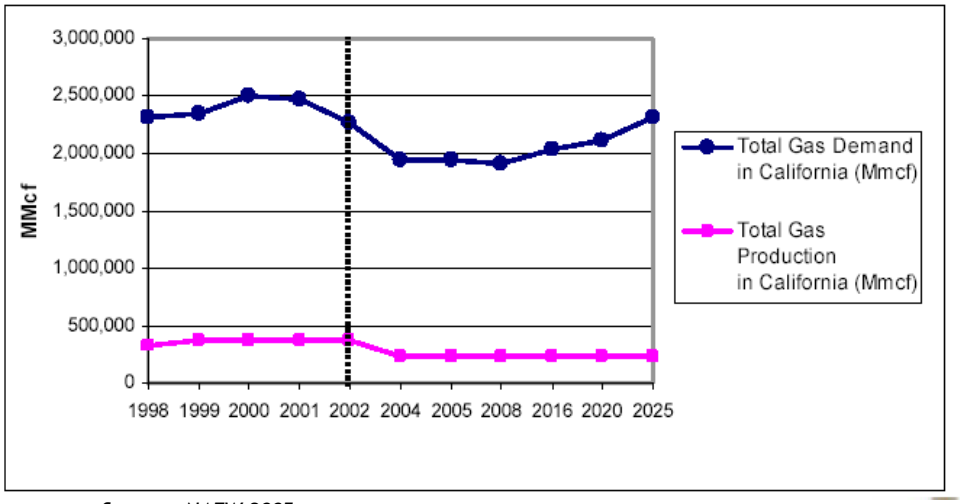
	In state	Others	Consumption
Petroleum	41.9%	Alaska: 21.68% Foreign:36.42	654 847 T o barels
Electricity	80.92% *(41.9% from gas)*	Imports :9.08%	264 740 GWh in 2003
Natural gas	15.5%	Canada:24.0% Rockies:24.3% Southwest:36.2%	7 047 MMcf

Source: California Energy Commission (2005)

In 2004, the gas demand in California was around 2,5 mil MMCf with an in state production of 0.5 mil MMcf: 85% of natural gas consumed in California is imported. During the next two decades, natural gas is expected to play a key role in California's energy system (Figure 1). Around 42% of the electricity produced in state is from gas and it is projected to rise. Natural gas-fired power plants are preferred, because they emit less air pollution and are more cost effective compared to other fossil-fuelled generation technology (lower capital and operating costs). The state has environmental objectives that could be reached thanks to natural gas. Public debates are numerous in California where public concerns on environment protection are important.

Even if the population is growing[ii], total residential natural gas consumption, however, has remained relatively flat at about 500 bcf per year.

The average household's natural gas consumption (most new homes and buildings have air conditioning and natural gas heating) is less than half of what it was thirty-five years ago even with our state's larger homes and more natural gas appliances. California's residential consumers use approximately one-third less natural gas per customer annually than is used by residential customers, nationwide. The natural gas demand is increasing thanks to the two biggest consumers of natural gas which are electricity generators (33%) and industrial use (32%).

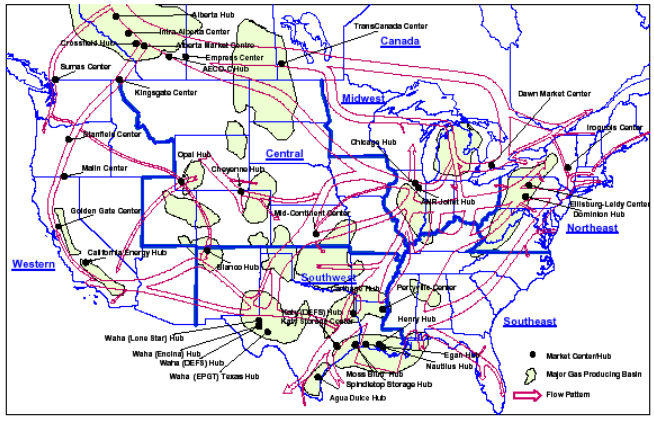


Source : NAEW 2005

Figure 1 : Natural gas demand and in state production from 1998 to 2025

The authorities are worried about the dependence of California on natural gas and are focusing on improving the situation. California is not the only state with an increasing demand: the demand of its neighbours impact the delivery capacity to California. At the same time, this state appeared to be at the end of pipelines networks. In the last decade, three new interstate gas pipelines were built to serve California (expanding the over one million miles of existing pipelines connecting the state with gas-producing areas) (Figure 2).

Figure 1. Natural Gas Centers/Hubs in Relation to Production Basins and Major Flow Corridors



Note: DEFS = Duke Energy Field Services Co; EPGT = EPGT Texas Pipeline Co.
Source: Energy Information Administration, GasTran Gas Transportation Information System, Natural Gas Market Hubs Database, as of August 2003.

Figure 2: California existing natural gas pipelines and natural gas centers/hubs in relation to production basins and major flow corridors.

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 natural gas importers. The tight natural gas supply situation impacts prices. With 85% of its consumption imported, the state is looking at prices that are higher than before. North American market interrelation has not helped to reduce the price volatility that has emerged since the mid-nineties. This volatility, caused by a tightening between supply and demand, has seen prices surge to as high as $ 10 per MMBtu and fall back to below $ 2 per MMBtu. Wholesale natural gas prices in California have doubled since 2002 and have at times been as much as four times the national average (Figures 3 and 4).

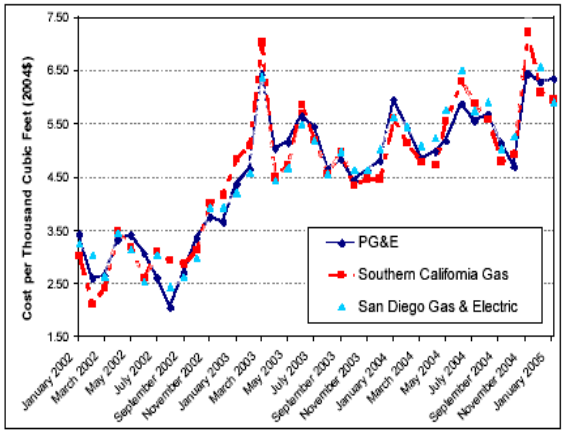


Figure 3: California's natural gas prices 2002 -2004

Sources: PG&E, Southern California Gas Cy, and San Diego Gas &Electric

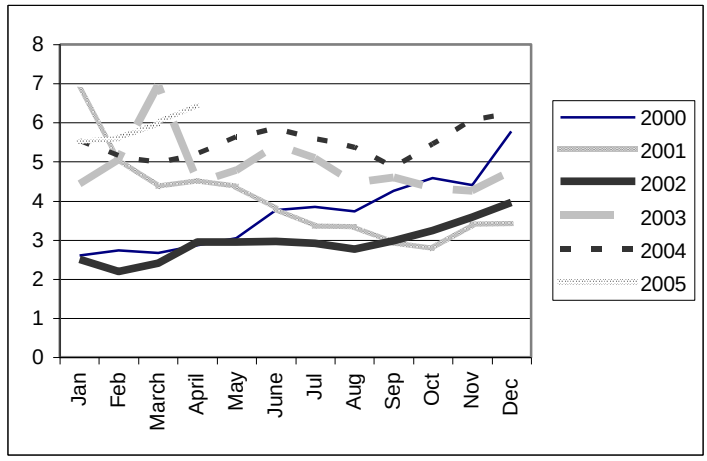


Figure 4: U.S. Natural Gas Wellhead Price (Dollars per Thousand Cubic Feet) 2000-2005

Source : EIA 2005

In 2003, the *Energy Report* established five options so that the existing energy demand and the future one can be satisfied.

1. Energy efficiency strategies
2. Displace natural gas-fired power plants with renewable energy
3. Deploy small-scale, "distributed" generation
4. Increase domestic supplies of natural gas from unconventional and remote sources
5. Import natural gas supplies from overseas

One of the options is to develop natural gas supplies. With a tight market, volatility and high prices, news sources of natural gas could be a solution. With the decrease of LNG costs along the value chain, importations of LNG could help to meet the demand. In the Integrated Energy Policy Report, LNG is recognized as a potential supply source to California and to serve the energy needs.

1.2. LNG in California

Historically, LNG imports represented a small amount of natural gas imports in the US about 1%. LNG imports more than doubled in 2003 from the prior year and now represent 3% of the total gas imports (NAEW 2005). The possibility that LNG might play an important role in meeting US energy needs has arisen only recently. Three year ago, in its Annual Energy Outlook 2002, the EIA indicated that LNG imports were "*not expected to become a major source of US. energy supply*".

The Californian natural gas demand by residential is relatively flat, due to the success of energy conservation programs. The demand is expected to rise especially because of the electricity generation. The state is really dependant on natural gas with 85% of its consumption imported. Authorities are looking at different ways of diversifying their supplies. The real driver, however, is price. An LNG terminal would allow the state to import foreign gas to compete with high-priced domestic gas. The most economic way to transport natural gas over long distances that can not be served by a pipeline is in liquid form. California has an interest in South America and in Mexico which are one of its closest sources. If these countries could provide LNG it would be a cost competitive supplier. A ship from Oman will take 25 days to come to California, 18 days from Australia, 16-17 days from Malaysia and Indonesia, 11 days from Russia and 5 days from Alaska (one way at 18.5 knot ship speed). The costs of LNG depend on projects and differ from countries to countries.

Currently, there are no LNG facilities on the Pacific Coast of the US. The early PacIndonesia project that was supposed to deliver LNG from Indonesia to California in 1980 was cancelled for several reasons, one of which was powerful popular resistance. Thus, many of the new West Coast LNG proposals are based on deliveries into Baja California and transmission across the US Mexico border by pipeline (see next section). Three LNG import terminals are proposed for the California coast (one in Long Beach and two off the coast of Oxnard) and one close to Oregon (Table 2).

Table 2: LNG projects proposals in California

Name	Location	Status
Long Beach LNG Facility *Sound Energy Solutions*	Port of Long Beach	*Joint EIS /EIR by FERC & Port of Long beach*
Cabrillo Deepwater Port *BHP Billiton*	12 miles off shore of Ventura County -Oxnard	*Joint EIS /EIR by Coast Guard & State Lands Commission*
Crystal Clearwater Port *Crystal Energy LLC*	11 miles off shore of Ventura County - Oxnard	*Filled application with Coast Guard & State Lands Commission*
Samoa Point Energy Center *Calpine Energy*	Humboldt Bay	*Project announced*

Source: FERC (2005)

The projects in Baja California are getting serious scrutiny. Developers of these projects must face a number of hurdles, ranging from funding for project investment to technological advances to development of appropriate policy and regulatory regimes and coordination for new transportation corridors. Developments upstream appear to be the key point in the development of LNG. At the same time, there is strong public opposition to new pipeline projects that cross through states. The NIMBY (not in my back yard) position is still present and accentuated by terrorist threat: citizen fear

that liquefied natural gas ship could be targets. Terminals in Baja California would be of great interest for the state. It would increase the source of supplies and it would reduce risks of supply disruptions for this area. Nevertheless, concerned people in Vallejo and Tijuana have already rejected attempts to site LNG terminals in their neighborhood. There are also concerns regarding FERC certificate delays. In addition, necessary infrastructure enhancements downstream to LNG terminals will be needed which are likely to raise landowner and cost allocation issues. Will firms take the risk of building a large number of LNG terminals only for some of them to become uneconomic to run? LNG facilities still represent important capital investments. While developing new pipeline capacity in these markets is more and more difficult, the decline in delivered LNG costs makes LNG an attractive, cost competitive in those gas consuming markets. The question is until which point it will be attractive.

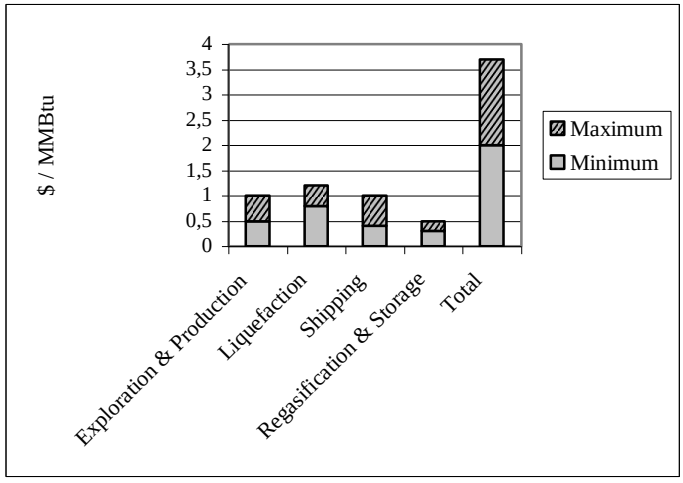
1.3 Analysis of prices

The future of LNG imports in California on different elements. The firsts are prices 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 form closed countries are preferable.

Thanks to technical innovations, costs along the LNG value chain have been reduced: they have fallen significantly over the past 20 years. All the technological improvements have allowed a decrease of around 30%. More and more projects are becoming economically viable.

In 2003, the cost of liquefaction, shipping and regasification push the cost of LNG between $2.75 and $4.00 per MBtu. There are very large disparities in individual costs among projects: costs differ a lot depending on projects and countries.

About 3.00 to $4.00 per MMBtu depending on the costs of natural gas liquefaction, transportation and regasification (Figure 5). Natural gas can be economically produced and delivered to the US as LNG in a price range of about $3.00 to $4.00 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. The total cost of LNG production has been quite streamlined and reduced thanks to competition and technological progress. According to the IELE, the LNG value chain "*incorporate now technology improvements for costs reductions and economies of scale, as well as enhancements and protections for health, safety and the environment*".



Source: IELE (2004)

Figure 5 : LNG Value Chain

SECTION 2: Natural Gas and LNG Markets in Mexico

2.1. Prospects of the Mexican Market and LNG Role

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. As a result, the program to substitute fuel oil with natural gas in power plants, investment plans for building new combined cycle plants, and the environmental regulations that went into effect in 1998 for all industries, ensure a strong demand for this hydrocarbon in Mexico for the next years.

On the supply side, approximately 64 Tcf of natural gas resources remain in Mexico, 15 Tcf of which are proved reserves (Pemex, 2004). Producing 1.6 Tcf per year, 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 2004-2013 (Sener, 2004a) 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 3 presents the results of the reference scenario (E1). This picture forecasts a growth in gas demand from 5,309 mmcfd in 2003 to 9,303 mmcfd in 2013 (average annual growth of 5.8%). Power generation will be the most dynamic and biggest consumer sector and its participation in total demand would rise from 34% to 51% in 2013. 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 983 mmcfd in 2003 to 3,784 mmcfd in 2013. These imports vary from 2,045 mmcfd under the scenario E6 to 4,076 mmcfd under E3 in 2013 (Figure 6). LNG imports are considered in 2013 from 555 mmcfd (E4 and E6) to 814 mmcfd (E1 and E2) (15-25% of total imports), additionally to imports coming by pipeline from the US.

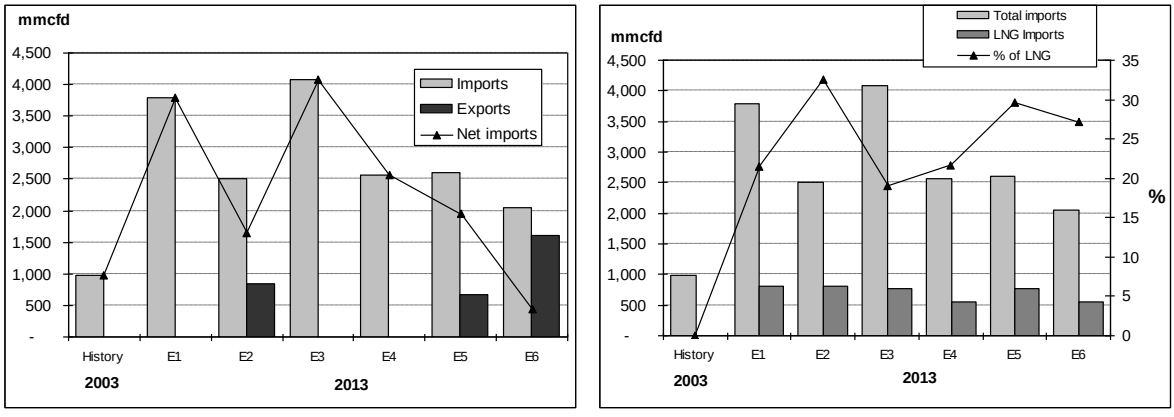
Five LNG terminal projects have received approval to be built in Mexico by the *Comisión Reguladora de Energía* (CRE-the Mexican Energy Regulatory Commission). Four of them would be installed in Baja California, other one in Altamira, in the State of Tamaulipas (Table 4). However, one of them to be developed by Marathon Oil Corp. (*Gas Natural Baja California*) has been called off in March 2004 after the State of Baja California seized land the company had planned to buy. Additionally, two proposals respectively in Manzanillo and Lázaro Cárdenas (central-pacific area of the country) are under revision by the CRE. For LNG imports to 2013, Sener´s study (2004a) only considers the Altamira LNG Project because Terminal de LNG de Altamira and the Federal Electricity Commission (CFE) have already signed a long term supply contract. The other three proposals are still negotiating a supply contract.

Dependency on foreign supply will increase since the rate of imports/demand would reach 42% for E3 and 41% for the reference case in 2013. Showing another panorama, the scenario E6 considers exports to be 1,613 mmcfd and imports 2,045 mmcfd (Figure 6). 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 3: Mexico's Natural Gas Supply and Demand 2003-2013: Estimations of the Mexican Secretary of Energy (reference case)

Millions of cubic feet daily (mmcfd)	2003 [a] History	2013 Estimations	aag [1] (%)
Supply	**5309**	**9303**	**5.8**
National	***4326***	***5519***	***2.5***
Pemex's processing plants	3029	3393	1.1
Direct from fields and others	1297	2126	3.0
Imports	***983***	***3784***	***14.4***
Demand	**5309**	**9303**	**5.8**
National	***5309***	***9303***	***5.8***
Oil sector	2141	2294	1.7
Industrial sector	1208	1970	5.0
Power generation sector	1819	4705	10.0
Households and commercial	139	280	10.5
Transport	2	54	37.3
Exports	***0***	***0***	

1/ average annual growth.
Source: Sener (2004a).



Source: Sener (2004a).

Figure 6: Mexico's Natural Gas Imports and Exports 2003-2013 Net imports and participation of LNG.

Table 4: LNG permits granted by the CRE

Company	Localization	Capacity (mmcfd)	Starting date	Investment (mmUS$)
Gas Natural Baja California[1]	Tijuana, Baja California	750	2007	558.5
Terminal de LNG de Altamira	Altamira, Tamaulipas	670	2006	440.0
Terminal de LNG de Baja California	Ensenada, Baja California	1000	2007	747.0
Energía Costa Azul	Ensenada, Baja California	1000	2007	668.6
ChevronTexaco de México	Puerto Coronado, Baja California	1000	2008	715.0

1/ the permit are still valid, but the project has been called off in March 2004.
Source: www.cre.gob.mx.

2.2. Baja California: Gas Supply and Demand, Import Points and Gas Power Plants

The States of Baja California Sur, Sinaloa, Sonora and Baja California compose the Northwest region, but natural gas is supplied and commercialized only in the two last ones. Gas consumption has rapidly grown in the last years from 5 mmcfd in 1993 to 250 mmcfd in 2003 (annual growth of 48%), which represents today about 5% of the national figures (Table 5). The power generation sector has mostly contributed to this evolution by rising from 7 mmcfd in 1999 to 233 mmcfd four years later (most of 90% of regional production).

Table 5: Northwest Mexico's Natural Gas Supply and Demand 1993-2013: Estimations of the Mexican Secretary of Energy (reference case).

Millions of cubic feet daily (mmcfd)	1993	1999	2003	2013	aag [1]	aag [1] (%)
	History			Estimations	1993-2003	2003-2013
Supply	**5**	**23**	**250**	**693**	**48.0**	**10.7**
Regional Production	***0***	***0***	***0***	***0***	---	---
Imports	***5***	***23***	***250***	***693***	***48.0***	***10.7***
Power generation	0	7	141	439	---	12.0
Others	*5*	*16*	*109*	*254*	***36.0***	***9.0***
LNG	0	0	0	0	---	---
Demand						
Regional	***5***	***23***	***250***	***693***	***48.0***	***10.7***
Oil sector	0	0	1	2	---	10.3
Industrial sector	4	15	15	29	13.7	6.7
Power generation	0	7	233	658	---	11.0
Households and com.	1	1	2	3	4.4	6.3
Transport	0	0	0	0	---	---
Exports	***0***	***0***	***0***	***0***	---	---

1/ average annual growth.
Source: Sener (2004a).

Concerning supply, all demand is satisfied by US imports since there is neither production in the zone nor pipelines from the south of the country. These imports are carried by means of six crossing-border pipelines (Table 6).

According to Secretary of Energy's projections (Sener, 2004a), gas demand in the zone will continue to grow with an annual rate of 10.7% to reach 693 mmcfd in 2013. The installation of 3,245 MW of gas fired combined cycle power plants will be responsible of the increase. Near of 450 mmcfd of additional imported gas will thus be required from 2003 to 2013.

Table 6. Northwest Mexico's Natural Gas Import Points and Consumers in 2003 (mmcfd)

Imports points		Import consumers			
		Electric Generation Plants [2]	Pemex Gas	Others	Total
Tijuana, BC	Capacity [1]				300.0
	Imports	0	0	0	0
Mexicali, BC	Capacity [1]				29.0
	Imports	0	0	7.7	7.7
Los Algodones, BC	Capacity [1]				500.0
	Imports	95.3	20.8	52.2	168.3
Naco, Sonora	Capacity [1]				130.0
	Imports	32.0	19.1	0	51.1
Naco-Agua Prieta, Sonora	Capacity [1]				215.0
	Imports	14.2	0	0	14.2
Agua Prieta, Sonora	Capacity [1]				85
	Imports	0	0	9.0	9.0
Total	Capacity [1]				1259.0
	Imports	141.5	39.9	68.9	250.3

1/ Maximal capacity.
2/ It includes the Federal Electricity Commission (CFE) and Independent Power Producers.
Source: the authors with data of Sener (2004a).

Concluding Remarks

The development of the gas resources within North America will be a lengthy process that will require the discovery of new gas fields, and the more efficiently exploitation of the already existing fields. The development of new large pipeline systems will naturally come associated with this process. Such a process will mature over many years. In the meantime, the timely construction of LNG infrastructure will be vital. LNG will thus have a very important role in the natural gas supply all over North America.

In 2004 LNG imports from the US were 1.8 mmmcfd, and they are forecasted to increase to around 7 mmmcfd by 2010. The increase of LNG imports is foreseen as so important, that by 2012 such imports will be higher than pipeline imports from Canada.[iii] These calculations are carried out under the assumption of gas imports from Baja California that --in turn-- originate from LNG imports into the Baja peninsula.

General natural gas price formation in the United States is very much linked to an interval whose boundaries are determined by low-sulfur heavy fuel oil and heating oil.[iv] The price differential between these two liquid fuels has increased, which implies that the price interval for natural gas has widened implying more uncertainty and price volatility. This is a crucial element to understand forward prices for the 2005 winter of around USD8 per mmbtu. In the longer run, marginal supply sources (such as LNG) establish a floor for the price of pipeline gas.

Price formation for LNG imports into the U.S. is basically determined by short run conditions. More specifically, LNG prices are linked to internal pipeline gas prices such as the ones in Henry Hub. Primarily, the U.S. market is characterized by non regulated gas-to-gas competition, as opposed to other gas regions in the world (e.g., Europe) where gas competes with oil and substitute fuels in a long-run framework. So, for example, the LNG price in Lake Charles, Louisiana (one of the most important LNG terminals), is highly correlated to the price at Henry Hub.[v]

Growing LNG imports are going to have an impact on natural prices in the area. Most likely, LNG will have an impact on natural gas prices in California because it will be part of the energy mix: natural gas supply will increase, therefore, prices should decrease. Its influence on price will be more determined by how many suppliers will effectively compete and how quick they will be able to supply. However, LNG will not be able to put prices at its level of costs. It will stay a “price taker” and it will not become a “price maker”. To have an influence on natural prices, LNG should present costs below prices level and be able to down prices to its costs level. As describe by Jensen (2004), many misunderstanding on LNG impacts are linked to the difference between “netback pricing” and “cost of services” pricing. LNG will

moderate gas prices but it is likely to retain its netback pricing. LNG suppliers operate with the idea that it is the US price level that will determine their netbacks (not that their costs will determine the US price level). Jensen emphasized that in the past American congress recognized the difficulty of trying to apply cost-of-service regulation to individual producers with very different costs when their product was an interchangeable commodity in the marketplace. The possible development of LNG supplies in the US corresponds to the same situation.

At the same time, LNG supplies in California could have an influence on basis differentials in the natural gas market in the US. The current price reference point used for trading is at Henry Hub. Prices at the end of pipeline networks are among the highest. Now the impact of LNG is also going to depend on transportation costs…The global price arbitrage system should evolve if LNG facilities are built in Baja California.

In Mexico, the LNG price contracts that CFE has agreed on have as a reference the internal prices in the U.S. While the LNG price in Altamira project (in the North east of Mexico) is linked to Henry Hub, the LNG price in Baja California is determined by the Southern California Border Average (Socal). In 2004, the price in Altamira was USD0.36 per mmbtu higher than the Baja California price. However, as Lajous (2005) argues, the arranged contract LNG prices seems odd. CFE agreed to pay the Henry Hub price plus USD0.17 in Altamira, and Socal less USD0.03 in Ensenada. In the first case, there is not a sound argument to pay a higher price to the Lake Charles one (very similar to Henry Hub), while in the second case it appears to be too high.

Apparently, CFE arranged LNG contract prices for what it would pay for pipeline gas imports. However, in the specific case of Ensenada, Baja California, the LNG contract price is higher to the gas price associated with bringing gas all the way from Texas to the California-Arizona borderline. This means, that CFE is ceding (artificial) rents to LNG companies. From an analytical point of view, this CFE policy is inconsistent with an efficient result derived from nodal price theory applied to natural gas regulation (Brito and Rosellón 2002, 2005). The new LNG supply sources should be considered as simply new supply nodes in a netback system. Pricing of LNG should be determined following the natural gas opportunity cost (netback rule) and reflect as well congestion in gas distribution. However, the CFE contracts seem to be generating additional rents with adverse distributional effects.

The entrance of LNG into the Mexican natural gas network (in both the Gulf of Mexico, and the Pacific Ocean) will then increase the number or arbitrage points as well as their location. This will of course imply a more complex price system. However, this should not represent a major problem to Mexican gas regulators since similar programs are devised in other infrastructure areas rather easily, even for much more complex industries such as the electricity industry. The adequate design of a price program in

accordance to nodal price theory would provide an efficient reference for gas trading and contracting, both in the natural gas and electricity sectors. Likewise, the regulator should develop programs that evaluate the impacts on welfare and pricing of the location, dimension, ownership and sequencing in the construction of LNG terminals.

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[i] We do not present the situation of the US market; we focus on the Californian situation.
[ii] Since 1967 the number of households in California has nearly doubled from 5 million to more than 9 million.
[iii] Lajous (2005).
[iv] Lajous (2005)
[v] In 2004, the average import price of pipeline gas in the U.S. was USD5.81 per mmmbtu, while the import LNG price was USD5.82, and the one registered at Henry Hub was USD 5.85. (Lajous, 2005).