

Natural gas market outlook  
2003-2012

Ministry of Energy

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# Presentation

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Natural gas grows in importance every day. To guarantee the efficient and competitive supply of natural gas has become one top-priority challenge within the energy sector. Its demand is growing and the country's production is insufficient. For this reason, the fundamental strategy should be to increase the available natural gas supply in the country, primarily by means of the appropriate use of our reserves; as well as in import diversification.

Although the productive efforts to increase the production of natural gas have been important, the resources historically assigned to the development of these projects were limited regarding the enormous investment necessities. It is for this reason that Mexico still continues registering an important deficit between natural gas production and consumption.

During 2002, important increments were registered in investments for the exploration and development of new projects aimed to satisfy the current and future demand. The Mexican government's effort will continue to be headed in that direction, without lessening the development of new trade schemes, inside the legal framework, that would increase *Petróleos Mexicanos'* execution capability.

An appropriate supply system is a fundamental part for an efficient natural gas industry. As it is established in the *Plan Nacional de Desarrollo 2001-2006* (National Development Plan), the possibilities of private investment have been enlarged regarding infrastructure, and the execution of natural gas interconnection projects have been promoted.

Energy policies to assure natural gas supply in the country will include the diversification of supply sources in order not to depend upon a single offerer. Based on this consideration, we perceive that our country has an enormous development potential regarding Liquefied Natural

Gas (LNG) projects, especially in the Pacific Coast area. This market segment offers important investment opportunities. Furthermore, it is important to boost at the same time the enlargement of the National Pipeline System's infrastructure.

The Natural Gas Market Outlook 2003-2012 offers the most updated information regarding the natural gas industry's situation, the expected evolution of its supply and demand for the next 10 years; as well as business opportunities in the market.

This information is intended to contribute to a better decision making process which efficiently responds to quick industry transformations and, to carefully specify the strategies and public policies that will allow the Mexican government to fulfill its main assignment: to meet the energy demand in Mexico in a competitive and efficient manner.

*Felipe Calderón Hinojosa*

Ministry of Energy

# Introduction

The Ministry of Energy publishes an annual prospective study of the natural gas market, which describes and analyzes the country's needs related to this industry for the following 10 years.

The Natural Gas Market Outlook 2003-2012 contains the most updated information about the future evolution of this fuel's national and regional demands, the existent and expected production capacity, available transport and distribution infrastructure, and the expansion, rehabilitation, modernization, substitution and capacity interconnection needs, among other aspects.

First, this study contemplates natural gas demand in a regional and sectorial scale based on the estimated growth in the economy for the following 10 years; as well as a supply analysis.

On the supply side, the production scenario labeled as adjusted average aligned with risk was elaborated, and a high production exercise in which the gas sector could become a driver of economic development. Both include the application of the Multiple Services Contracts (CSM).

Finally, to complement and to facilitate the understanding of this document an statistical annex is presented. This annex includes several supply and demand historical statistic tables, historic reserve tables; as well as Mexican natural gas infrastructure maps.

# Natural Gas Demand and Supply 2003-2012

During 2003-2012, the growth of the Mexican natural gas market will be one of the most dynamic markets compared with other fuels<sup>1</sup>, with an estimated annual growth rate in its demand of 6.8 percent.

Given this scenario, in order to meet the domestic natural gas market requirements, new strategies have been designed to support the development of its supply. The main goal is to make the best use of this hydrocarbon reserve, enlarge and optimize the use of the production infrastructure; as well as to acquire new capacities with a state-of-the-art technological base.

This chapter analyses the future demand of natural gas, both sectorial and regional, defined by a base scenario which considers an average annual growth rate for the national economy of 4.7 percent for the 2002-2012 period.

A medium risk-adjusted supply scenario is presented. This scenario implies reaching a dry gas production level of 6,822.5 mmcf in 2012. In order to reach this objective, it is necessary to guarantee investment resources and to be successful in exploratory works. At the end of the chapter, five alternative balances are annexed and show the result of the combination of high and low demand scenarios and of high and medium supply scenarios previously mentioned.

## 1 Natural Gas Demand Analysis

In the next 10 years, the national demand of natural gas is expected to reach an average annual growth rate of 6.8 percent, from 4,855 mmcf in 2002 to 9,389 mmcf in 2012. Without the oil sector's demand, the

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<sup>1</sup> The electricity demand for the same period is calculated in 5.6 percent annually, diesel in 3.8 percent annually, gasoline in 3.3 percent annually, and liquefied petroleum gas in 1.6 percent annually.

increase is calculated in 8.9 percent.<sup>2</sup> These results show differences compared with last year's Outlook due to the downward revision in nominal terms of GDP growth in various macroeconomic scenarios. As a result, natural gas demand dynamics decreased in almost all consumption sectors along the planned horizon, with the exception of the oil sector.

The evolution of the world economy in 2002 was one of the factors that modified GDP growth forecasts in Mexico. Nevertheless, total natural gas demand will increase nearly 93.4 percent during the period of analysis. The electric sector maintains the biggest growth within the market absorbing almost two thirds of total consumption in 2012 compared with a participation of 52.6 percent in 2002, without considering the oil sector. Therefore, the electric sector requirements will grow up to 4,180 mmcf in 2012 with an annual growth rate of 10.8 percent (Table 1).

The introduction of natural gas in the residential and services sectors has been slower than expected due to the difficulties which distributors have faced to fulfil their duct installation programs. This explains why the estimates of these sectors are lower compared to the forecasts of the 2002-2011 Outlook. It is expected that their consumption will reach 361 mmcf in 2012. Together these sectors will have a participation of 5.4 percent in the last year of analysis.

The transport sector represents a very weak market with several factors that have limited its development. In 2002 its consumption was of 1.9 mmcf, which will increase to 54 mmcf in the year 2012. Consequently, its market presence during the same year will be 1 percent approximately.

The South-southeast region will be the largest natural gas consumer with a volume in 2012 of 3,820 mmcf which represents 40.7 percent of national consumption. This mainly follows the concentration of the

Table 1  
Natural Gas Demand by Sector, 2002-2012  
(million cubic feet per day)

Sector	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	aagr
Total	4,855	5,365	6,234	6,577	7,312	7,647	8,086	8,306	8,544	9,030	9,389	6.8
Oil	1,994	2,198	2,471	2,641	2,841	2,897	2,959	2,885	2,764	2,716	2,684	3.0
Self-consumption <sup>1</sup>	995	1,078	1,222	1,271	1,386	1,378	1,444	1,425	1,377	1,377	1,379	3.3
Gas lift	999	1,120	1,249	1,370	1,455	1,519	1,515	1,460	1,386	1,339	1,304	2.7
Demand without Pemex	2,860	3,167	3,763	3,936	4,471	4,749	5,127	5,420	5,780	6,314	6,705	8.9
Industrial	1,260	1,196	1,234	1,378	1,564	1,656	1,754	1,836	1,931	2,019	2,110	5.3
Pemex Petroquímica	295	290	279	321	383	400	400	400	400	400	400	3.1
Others	965	906	955	1,057	1,181	1,256	1,354	1,436	1,531	1,619	1,711	5.9
Electric <sup>2</sup>	1,505	1,856	2,392	2,386	2,696	2,841	3,080	3,253	3,485	3,904	4,180	10.8
Public	959	1,046	1,066	904	1,029	925	1,044	925	823	797	707	-3.0
Private	546	809	1,326	1,482	1,668	1,916	2,036	2,328	2,662	3,106	3,473	20.3
Residential	71	84	99	119	144	172	200	224	243	258	268	14.2
Services	22	28	31	38	45	54	62	70	78	85	93	15.2
Transport	2	3	7	15	21	26	32	37	43	49	54	39.6

aagr: annual average growth rate.

<sup>1</sup>Includes the Cantarell Nitrogen Company consumption

<sup>2</sup>Does not consider the projects of Tula and Salamanca

Source: IMP, based on BANXICO, CNA, CONAPO, CRE, INEGI, Pemex, Sener and private companies.

The industrial sector will absorb the other third part of the total national market consumption to the end of the period without including the oil sector's demand, with 2,110 mmcf. These forecasts include the petrochemical project Fénix whose start up date is expected in 2008.

oil sector's activities in that region. In second term, the Northeast region will absorb 26.9 percent of natural gas demand in the last projection year due to the electric and industrial sectors as main natural gas consumers. In this manner, 67.6 percent of total natural gas demand will be concentrated between these two regions.

<sup>2</sup> In this chapter, within the demand analysis, the emphasis is in the demand without Pemex, and to the fact that the demand without Pemex represents the market in which, effectively, private entities can participate under the current regulatory framework.

The Northwest area, will exhibit the greatest annual growth rate in its consumption of 15.9 percent as a result of the expected requirements for the electric sector. The supply of this region will be met with imports.

Table 2  
Natural Gas National Demand by Sector, 2002-2012  
(million cubic feet per day)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	aagr
Total	4,855	5,365	6,234	6,577	7,312	7,647	8,086	8,306	8,544	9,030	9,389	6.8
Northwest	153	267	342	393	423	438	484	500	549	600	669	15.9
Northeast	1,309	1,425	1,827	1,941	2,158	2,153	2,279	2,311	2,355	2,517	2,528	6.8
Center-west	473	472	527	544	609	715	787	902	973	1,018	1,059	8.4
Center	606	659	685	734	837	923	981	1,022	1,080	1,189	1,313	8.0
South-southeast	2,314	2,542	2,854	2,965	3,285	3,417	3,555	3,570	3,587	3,704	3,820	5.1

aagr: annual average growth rate.

Source: IMP, based on BANXICO, CNA, CONAPO, CRE, INEGI, PEMEX, SENER and private companies.

## 1.1 Electric Sector

In order to produce the necessary energy the country needs to maintain its development path, the electric sector sustains great part of its expansion in the combined cycle technology which embodies technical efficiency and productivity. CFE and the Independent Power Producers (IPP) will drive regional development and environmental protection with this technology.

The expansion path of the electric infrastructure for Mexico contemplates the construction of a greater number of combined cycle plants that would use natural gas. Thereby, the national electric sector will be the biggest consumer of this fuel. Its natural gas requirements will increase from 1,505 mmcf consumed in 2002, to 4,180 mmcf in 2012, which represents an annual average growth rate of 10.8 percent.

### 1.1.1 Natural Gas Demand for the Public Power Service

In December 31, 2002, the National Electric System (SEN) reached a generation capacity of 41,177 MW and it is expected that in 2012 it will reach 62,730 MW. In order to achieve this growth, 12,087 MW of new capacity are planned or under construction. In addition, 13,670 MW capacity is required, plus 2,440 MW of capacity from self generation projects which will be added to the SEN.

According to the SEN expansion program, it is expected that national natural gas demand for electricity generation for public service will rise from 1,383 mmcf to 3,738 mmcf between 2002 and 2012, with an annual average growth rate of 10.5 percent.

The expected evolution of natural gas consumption considers population's growth, total consumption's intensity within the big industry, observation of the environmental norms and the evolution of the expected relative prices of gas and fuel oil, among others. For this reason, this fuel's requirements will almost triple in the following 10 years and will represent 44.5 percent of total demand in 2012.

During 2002, CFE had the greatest share in natural gas demand in electricity generation (66.8 percent), with 924 mmcf. Its requirements in 2012 will be 18.8 percent of the whole (703 mmcf). In contrast, independent producers will become the main users of natural gas since their consumption will rise to 21.7 percent, reaching 3,032 mmcf in 2012.

Natural gas demand in the electric sector considers the gradual displacement of fuel oil consumption as a consequence of the observation of environmental rules. In 2004, the effect of fuel oil substitution for natural gas will represent 12.5 percent of total consumption. During 2003-2012, the substitution will represent 5.8 percent of total demand.

Nowadays, most of the natural gas consumption for electricity generation takes place in the Northeast, Center, and Center-West regions. By 2012, it is expected that the Northeast region consumes the greatest volume of natural gas (1,297 mmcf) with an annual average growth rate of 8.3 percent. The most important increase will take place in the Center West region, where an annual increment of 13.2 percent (539 mmcf) is estimated by 2012.

Table 3  
Domestic Natural Gas Demand for Public Electricity Generation  
(million cubic feet per day)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	aagr
Total	1,383	1,557	1,987	1,969	2,273	2,412	2,651	2,823	3,056	3,475	3,738	10.5
CFE	924	997	1,039	883	1,003	900	1,027	922	820	794	703	-2.7
LFC	35	49	27	21	26	25	17	3	3	3	3	-21.1
Independent Power Producers	424	510	921	1,065	1,244	1,486	1,607	1,898	2,233	2,677	3,032	21.7

aagr: annual average growth rate.

Source: CFE.

### 1.1.2 Natural Gas Consumption for Self-generation Electricity

The self-generation electricity is composed by self-supply modalities, uninterrupted self usage and cogeneration undertaken by the private sector within the industrial sector.

In order to calculate the estimated natural gas demand of those modalities, the following assumptions are taken into account:

The projection of the electric generation 2003-2012 which includes permits in operation, new permits and projects with high probability to be realized, like the case of a cogeneration project associated to Pemex facilities.

According to historical self-generators' information, the plants in operation contemplate an average efficiency in accordance with different groups of economic activity; meanwhile new permits and cogeneration projects are based on approaches made by licensees and equipment makers.

Table 4  
Domestic Natural Gas Consumption for Public Electricity Generation by Region, 2002-2012  
(million cubic feet per day)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	aagr
Total	1,383	1,557	1,987	1,969	2,273	2,412	2,651	2,823	3,056	3,475	3,738	10.5
Northwest	130	134	126	175	201	215	259	274	321	371	438	12.9
Northeast	584	621	944	965	1,105	1,077	1,170	1,168	1,202	1,321	1,297	8.3
Center-west	156	164	199	190	219	299	349	451	496	520	539	13.2
Center	272	312	316	269	298	332	350	394	406	472	554	7.4
South-southeast	241	326	403	371	449	488	523	536	632	791	911	14.2

aagr: annual average growth rate.

Source: CFE.

Two new permits and a project associated to Pemex facilities were added (one of self-supply and two of cogeneration) that will demand 60 mmcf/d of natural gas for the year 2012. On the other hand, there are six more firms that will generate electricity under the following

modalities: two of self-supply (cement industry) and four of cogeneration (projects associated to Pemex) who will respectively consume petroleum coke and residual fuel oil<sup>3</sup> (see the chart below).

Natural gas demand originated by Pemex's power generation was not included, since it is considered in their own self-consumptions.

<sup>3</sup> Currently, Pemex Refinación accomplishes reconfigurations within its productive plant, with the sole purpose of improving the elaboration of refined products. As a consequence, residual such as petroleum coke and residual fuel oil will be obtained instead of fuel oil which, nowadays, is processed and used in some areas of the public and private electricity sector.

Table 5  
New Permits' Characteristics and Electricity Self-generation Projects, 2002-2012

Fuel	Number of companies	Capacity (MW)	Generation (GW/H)	Natural gas consumption (mmcf/d)
Total	9	2,624.4	17,982.8	60.0
Natural Gas	3	714.4	3,958.4	60.0
Others <sup>1</sup>	6	1,910.0	14,024.4	n.a.

N.A.: Doesn't apply

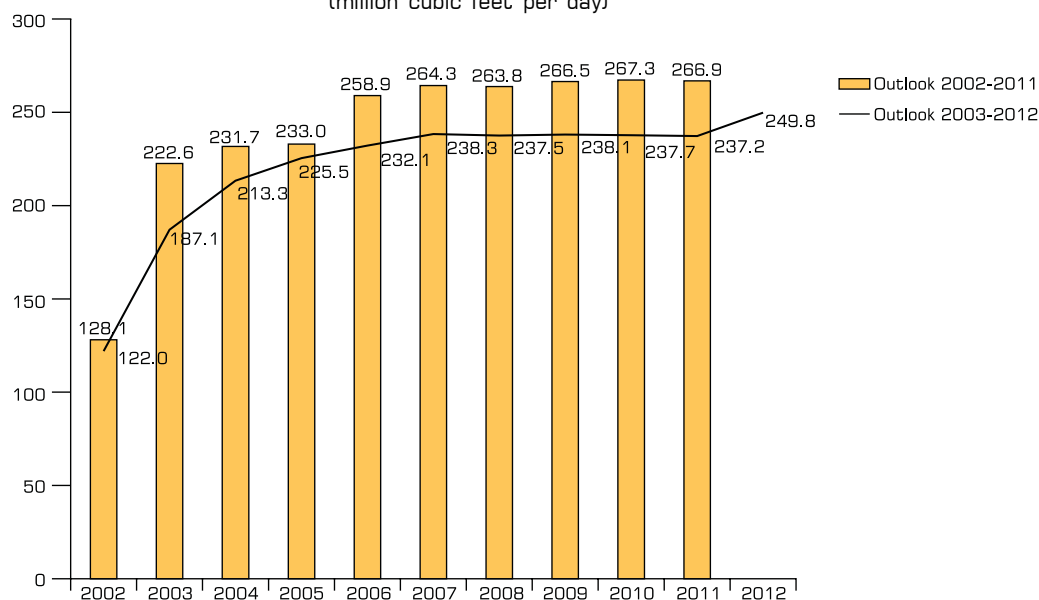
<sup>1</sup> Includes: Vacuum residuals and petroleum coke.

Source: IMP, based on CRE and self-generators' information.

In comparison with the results obtained in the 2002-2011 Outlook, the current one presents the following differences:

- The initial phase of a self-supplying permit in the Northeast region that had been previously considered for the year 2003 was started ahead of schedule.
- During 2003-2006, it gradually incorporated natural gas demand of a self-supplying permission located in the Center-West region. During that period, a portion of the generated electricity will be channelled to the public sector; later on, the whole energy will be sent out to their commercial associates.
- For the year 2004, an additional cogeneration permit was considered because it had a high probability of beginning operations in the Center region.
- The beginning of a construction program of an electric power station located in the South-southeast region was restructured. It was planned to begin operations in 2006, but was postponed until 2012.
- Furthermore, it was considered that an important part of the produced electricity should be channelled to the public sector in form of surpluses. In particular, this situation encouraged the decrease of 11.1 percent in natural gas demand, with regard to last year's Outlook (see Figure 1).

Figure 1  
Natural Gas Demand Forecast Comparison by Self-generation, 2002-2011 Outlook versus 2003-2012 Outlook  
(million cubic feet per day)



Source: IMP, based on information from self-generators, CRE and Pemex.

It is convenient to point out that these electricity self-generators will use the combined cycle technology which offers advantages such as high efficiency, more capacity, smaller environmental contamination, better operational flexibility<sup>4</sup> and stronger security in investment returns, through the improvement and reliability of the electric power required in their productive processes.

Looking at the regional picture, the Northeast area will occupy the first place in the demand of natural gas, averaging 68.7 percent of the national demand, due mainly to self-generation partnerships' requirements (self-supply and cogeneration) located in the state of Nuevo León; as well as a steel maker company located in the state of Coahuila. Both will represent more than 50 percent of that region's demand (see Table 6).

Table 6  
Natural Gas Regional Demand by Self-generation, 2002-2012  
(million cubic feet per day)

Region	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	aagr
Total	122.0	187.1	213.3	225.5	232.1	238.3	237.5	238.1	237.7	237.2	249.8	7.4
Northwest	1.9	1.1	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	-3.9
Northeast	57.5	135.2	151.7	156.7	160.0	163.1	162.6	163.0	162.9	162.7	162.1	10.9
Center-west	35.1	23.2	26.6	30.5	33.6	36.7	36.6	36.6	36.6	36.5	36.3	0.3
Center	23.0	20.6	26.6	29.5	29.6	29.7	29.5	29.6	29.5	29.4	29.2	2.4
South-southeast	4.6	7.0	7.2	7.5	7.5	7.5	7.5	7.5	7.5	7.4	20.9	16.4

aagr: annual average growth rate.

Source: IMP, based on CRE, PEMEX and self-generators' information.

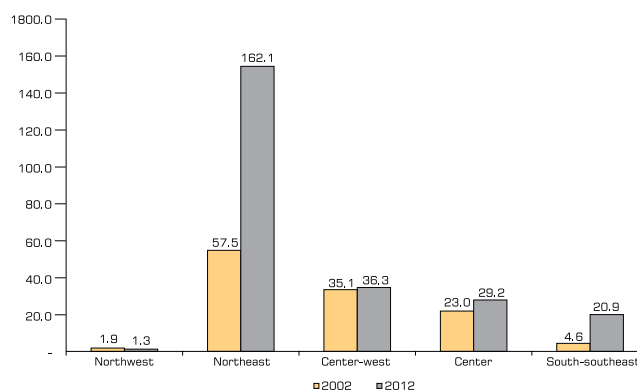
Between 2003 and 2012, the Center-West region demand will represent 14.5 percent of the National average, the central driver of the regional demand will be a self-supplying partnership located in the state of Guanajuato which includes: basic chemistry, metallic products and auto makers. Additionally, other productive activities are considered such as nutritious products, paper and cardboard, which, added to the previous ones, represent a participation in 2012 of 75 percent for that fuel demand in this region.

The Center region will have an average participation of 12.4 percent. In 2004, most of its demand will be from a cogeneration partnership which will be located in the state of Hidalgo; as well as the industrial activities of paper and cardboard, beer and malt located in the states of Hidalgo, Mexico and Tlaxcala, and the Federal District, respectively.

The regions with a smaller share of national natural gas's demand will be the South-southeast area with 3.8 percent and Northwest with 0.6 percent. The first one has as a driver of its demand the cogeneration project associated to Pemex's facilities built in the state of Veracruz

(scheduled for early 2012). The second region will face low consumption due to the lack of transport and distribution infrastructure; the only large consumer is the mining industry (see Figure 2).

Figure 2  
Natural Gas Regional Demand for Self-generation,  
2002 and 2012  
(million cubic feet per day)



Source: IMP based on information from CRE and Pemex.

<sup>4</sup> One of the advantages of this plant is the possibility to build it in two phases. The first one corresponds to turbogas units which could be finished in a short term prior to initiating its operation; later on, the construction of a vapour unit, thus finishing the combined cycle central. See *Costos y Parámetros de Referencia para la Formulación de Proyectos de Inversión en el Sector Eléctrico*. CFE. Dirección de Operación, México, 1999.

## 1.2 Industrial Sector

### 1.2.1 Industrial Demand

The estimated natural gas demand for the industrial sector 2003-2012, was generated considering three elements:

1. Demand trends.
2. Effect of the application of environment protection rules.
3. Additional demand due to the opening of new distribution grids in residential areas

#### Demand trends

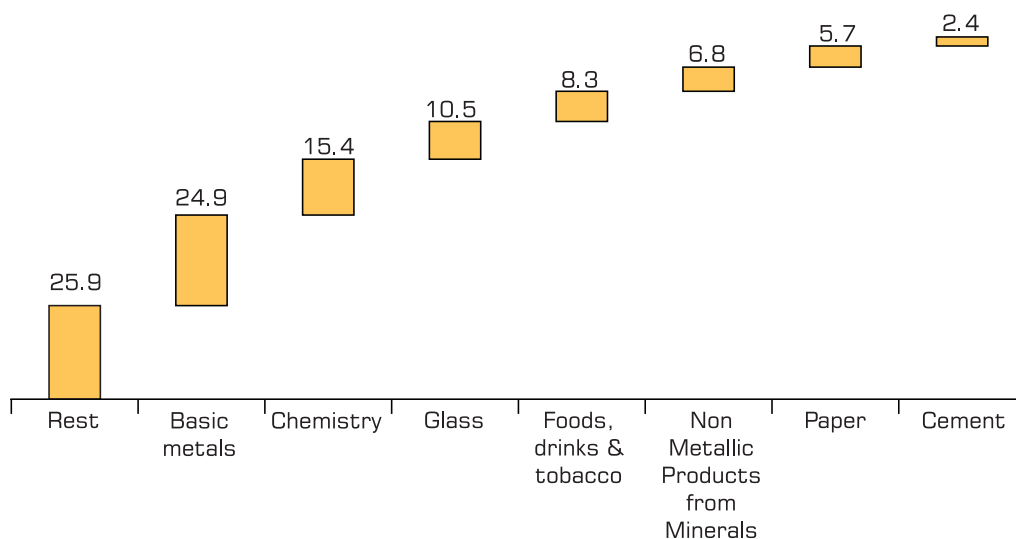
The analysis of the historical demand of natural gas in this sector identified that most of its volume is distributed among seven groups of industrial branches (see Figure 3):

- Basic metallic industries (branches 46 and 47)
- Chemistry, rubber and plastics (branches 35 to 42)
- Glass and glass products (branch 43)
- Foods, drinks and tobacco (branches 11 to 20, 22 and 23)
- Non metallic minerals' products (branch 45)
- Paper and cardboard, printings and editorials (branches 31 and 32)
- Hydraulic Cement (branch 44)
- Rest of the industrial branches (5 to 10, 21, and 48 to 60)

#### Basic metallic industries

In the year 2002, this group of industries' share of total natural gas demand was 24.9 percent, leading the rest of the industry. It is estimated that their participation in the sector will be around 30.2 percent towards the end of 2012, with an average annual growth rate of 6.0 percent, reaching a total volume of 429.5 mmmcf.

Figure 3  
Natural Gas Demand Participation by Industrial Branch Group (without Pemex Petroquímica), 2002 (percentages)



Source: IMP, based on CRE, PEMEX and private companies.

After the recession that prevailed in 2001, it is expected that this group of branches will regain a positive and constant consumption tendency,

specially because of the participation of the Northeast and Center-West regions. These regions together represent 85.4 percent of the average expected consumption for the following ten years (see Table 7).

Table 7  
Regional Demand of the Basic Metallic Industries, 2002-2012  
(million cubic feet per day)

Region	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	aagr
Total	240.6	241.5	250.4	270.5	293.0	311.9	330.0	353.8	383.9	403.9	429.5	6.0
Northwest	1.3	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.1	2.2	2.3	5.8
Northeast	99.0	100.3	104.9	113.9	123.8	132.2	139.8	150.4	163.5	171.9	182.5	6.3
Center-west	106.0	106.1	109.0	117.4	126.6	134.5	142.5	152.1	164.4	172.6	183.7	5.7
Center	32.7	32.2	33.4	36.1	39.2	41.5	43.8	47.1	51.6	54.7	58.4	6.0
South-southeast	1.6	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.5	2.6	5.2

aagr: annual average growth rate.

Source: IMP, based on Pemex, Sener and private companies.

#### Chemistry, rubber and plastics

The group of industries that includes chemistry, rubber and plastics represented, in 2002, 15.4 percent of national natural gas demand in the sector, which translated into a volume of 149.0 mmcf/d. This group of industries is located mainly in the Northeast, Center-West, South-southeast and Center regions.

Although the Northwest area will have a annual average growth rate of 2.8 percent for the prospective period, it will be the region with the smallest participation since it will only contribute with 0.4 percent of the estimated average demand.

Towards the end of 2012, the demand of this group will be located in 198.4 mmcf/d, which will represent an average annual growth for the period 2002-2012 of 2.9 percent (see Table 8).

Table 8  
Regional Demand of the Chemistry, Rubber and Plastics Group, 2002-2012  
(million cubic feet per day)

Region	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	aagr
Total	149.0	144.0	142.7	148.4	154.9	160.4	166.4	174.8	182.1	190.6	198.4	2.9
Northwest	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.8	0.8	0.8	2.8
Northeast	41.8	40.3	40.1	41.7	43.5	45.1	46.8	49.0	51.1	53.4	55.5	2.9
Center-west	30.1	29.1	28.8	30.1	31.2	32.3	33.4	35.2	36.5	38.0	39.6	2.8
Center	25.3	24.5	24.2	25.2	26.3	27.3	28.3	29.5	30.7	32.1	33.4	2.8
South-southeast	51.1	49.5	49.0	50.7	53.1	55.0	57.2	60.3	63.1	66.3	69.1	3.1

aagr: annual average growth rate.

Source: IMP, based on Pemex, Sener and private companies.

## Glass and glass products

The main consumption of natural gas of these branches will be located in the Northeast, Center-West and Center regions. The region with the

least glass industry demand will be the South-southeast area, requiring only 0.7 percent of the expected natural gas demand for the following 10 years (see Table 9).

Table 9  
Regional Demand of Glass Products, 2002-2012  
(million cubic feet per day)

Region	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	aagr
Total	101.5	94.9	96.2	103.4	110.6	116.0	121.9	130.8	141.1	151.9	164.5	5.0
Northwest	1.2	1.2	1.2	1.3	1.4	1.4	1.5	1.6	1.7	1.9	2.1	5.2
Northeast	52.4	49.0	49.8	53.6	57.4	60.1	63.1	67.9	74.0	79.5	86.3	5.1
Center-west	17.7	16.6	16.8	18.1	19.4	20.5	21.5	22.9	24.7	26.6	28.8	5.0
Center	29.5	27.5	27.7	29.7	31.7	33.2	35.0	37.5	39.7	42.8	46.3	4.6
South-southeast	0.7	0.6	0.6	0.7	0.7	0.8	0.8	0.9	0.9	1.0	1.1	4.9

Source: IMP, based on Pemex, Sener and private companies.

The consumption trend of these industries is characterized by an estimated constant reduction in the energy sources of fossil origin

## Foods, drinks and tobacco

The demand of this group for the next years will grow at an annual average rate of 1.6 percent. The biggest average consumption in the period 2002-2012 for these industries will correspond to the Center-

West region with 30.1 mmcf, followed by the Center area with 27.3 mmcf and the Northeast with an average of 18.4 mmcf. Also, as shown in Table 10, these industries together will represent 92.2 percent of the total average consumption of the entire group. The regions that will show a smaller food, drinks and tobacco industries' consumption are the South-southeast one with 6.1 percent and the Northwest with 1.7 percent with respect to total participation.

Table 10  
Regional Demand of the Foods, Beverages and Tobacco Group, 2002-2012  
(million cubic feet per day)

Region	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	aagr
Total	79.8	76.3	73.8	75.5	77.9	79.2	81.7	84.4	88.0	91.3	93.9	1.6
Northwest	1.3	1.3	1.2	1.2	1.3	1.3	1.3	1.4	1.5	1.5	1.6	1.9
Northeast	17.5	16.7	16.1	16.6	17.2	17.5	18.2	19.0	20.0	20.9	21.5	2.1
Center-west	29.0	27.7	27.0	27.7	28.5	29.2	29.9	30.8	32.2	33.6	34.5	1.8
Center	27.3	26.0	25.0	25.4	26.2	26.4	27.2	28.0	28.8	29.7	30.4	1.1
South-southeast	4.8	4.6	4.5	4.6	4.7	4.8	5.0	5.2	5.4	5.6	5.8	2.0

aagr: annual average growth rate.

Source: IMP, based on Pemex, Sener and private companies.

## Non metallic mineral products

This group presents an upward trend in consumption for the year 2012, reaching 107.8 mmcf/d, which will represent 6.3 percent of the industrial sector. For this same period of time, an annual average growth of 5.1 percent is estimated (see Table 11).

The regional demand for this fuel will concentrate on certain areas. The Northeast region is expected to show a natural gas demand in 2012 of 48.0 mmcf/d with an annual average growth rate of 5.3 percent and the non-metallic industries in the Center region will exhibit a consumption of 47.6 equivalent mmcf/d with an annual average growth rate of 4.8 percent.

Table 11  
Regional Demand of Non Metallic Minerals Products Group, 2002-2012  
(million cubic feet per day)

Region	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	aagr
Total	65.8	61.6	62.5	67.2	72.0	75.6	79.6	85.5	92.1	99.4	107.8	5.1
Northwest	-	-	-	-	-	-	-	-	-	-	-	-
Northeast	28.6	26.8	27.3	29.4	31.5	33.1	34.8	37.5	40.9	44.1	48.0	5.3
Center-west	7.4	6.9	7.1	7.6	8.2	8.7	9.1	9.7	10.5	11.3	12.2	5.2
Center	29.8	27.8	28.1	30.1	32.2	33.8	35.7	38.3	40.7	43.9	47.6	4.8
South-southeast	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.1

aagr: annual average growth rate.

Source: IMP, based on Pemex, Sener and private companies.

## Paper and cardboard, printings and editorials

It is estimated that the natural gas demand of this industry will represent in 2012 a volume of 63.9 mmcf/d. Furthermore, it is expected that this group will reach a 4.5 percent of demand during that year, and that it will have an annual growth rate of 1.5 percent between the

2002-2012 period. The Center and Northeast regions will continue to have the biggest participation in average consumption, with inputs of 29.1 and 19.6 mmcf/d respectively (see Table 12). However, in general terms, the share of the group within the industrial sector will be smaller during the last projection year, in comparison with the 2002 participation which was of 5.7 percent.

Table 12  
Regional Demand of the Paper Cardboard, Printing and Editorials Group, 2002-2012  
(million cubic feet per day)

Region	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	aagr
Total	55.0	52.0	50.7	52.2	53.9	55.1	56.2	58.0	60.0	61.9	63.9	1.5
Northwest	1.6	1.5	1.5	1.6	1.6	1.6	1.7	1.7	1.8	1.9	1.9	1.6
Northeast	16.8	15.9	15.6	16.1	16.6	17.0	17.4	17.9	18.5	19.0	19.6	1.5
Center-west	5.7	5.4	5.3	5.4	5.6	5.8	5.9	6.1	6.3	6.5	6.7	1.6
Center	25.2	23.8	23.2	23.7	24.5	25.0	25.5	26.3	27.2	28.2	29.1	1.5
South-southeast	5.6	5.3	5.2	5.4	5.6	5.7	5.8	6.0	6.2	6.4	6.6	1.6

aagr: annual average growth rate.

Source: IMP, based on Pemex, Sener and private companies.

## Cement

The cement industry will be characterized by a cost minimization tendency on energy issues, due to the fact that it has found highly competitive energy sources as an alternative to natural gas. A significant number of cement plants have been technologically transformed with

the purpose of being able to burn elements like waste tires, bituminous sands, waste oils and, mainly, petroleum coke.

The use of these alternative fuels will be the main cause for this industrial branch to go from a natural gas consumption of 23.5 mmcf/d in 2002, to a null consumption of the fuel in 2006 (see Table 13).

Table 13  
Regional Demand of the Hydraulic Cement Branch, 2002-2012  
(million cubic feet per day)

Region	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	aagr
Total	23.5	9.8	8.8	7.9	-	-	-	-	-	-	-	-
Northwest	-	-	-	-	-	-	-	-	-	-	-	-
Northeast	7.0	4.7	4.3	3.8	-	-	-	-	-	-	-	-
Center-west	0.8	-	-	-	-	-	-	-	-	-	-	-
Center	9.0	5.0	4.5	4.1	-	-	-	-	-	-	-	-
South-southeast	6.7	-	-	-	-	-	-	-	-	-	-	-

aagr: annual average growth rate.

Source: IMP, based on Pemex, Sener and private companies.

## Rest of the industrial branches

Natural gas demand in the rest of the industrial branches will increase in an annual average growth rate of 3.8 percent, reaching 363.1 mmcf/d in 2012. In addition, the growth in the consumption of natural gas registered in some branches of the sector, as metallic products, machinery and equipment, mainly because the productive activities in this branch require a large volume of the energetic. Other branches

that will participate in a significant way are: textile, mining and the industry of beer and malt.

The Northeast region will concentrate on the average, 53.8 percent of the group's demand for the prospective period, while the group's demand in the Northwest area will have an annual growth rate of 4.1 percent locating it as the highest among the different regions (see Table 14).

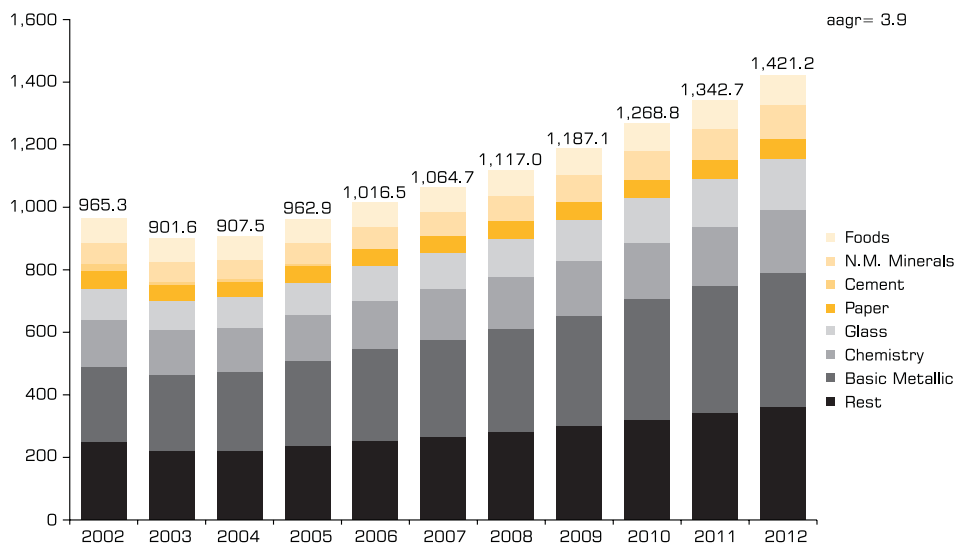
Table 14  
Regional Demand of the Rest of the Industrial Branches, 2002-2012  
(million cubic feet per day)

Region	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	aagr
Total	250.1	221.6	222.5	237.8	254.2	266.4	281.3	299.7	321.6	343.7	363.1	3.8
Northwest	12.7	11.3	11.5	12.3	13.2	13.8	14.6	15.6	16.8	17.9	19.0	4.1
Northeast	134.0	119.0	119.4	127.8	136.7	143.4	151.2	161.2	173.0	185.2	195.6	3.9
Center-west	32.7	28.9	29.2	31.2	33.5	35.3	37.3	39.8	42.8	45.7	48.1	3.9
Center	46.7	41.2	41.2	44.0	46.9	49.0	51.8	55.1	59.1	63.2	66.8	3.6
South-southeast	24.0	21.2	21.2	22.5	23.9	24.9	26.3	28.0	29.8	31.7	33.6	3.4

aagr: annual average growth rate.

Source: IMP, based on Pemex, Sener and private companies.

Figure 4  
Industrial Sector Natural Gas Demand Trends by Industrial Branch 2002-2012  
(million cubic feet per day)



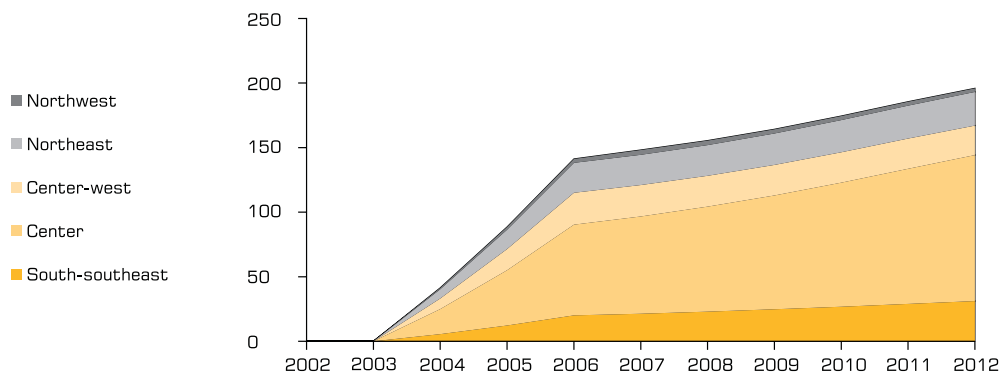
Source: IMP, based on Pemex, Sener and private companies.  
Pemex Petroquimica's demand not included in chart.

#### Environmental rules enforcement

The estimates for natural gas demand take into account an extra volume of this fuel because of the gradual enforcement of the environmental norms 085 and 086. This scenario begins to operate in 2004 and reaches

full enforcement in 2006. In terms of fuels, it means that from the first year of the scenario, and in a gradual way, the fuel oil volume consumed by the industrial sector in key areas will be substituted by natural gas; in such a way that in 2007, fuel oil consumption will be null in these environmentally sensitive areas (see Figure 5).

Figure 5  
Substitution of Fuel Oil by Natural Gas by Region, 2002-2012  
(million cubic feet per day)



Source: IMP, based on Pemex, Sener and private companies.

## Creation of new natural gas distribution infrastructure

The last element of this estimation is the gas volume which is added to the demand as a consequence of the opening and development of new geographic areas (ZG) for the distribution of natural gas. The Regulatory Energy Commission (CRE), estimates that in the next ten years, three new ZG will be bid: *Pachuca*, *Mérida* and *Veracruz*.

The three elements considered to estimate the demand, indicate that it will show an annual average growth of 5.7 percent, going from a consumption of 965.3 mmcf in 2002 to 1,674.4 in 2012 (see Table 15).

The relevant industrial fuels for this estimation were: natural gas, fuel oil and liquefied petroleum gas (LPG). The natural gas market will increase its participation from 65.6 percent in 2002 to 75.1 percent in 2012. Furthermore, it is remarkable the practically null growth rate expected for fuel oil (see Table 16).

Table 15  
Industrial Sector: Natural Gas Demand by Component, 2002-2012  
(million cubic feet per day)

Year	Estimate			Total
	Trend	Sustitution by norm	New Infrastructure	
2002	965.3	-	-	965.3
2003	901.6	-	4.8	906.4
2004	907.5	41.3	6.0	954.9
2005	962.9	88.5	6.1	1,057.5
2006	1,016.5	141.2	23.2	1,180.9
2007	1,064.7	148.2	43.6	1,256.4
2008	1,117.0	155.4	45.6	1,318.0
2009	1,187.1	164.2	48.3	1,399.6
2010	1,268.8	174.5	51.2	1,494.6
2011	1,342.7	185.5	54.2	1,582.4
2012	1,421.2	195.9	57.3	1,674.4
aagr	3.9	-	-	5.7

aagr: annual average growth rate.

Source: IMP, based on AMG, Banxico, CRE, INEGI, Pemex, Profeco, Sener and private companies.

Pemex Petroquímica's demand not included.

Table 16  
National Industrial Fuels Demand (without PPQ), 2002-2012  
(equivalent natural gas million cubic feet per day)

Year	Industrial fuels				Natural gas incursion with respect to the total (%)	Growth rate			
	Natural gas	Fuel oil	LPG	Total		Natural gas	Fuel oil	LPG	Total
2002	965.3	388.2	119.0	1,472.5	65.6				
2003	906.4	335.5	101.4	1,343.3	67.5	-6.1	-13.6	-14.8	-8.8
2004	954.9	320.4	109.3	1,384.6	69.0	5.3	-4.5	7.8	3.1
2005	1,057.5	299.2	117.2	1,473.9	71.7	10.7	-6.6	7.2	6.4
2006	1,180.9	271.0	124.5	1,576.4	74.9	11.7	-9.4	6.3	7.0
2007	1,256.4	284.3	129.6	1,670.3	75.2	6.4	4.9	4.1	6.0
2008	1,318.0	300.6	135.5	1,754.1	75.1	4.9	5.7	4.6	5.0
2009	1,399.6	320.4	142.5	1,862.5	75.1	6.2	6.6	5.2	6.2
2010	1,494.6	344.0	150.5	1,989.0	75.1	6.8	7.4	5.6	6.8
2011	1,582.4	367.2	158.8	2,108.4	75.1	5.9	6.7	5.5	6.0
2012	1,674.4	388.0	166.1	2,228.5	75.1	5.8	5.7	4.6	5.7
aagr	5.7	0.0	3.4	4.2					

aagr: annual average growth rate.

Source: IMP, based on AMGN, BANXICO, CRE, INEGI, Pemex, PROFECO, Sener and private companies.

## 1.2.2 Pemex Petroquímica's (PPQ) Demand

PPQ's natural gas demand is related both to its use as fuel in a productive process or as raw material in the generation of secondary petrochemical products. In 2002, the reported demand volume was of 295 mmcf, and it is expected that the demand increases annually by a 3.1 percent, reaching 400 mmcf in 2012 (see Table 17).

Thus, it is expected that the natural gas demand of the industrial sector to grow by an annual average rate of 5.3 percent, concluding 2011 with a demand of 2,110 mmcf (see the chart below).

Table 17  
PPQ's Natural Gas Demand, 2002-2012  
(million cubic feet per day)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	aagr
Total	295.0	289.7	278.6	320.6	383.3	400.0	399.6	400.0	400.0	400.0	400.0	3.1
Fuel	228.0	238.7	241.4	265.4	300.4	317.1	316.9	317.1	317.1	317.1	317.1	3.4
Raw material	67.0	51.0	37.2	55.2	82.9	82.9	82.7	82.9	82.9	82.9	82.9	2.2

aagr: annual average growth rate.  
Source: PPQ.

Table 18  
Industrial Sector's Natural Gas Regional Demand, 2002-2012  
(million cubic feet per day)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	aagr
Total	1,260	1,196	1,234	1,378	1,564	1,656	1,754	1,836	1,931	2,019	2,110	5.3
Northwest	19	17	18	21	23	24	25	26	28	29	30	5.0
Northeast	400	373	385	418	450	472	495	527	566	600	635	4.8
Center-west	230	226	237	260	284	297	310	327	348	365	385	5.3
Center	254	245	247	308	361	390	408	432	458	486	514	7.3
South-southeast	358	336	346	372	447	473	516	523	531	539	547	4.3

aagr: annual average growth rate.  
Source: IMP, CRE, Pemex, Sener and private companies.

Pemex has set as a goal to give new impulse to the country's petrochemical sector in order to support the economy, generate employment and strengthen the country's competitive capacity. Under this purpose, the Fénix project is planned. It will begin with the construction of two new petrochemical complexes; the first one for olefine production and derivates and the second for aromatic and other products. The development of these projects accounts for an investment close to 1.8 billion USD, where Pemex Petroquímica (PPQ) will be the minority partner, reason why the new companies will be able to operate as private firms. In these facilities, a series of petrochemical derived products will be produced and will avoid at least 4 billion USD in imports.

In the second semester of 2004, Pemex will choose the best proposals offered by the investors. In 2005 the construction of the new plants will begin and will be ready to operate by the second half of 2008.

Consumptions will ascend to 36.5 mmcf and they are accounted for in the industrial sector in the South-southeast region.

## 1.3 Oil Sector

Currently, 41 percent<sup>5</sup> of natural gas consumption takes place in the oil sector. Pemex uses this hydrocarbon as fuel in, refineries, for gas lift and to generate electric power. In accordance with the estimates of each Pemex subsidiary, without including PPQ, it is expected that the total consumption of natural gas grows at an annual average rate of 3.0 percent, from 1,994 mmcf in 2002 to 2,684 mmcf in 2012. Towards the end of the period, Pemex will use 28.6 percent of total national consumption.

<sup>5</sup>Including Re-circulations

The volume of gas dedicated to combustion processes (self-consumption) represents an average of 49.3 percent of the total oil sector's requirements. The remaining 50.6 percent is destined, basically, to internal *Pemex Exploración y Producción* (PEP) recirculations for gas lifting which is fundamental to maintain crude oil production. As it is observed in the chart below, PEP's self-consumption increased just above 50 percent between 2002 and 2012.

*Pemex Gas y Petroquímica Básica* (PGPB) natural gas requirements will increase in an annual average rate of 2.4 percent, from 256 mmcf in 2002 to 326 mmcf in 2012. Its average consumption in processing plants represents 86.7 percent, while the operation of the national pipeline system uses the remaining 13.3 percent.

Table 19  
Oil Sector's Natural Gas Demand, 2002-2012  
(million cubic feet per day)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	aagr
Total	1,994	2,198	2,471	2,641	2,841	2,897	2,959	2,886	2,764	2,716	2,684	3.0
Self-consumptions	995	1,078	1,222	1,271	1,386	1,378	1,444	1,425	1,377	1,377	1,379	3.3
Pemex Exploración y Producción	500	546	655	717	802	750	784	792	786	783	783	4.6
Pemex Refinación	238	273	282	301	319	332	330	299	268	267	270	1.3
Pemex Corporativo	1	1	1	1	1	1	1	1	1	1	1	0.0
Pemex Gas y Petroquímica Básica	256	259	284	252	265	296	330	334	323	326	326	2.4
Gas lift	999	1,120	1,249	1,370	1,455	1,519	1,515	1,460	1,386	1,339	1,304	2.7

aagr: annual average growth rate.  
Source: Pemex.

Table 20  
Oil Sector's Natural Gas Consumption by Sector, 2002-2012  
(million cubic feet per day)

Region	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	aagr
Total	1,994	2,198	2,471	2,641	2,841	2,898	2,959	2,886	2,763	2,715	2,684	3.0
South-southeast	1,711	1,873	2,098	2,214	2,381	2,448	2,508	2,501	2,414	2,363	2,337	3.2
Northeast	194	208	251	297	330	320	323	317	283	286	281	3.8
Center	40	61	63	80	80	80	79	29	28	27	28	-3.6
Center-west	49	55	56	49	50	50	49	38	38	38	38	-2.5
Northwest	1	1	2	1	1	1	1	1	1	1	1	7.8

aagr: annual average growth rate.  
Source: Pemex.

Towards the year 2007, an increase of almost 94 mmcf will be observed in Pemex Refinación's natural gas consumption, due to the increments in the demand of the Cadereyta, Minatitlán and Salina Cruz refineries. Nevertheless, from 2008 to 2012, a decreasing trend will appear in the Tula, Madero and Salamanca refineries where natural gas will be substituted by other fuels. These changes will be present in the process level and the type of configuration in each one of them.

Regional natural gas demand within the oil sector will depend on the geographical concentration of the sector's activities. The South-southeast region coincides in highly required energy sector activities, such as hydrocarbons exploitation, production, transformation and distribution; in this region, 82.9 percent of the consumption will be concentrated at the end of the period.

## 1.4 Residential and Services Sector

The demand of natural gas in the residential and services sectors has shown only a slight growth. This situation is due to problems that distributors face in installing the projected pipeline networks, especially in those geographical areas where the existing infrastructure was almost null or nonexistent. On the other hand, it is expected that this situation improves in the second half of the projection period, when the distributors are closer to complete their objectives.

Considering the facts described above, as well as the new macroeconomic scenarios, the demand indicates a decrease for the estimated period in comparison to the previous one (2002-2011 Outlook). Therefore, the forecast points out a demand of 360.8 mmcf/d matching a lower natural gas penetration in the fuels market within the residential and services sectors (see Figure 6).

Figure 6  
Comparisons of the Natural Gas Demand Projections of the 2003-2012 Outlook versus the 2002-2011 Outlook  
(million cubic feet per day)

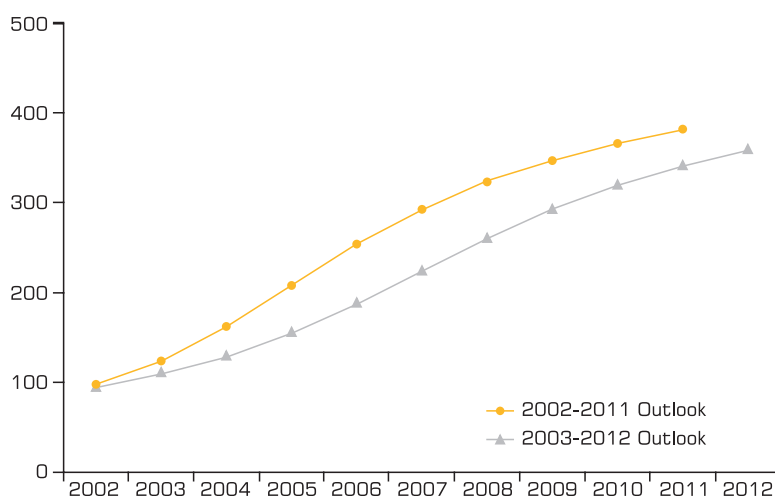


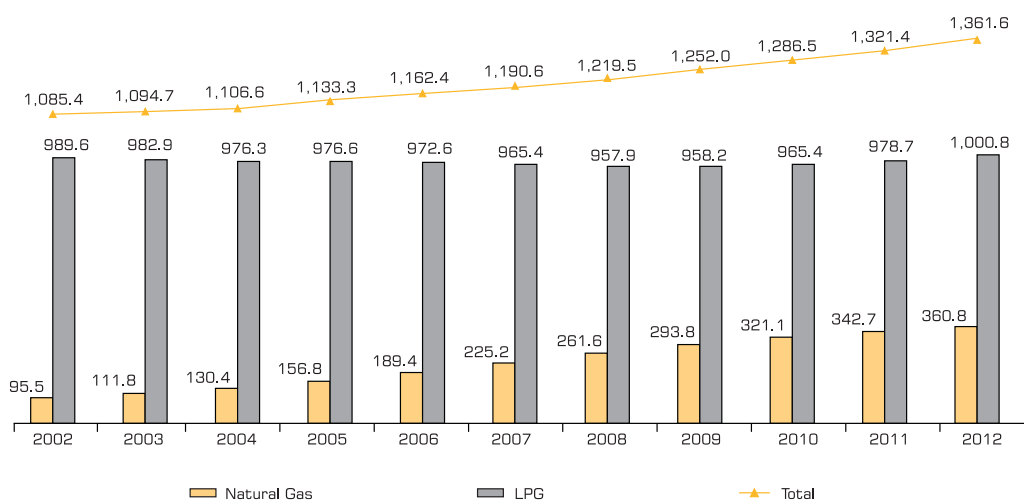
Table 21  
Natural Gas and Liquefied Petroleum Gas (LPG) Demand of the Residential and Services Sector, 2002-2012  
(equivalent natural gas million cubic feet per day)

Year	Natural gas	LPG	Total	Natural gas incursion with respect to the total (%)	Inhabitants	Natural gas and LPG consumption by inhabitant* 10 <sup>6</sup>	Growth (%)
2002	95.5	989.9	1,085.4	8.8	102,443,471	10.6	
2003	111.8	982.9	1,094.7	10.2	103,636,353	10.6	-0.3
2004	130.4	976.3	1,106.6	11.8	104,790,554	10.6	0.0
2005	156.8	976.6	1,133.3	13.8	105,909,000	10.7	1.3
2006	189.4	972.9	1,162.4	16.3	106,994,248	10.9	1.5
2007	225.2	965.4	1,190.6	18.9	108,056,048	11.0	1.4
2008	261.6	957.9	1,219.5	21.4	109,096,653	11.2	1.5
2009	293.8	958.2	1,252.0	23.5	110,117,748	11.4	1.7
2010	321.1	965.4	1,286.5	25.0	111,120,810	11.6	1.8
2011	342.7	978.7	1,321.4	25.9	112,106,894	11.8	1.8
2012	360.8	1,000.8	1,361.6	26.5	113,076,791	12.0	2.2
aagr	14.1	0.1	2.2	11.6	1.0	1.1	-

aagr: annual average growth rate.

Source: IMP, based on Banxico, CNA, CONAPO, CRE, INEGI, Pemex, Sener and private companies.

Figure 7  
Natural Gas and LPG's Demand of the Residential and Services Sectors, 2002-2012  
(equivalent natural gas million cubic feet per day)



Concerning regional consumption, it is expected that the Center area surpasses the Northeast block in 2010 as a result of an expansion in the natural gas transport and distribution systems in the region. It is important to point out that the residential and services sectors' demand will concentrate basically in the regions with greater population, where the main cities of the country are located.

The natural gas distribution areas of the country's Northeast region have reached certain maturity within the natural gas market, for this reason, they present few expansion possibilities inside the transport

and distribution systems of this product. However, the Center-West region will show a quick expansion, with an annual average growth rate of approximately 35.0 percent, being this region the third most important in natural gas consumption in the residential and services sectors (see Table 22).

As a result of the information provided by the natural gas distributors, it has been possible to separate the demand of the residential and services sectors. Thereby, the demand analysis specifies the tendencies about the natural gas market for each sector.

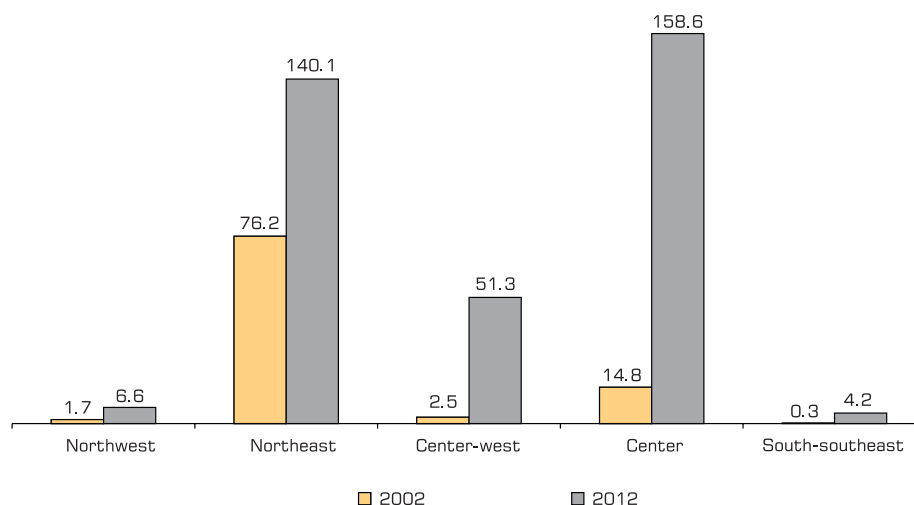
Table 22  
Natural Gas Demand by Region, Residential and Services Sectors, 2002-2012  
(million cubic feet per day)

Region	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	aagr
Total	95.5	111.8	130.4	156.8	189.4	225.2	261.6	293.8	321.1	342.7	360.8	14.2
Northwest	1.7	2.0	3.0	4.0	4.8	5.4	5.8	6.1	6.2	6.4	6.6	14.7
Northeast	76.2	87.9	94.3	101.9	109.4	116.2	122.5	127.4	131.9	136.0	140.1	6.3
Center-west	2.5	4.3	7.5	12.8	20.3	28.9	36.8	43.0	47.2	49.6	51.3	35.0
Center	14.8	17.2	25.3	37.8	54.5	74.1	95.5	115.7	133.3	147.4	158.6	26.8
South-southeast	0.3	0.3	0.3	0.3	0.4	0.5	0.9	1.6	2.4	3.4	4.2	32.0

aagr: annual average growth rate.

Source: IMP, based on Banxico, CNA, CONAPO, CRE, INEGI, Pemex, Sener and private companies.

Figure 8  
Natural Gas Regional Demand, Residential and Services Sectors, 2002 and 2012  
(million cubic feet per day)



The residential sector will show the greatest growth going from 71.0 mmcf/d in 2002 to 268.1 mmcf/d in 2012. For the Center region, it is expected that natural gas will displace LPG by 109.5 mmcf/d, in the Northeast region by 42.5 mmcf/d and in the Center-West by 39.7 mmcf/d, being these the most important. This change is due especially to the investment expectation that distributors will carry out in these regions in terms of infrastructure within the natural gas pipeline net (see Table 23).

In addition to the geographical distribution areas bid by the CRE, municipalities of different federative entities could count as new areas of distribution, allowing the promotion of new distribution projects in the country. In this way, the CRE considers the potential development within Pachuca and Mérida. In particular, it is planned that Pachuca will be declared as a geographical distribution area in order to start the bid process in 2004.

Table 23  
Natural Gas Demand by Region, Residential Sector, 2002-2012  
(million cubic feet per day)

Region	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	aagr
Total	71.0	84.3	98.9	119.2	144.3	171.6	199.7	223.6	243.1	257.7	268.1	14.2
Northwest	1.8	1.7	2.4	3.2	3.8	4.2	4.4	4.5	4.5	4.6	4.6	9.8
Northeast	54.9	64.5	69.3	74.5	79.7	84.1	88.4	91.2	93.6	95.7	97.4	5.9
Center-west	2.7	3.4	6.2	10.9	17.4	24.7	31.4	36.4	39.6	41.3	42.3	31.9
Center	11.6	14.7	21.1	30.6	43.3	58.4	75.0	90.6	103.8	114.0	121.1	26.4
South-southeast	-	0.0	0.0	0.0	0.1	0.2	0.5	0.9	1.5	2.1	2.7	-

aagr: annual average growth rate.

Source: IMP, based on AMGN, Banxico, CNA, CONAPO, CRE, INEGI, Pemex, Sener and private companies.

The services sector will show a similar trend to that of the residential sector. The demand is estimated to rise from 22.4 mmcf/d in 2002 to

92.6 mmcf/d in 2012. The different growth rates by region will depend by the populational level. The same occurs in the residential sector (see Table 24).

Table 24  
Natural Gas Demand by Region, Services Sector, 2002-2012  
(million cubic feet per day)

Region	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	aagr
Total	22.4	27.5	31.5	37.6	45.2	53.7	61.9	70.2	78.0	85.1	92.6	15.2
Northwest	0.1	0.3	0.5	0.8	1.0	1.3	1.4	1.6	1.7	1.8	2.0	31.2
Northeast	18.1	23.5	25.1	27.3	29.7	32.1	34.1	36.2	38.3	40.3	42.7	9.0
Center-west	0.3	0.9	1.3	1.9	2.9	4.2	5.5	6.6	7.5	8.3	9.0	38.8
Center	3.5	2.5	4.3	7.3	11.2	15.8	20.4	25.2	29.5	33.4	37.5	26.7
South-southeast	0.3	0.3	0.3	0.3	0.3	0.3	0.5	0.7	0.9	1.3	1.6	17.0

aagr: annual average growth rate.

Source: IMP, based on AMGN, Banxico, CNA, CONAPO, CRE, INEGI, Pemex, Sener and private companies.

## 1.5 Transport Sector

Compressed Natural Gas (GNC) has become an environmentally conscious alternative source of energy in the big cities. This fuel has wide ecologic safety and economic advantages compared with other fuels of fossil origin. At the moment, there are around 2.8 million vehicles that use GNC and 6.5 thousand service stations in the entire world. The regional demand of this fuel presents a universal tendency toward increased use in cities with high vehicular concentration, as shown in Table 25.

Table 25  
GNC Vehicular Park and Services Stations,  
International Experience, 2002

Countries	Converted vehicles	Stations in operation
Argentina	926,352	1,064
Brazil	550,000	565
Italy	434,000	414
Pakistan	350,000	366
India	137,000	116
United States	126,341	1,250
Venezuela	44,146	147
Others	248,959	2,533

Source: IMP, based on INGVS.

Four service stations operate currently in Mexico, two of them in the Federal District and the remaining ones in the State of Mexico and Monterrey. The number of vehicles that circulate within the Valley of Mexico's Metropolitan Area (ZMVM) that use GNC is slightly greater than 1,250 units.

The estimated consumption of natural gas for this sector is based mainly on the expectations expressed by the sector's key players and by natural gas distributing companies involved in the business. On the other hand, a wide market exists which responds to the growing dynamism of the vehicular park, however, the main investment opportunities are only for intensive use transport vehicles.

The investment required to convert vehicles to natural gas can be attractive for industrial and commercial fleets, municipal service vehicles and public transportation fleets.

The difficulties faced in this sector's development are the following:

- High conversion costs to GNC compared to those of its main competitor: liquefied petroleum gas (LPG).
- Difficulties to obtain permits and authorizations for the installation and operation of GNC stations.
- Scarce sensitivity knowledge in the communities on the creation of GNC service station, environmental benefits and security level.
- Lack of infrastructure for the construction of service stations, preventive and corrective maintenance repair shops for GNC vehicles.
- Some businessmen consider that the price of this fuel is still too high and does not represent a viable investment alternative

The expectations considered for the years 2002 and 2012, are that the GNC fuelled fleet will increase from 1,250 to 93,550 vehicles, like it is shown in the figure below, and that the following trends continue:

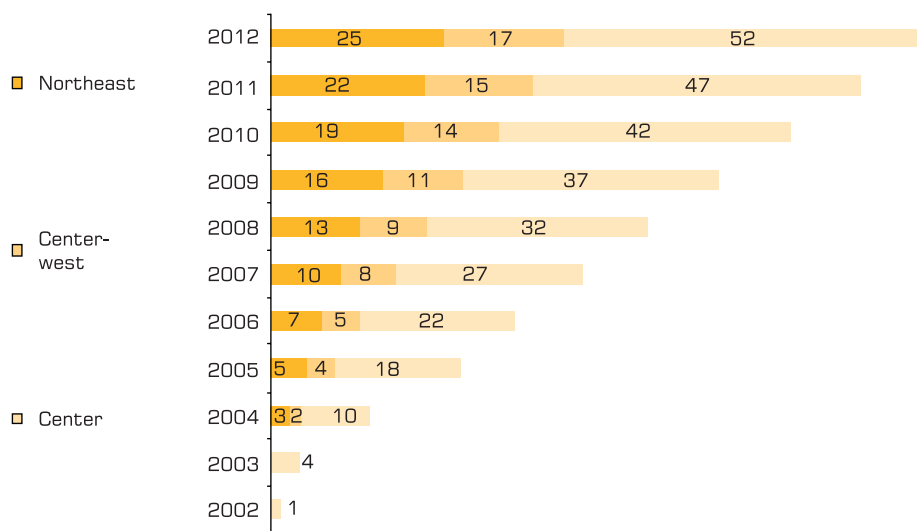
- Promotion and support of the federal and local authorities about the benefits of GNC.
- Greater investment in this sector and therefore, a technological development with a smaller GNC conversion cost.

- New transport systems with GNC fuelled technologies.

- Positive international experiences in the development, trade and use of GNC.

The regional demand of this fuel will concentrate on certain areas like the Center region, where a GNC demand in 2012 will be of 30.9 mmcf/d and a national consumption of 54.3 mmcf/d. Also, it is considered that the Northeast and Center West regions will demand this fuel starting from 2003 and 2004, as a consequence of an infrastructure growth in those areas (see Table 26).

Figure 9  
GNC Vehicular Fleet, 2002-2012  
(thousand vehicles)



Source: IMP, based on private companies.

Table 26  
Compressed Natural Gas Regional Demand, 2002-2012  
(million cubic feet per day)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	aagr
Total	1.9	3.0	7.4	14.9	21.3	26.4	31.7	37.3	43.1	48.8	54.3	39.6
Northwest	-	-	-	-	-	-	-	-	-	-	-	-
Northeast	-	0.1	0.9	2.3	3.6	5.0	6.5	8.2	9.9	11.7	13.3	-
Center-west	-	-	0.6	1.8	2.9	4.1	5.3	6.4	7.7	9.0	10.1	-
Center	1.9	2.9	5.9	10.8	14.8	17.3	19.8	22.6	25.4	28.1	30.9	32.0
South-southeast	-	-	-	-	-	-	-	-	-	-	-	-

Source: IMP, based on CONAPO, INEGI, Sener, Pemex and private companies.

In the case of service stations, it is estimated a total of 180 by 2012 will exist, 56.5 percent of these will be located in the Center region, while the rest will be set in the Northwest and Center West blocks with 24.5 percent and 19.0 percent respectively. This data is shown in Table 27 and it assumes that in 2004, the Mexican Congress approves legislation allowing the establishment of dual type service stations.<sup>6</sup>

With respect to the participation within the consumption of fuels, GNC will represent in 2012 only 2.3 percent in terms of vehicles and 0.8 percent in terms of fuel (see Table 28).

Table 27  
Compressed Natural Gas Service Stations by Region, 2002-2012

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total	3	9	26	50	65	84	103	123	142	163	180
Northwest	-	-	-	-	-	-	-	-	-	-	-
Northeast	-	1	5	10	14	19	25	31	36	43	48
Center-west	-	0	3	8	11	16	20	24	29	33	36
Center	3	8	18	32	40	49	58	68	77	87	96
South-southeast	-	-	-	-	-	-	-	-	-	-	-

Source: IMP, based on World Bank, Banxico, Dargay & Galety (2001) CONAPO, INEGI, Sener, Pemex and private companies.

Table 28  
Gasoline, LPG, and GNC Shares in the Transport Sector Fuel Demand, 2003-2012  
(percentages)

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
In fuels' terms										
Total	100	100	100	100	100	100	100	100	100	100
Gasoline	94.8	94.5	94.0	93.6	93.2	93.0	92.8	92.7	92.6	92.5
LPG	5.2	5.5	5.8	6.2	6.4	6.6	6.6	6.7	6.7	6.7
GNC	0.0	0.1	0.2	0.3	0.4	0.5	0.5	0.6	0.7	0.8
In fuels' terms										
Total	100	100	100	100	100	100	100	100	100	100
Gasoline	98.1	98.0	97.8	97.6	97.5	97.5	97.4	97.4	97.4	97.4
LPG	0.0	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.3
GNC	1.9	2.0	2.1	2.2	2.3	2.3	2.3	2.3	2.3	2.3

Source: IMP, based on the World Bank, Banxico, Dargay & Gately (2001) CONAPO, INEGI, Sener, Pemex and private companies.

The market impulse in favour of this fuel is growing. Private investment alternatives and legislative adaptations in this matter will determine the future of the activities developed around GNC. The Center area will

be, without a doubt, the first sector where the developing of GNC will be continued, given the growing need for efficient transport systems and the enforcement of environmental protection laws.

<sup>6</sup>The dual type service stations refer to the commercialization of gasoline and/or diesel along with GNC inside the same physical space; nowadays, several legislative adequacies and norms are in progress for their establishment.

## 2 Natural Gas Supply

In order to increase production levels, one of the high-priority objectives is to continue with the modernization of the exploration and development activities to enlarge natural gas productive capacity, mainly of non associated gas in the Burgos Basin, in the Northeastern part of the country. Another of the strategies is to advance with the Gas Strategic Program (PEG), for it will be necessary to identify and accelerate the execution of gas projects, to minimize the time associated to the exploration-development-production cycle, to reduce costs, to increase the efficiency and the quality of the processes and to impel the continuous improvement in project control.

In the case of Pemex, the integral strategy for the increase in natural gas supply in the medium and long terms is based on four principal elements: a) reactivation of exploration in areas of greater potential; b) preferential focus on non associated gas reserves, c) reach production in levels comparable with international practices, and d) the implementation of the Multiple Services Contracts.

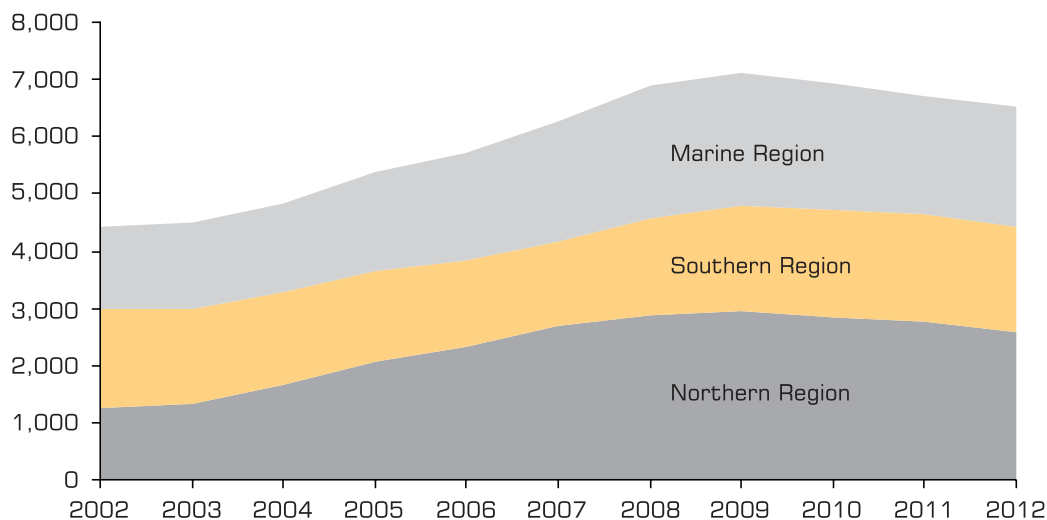
### Medium case, risk-adjusted scenario

This scenario contemplates PEP's projects that have authorization to be financed in the next years and whose development will depend on the existence of budgetary sufficiency, Pemex financing capacity and success in exploratory activities. This projection also considers the Multiple Services Contracts (CSM).

Under these premises, natural gas production is expected to increase at an annual average rate of 4.2 percent, from 4,423 mmcf/d in 2002 to 6,542 mmcf/d in 2012, with a maximum production level in 2009 of 7,122 mmcf/d.

The Northern region is expected to reach 2,563 mmcf/d with an annual average growth rate of 7.3 percent, the greatest production increment. In this region, the Burgos Area plays a fundamental role in the development of the CSM, where it is expected to reach the biggest production in 2009 of 2,049 mmcf/d. In this way, the production of the Northern Region will reach a participation of 40 percent in 2012, considering it was 29% in 2002.

Figure 10  
Natural Gas Production by Region, 2002-2012  
(million cubic feet per day)

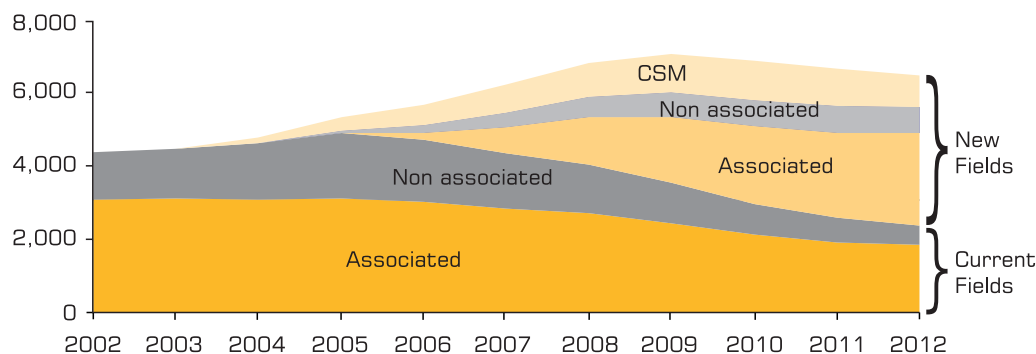


Source: Sener, based on information from Pemex.

This scenario considers the development of new important projects with great potential for incorporating reserves and diversify the regions from where the production will be obtained. This means that besides the *Burgos* Basin for the exploitation of gas, the areas of *Veracruz*, *Macuspana* and the continental platform of the Gulf of Mexico are contemplated.

The physical investment required to reach these production volumes is around an average of 104 billion annual pesos in the period between 2003-2012. It should be underlined that the contribution of the CSM to national production goes from 3 percent in 2004 to 15.4 percent in 2010, year in which it is expected to reach its maximum contribution around 1,065 mmcf. This alternative will allow the reduction of natural gas imports in the National Pipeline System (SNG), implying advantages for the country.

Figure 11  
Natural Gas Production by Gas Type and Activity  
(million cubic feet)



Source: PEP.

## 2.1 Multiple Services Contracts

The operative capacity of Pemex to increase gas production has been restricted by financial limitations and by geologic factors. The fields of light crude oil, where the greatest associated gas quantities are located, are registering an important decline. Moreover, associate gas deposits require considerable capital and long investment recovery periods.

On the other hand, there is a dependence upon the imports from the United States whose market is characterized by an enormous demand, a decreasing production and substantial imports.

Considering this situation, all the viable alternatives were revised in order to increase national production. It was considered that it could be possible to improve the way in which Pemex carries out its contracts traditionally without modifying the legal framework; the result was the implementation of the CSM.

CSM are public work contracts based on unitary prices, in which Mexico maintains the property of hydrocarbon and executed works. They simply group together, in a single contract, the services that Pemex has always hired and the contractor receives a cash payment based on unitary prices.

With these contracts, Pemex strengthens its execution capacities for the development of the Integral Burgos Basin Project directed to increase non associated natural gas production in the northern part of the country, this will reduce imports and to help cover the growing demand of this fuel within Mexico.

The first block Reynosa-Monterrey was awarded to the Spanish company Repsol whose offered amount was of 2.4 billion USD which includes the works and services' cost that the company will incur during the 20 years term contract.

The second bid under the CSM scheme for the execution of development works, infrastructure and maintenance of non associate gas fields in the *Cuervito* block inside the Burgos Basin was granted to the consortium integrated by the Brazilian company *Petróleo Brasileiro, S.A., (Petrobras)*; the Japanese company *Teikoku Oil Co. LTD.*, and the Mexican company *D&S Petroleum*, a subsidiary of the *Grupo Diavaz*. The *Cuervito* block is located in the state of Nuevo León; with a surface of 231 square kilometers, area in which the perforation of more than 100 wells will be undertaken during the 15 years contract, according to Pemex estimates.

*Misión* is the third awarded block of the Burgos Basin. This block is located in the states of Nuevo León and Tamaulipas, with a surface of one thousand 972 square kilometers. It is expected that with the works executed by the winning contractor, Pemex will be able to increase natural gas production in the *Misión* block up to 91 million cubic feet per day in the short term.

The fourth contract is associated to the *Cuervito* block. It was signed with the same Brazilian-Japanese-Mexican holding that will develop the *Cuervito* block.

The fifth bid contract is the *Olmos* block located in the Burgos Basin, with the Texan enterprise Lewis Energy Group. With the formalization of this contract, a total investment of 343.6 million USD is generated during the 15 years operation contract; investment with which Pemex estimates to obtain an additional natural gas production above 40 million cubic feet per day.

With the first five CSM, Pemex ensures a national natural gas production increase close to 440 million cubic feet per day, with the consequent import decrease, which will attract new investments for the country of 4.4 billion USD, state-of-the-art technology (which will increase the execution capacities of Pemex), and will generate savings for the company of 800 million USD.

The CSM includes several different services such as seismic studies, perforation and development, pipeline construction and maintenance. Previously, these services were hired in an individual manner.

Besides the *Burgos* Basin, the possibility of awarding new CSM for the development of the *Coatzacoalcos*, Tertiary Gas and *Cuichapa*

projects, in the states of *Veracruz* and *Tabasco*, is being carefully analyzed, as much in shore and off shore. This will give an impulse to non associated gas production in Mexico, through national and international participation.

## 2.2 Liquefied Natural Gas (LNG)

Another of the strategies to guarantee natural gas supply and to diversify the supply sources has been the promotion of re-gasification terminals to import liquefied natural gas. Under this policy, in September 2003, a decision was made on the construction of an LNG terminal for the electric sector's supply in the area of *Altamira, Tamaulipas*, which will allow to supply combined cycle plants *Altamira V, Tuxpan V* and *Tamazunchale*, adjacent to the states of *Tamaulipas, Veracruz* and *San Luis Potosí*.

This plant is programmed to begin operations in the fourth trimester of 2006 with a demand from CFE of 300 mmcf by 2010 and of 500 mmcf by 2011. In this way, the power stations of *Tuxpan V, Altamira V, Tamazunchale* and *Valladolid III* will be supplied.

In the municipality of *Ensenada, Baja California*, three companies will build three LNG terminals in order to supply the electric sector and opens the possibility to export to the North American market.

CFE has also declared the possibility to carry out another bidding process for a similar re-gasification plant in *Lázaro Cárdenas, Michoacán* in the Pacific Coast.

Also, *Topolobampo*, in *Sinaloa*, is considered a potential area for the future installation of a micro LNG terminal, and will be associated to *Lázaro Cárdenas* as a support terminal.

## 2.3 Natural Gas Availability from PEP to PGPB

The gas delivered by PEP to PGPB in 2002 was of 4,411 mmcf, volume that will increase to 6,367 mmcf in 2012. In 2002, 72.7 percent of the delivered gas was wet and sour, 61.4 percent in 2012. The dry gas will increase its participation of 15.8 percent to 17.9 percent, while the sweet gas with liquids will increase its volume 2.6 times in this period reaching 1,321 mmcf.

Table 29  
 Natural Gas Availability from PEP to PGPB, 2002-2012  
 (million cubic feet per day)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	aagr
Total	4,411	4,646	4,677	5,133	5,403	6,242	6,852	7,049	6,796	6,573	6,367	3.7
Wet bitter	3,208	3,390	3,121	3,135	3,185	3,632	4,031	4,123	3,988	3,875	3,907	2.0
Dry	697	764	899	1,037	1,065	1,464	1,583	1,587	1,461	1,299	1,139	5.0
Wet sweet	506	491	657	961	1,152	1,145	1,238	1,339	1,346	1,399	1,321	10.1

aagr: annual average growth rate.  
 Source: 2003 POT IV v 10.0  
 2004 POA v M0.015  
 2005-2012 MEDIUM ADJUSTED ALIGNED SCENARIO WITH RISK (v.3.0 PROD), BALANCE v 0.11

## 2.4 Supply-Demand Outlook Balance, 2002-2012

The natural gas market balance indicates that the country will continue to have a deficit in the future. Towards 2012, net imports will reach 2,566 mmcf/d, 27.3 percent of national demand (see Figure 12). This is due to the decrease in production and exploration investments at the end of the period.

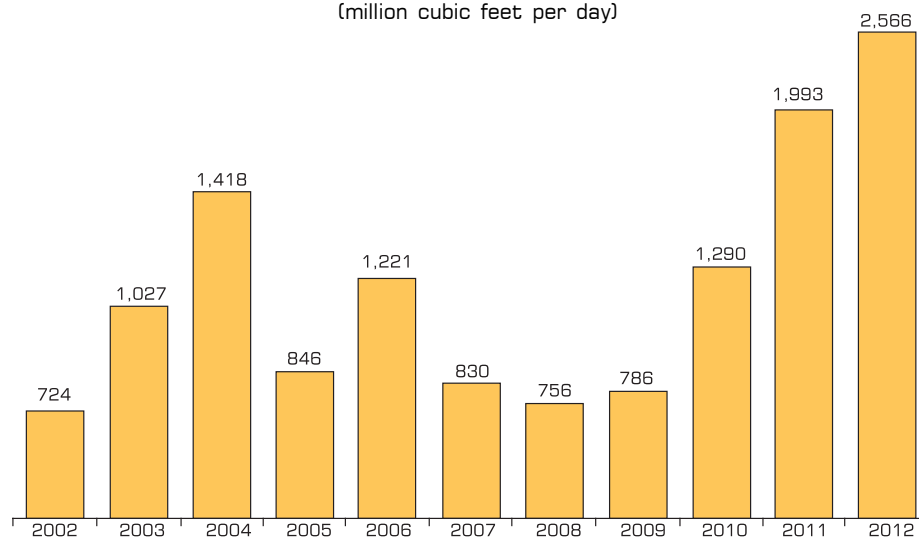
However, it is relevant to notice that in 2012, the imports corresponding to the isolated systems that depend solely on imports will represent 63.2 percent of the total. These includes the purchases

that PGPB carries out for the system Naco-Hermosillo, for Baja California and Samalayuca; as well as the private ones in the state of Sonora and Piedras Negras.

As mentioned before, in Baja California towards 2007, the installation of LNG terminals that will allow to supply the expected demand and thus diversification of supply sources is expected.

It is important to notice that the expected natural gas deficit for the country is bigger than that of the previous Outlook document. This is explained by the selection of a gas production scenario that discounts the associated exploration risks, that is, a more feasible scenario.

Figure 12  
 Natural Gas Net Imports, 2002-2012  
 (million cubic feet per day)



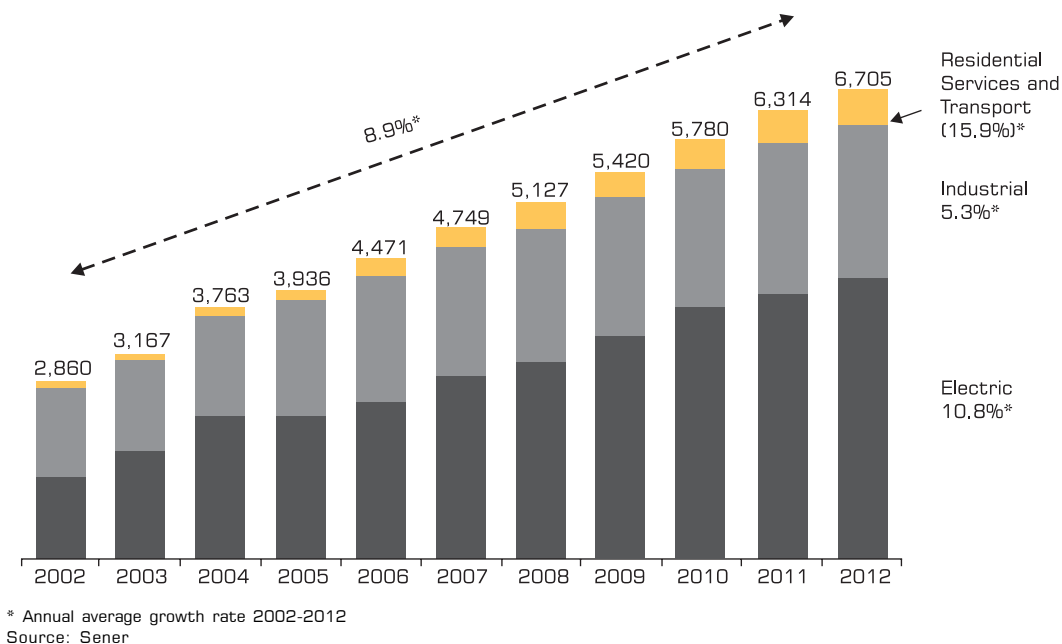
Source: Sener based on information from CFE, CRE, Pemex and IMP.

Among the different fuels required by the country, the demand of natural gas (without Pemex) is the one that presents the greatest dynamism. It is expected that it will register an annual average growth rate of 8.9 percent in the period between 2002-2012. As stated before, the demand will be led by the electric sector followed by the industrial one; and, to a lesser extent, by the residential, services and transport sectors (see Figure 13).

### 3 High Scenario, 1.5 Portfolio

The potential of the country's natural gas production is still very wide, considering that the estimate that takes into account the entire PEP project portfolio can put the natural gas production on levels up to 8,393 mmcf/d in 2012, i.e., a difference of 1,851 mmcf/d in comparison to the medium case risk-adjusted scenario. One of the characteristics of this scenario is the quick increment of non associated gas production.

Figure 13  
National Natural Gas Demand without Pemex by Sector 2002-2012  
(million cubic feet per day)



The success of this scenario is subject to its future approval, to the existence of budgetary sufficiency, to Pemex financing capacity, and to the exploratory success. In this exercise, PEP does not consider budget restrictions imposed in the federal budget year with year, implying a change of Pemex's fiscal regime.

A structural change is assumed within the relationship between Pemex and the Federal Government: administrative autonomy is granted to the organism; the decision abilities of the Administration Council are strengthened and changes are introduced in the legal and normative framework with the purpose of privileging the efficiency, competitiveness and accountability.

Within the projects' portfolio that allows the maximum production potential in the period 2002-2012, CSM reaches a maximum production volume of 1,086 mmcf/d in 2009.

In this scenario, an annual physical investment of 107.5 billion 2003 Mexican pesos is required in the period 2003-2012; 3.2 percent more than in the medium case risk-adjusted scenario. Gas production, in the same lapse, would average 7,298 mmcf/d and will reach a maximum of 8,853 mmcf/d in 2009. As a result, Mexico would become an important actor within the natural gas market and the energy sector would regain its role as promoter of economic growth.

Table 30  
Natural Gas National Balance. Reference Case Base Demand-Medium Risk  
Aligned Supply  
(million cubic feet per day)

Concept	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	aagr 2002-2012
<b>Origin</b>	<b>4,862</b>	<b>5,407</b>	<b>6,234</b>	<b>6,886</b>	<b>7,399</b>	<b>8,319</b>	<b>8,943</b>	<b>9,194</b>	<b>9,042</b>	<b>9,236</b>	<b>9,389</b>	<b>6.8</b>
National production	4,134	4,380	4,816	5,730	6,091	6,817	7,331	7,520	7,254	7,037	6,823	5.1
Imports	729	1,027	1,418	1,156	1,307	1,501	1,612	1,674	1,788	2,199	2,566	13.4
Imports by logistics	337	616	792	881	945	945	1,041	1,112	1,241	1,453	1,624	17.0
PGPB Imports	201	341	372	348	377	359	408	453	465	475	466	8.8
Imports electric sector	110	139	202	313	346	362	409	432	548	747	926	23.8
Imports by private sector	27	137	218	220	222	223	225	227	229	231	232	24.2
PGPB Imports by balance	392	411	626	275	287	257	271	261	247	247	442	1.2
PGPB Imports by balance (fixed: Kinder-Morgan MTY)	-	234	293	275	287	257	271	261	247	247	225	
PGPB Imports by balance (variable)	392	177	334	-	-	-	-	-	-	-	217	-5.7
Liquefied natural gas imports	-	-	-	-	75	300	300	300	300	500	500	
<b>Destination</b>	<b>4,862</b>	<b>5,407</b>	<b>6,234</b>	<b>6,886</b>	<b>7,399</b>	<b>8,319</b>	<b>8,943</b>	<b>9,194</b>	<b>9,042</b>	<b>9,236</b>	<b>9,389</b>	<b>6.8</b>
National demand	4,855	5,365	6,234	6,577	7,312	7,647	8,086	8,306	8,544	9,030	9,389	6.8
Oil sector	995	1,078	1,222	1,271	1,386	1,378	1,444	1,425	1,377	1,377	1,379	3.3
Pemex Exploración y Producción <sup>1</sup>	500	546	655	717	802	750	784	792	786	783	783	4.6
Pemex Refinación	238	273	282	301	319	332	330	299	268	267	270	1.3
Pemex Corporativo	1	1	1	1	1	1	1	1	1	1	1	0.5
Pemex Gas y Petroquímica Básica	256	259	284	252	265	296	330	334	323	326	326	2.4
Oil sector domestic gas lifts	999	1,120	1,249	1,370	1,455	1,519	1,515	1,460	1,386	1,339	1,304	2.7
Industrial sector	1,260	1,196	1,234	1,378	1,564	1,656	1,754	1,836	1,931	2,019	2,110	5.3
Industrial	965	906	955	1,057	1,181	1,256	1,354	1,436	1,531	1,619	1,711	5.9
Pemex Petroquímica	295	290	279	321	383	400	400	400	400	400	400	3.1
Electric sector	1,505	1,856	2,392	2,386	2,696	2,841	3,080	3,253	3,485	3,904	4,180	10.8
Public	959	1,046	1,066	904	1,029	925	1,044	925	823	797	707	-3.0
Comisión Federal de Electricidad	924	997	1,039	883	1,003	900	1,027	922	820	794	703	-2.7
Luz y Fuerza del Centro	35	49	27	21	26	25	17	3	3	3	3	-21.1
Private sector	546	809	1,326	1,482	1,668	1,916	2,036	2,328	2,662	3,106	3,473	20.3
Independent power producers	424	510	921	1,065	1,244	1,486	1,607	1,898	2,233	2,677	3,032	21.7
Electricity self-generation	122	187	213	225	232	238	237	238	238	237	250	7.4
Electricity export	-	112	192	192	192	192	192	192	192	192	192	
Residential sector	71	84	99	119	144	172	200	224	243	258	268	14.2
Services sector	22	28	31	38	45	54	62	70	78	85	93	15.2
Transport sector	2	3	7	15	21	26	32	37	43	49	54	39.6
Exports	4	-	-	310	87	672	856	888	498	206	-	
Stock variation and differences*	3	42	-	-	-	-	-	-	-	-	-	

aagr: annual average growth rate.

<sup>1</sup> Includes the Cantarell Nitrogen consumption starting from 2000.

\* Includes differences and packing.

Source: IMP, based on Banxico, CFE, CNA, Conapo, CRE, INEGI, Pemex, Sener and private enterprises.

Among the multiple benefits the country could gain under such scenario, the following stand out:

- Strengthening of the natural gas industry in need of new investment
- An increase of natural gas production of 28 percent
- Foreign currency savings
- Reduction of operational costs
- Support natural gas supply used for electric power generation
- Job creation

- Make available natural gas to regions of the country that currently do not have the option of using this fuel. Therefore, the decentralization and a more balanced regional development in the country would be promoted
- Favourable conditions would be generated to attract private investment resources.
- Greater production of gas liquids, among them the liquefied gas thus promoting less imports.

Table 31  
Natural Gas National Balance  
Base Demand-High Supply  
(million cubic feet per day)

Concept	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	aagr 2002-2012
<b>Origin</b>	4,862	5,407	6,234	7,421	8,491	9,559	10,284	10,614	10,575	10,828	10,745	8.3
National production	4,134	4,380	4,816	6,265	7,184	8,057	8,672	8,940	8,787	8,629	8,395	7.3
Imports	729	1,027	1,418	1,156	1,307	1,501	1,612	1,674	1,788	2,199	2,350	12.4
Imports by logistic	337	616	792	881	945	945	1,041	1,112	1,241	1,453	1,624	17.0
PGPB Imports	201	341	372	348	377	359	408	453	465	475	466	8.8
Imports electric sector	110	139	202	313	346	362	409	432	548	747	926	23.8
Imports by private sector	27	137	218	220	222	223	225	227	229	231	232	24.2
PGPB Imports by balance	392	411	626	275	287	257	271	261	247	247	225	-5.4
PGPB Imports by balance (fixed: Kinder-Morgan MTY)	-	234	293	275	287	257	271	261	247	247	225	
PGPB Imports by balance (variable)	392	177	334	-	-	-	-	-	-	-	-	
Liquefied natural gas imports	-	-	-	0	75	300	300	300	300	500	500	
<b>Destination</b>	4,862	5,407	6,234	7,421	8,491	9,559	10,284	10,614	10,575	10,828	10,745	8.3
National demand	4,855	5,365	6,234	6,624	7,424	7,807	8,208	8,415	8,665	9,154	9,506	7.0
Oil sector	995	1,078	1,222	1,292	1,466	1,555	1,602	1,597	1,555	1,548	1,554	4.6
Pemex Exploración y Producción <sup>1</sup>	500	546	655	717	763	835	876	898	893	888	888	5.9
Pemex Refinación	238	273	282	301	319	332	330	299	268	267	270	1.3
Pemex Corporativo	1	1	1	1	1	1	1	1	1	1	1	1
Pemex Gas y Petroquímica Básica	256	259	284	274	384	388	395	399	393	393	395	4.4
Oil sector domestic gas lifts	999	1,120	1,249	1,396	1,487	1,502	1,478	1,398	1,330	1,291	1,247	2.2
Industrial sector	1,260	1,196	1,234	1,378	1,564	1,656	1,754	1,836	1,931	2,019	2,110	5.3
Industrial	965	906	955	1,057	1,181	1,256	1,354	1,436	1,531	1,619	1,711	5.9
Pemex Petroquímica	295	290	279	321	383	400	400	400	400	400	400	3.1
Electric sector	1,505	1,856	2,392	2,386	2,696	2,841	3,080	3,253	3,485	3,904	4,180	10.8
Public	959	1,046	1,066	904	1,029	925	1,044	925	823	797	707	-3.0
Comisión Federal de Electricidad	924	997	1,039	883	1,003	900	1,027	922	820	794	703	-2.7
Luz y Fuerza del Centro	35	49	27	21	26	25	17	3	3	3	3	-21.1
Private sector	546	809	1,326	1,482	1,668	1,916	2,036	2,328	2,662	3,106	3,473	20.3
Independent power producers	424	510	921	1,065	1,244	1,486	1,607	1,898	2,233	2,677	3,032	21.7
Electricity self-generation	122	187	213	225	232	238	237	238	238	237	250	7.4
Electricity export	-	112	192	192	192	192	192	192	192	192	192	
Residential sector	71	84	99	119	144	172	200	224	243	258	268	14.2
Services sector	22	28	31	38	45	54	62	70	78	85	93	15.2
Transport sector	2	3	7	15	21	26	32	37	43	49	54	39.6
Exports	4	-	-	797	1,068	1,752	2,077	2,199	1,910	1,674	1,239	75.8
Stock variation and differences*	3	42	-	-	-	-	-	-	-	-	-	

aagr: annual average growth rate.

<sup>1</sup> Includes the Cantarell Nitrogen Company consumption starting from 2000.

\* Includes differences and packing.

Source: IMP, based on Banxico, CFE, CNA, CONAPO, CRE, INEGI, Pemex, Sener and private enterprises.

#### 4 PGPB's Investments for Natural Gas Processing and Transportation

A sustained growth scenario in gas supply and condensates forecasted by PEP, visualized mainly in the Northern Region of the country, PGPB structured its investment program for the period 2003-2012.

This investment program is 40.9 billion (2003 Mexican pesos) and it will be oriented mainly to the efficient handling of the products' balance and the operative flexibility, areas in which 71 percent of the

mentioned resources will be destined, i.e., 29.1 billion (Mexican pesos). In second term, and in accordance with Pemex's strategic priorities, it will dedicate 6.3 billion Mexican pesos, meaning 16 percent of the period's total destined to the continuous improvement processes such as the Security Program, Health and Environmental Protection (PROSSPA) and Uptime.

The rest of the resources, 3 billion Mexican pesos will be destined to the systems' technological integration and 2.5 billion to the company's administrative support.

Total foreseen investments are classified taking into consideration the project's type.

In the functions related with natural gas processing and transportation, PGPB has foreseen an investment of 28.2 billion Mexican pesos in the period, 69 percent of total investment.

Table 32  
PGPB Investments, 2003-2012

Project type	Million pesos	percent
Strategic projects	14,455	35.3
Integral projects	24,147	59.0
Pidiregas amortization	2,322	5.7
<b>Total</b>	<b>40,924</b>	<b>100.0</b>

Source: PGPB.

With these resources the capacity to process sour gas will be increased in 680 mmcf/d, the sulfur recuperation in 898 tons per day, wet gas processing for liquids recovery in 1,756 mmcf/d and the breaking up of light hydrocarbons in 152 thousand barrels per day.

Table 33  
PGPB Gas Processing Projects, 2003-2012

Product	2003 Capacity	2012 Capacity	Increment
Gas removal of sulphur and impurities (mmpcd)	4,542.0	5,222.0	680.0
Sulphur retrieval (tpd)*	3,367.0	4,265.0	898.0
Liquid retrieval (mmpcd)	4,776.0	6,526.0	1,756.0
Light hydrocarbon breaking up (mbd)	579.5	731.5	152.0

Source: PGPB.

In order to fulfill the above-mentioned, the construction of the following projects is needed:

5 modular cryogenic plants in the area of Reynosa, 4 of 200 mmcf/d each one and one of 100 mmcf/d.

The South Integral Burgos project

The increase of bitter wet gas process in Poza Rica

A breaking up industry with a capacity of 104 mbd in the Coatzacoalcos area

A cryogenic plant of 400 mmcf/d in Cactus

On the other hand, with respect to the transport sector, the main projects are:

Table 34  
PGPB Gas Transport Projects, 2003-2012

Project	Starting of operation	HP Capacity
<b>Compression stations</b>		
<i>Emiliano Zapata</i>	2006	35,000
<i>Santa Ana</i>	2006	48,000
<i>Soto la Marina</i>	2006	45,000
<i>Macarela o Tecolutla</i>	2006	45,000
<b>Petrochemical pipelines</b>		
	Product	Diameter/length
<i>Cd. Pemex-Nvo. Pemex</i>	C <sub>2</sub> +	16" x 70 km.
<i>Cd. Pemex-Nvo. Pemex-Cactus</i>	C <sub>3</sub> +	16" x 81 km.
<i>Cactus-Nvo. Pemex-cangrejera</i>	C <sub>2</sub> +	24" x 140 km.

Source: PGPB.

With the previously mentioned investments, PGPB will be prepared to process the PEP hydrocarbons' supply guaranteeing its optimal use and operating the assets in a reliable and safe way, increasing the Pemex's contribution to the Mexican economy.

Table 35  
Natural Gas National Balance  
High Demand-Risk Aligned Mean Supply  
(million cubic feet per day)

Concept	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	aagr 2002-2012
<b>Origin</b>	<b>4,862</b>	<b>5,421</b>	<b>6,187</b>	<b>6,886</b>	<b>7,370</b>	<b>8,364</b>	<b>8,909</b>	<b>9,223</b>	<b>9,123</b>	<b>9,367</b>	<b>9,862</b>	<b>7.3</b>
<b>National production</b>	<b>4,134</b>	<b>4,380</b>	<b>4,816</b>	<b>5,730</b>	<b>6,091</b>	<b>6,817</b>	<b>7,331</b>	<b>7,520</b>	<b>7,254</b>	<b>7,037</b>	<b>6,823</b>	<b>5.1</b>
<b>Imports</b>	<b>729</b>	<b>1,041</b>	<b>1,371</b>	<b>1,156</b>	<b>1,278</b>	<b>1,547</b>	<b>1,579</b>	<b>1,703</b>	<b>1,869</b>	<b>2,330</b>	<b>3,040</b>	<b>15.4</b>
Imports by logistics	337	617	781	890	949	1,003	1,035	1,160	1,334	1,490	1,679	17.4
PGPB Imports	201	341	361	356	378	372	402	450	442	452	454	8.5
Imports electric sector	110	138.6	201.5	313.2	348.2	406.0	405.3	481.1	660.1	804.1	988.3	24.6
Imports by private sector	27	137	218	221	223	225	227	229	232	234	237	24.5
PGPB Imports by balance	392	423	590	266	254	244	244	243	235	340	861	8.2
PGPB Imports by balance (fixed: Kinder-Morgan MTY)	-	234	281	266	288	244	244	243	235	230	229	
PGPB Imports by balance (variable)	392	189	308	-	34	-	-	-	-	110	633	4.9
Liquefied natural gas imports	-	-	-	-	75	300	300	300	300	500	500	
<b>Destination</b>	<b>4,862</b>	<b>5,421</b>	<b>6,187</b>	<b>6,886</b>	<b>7,370</b>	<b>8,364</b>	<b>8,909</b>	<b>9,223</b>	<b>9,123</b>	<b>9,367</b>	<b>9,862</b>	<b>7.3</b>
<b>National demand</b>	<b>4,855</b>	<b>5,378</b>	<b>6,187</b>	<b>6,586</b>	<b>7,370</b>	<b>7,772</b>	<b>8,204</b>	<b>8,533</b>	<b>8,910</b>	<b>9,367</b>	<b>9,862</b>	<b>7.3</b>
Oil sector	995	1,079	1,222	1,271	1,386	1,379	1,445	1,426	1,378	1,377	1,380	3.3
Pemex Exploración y Producción <sup>1</sup>	500	546	655	717	802	750	784	792	786	783	783	4.6
Pemex Refinación	238	273	282	301	319	332	330	299	268	267	270	1.3
Pemex Corporativo	1	1	1	1	1	1	1	1	1	1	1	-1.4
Pemex Gas y Petroquímica Básica	256	259	284	252	265	296	330	334	323	326	326	2.4
Oil sector domestic gas lifts	999	1,120	1,249	1,370	1,455	1,519	1,515	1,460	1,386	1,339	1,304	2.7
Industrial sector	1,260	1,209	1,263	1,424	1,629	1,746	1,866	1,972	2,094	2,210	2,342	6.4
Industrial	965	919	984	1,104	1,246	1,347	1,466	1,572	1,694	1,810	1,943	7.2
Pemex Petroquímica	295	290	279	321	383	400	400	400	400	400	400	3.1
Electric sector	1,505	1,856	2,314	2,348	2,687	2,874	3,080	3,336	3,679	4,039	4,409	11.3
Public	959	1,046	976	853	1,020	919	916	781	736	678	626	-4.2
Comisión Federal de Electricidad	924	997	959	832	999	895	907	777	733	675	623	-3.9
Luz y Fuerza del Centro	35	49	17	21	21	24	9	3	3	3	3	-20.6
Private sector	546	809	1,338	1,495	1,667	1,955	2,164	2,556	2,943	3,361	3,783	21.3
Independent power producers	424	510	933	1,078	1,243	1,525	1,735	2,126	2,514	2,932	3,341	22.9
Electricity self-generation	122	187	213	225	232	238	237	238	238	237	250	7.4
Electricity exports	-	112	192	192	192	192	192	192	192	192	192	
Residential sector	71	84	99	120	145	173	202	227	247	262	274	14.4
Services sector	22	28	32	38	46	55	65	74	83	90	100	16.1
Transport sector	2	3	7	15	21	26	32	37	43	49	54	39.6
<b>Exports</b>	<b>4</b>	<b>-</b>	<b>-</b>	<b>300</b>	<b>-</b>	<b>591</b>	<b>706</b>	<b>690</b>	<b>213</b>	<b>-</b>	<b>-</b>	
<b>Stock variation an differences*</b>	<b>3</b>	<b>42</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	

aagr: annual average growth rate.

<sup>1</sup> Includes the Cantarell Nitrogen Company consumption starting from 2000.

\* Includes differences and packing.

Source: IMP, based on Banxico, CFE, CNA, Conapo, CRE, INEGI, Pemex, Sener and private companies.

Table 36  
 Natural Gas National Balance  
 Low Demand-Risk Aligned Mean Supply  
 (million cubic feet per day)

Concept	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	aagr 2002-2012
<b>Origin</b>	<b>4,862</b>	<b>5,374</b>	<b>6,139</b>	<b>6,867</b>	<b>7,340</b>	<b>8,274</b>	<b>8,847</b>	<b>9,118</b>	<b>8,903</b>	<b>9,006</b>	<b>8,866</b>	<b>6.2</b>
National production	4,134	4,380	4,816	5,730	6,091	6,817	7,331	7,520	7,254	7,037	6,823	5.1
<b>Imports</b>	<b>729</b>	<b>993</b>	<b>1,322</b>	<b>1,137</b>	<b>1,249</b>	<b>1,457</b>	<b>1,516</b>	<b>1,598</b>	<b>1,649</b>	<b>1,969</b>	<b>2,044</b>	<b>10.9</b>
Imports by logistics	337	616	786	871	914	916	946	1,037	1,097	1,221	1,294	14.4
PGPB imports	201	340	368	343	360	347	364	408	455	463	464	8.7
Imports electric sector	110	139	201	309	334	348	360	407	418	534	604	18.6
Imports by private sector	27	137	217	219	220	221	222	222	223	224	225	23.8
PGPB imports by balance	392	378	537	266	260	241	270	261	252	249	250	-4.4
PGPB imports by balance (fixed: Kinder-Morgan MTY)	-	234	289	266	260	241	270	261	252	249	250	
PGPB imports by balance (variables)	392	144	248	-	-	-	-	-	-	-	-	
Liquefied natural gas import	-	-	-	-	75	300	300	300	300	500	500	
<b>Destination</b>	<b>4,862</b>	<b>5,374</b>	<b>6,139</b>	<b>6,867</b>	<b>7,340</b>	<b>8,274</b>	<b>8,847</b>	<b>9,118</b>	<b>8,903</b>	<b>9,006</b>	<b>8,866</b>	<b>6.2</b>
<b>National demand</b>	<b>4,855</b>	<b>5,331</b>	<b>6,139</b>	<b>6,411</b>	<b>6,990</b>	<b>7,249</b>	<b>7,596</b>	<b>7,641</b>	<b>7,712</b>	<b>7,960</b>	<b>8,133</b>	<b>5.3</b>
Oil sector	995	1,079	1,222	1,271	1,386	1,379	1,445	1,426	1,378	1,377	1,380	3.3
Pemex Exploración y Producción <sup>1</sup>	500	546	655	717	802	750	784	792	786	783	783	4.6
Pemex Refinación	238	273	282	301	319	332	330	299	268	267	270	1.3
Pemex Corporativo	1	1	1	1	1	1	1	1	1	1	1	7.2
Pemex Gas y Petroquímica Básica	256	259	284	252	265	296	330	334	323	326	326	2.4
Oil sector domestic gas lifts	999	1,120	1,249	1,370	1,455	1,519	1,515	1,460	1,386	1,339	1,304	2.7
Industrial sector	1,260	1,162	1,179	1,297	1,446	1,509	1,565	1,599	1,642	1,685	1,708	3.1
Industrial	965	873	900	976	1,063	1,109	1,165	1,199	1,242	1,285	1,309	3.1
Pemex Petroquímica	295	290	279	321	383	400	400	400	400	400	400	3.1
Electric sector	1,505	1,856	2,351	2,304	2,497	2,597	2,789	2,838	2,959	3,188	3,349	8.3
Public	959	1,046	1,026	824	865	820	1,002	906	863	854	853	-1.2
Comisión Federal de Electricidad	924	997	1,007	808	846	794	988	897	849	846	843	-0.9
Luz y Fuerza del Centro	35	49	20	16	19	25	14	9	14	8	10	-11.8
Private sector	546	809	1,325	1,479	1,632	1,778	1,786	1,932	2,095	2,334	2,497	16.4
Independent power producers	424	510	920	1,062	1,208	1,348	1,357	1,503	1,666	1,906	2,055	17.1
Electricity self-generation	122	187	213	225	232	238	237	238	238	237	250	7.4
Electricity export	-	112	192	192	192	192	192	192	192	192	192	
Residential sector	71	84	98	118	142	169	195	218	236	249	258	13.8
Services sector	22	27	31	36	42	50	56	63	68	73	78	13.3
Transport sector	2	3	7	15	21	26	32	37	43	49	54	39.6
<b>Exports</b>	<b>4</b>	<b>-</b>	<b>-</b>	<b>457</b>	<b>350</b>	<b>1,025</b>	<b>1,250</b>	<b>1,477</b>	<b>1,191</b>	<b>1,046</b>	<b>734</b>	<b>66.8</b>
<b>Stock variation and differences*</b>	<b>3</b>	<b>42</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	

aagr: annual average growth rate.

<sup>1</sup> Includes the Cantarell Nitrogen Company consumption starting from 2000.

\* Includes differences and packing.

Source: IMP, based on Banxico, CFE, CNA, Conapo, CRE, INEGI, Pemex, Sener and private enterprises.

Table 37  
Natural Gas National Balance  
High Demand-High Supply  
(million cubic feet per day)

Concept	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	aagr 2002-2012
<b>Origin</b>	4,862	5,420	6,186	7,421	8,496	9,604	10,251	10,643	10,656	10,849	10,803	8.3
National production	4,134	4,380	4,816	6,265	7,184	8,057	8,672	8,940	8,787	8,629	8,395	7.3
<b>Imports</b>	729	1,040	1,370	1,156	1,312	1,547	1,579	1,703	1,869	2,220	2,407	12.7
Imports by logistic	337	617	781	890	949	1,003	1,035	1,160	1,334	1,490	1,679	17.4
PGPB imports	201	341	361	356	378	372	402	450	442	452	454	8.5
Imports electric sector	110	139	202	313	348	406	405	481	660	804	988	24.6
Imports by private sector	27	137	218	221	223	225	227	229	232	234	237	24.5
PGPB imports by balance	392	423	589	266	288	244	244	243	235	230	229	-5.2
PGPB imports by balance (fixed: Kinder-Morgan MTY)	-	234	281	266	288	244	244	243	235	230	229	
PGPB imports by balance(variables)	392	189	308	-	-	-	-	-	-	-	-	
Liquefied natural gas imports	-	-	-	-	75	300	300	300	300	500	500	
<b>Destination</b>	4,862	5,420	6,186	7,421	8,496	9,604	10,251	10,643	10,656	10,849	10,803	8.3
<b>National demand</b>	4,855	5,378	6,186	6,634	7,482	7,932	8,325	8,642	9,032	9,491	9,979	7.5
Oil sector	995	1,078	1,222	1,292	1,466	1,556	1,602	1,597	1,555	1,549	1,554	4.6
Pemex Exploración y Producción <sup>1</sup>	500	546	655	717	763	835	876	898	893	888	888	5.9
Pemex Refinación	238	273	282	301	319	332	330	299	268	267	270	1.3
Pemex Corporativo	1	1	1	1	1	1	1	1	1	1	1	7.2
Pemex Gas y Petroquímica Básica	256	259	284	274	384	388	395	399	393	393	395	4.4
Oil sector domestic gas lifts	999	1,120	1,249	1,396	1,487	1,502	1,478	1,398	1,330	1,291	1,247	2.2
Industrial sector	1,260	1,209	1,263	1,424	1,629	1,746	1,866	1,972	2,094	2,210	2,342	6.4
Industrial	965	919	984	1,104	1,246	1,347	1,466	1,572	1,694	1,810	1,943	7.2
Pemex Petroquímica	295	290	279	321	383	400	400	400	400	400	400	3.1
Electric sector	1,505	1,856	2,314	2,348	2,687	2,874	3,080	3,336	3,679	4,039	4,409	11.3
Public	959	1,046	976	853	1,020	919	916	781	736	678	626	-4.2
Comisión Federal de Electricidad	924	997	959	832	999	895	907	777	733	675	623	-3.9
Luz y Fuerza del Centro	35	49	17	21	21	24	9	3	3	3	3	-20.6
Private sector	546	809	1,338	1,495	1,667	1,955	2,164	2,556	2,943	3,361	3,783	21.3
Independent power producer	424	510	933	1,078	1,243	1,525	1,735	2,126	2,514	2,932	3,041	22.9
Electricity self-generation	122	187	213	225	232	238	237	238	238	237	250	7.4
Electricity export	-	112	192	192	192	192	192	192	192	192	192	
Residential sector	71	84	99	120	145	173	202	227	247	262	274	14.4
Services sector	22	28	32	38	46	55	65	74	83	90	100	16.1
Transport sector	2	3	7	15	21	26	32	37	43	49	54	39.6
<b>Exports</b>	4	-	-	787	1,014	1,671	1,926	2,001	1,625	1,358	823	68.7
<b>Stock variation an differences*</b>	3	42	-	-	-	-	-	-	-	-	-	

aagr: annual average growth rate.

<sup>1</sup> Includes the Cantarell Nitrogen Company consumption starting from 2000.

\* Includes differences and packing.

Source: IMP, based on Banxico, CFE, CNA, Conapo, CRE, INEGI, Pemex, Sener and private enterprises.

Table 38  
Natural Gas National Balance  
Low Demand-High Supply  
(million cubic feet per day)

Concept	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	aagr 2002-2012
<b>Origin</b>	<b>4,862</b>	<b>5,373</b>	<b>6,138</b>	<b>7,402</b>	<b>8,433</b>	<b>9,514</b>	<b>10,188</b>	<b>10,538</b>	<b>10,436</b>	<b>10,598</b>	<b>10,439</b>	<b>7.9</b>
National production	4,134	4,380	4,816	6,265	7,184	8,057	8,672	8,940	8,787	8,629	8,395	7.3
<b>Imports</b>	<b>729</b>	<b>993</b>	<b>1,322</b>	<b>1,137</b>	<b>1,249</b>	<b>1,457</b>	<b>1,516</b>	<b>1,598</b>	<b>1,649</b>	<b>1,969</b>	<b>2,044</b>	<b>10.9</b>
Imports by logistics	337	616	786	871	914	916	946	1,037	1,097	1,221	1,294	14.4
PGPB imports	201	340	368	343	360	347	364	408	455	463	464	8.7
Imports electric sector	110	139	201	309	334	348	360	407	418	534	604	18.6
Imports by private sector	27	137	217	219	220	221	222	222	223	224	225	23.8
PGPB imports by balance	392	377	536	266	260	241	270	261	252	249	250	-4.4
PGPB imports by balance (fixed: Kinder-Morgan MTY)	-	234	289	266	260	241	270	261	252	249	250	
PGPB imports by balance (variables)	392	143	247	-	-	-	-	-	-	-	-	
Liquefied natural gas imports	-	-	-	-	75	300	300	300	300	500	500	
<b>Destination</b>	<b>4,862</b>	<b>5,373</b>	<b>6,138</b>	<b>7,402</b>	<b>8,433</b>	<b>9,514</b>	<b>10,188</b>	<b>10,538</b>	<b>10,436</b>	<b>10,598</b>	<b>10,439</b>	<b>7.9</b>
<b>National demand</b>	<b>4,855</b>	<b>5,331</b>	<b>6,138</b>	<b>6,458</b>	<b>7,102</b>	<b>7,409</b>	<b>7,717</b>	<b>7,751</b>	<b>7,834</b>	<b>8,085</b>	<b>8,250</b>	<b>5.4</b>
Oil sector	995	1,078	1,222	1,292	1,466	1,556	1,602	1,597	1,555	1,549	1,554	4.6
Pemex Exploración y Producción <sup>1</sup>	500	546	655	717	763	835	876	898	893	888	888	5.9
Pemex Refinación	238	273	282	301	319	332	330	299	268	267	270	1.3
Pemex Corporativo	1	1	1	1	1	1	1	1	1	1	1	7.2
Pemex Gas y Petroquímica Básica	256	259	284	274	384	388	395	399	393	393	395	4.4
Oil sector domestic gas lifts	999	1,120	1,249	1,396	1,487	1,502	1,478	1,398	1,330	1,291	1,247	2.2
Industrial sector	1,260	1,162	1,179	1,297	1,446	1,509	1,565	1,599	1,642	1,685	1,708	3.1
Industrial	965	873	900	976	1,063	1,109	1,165	1,199	1,242	1,285	1,309	3.1
Pemex Petroquímica	295	290	279	321	383	400	400	400	400	400	400	3.1
Electric sector	1,505	1,856	2,351	2,304	2,497	2,597	2,789	2,838	2,959	3,188	3,349	8.3
Public	924	1,046	1,026	824	865	820	1,002	906	863	854	853	-1.2
Comisión Federal de Electricidad	924	997	1,007	808	846	794	988	897	849	846	843	-0.9
Luz y Fuerza del Centro	35	49	20	16	19	25	14	9	14	8	10	-11.8
Private sector	546	809	1,325	1,479	1,632	1,778	1,786	1,932	2,095	2,334	2,497	16.4
Electricity independent power producers	424	510	920	1,062	1,208	1,348	1,357	1,503	1,666	1,906	2,055	17.1
Electricity self-generation	122	187	213	225	232	238	237	238	238	237	250	7.4
Electricity exports	-	112	192	192	192	192	192	192	192	192	192	
Residential sector	71	84	98	118	142	169	195	218	236	249	258	13.8
Services sector	22	27	31	36	42	50	56	63	68	73	78	13.3
Transport sector	2	3	7	15	21	26	32	37	43	49	54	39.6
<b>Exports</b>	<b>4</b>	<b>-</b>	<b>-</b>	<b>944</b>	<b>1,331</b>	<b>2,105</b>	<b>2,471</b>	<b>2,788</b>	<b>2,603</b>	<b>2,514</b>	<b>2,190</b>	<b>86.1</b>
<b>Stock variation and differences*</b>	<b>3</b>	<b>42</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	

aagr: annual average growth rate.

<sup>1</sup> Includes the Cantarell Nitrogen Company consumption starting from 2000.

\* Includes differences and packing.

Source: IMP, based on Banxico, CFE, CNA, Conapo, CRE, INEGI, Pemex, Sener and private enterprises.

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# Annex

# I. Natural gas infrastructure

Table 1  
Natural Gas Transportation and Distribution Permits  
Granted up to August 2003

Modality	Permits	Length(km)	Investment (billion USD)
Transportation	102	11,487	1.586
Open access	16	10,864	1.385
Self use	86	623	0.201
Distribution	21	28,042	0.989
<b>Total</b>	<b>123</b>	<b>39,529</b>	<b>2.575</b>

Source: CRE

Figure 1  
Distribution Projects



Source: CRE

Table 2  
Potential Geographical Distribution Zones

Geographical zone	Location	Potential municipalities
Pachuca	Hidalgo	Pachuca, Tulancingo, Tepeapulco, Tizayuca, Atitalaquia, Tula, Tepeji del Río, Huichapan, Cuauhtemoc
Mérida	Yucatán	Mérida, Progreso, Valladolid, Tizimín, Izamal

Source: CRE

Figure 2  
Pipeline Net and Gas Processing Centers



Figure 3  
Natural Gas Compression Stations



Figure 4  
Natural Gas Interconnections' Capacity with USA  
(million cubic feet per day)



Figure 5  
Potential LNG Terminal Projects



Source: Sener

## II. Natural gas supply and demand 1993-2002

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Table 3  
Natural Gas Balance 1993-2002  
(million cubic feet per day)

Concept	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	growth rate % 1993-2002
<b>Origin</b>	<b>3,067</b>	<b>3,256</b>	<b>3,353</b>	<b>3,629</b>	<b>3,835</b>	<b>4,156</b>	<b>4,207</b>	<b>4,373</b>	<b>4,455</b>	<b>4,862</b>	<b>5.3</b>
National production	2,970	3,131	3,180	3,545	3,726	4,004	4,039	4,091	4,074	4,134	3.7
Imports	97	125	173	84	109	152	168	282	381	729	25.2
Imports by logistic	30	39	50	56	68	131	163	207	229	337	30.8
PGPB imports	30	39	50	56	68	125	140	156	140	201	23.5
Electricity imports	-	-	-	-	-	-	-	25	67	110	-
Imports by private sector	-	-	-	-	1	6	22	25	22	27	-
PGPB balance imports	66	86	123	28	41	21	6	75	152	392	21.8
PGPB imports by balance (fixed: KM MTY)	-	-	-	-	-	-	-	-	-	-	-
PGPB imports by balance (variables)	66	86	123	28	41	21	6	75	152	-	-
<b>Destination</b>	<b>3,045</b>	<b>3,255</b>	<b>3,370</b>	<b>3,641</b>	<b>3,801</b>	<b>4,093</b>	<b>4,128</b>	<b>4,350</b>	<b>4,383</b>	<b>4,859</b>	<b>5.3</b>
National demand	3,040	3,235	3,349	3,605	3,764	4,060	3,992	4,326	4,358	4,855	5.3
Oil sector	738	751	695	735	754	825	845	913	994	995	3.4
Pemex Exploración y Producción <sup>1</sup>	336	342	325	364	357	374	398	442	505	500	4.5
Pemex Refinación	131	137	135	140	180	194	198	207	230	238	6.9
Pemex Corporativo	1	1	1	1	1	1	1	1	1	0	-9.4
Pemex Gas y Petroquímica Básica	271	272	235	230	216	256	247	264	258	256	-0.6
Oil sector gas lift	388	459	510	672	809	904	777	930	967	999	11.1
Industrial sector	1,372	1,406	1,482	1,525	1,468	1,503	1,472	1,393	1,154	1,260	-0.9
Industrial	738	748	801	868	888	966	1,023	1,020	838	961	3.0
Pemex Petroquímica	634	658	680	657	580	537	449	373	316	295	-8.2
Electricity sector	465	546	589	596	653	756	821	1,011	1,158	1,505	13.9
Public	385	465	494	492	538	639	705	870	987	959	10.7
Comisión Federal de Electricidad	376	437	470	465	513	600	669	816	949	924	10.5
Luz y Fuerza del Centro	9	28	24	27	24	39	36	54	38	35	15.6
Private	80	81	95	104	116	116	116	140	170	546	23.8
Independent power producers	-	-	-	-	-	-	-	26	89	424	-
Electricity self generation	80	81	95	104	116	116	116	114	80	122	4.8
Residential sector	62	58	57	60	62	56	57	60	64	71	1.5
Services sector	15	15	16	17	18	17	19	20	21	22	4.9
Transport sector	-	-	-	-	-	-	1	1	1	2	-
Exports	5	19	21	36	37	32	136	24	25	4	-0.6
Stock variation and differences*	22	1	17	12	34	63	80	23	71	3	-19.1

<sup>1</sup> Includes the Cantarell Nitrogen Company consumption since 2000.

\* Includes differences and packing.

Source: IMP, based on Banxico, CFE, CNA, Conapo, CRE, INEGI, Pemex, Sener and private companies.

Table 4  
Natural Gas Demand Regionalization in Mexico

Northwest	Northeast	Center-west	Center	South-southeast
Baja California	Chihuahua	Aguascalientes	Distrito Federal	Campeche
Baja California Sur	Durango	Colima	Hidalgo	Chiapas
Sinaloa	Coahuila	Guanajuato	México	Guerrero
Sonora	Nuevo León	Jalisco	Morelos	Oaxaca
	Tamaulipas	Michoacán	Puebla	Quintana Roo
		Nayarit	Tlaxcala	Tabasco
		Querétaro		Veracruz
		San Luis Potosí		Yucatán
		Zacatecas		

Table 5  
Natural Gas Consumption by Region, 1993-2002  
(million cubic feet per day)

Region	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	aagr
Total	3,040	3,235	3,349	3,605	3,764	4,060	3,992	4,326	4,358	4,855	5.3
South-southeast	1,607	1,725	1,764	1,961	2,019	2,169	1,957	2,114	2,233	2,314	4.1
Northwest	740	763	802	851	865	931	1,013	1,138	1,068	1,309	6.5
Center	464	506	504	494	543	586	616	625	615	606	3.0
Center-west	226	237	272	287	325	359	383	389	345	473	8.5
Northeast	4	4	7	12	12	16	25	61	97	153	50.9

aagr: annual average growth rate.  
Source: Sener based on CRE and PGBP.

Table 6  
Natural Gas Consumption in the South-southeast Region, 1993-2002  
(million cubic feet per day)

Sector	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	growth rate %
Total	1,607	1,725	1,764	1,961	2,019	2,169	1,957	2,114	2,233	2,314	4.1
Oil	931	1,030	1,034	1,230	1,353	1,509	1,376	1,576	1,679	1,711	7.0
Self consumption	596	626	581	619	599	654	650	702	770	768	2.9
Gas lifts	335	404	453	611	754	855	726	874	909	943	12.2
Total without pemex	676	695	730	731	666	660	581	538	554	603	-1.2
Industrial	636	656	683	668	602	587	514	426	367	358	-6.2
Pemex Petroquímica	546	570	589	563	499	483	417	331	283	263	-7.8
Others	90	86	94	104	102	104	96	94	83	95	0.5
Electricity	40	38	46	64	64	73	67	112	188	245	22.5
Public	35	34	41	58	58	68	62	81	113	113	13.7
Private	4	4	5	5	6	6	5	31	75	133	47.0
Residential	-	-	-	-	-	-	-	-	-	-	-
Services	-	-	-	-	-	-	-	-	-	-	-
Transport	-	-	-	-	-	-	-	-	-	-	-

Source: Sener based on information from CRE and PGPB.

Table 7  
Natural Gas Consumption in the Northeast Region, 1993-2002  
(million cubic feet per day)

Sector	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	growth rate % 1993-2002
Total	740	763	802	851	865	931	1,013	1,138	1,068	1,309	6.5
Oil	133	128	122	132	132	118	133	154	183	194	4.3
Self consumption	80	73	66	71	76	69	82	99	125	138	6.2
Gas lifts	53	54	56	61	56	49	51	56	58	56	0.7
Total without Pemex	607	635	679	718	733	813	880	983	888	1,115	7.0
Industrial	335	338	355	391	382	413	425	445	345	400	2.0
Pemex Petroquímica	19	20	19	22	20	18	1	9	5	3	-17.5
Others	316	318	337	370	362	395	424	436	340	397	2.6
Electricity	207	236	261	263	285	340	388	470	470	641	13.4
Public	161	192	207	203	228	274	320	412	428	387	10.2
Private	46	44	55	60	57	65	68	58	42	255	20.8
Residential	52	48	48	49	51	47	50	51	53	55	0.6
Services	12	13	14	15	15	14	17	18	17	18	4.5
Transport	-	-	-	-	-	-	-	-	-	-	-

Source: Sener based on information from CRE and PGPB.

Table 8  
Natural Gas Consumption in the Center Region, 1993-2002  
(million cubic feet per day)

Sector	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	growth rate % 1993-2002
Total	464	506	504	494	543	586	616	625	615	606	3.0
Oil	25	24	18	17	43	50	64	68	55	40	5.3
Self consumption	25	24	18	17	43	50	64	68	55	40	5.3
Gas lift	-	-	-	-	-	-	-	-	-	-	-
Total without Pemex	439	482	486	477	500	536	552	557	557	566	2.9
Industrial	236	238	236	241	246	257	269	254	237	254	0.8
Pemex Petroquímica	35	37	39	38	34	36	31	33	28	28	-2.4
Others	201	201	197	203	212	221	238	221	209	226	1.3
Electricity	193	234	240	226	244	270	276	295	311	295	4.8
Public	173	212	218	201	217	248	257	275	293	272	5.2
Private	20	22	22	25	27	22	19	20	18	23	1.5
Residential	8	8	8	8	8	7	5	7	8	12	4.6
Services	2	2	2	2	2	2	1	0	2	4	7.9
Transport	-	-	-	-	-	-	1	1	1	2	-

Source: Sener based on CRE and PGPB.

Table 9  
Natural Gas Consumption in the Center-west Region, 1993-2002  
(million cubic feet per day)

Sector	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	growth rate % 1993-2002
Total	226	237	272	287	325	359	383	389	345	473	8.5
Oil	37	27	30	27	35	53	50	44	44	49	3.2
Self consumption	37	27	30	27	35	53	50	44	44	49	3.2
Gas lift	-	-	-	-	-	-	-	-	-	-	-
Total without Pemex	189	210	242	260	289	306	332	345	301	424	9.4
Industrial	163	172	200	215	228	232	246	248	191	230	3.9
Pemex Petroquímica	35	32	33	34	27	-	-	-	-	-	-
Others	128	140	166	181	201	232	246	248	191	230	6.7
Electricity	25	37	41	43	60	73	85	96	109	192	25.3
Public	16	26	28	30	34	50	61	65	86	82	20.3
Private	10	11	13	13	26	23	24	31	23	110	31.0
Residential	1	1	1	1	1	1	1	1	1	3	9.0
Services	-	-	-	-	-	1	1	1	1	-	-
Transport	-	-	-	-	-	-	-	-	-	-	-

Source: Sener based on CRE and PGPB.

Table 10  
Natural Gas Consumption in Northwest Region, 1993-2002  
(million cubic feet per day)

Sector	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	growth rate % 1993-2002
Total	4	4	7	12	12	16	25	61	97	153	51.0
Oil	-	-	-	-	-	-	-	-	-	1	-
Self consumption	-	-	-	-	-	-	-	-	-	1	-
Gas lift	-	-	-	-	-	-	-	-	-	-	-
Total without Pemex	4	4	7	12	12	16	25	61	97	153	50.9
Industry	3	3	7	10	11	14	18	21	14	19	24.4
Pemex Petroquímica	3	3	7	10	11	14	18	21	14	19	24.4
Others	-	-	-	-	-	-	-	-	-	-	-
Electricity	-	-	-	-	-	-	5	38	80	132	-
Public	-	-	-	-	-	-	5	38	69	105	-
Private	-	-	-	-	-	-	-	0	11	26	-
Residential	1	2	-	-	-	-	1	1	2	2	-
Services	-	-	-	2	1	2	-	-	-	-	-
Transport	-	-	-	-	-	-	-	-	-	-	-

Source: Sener based on CRE and PGPB.

Figure 6  
Natural Gas Consumption by Region 1993-2002  
(million cubic feet per day)

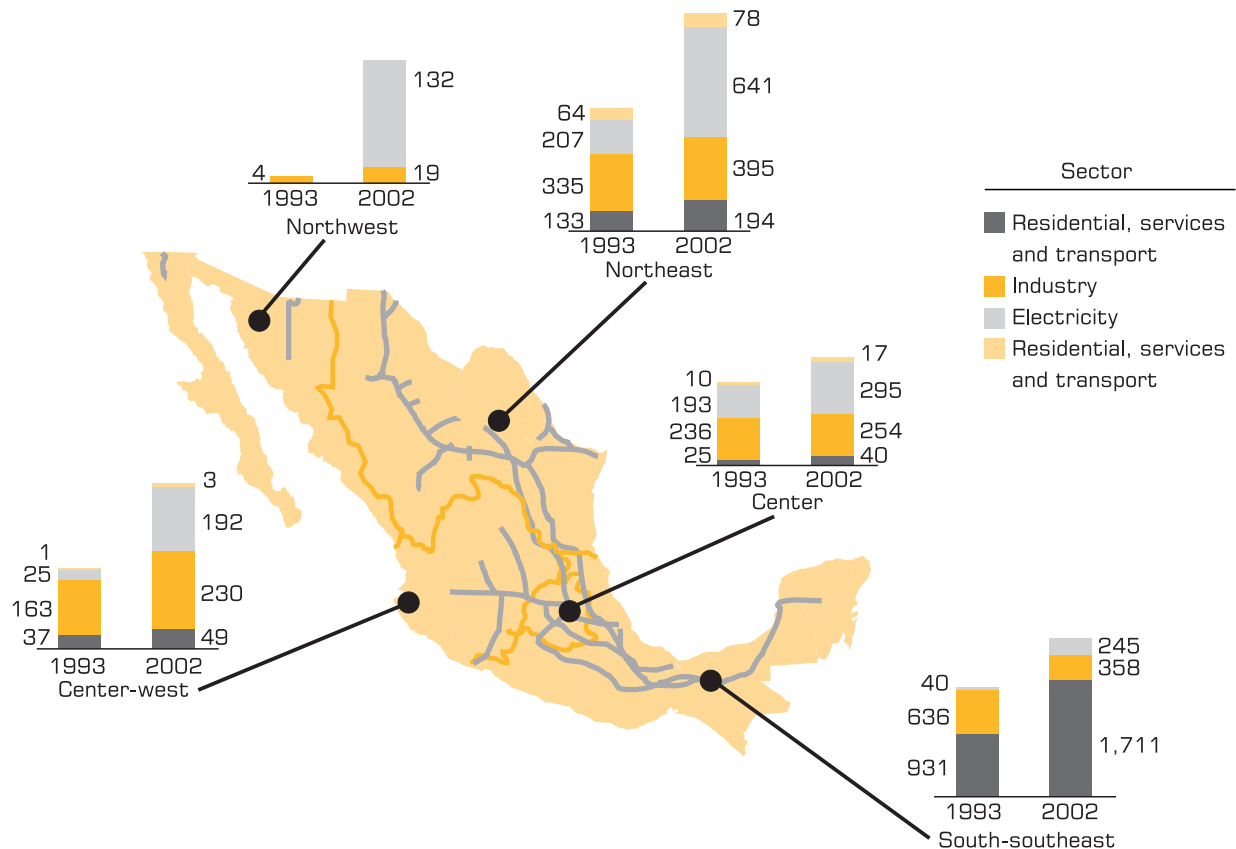


Table 11  
Total Natural Gas Remaining Reserves, 2000-2003  
(billion cubic feet per day)

	Total	Northeastern Marine Region	Southeastern Marine Region	Northern Region	Southern Region
<b>2000</b>					
Associated	62,049.6	8,897.9	4,979.3	36,853.0	11,319.4
Non associated	16,236.9	0.0	1,935.7	7,321.5	6,979.7
<b>2001</b>					
Associated	60,010.5	8,161.3	4,663.7	36,319.6	10,865.9
Non associated	16,424.4	0.0	1,935.7	7,663.7	6,825.0
<b>2002</b>					
Associated	55,049.1	7,916.5	3,982.5	33,424.6	9,725.5
Non associated	14,055.8	0.0	1,944.2	6,373.5	5,738.1
<b>2003</b>					
Associated	52,010.9	6,919.5	3,627.6	32,659.2	8,804.5
Non associated	13,422.1	0.0	2,773.8	6,087.4	4,560.9

Source: Mexico's hydrocarbon reserves, Pemex. January 1, 2003

Table 12  
Dry Gas Proven Reserves by Region, 1998-2003  
(billion cubic feet)

Region	1998	1999	2000	2001	2002	2003
<b>Total</b>	<b>31,339</b>	<b>30,064</b>	<b>30,394</b>	<b>29,505</b>	<b>16,256</b>	<b>14,985</b>
Southern	9,105	8,231	9,237	8,655	8,334	7,571
Northern	18,034	17,873	16,402	16,311	3,692	3,231
Northeastern Marine	2,815	2,584	3,308	3,063	2,885	2,737
Southeastern Marine	1,385	1,376	1,447	1,476	1,345	1,446

\*Numbers to January 1<sup>st</sup> of each year. The 2002 figures correspond to the September revision.  
Source: Mexico's hydrocarbon reserves.

Table 13  
Natural Gas Production by Type and Region, 1993-2003  
(billion cubic feet)

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	growth rate% 1993-2002
<b>Total</b>	<b>3,576</b>	<b>3,625</b>	<b>3,759</b>	<b>4,196</b>	<b>4,468</b>	<b>4,791</b>	<b>4,791</b>	<b>4,679</b>	<b>4,511</b>	<b>4,423</b>	<b>2.4</b>
Associated	3,093	3,108	3,154	3,479	3,631	3,704	3,526	3,380	3,239	3,118	0.1
Southern	1,724	1,641	1,649	1,788	1,854	1,888	1,839	1,709	1,597	1,559	-1.1
Marines	1,244	1,339	1,379	1,563	1,649	1,686	1,570	1,557	1,529	1,452	1.7
Northern	125	128	126	128	128	130	117	114	113	107	-1.7
Non associated	483	517	605	717	837	1,087	1,265	1,299	1,272	1,305	11.7
Southern	167	166	183	202	192	179	158	148	146	145	-1.6
Marines	-	-	-	-	-	-	-	-	-	-	-
Northern	316	351	422	515	645	908	1,107	1,151	1,125	1,161	15.6

Figure 7  
Natural Gas Production by Region 1993-2002  
(million cubic feet per day)

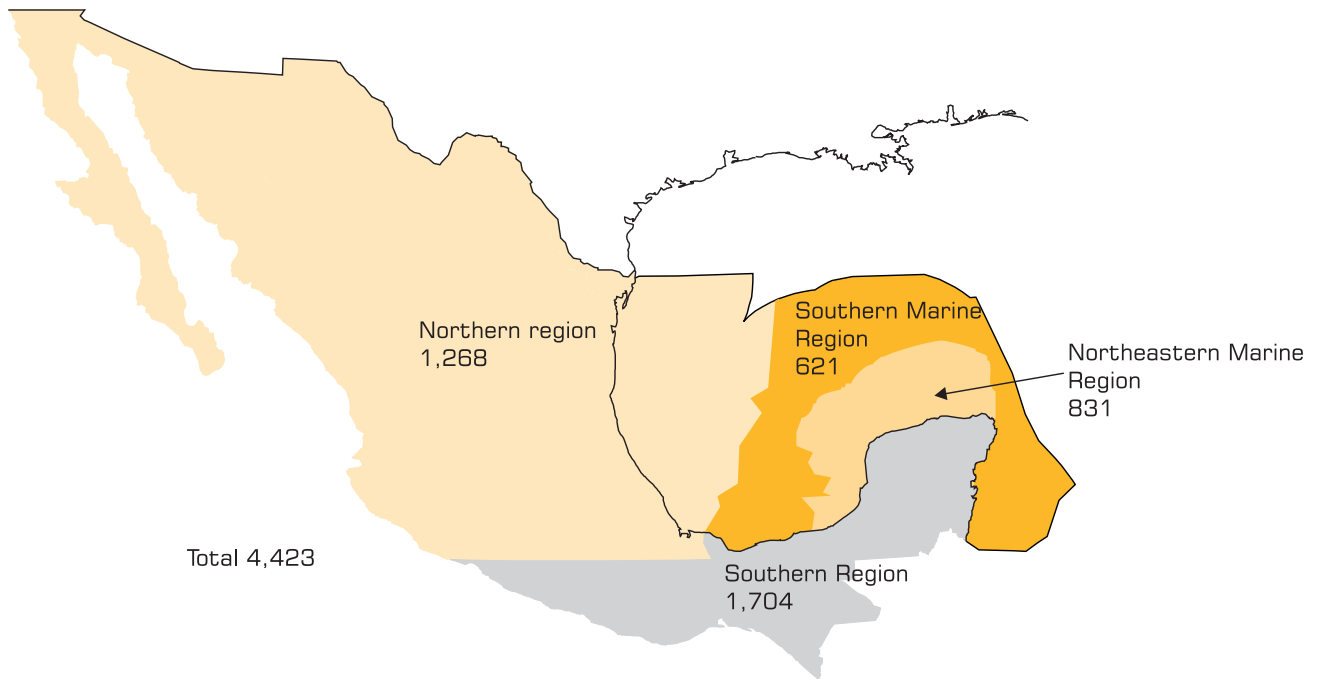


Table 14  
PGPB: Installed Capacity and Natural Gas Production, 2002  
(million cubic feet per day)

Processing center	Installed capacity of sweeten bitter gas	Installed capacity of liquids recovery	Bitter gas sweetening process	Liquids' recovery process from sweet gas	Dry gas production <sup>1</sup>
<b>Total</b>	<b>4,173</b>	<b>5,034</b>	<b>3,220</b>	<b>3,560</b>	<b>2,916</b>
Cactus	1,800	1,275	1,581	928	720
Nuevo Pemex	800	1,550	676	1,225	924
Cd. Pemex	1,290	915	785	741	668
La Venta		382		159	135
Matapionche	53	125	94	92	86
Pajaritos		192			
Cangrejera		30			
Poza Rica	230	290	84	80	71
Reynosa		275		336	312

Table 15  
 Natural Gas Trade by Interconnection Point, 1993-2002  
 (million cubic feet per day)

Point of interconnection	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
<b>Imports</b>	<b>96.6</b>	<b>125.1</b>	<b>172.9</b>	<b>83.7</b>	<b>109.2</b>	<b>151.5</b>	<b>168.5</b>	<b>281.1</b>	<b>380.1</b>	<b>728.8</b>
<b>National pipeline system</b>	<b>66.5</b>	<b>85.7</b>	<b>123.0</b>	<b>27.8</b>	<b>40.8</b>	<b>20.9</b>	<b>6.0</b>	<b>75.0</b>	<b>152.1</b>	<b>391.5</b>
1. Argüelles, Tam. (Kinder Morgan)								12.7	115.6	205.7
2. Argüelles, Tam. (El Paso Field Services)	49.2	63.3	91.0	16.1	10.5	7.0	-	1.7	-	13.2
3. Reynosa, Tam. (Tennessee Gas)							0.6	59.6	32.9	133.2
4. Reynosa, Tam. (Tetco)	17.3	22.4	32.0	11.7	30.2	13.9	5.4	1.1	3.6	39.5
<b>Isolated systems</b>	<b>30.1</b>	<b>39.4</b>	<b>50.0</b>	<b>55.8</b>	<b>68.5</b>	<b>130.7</b>	<b>162.5</b>	<b>206.1</b>	<b>228.0</b>	<b>337.3</b>
5. Naco, Son.	5.2	4.0	8.7	11.7	11.6	10.2	6.8	15.3	25.8	42.9
<b>Private sector</b>									<b>10.3</b>	<b>24.48</b>
PGPB	5	4.0	8.7	11.7	11.6	10.2	6.8	15.3	15.5	18.41
6. Cd. Juárez, Chih.	22.9	33.3	39.1	41.6	52.6	110.3	43.9	41.8	48.5	92.9
7. Piedras Negras, Coah.	2.0	2.1	2.1	2.6	3.3	4.0	6.8	5.1	6.1	6.1
PGPB	2.0	2.1	2.1	2.6	3.3	4.0	1.4			-
<b>Private sector</b>							<b>5.4</b>	<b>5.1</b>	<b>6.1</b>	<b>6.1</b>
8. San Isidro							88.3	99.3	75.8	85.3
9. Tijuana BC.								25.3	57.0	85.3
10. Nacozari de García, Son							5.9	8.4	9.0	10.6
11. Mexicali, BC					0.9	6.1	10.8	10.9	5.8	9.8
12. Los Algodones, BC.										4.3
<b>Exports</b>	<b>4.6</b>	<b>19.2</b>	<b>21.5</b>	<b>36.2</b>	<b>36.8</b>	<b>32.2</b>	<b>135.7</b>	<b>23.6</b>	<b>24.9</b>	<b>4.4</b>
Reynosa	4.6	19.2	21.5	36.2	36.8	32.2	135.7	23.6	24.9	4.4