

## Distribution of Hydrocarbon Reserves

The purpose of this chapter is to detail the evolution of reserves in proved, probable and possible categories, at a regional level, from January 1 to December 31, 2003. The differences in the volumes between these two dates are explained by additions, revisions, developments and production.

Additions cover both discoveries and delimitations caused by drilling exploratory wells, and the volume of these reserves can be increased or decreased. Similarly, the concept of development is related to the modifications of reserves due to the drilling of development wells, and the result can be a positive or negative adjustment of reserves. Revisions are due to the updating of both the pressure-production behavior of the fields and geological-petrophysical models that explain the original volume, among other things and not due to the drilling of wells. Finally, production is a significant event that regularly decreases proved reserves, because they are the ones being produced.

Reserves distribution at an integral business unit level is also stressed in this chapter. It should be noted that with the implementation of a new Pemex Exploración y Producción organizational scheme in 2003, the distribution and capacities of these business units have been changed to efficiently ensure value acquisition. Table 5.1 shows how different business units of the previous organization have been added to form integral business units, which in addition to their task of producing the already existing reserves, are also engaged in the fields discovered through reserve incorporation and delimitation activities. This aspect is relevant in order to maintain the statistical continuity of the data published since 1999 at a business unit level, and to make this new business unit distribution that

*Table 5.1 Regional distribution of integral business units in accordance with the new PEP organization implemented in 2003.*

Region	1996	2003
Northeastern Offshore	Cantarell	Cantarell
	Ek-Balam	
	Ku-Maloob-Zaap	Ku-Maloob-Zaap
Southwestern Offshore	Abkatún	Abkatún-Pol-Chuc
	Pol-Chuc	
	Litoral de Tabasco	Litoral de Tabasco
Northern	Altamira	Poza Rica-Altamira
	Poza Rica	
	Burgos	Burgos
	Veracruz	Veracruz
Southern	Bellota-Chinchorro	Bellota-Jujo
	Jujo-Tecominoacán	
	Chilapilla-José Colomo	Macuspana
	Cinco Presidentes	Cinco Presidentes
	Muspac	Muspac
	Samaria-Sitio Grande	Samaria-Luna
	Luna	

groups several of the old business units consistent, in accordance with the above mentioned table.

As usual, all of the reserves' figures presented throughout this chapter have been estimated in accordance with definitions accepted by the industry. The definitions issued by the Securities and Exchange Commission (SEC) are used for the proved reserves. Financially speaking, the SEC is a regulatory body that issues definitions to quantify this category of reserves. It should be emphasized that the SEC definitions are extremely conservative, especially for clast or sandy deposits, and generally the quantification of proved reserves is limited to reserves corresponding to existing plus undrilled wells in their immediate vicinity. Consequently, the decision in 2002 to use these definitions led to the reclassification of proved reserves to

probable reserves, as documented in the previous edition of *Hydrocarbon Reserves of Mexico, Evaluation as of January 1, 2003*.

In the case of the probable and possible reserves, the definitions used herein correspond to those issued by the Society of Petroleum Engineers (SPE) and the World Petroleum Congresses (WPC). In terms of certainty, the intention is to express that proved reserves have the highest degree of confidence that the quantities will be recovered, and possible reserves have the lowest degree of confidence. The magnitudes of the reserves are mentioned in their three categories for each business unit and region. This makes it possible to observe the evolution and behavior of these reserves over time.

It should also be noted that the intense drilling of exploratory and development wells during 2003 produce new reserves and lead to their reclassification. For

example, the drilling of more than 90 wells in Chicontepec led to the reclassification of probable to proved reserves because the immediate surroundings of the producing zone has changed, that is, the wells drilled during 2003 are generally located in zones that, as of January 1, 2003, are considered as probable or proved undeveloped. With drilling, they become proved developed and the vicinity is classified as proved undeveloped. This explains why the amount of proved reserves in Chicontepec has grown.

Finally, it should be mentioned that in each region a distinction has been made for non-associated gas; corresponding to reservoirs of wet and dry gas, and that found in gas-condensate reservoirs. This distinction is necessary because the gas-condensate reservoirs included in the non-associated category accompany the gas production with significant volumes of condensates that are later added to the crude oil flow. Thus, the production of gas-condensate reservoirs



Figure 5.1 The Northeastern Offshore Region is located in National territorial waters, off the coasts of Campeche, Yucatán and Quintana Roo.

implies greater production of liquids, a situation that does not occur with the production of dry and wet gas reservoirs.

### 5.1 Northeastern Offshore Region

This region is located in the Southeast of the Mexican Republic in territorial waters, off the coasts of the states of Campeche, Yucatán and Quintana Roo. It covers an area of 166,000 square kilometers and includes part of the continental shelf and the Gulf of Mexico slope. As from 2003, and as a result of applying a new organizational structure, which objective is to strengthen the integral management of the reservoirs throughout their productive life, the region was organized into two integral business units. These are Cantarell and Ku-Maloob-Zaap. Their responsibilities include the administration of the reservoirs from the exploratory phases, in the reserve incorporation and delimitation

phases, up to the production and field-abandonment stages. Figure 5.1 shows the geographic location of this region.

The region currently has 12 producing fields: eight in Cantarell and four in Ku-Maloob-Zaap, with an annual production in 2003 of 882.0 million barrels of oil and 343.3 billion cubic feet of natural gas. This production represents 71.7 and 20.9 percent, respectively, of the national output in 2003. The fields that were not being exploited as of January 1, 2004 are Takín in Cantarell, and Lum and Zazil-Ha in Ku-Maloob-Zaap. Figure 5.2 shows the names of the integral business units that make up the Northeastern Offshore Region.

It should also be noted that in 2003, the region reached an average daily production of 2.4 million barrels of oil and 940.5 million cubic feet of natural gas. Furthermore, the Akal field, which forms part of the Cantarell complex, reported an average daily production of 2.0

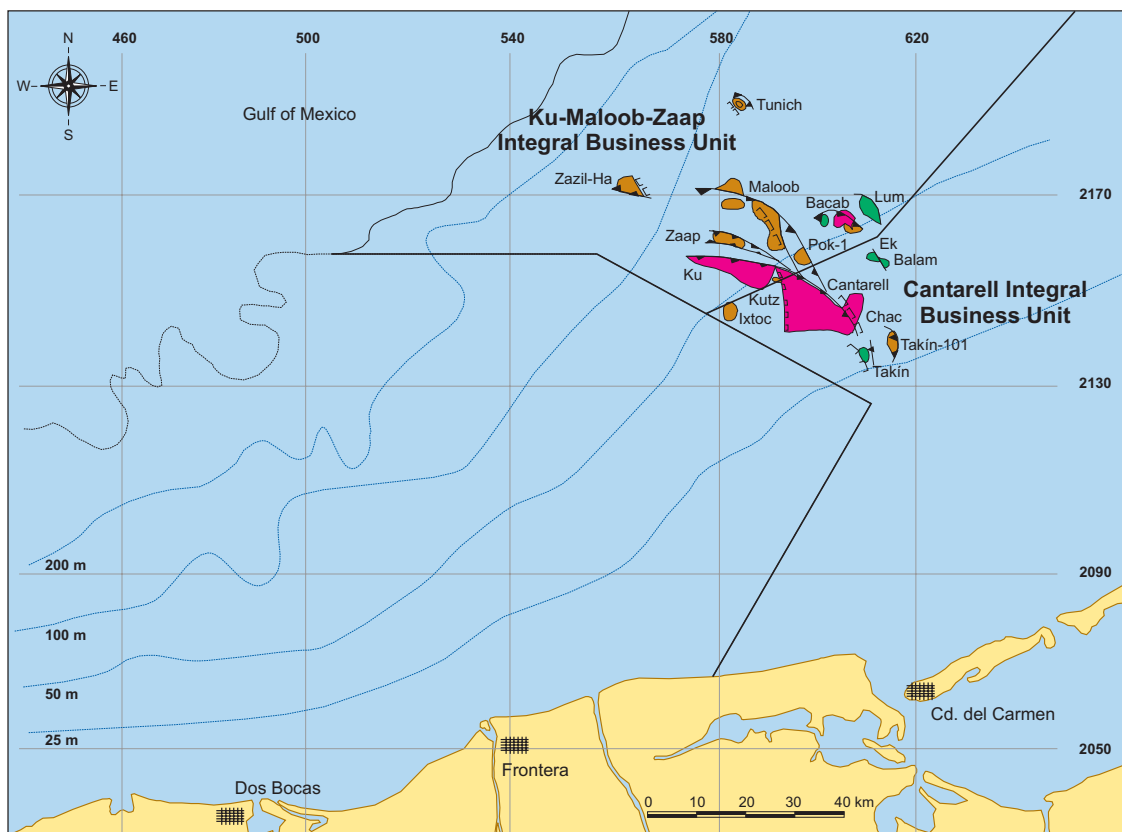


Figure 5.2 Geographic location of the integral business units of the Northeastern Offshore Region.

million barrels of oil and 744.6 million cubic feet of natural gas, all of which was the result of activity in the Cantarell field where well drilling and the continuation of pressure maintenance projects through nitrogen injection stand out. In this context, the Northeastern Offshore Region is the most important producer of hydrocarbons in Mexico, with production volumes that exceed the output of many companies operating in the world.

### 5.1.1. Evolution of Original Volumes

The original proved volume of crude oil as of January 1, 2004 is 51,260.8 million barrels, equivalent to 36.0 percent of the total national proved (table 5.2). The probable and possible original volumes contain 168.2 and 1,556.0 million barrels of oil, which means 0.2 and 3.1 percent of the country's probable and possible volumes, respectively. Most of the original proved volume of the Northeastern Offshore Region is in the Cantarell business unit, with 73.3 percent of the regional total, while the Ku-Maloob-Zaap business unit has 26.7 percent. In the case of original volumes of probable oil, the Ku-Maloob-Zaap business unit con-

tains 100 percent of the region's volume, while the original volume of possible oil is distributed in the Cantarell and Ku-Maloob-Zaap business units, with a participation of 74.3 and 25.7 percent, respectively.

In reference to the original proved volume of natural gas, a volume of 23,348.6 billion cubic feet is estimated for the region. This amount represents 13.9 percent of the national total. The original probable and possible volumes of natural gas amount to 31.2 and 406.0 billion cubic feet, respectively, and account for 0.1 and 1.3 percent of the national total. The Cantarell and Ku-Maloob-Zaap business units represent 76.6 and 23.4 percent of the region's original proved natural gas volume, respectively. In the probable category, the Ku-Maloob-Zaap business unit contains 100.0 percent of the original gas volume. The original possible volume of natural gas of the region lies in the Cantarell field, 67.1 percent, with the remaining 32.9 percent is in the Ku-Maloob-Zaap. It should be noted that the entire volume of natural gas, in its three categories, is associated, that is, it does not exist in dry, wet or gas-condensate reservoirs.

### Crude Oil and Natural Gas

Table 5.2 Historical evolution over the last three years of the original volumes in the Northeastern Offshore Region.

Year	Category	Crude Oil MMbbl	Natural Gas Bcf
2002	<b>Total</b>	<b>54,139.9</b>	<b>25,300.9</b>
	Proved	51,141.8	23,628.6
	Probable	758.8	649.1
	Possible	2,239.4	1,023.2
2003	<b>Total</b>	<b>53,344.9</b>	<b>23,936.6</b>
	Proved	51,155.0	23,235.1
	Probable	274.0	144.7
	Possible	1,915.9	556.8
2004	<b>Total</b>	<b>52,985.0</b>	<b>23,785.8</b>
	Proved	51,260.8	23,348.6
	Probable	168.2	31.2
	Possible	1,556.0	406.0

As of January 1, 2004, this region's original proved volume of crude oil has increased 0.2 percent compared to the previous year. This increase is located in the Sihil field, with 105.8 million barrels of crude oil, as a result of the reclassification of the volume from probable to proved, because of the development activity in the Upper Jurassic Kimmeridgian reservoir carried out during 2003. In reference to the original proved volume of natural gas, an increase of 113.5 billion cubic feet was reported, which is equal to 0.5 percent of the volume reported in 2003. This increase is located in Sihil, and it is the consequence of development activity

that made it possible to identify 113.5 billion cubic feet in the reservoir at the Upper Jurassic level. Table 5.2 shows the variation in the original volumes of oil and gas for the last three years.

The region’s original probable volume of crude oil decreased by 105.8 million barrels of crude oil compared with 2003. The explanation lies in the Upper Jurassic level of the Sihil field caused by the reclassification of the volume from probable to proved due to the drilling of the Sihil-19 development well. Consequently, the original probable volume of gas also decreased 113.5 billion cubic feet compared to the previous year. The difference is explained by the above-mentioned development well drilling activities in the Sihil field.

In a similar manner, the original possible volume of crude oil in the region shows a net reduction of 359.9 million barrels of crude oil. The decreases are caused by the delimitation activities in Sihil of 369.0 million barrels of crude oil and the reservoir characterization studies in Zazil-Ha of 72.0 million barrels of crude oil. Nevertheless, from the point of view of increases, the Takín field raised its original possible volume by 81.2 million barrels of crude oil, as a result of the characterization studies carried out in 2003.

Furthermore, the original possible volume of natural gas decreased a net 150.8 billion cubic feet compared with the previous year. The difference is explained by reductions in different fields like Sihil; 127.8 billion cubic feet due to delimitation activities, Zazil-Ha, 28.9 billion cubic feet caused by the characterization studies carried out during 2003, in addition to the increase reported in Takín of 5.9 billion cubic feet due to the updating of the geological-geophysical model.

### 5.1.2 Evolution of Reserves

Figures 5.3 and 5.4 show the variations in crude oil and natural gas reserves over the last three years. As of January 1, 2004, the 3P reserves totaled 14,040.2

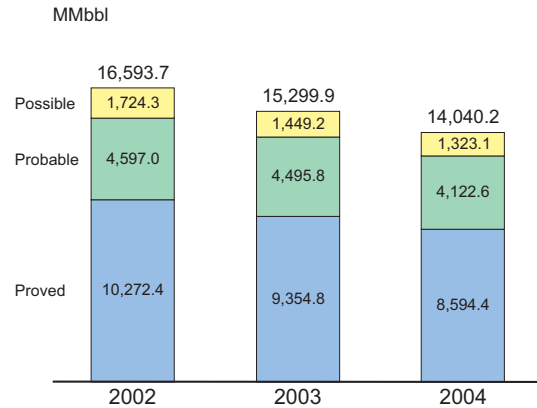


Figure 5.3 Historical evolution of the remaining crude oil reserves in the Northeastern Offshore Region in the last three years.

million barrels of crude oil and 6,437.4 billion cubic feet of natural gas. Additionally, the 2P reserves are estimated at 12,717.1 million barrels of crude oil and 5,963.4 billion cubic feet of natural gas. Tables 5.3 and 5.4 show the composition of these reserves classified as heavy, light and superlight crude oil, as well as the associated and non-associated gas at an integral business unit level. It should be noted that the non-associated gas includes the volumes of gas-condensate, dry gas and wet gas reservoirs. Nevertheless, in the case of the Northeastern Offshore Region, all the gas is associated.

Proved reserves as of January 1, 2004 amounts to 8,594.4 million barrels of crude oil, that is, it repre-

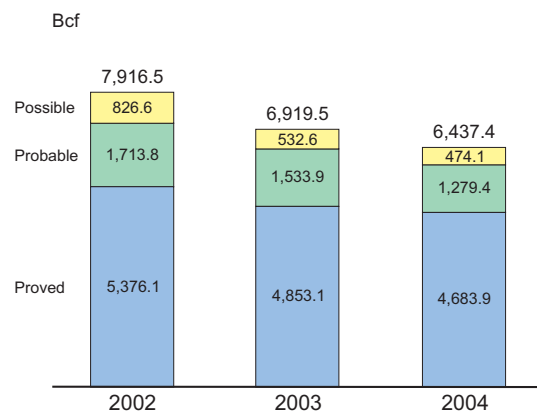


Figure 5.4 Historical evolution of the remaining natural gas reserves in the Northeastern Offshore Region in the last three years.

Table 5.3 Composition of 2P reserves by business unit of the Northeastern Offshore Region.

Business Unit	Crude Oil			Natural Gas	
	Heavy MMbbl	Light MMbbl	Superlight MMbbl	Associated Bcf	Non-associated Bcf
<b>Total</b>	<b>12,639.4</b>	<b>77.7</b>	<b>0.0</b>	<b>5,963.4</b>	<b>0.0</b>
Cantarell	8,495.8	77.7	0.0	4,249.8	0.0
Ku-Maloob-Zaap	4,143.6	0.0	0.0	1,713.5	0.0

sents 60.9 percent of the country proved reserves. As for natural gas, proved reserves climbed to 4,683.9 billion cubic feet, which represents 22.6 percent of the total proved reserves.

Proved developed reserves totaled 6,326.3 million barrels of crude oil and 2,574.8 billion cubic feet of natural gas. These figures mean 73.6 and 54.9 percent of the region's total proved reserves, respectively; the proved undeveloped reserves are 2,268.2 million barrels of crude oil and 2,109.1 billion cubic feet of natural gas. These magnitudes correspond to 26.4 and 45.0 percent of the region's total proved reserve. In terms of oil density, light and superlight total 0.8 percent of the proved reserve of the region, while heavy oil accounts for 99.2 percent. In reference to gas, as mentioned before, 100.0 percent of the gas is associated.

Probable crude oil reserves, as of January 1, 2004 amount to 4,122.6 million barrels of crude oil, or 34.9 percent of the national total; while the probable gas reserves stand at 1,279.4 billion cubic feet, or 6.2 percent of the national total. The possible oil reserves as of January 1, 2004 are estimated at 1,323.1 million

barrels of crude oil, and correspond to 15.6 percent of the national total. The possible reserves of natural gas are estimated at 474.1 billion cubic feet, or 2.1 percent of Mexico's total.

### Crude Oil and Natural Gas

During 2003, proved crude oil reserves decreased by 760.4 million barrels compared to the figure reported the previous year. The 8.1 percent decrease was essentially due to the production of 882.0 million barrels of crude oil during the period. Nevertheless, there were net increments of 121.4 million barrels of crude oil, basically located in the Sihil and Ku fields, with 27.9 and 331.2 million barrels of crude oil, respectively, and due to the reclassification of reserves from probable to proved because of drilling activities in the Sihil field and in Ku because of the revision of the pressure-production behavior due to the reclassification of the indicated volume from probable to proved reserves. Additionally, in the Akal field, there were noteworthy reductions proved oil reserves of 235.9 million barrels of crude oil as a result of the updating of the pressure-production behavior. It should be mentioned that the Cantarell integral business unit provides 82.0 percent

Table 5.4 Composition of 3P reserves by business unit of the Northeastern Offshore Region.

Business Unit	Crude Oil			Natural Gas	
	Heavy MMbbl	Light MMbbl	Superlight MMbbl	Associated Bcf	Non-associated Bcf
<b>Total</b>	<b>13,929.6</b>	<b>110.6</b>	<b>0.0</b>	<b>6,437.4</b>	<b>0.0</b>
Cantarell	9,663.4	110.6	0.0	4,671.4	0.0
Ku-Maloob-Zaap	4,266.3	0.0	0.0	1,766.0	0.0

of the proved reserves, with 7,051.3 million barrels of crude oil, and the remaining 18.0 percent is in the Ku-Maloob-Zaap business unit.

Remaining proved natural gas reserves in the Northeastern Offshore Region have a negative balance of 169.2 billion cubic feet compared to 2003. During the period, an average daily rate of 343.3 billion cubic feet of gas was reported, with increases in the Sihil and Ku fields of 207.3 billion cubic feet of natural gas caused by the reclassification of reserves from probable to proved as a result of development drilling activity in Sihil and the revision of the pressure-production performance in the Ku field. In terms of the distribution of proved gas reserves by business unit, Cantarell accounted for 78.9 percent of the region's proved natural gas reserves. The Akal and Ku fields have a total of 3,935.0 billion cubic feet, and account for 84.0 percent of the region's total.

Proved oil reserves as of January 1, 2004 show a net decrease of 373.2 million barrels of crude oil, that is, 8.3 percent less when compared with 2003. The Akal, Sihil and Ku explain the reduction by 108.4, 28.3 and 240.3 million barrels of crude oil, respectively. These decreases are the result of the revision of the pressure-production behavior in Akal, the reclassification of reserves from probable to proved in Ku of 331.2 million barrels of crude oil, the 28.3 million barrel decrease as a result of development drilling activity in Sihil at the Upper Jurassic level, in addition to the increase of 90.9 million barrels of crude oil in Ku caused by the drilling of the Pakal-1 exploratory well. The proved oil reserves totaled 4,122.6 million barrels of crude oil, grouped as 1,522.2 million barrels of crude oil in Cantarell and 2,600.5 million in Ku-Maloob-Zaap.

Probable gas reserves declined by 254.5 billion cubic feet of natural gas compared with January 1, 2003, and totaled 1,279.4 billion cubic feet. The most important reductions were in the Akal, Sihil and Ku fields, of 91.1, 30.3 and 129.8 billion cubic feet, respectively.

These reductions are due to the following issues: revision of the pressure-production performance in Akal, development and reclassification from probable to proved reserves in the Sihil field, and an increment caused by the drilling of the exploratory well Pakal-1. At an integral business unit level, the probable gas reserves are concentrated in Ku-Maloob-Zaap and Cantarell, with 56.8 and 43.2 percent, respectively.

As of January 1, 2004, possible crude oil reserves decreased 126.1 million barrels of crude oil compared with the previous period. This is basically explained by the drilling of delimitation wells in Sihil that have made it possible to identify reductions of 96.5 million barrels of crude oil in the field's reservoirs, and the updating of the geological-geophysical characterization in Zazil-Ha of 33.9 million barrels of crude oil. Possible oil reserves are concentrated in the Cantarell business unit, which makes up 90.7 percent of the regional total.

Compared with the previous year, possible reserves of natural gas, as of January 1, 2004, declined 58.5 billion cubic feet of natural gas compared with that reported last year. In the balance, Sihil stands out with a decline of 34.5 billion cubic feet, explained by the drilling of delimitation wells in 2003 and 15.4 billion cubic feet in Zazil-Ha, because of the updating of the geological-geophysical characterization. In terms of reserve distribution, the Cantarell business unit contains 88.9 percent of the region's possible natural gas reserves. Table 5.5 shows the reserves estimated as of January 1, 2004 in the proved, probable and possible categories, for the different fluids described above.

### Oil Equivalent

As of January 1, 2004, the Northeastern Offshore Region has a proved reserve of 9,689.7 million barrels of oil equivalent, that is, 51.3 percent of the national total. As can be seen from figure 5.5, the Cantarell and Ku-Maloob-Zaap business units contain 81.6 and

Table 5.5 Distribution of remaining gas reserves by business unit of the Northeastern Offshore Region as of January 1, 2004.

Category	Business Unit	Natural Gas	Gas to be	Dry Gas
		Bcf	Delivered to Plant Bcf	Bcf
Proved	<b>Total</b>	<b>4,683.9</b>	<b>3,525.0</b>	<b>2,749.7</b>
	Cantarell	3,697.3	2,717.9	2,120.1
	Ku-Maloob-Zaap	986.6	807.1	629.6
Probable	<b>Total</b>	<b>1,279.4</b>	<b>997.8</b>	<b>778.3</b>
	Cantarell	552.5	407.4	317.8
	Ku-Maloob-Zaap	726.9	590.4	460.5
Possible	<b>Total</b>	<b>474.1</b>	<b>355.3</b>	<b>277.2</b>
	Cantarell	421.6	313.4	244.5
	Ku-Maloob-Zaap	52.5	41.9	32.7

18.4 percent of the region’s total, respectively. Figure 5.6 shows the evolution of 3P reserves during 2003 in oil equivalent, compared with the three preceding years.

Proved reserves decreased by 815.6 million barrels of oil equivalent as against the previous year, because of the effect of producing 951.7 million barrels of oil equivalent during 2003, in addition to other factors. The incremental difference of 136.1 million barrels is explained by the increases reported in the Ku and Sihil fields of 372.5 and 34.3 million barrels of oil equivalent,

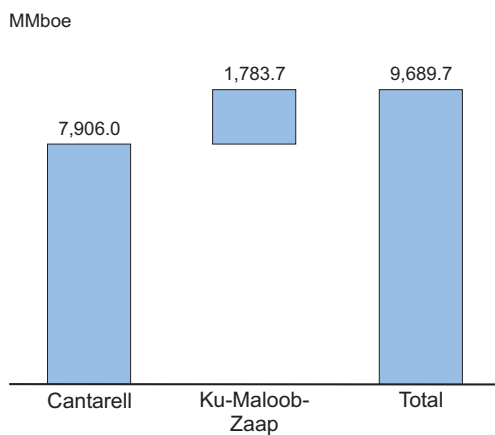


Figure 5.5 Proved reserves as of January 1, 2004, distributed by business unit in the Northeastern Offshore Region.

lent, respectively. This was the result of the classification from probable to proved reserves in Ku and the drilling of development wells in Sihil. Likewise, there were reductions of 265.1 million barrels of oil equivalent in Akal as a result of the updating of the field’s pressure-production behavior.

Probable reserves as of January 1, 2004 amount to 4,427.5 million barrels of oil equivalent, or 27.6 percent of the country’s reserves (figure 5.7). In comparison with the previous year, this is a decrease of 439.0 million barrels of oil equivalent. This effect is mostly due to the negative balance in fields, such as Ku, that declined 272.8 million barrels of oil equivalent, because of the decrease by the reclassification of 372.5 million barrels from probable to proved and the increase of 99.7 million barrels of oil equivalent caused by the drilling of the Pakal-1 exploratory well. Reductions of 131.7 million barrels were also reported in the Akal field due to the revision of the pressure-production behavior through its flow simulation model.

The possible oil equivalent reserve as of January 1, 2004 is estimated at 1,433.4 million barrels, which is 10.9 percent of the national figure. During 2003, there was a net decrease of 141.8 million barrels compared

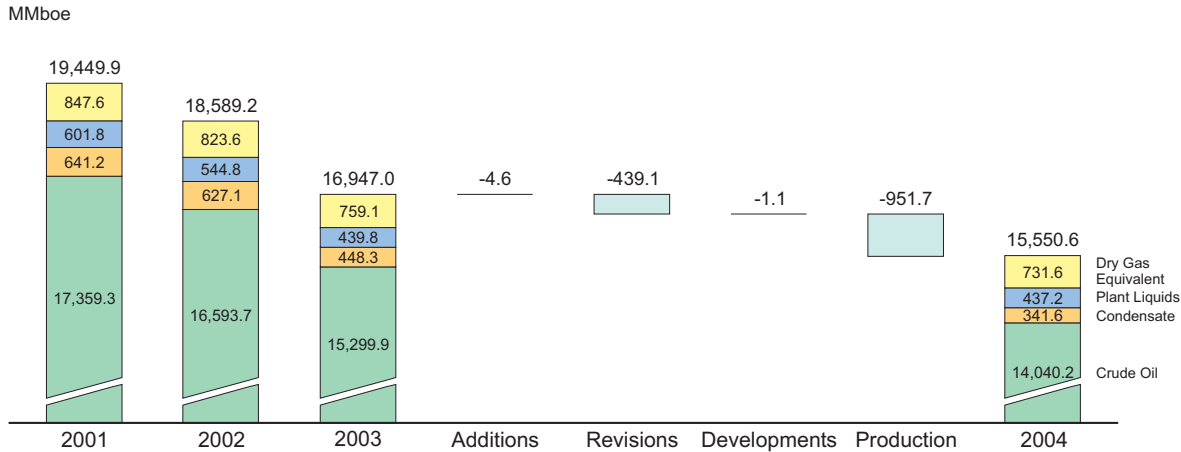


Figure 5.6 Elements of change in the total reserve of the Northeastern Offshore Region.

with the previous year, that was largely caused by the delimitation activities carried out in 2003 in the Sihil field, which reported decreases of 108.3 million barrels of oil equivalent in the 22 degrees API reservoir and declines of 37.7 million barrels in the Zazil-Ha field, caused by the updating of the geological-geophysical characterization.

### Reserve-Production Ratio

The region’s proved reserve-production ratio is 10.2 years considering a constant rate of 951.7 million barrels of oil equivalent. If the 2P reserve is used in this ratio, the number of years is 14.8, and 16.3 years with 3P. The business unit with the lowest proved

reserve-production ratio is Cantarell with 9.5 years, and Ku-Maloob-Zaap with 15.0 years. These ratios only show the current level of activity in the business units.

The Cantarell business unit, the leading oil producer with a rate of 2.1 million barrels per day and the second most important gas producer with 786.1 million cubic feet per day, has a reserve-production ratio of 11.5 and 13.0 years, if the 2P and 3P reserves are considered, respectively.

In terms of 2P reserves, the Ku-Maloob-Zaap business unit’s reserve-production ratio is the longest, with 38.4 years. The situation is the same in the case of 3P re-

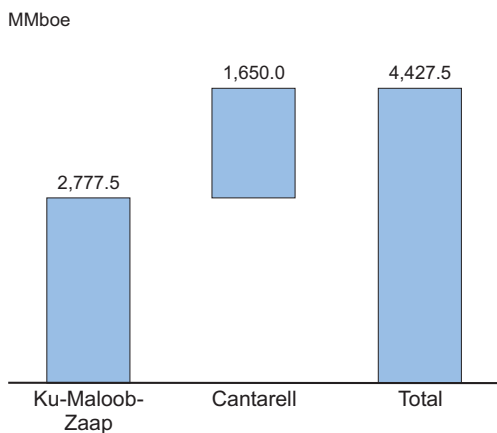


Figure 5.7 Probable reserves as of January 1, 2004, distributed by business unit in the Northeastern Offshore Region.

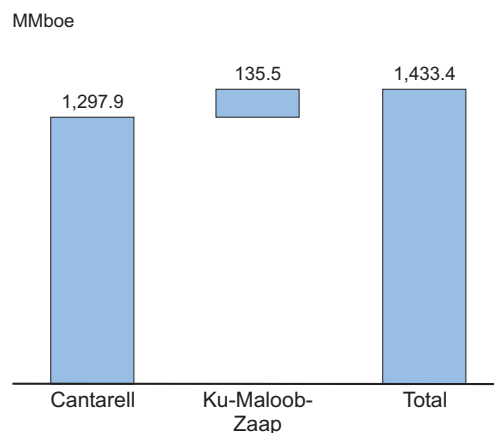


Figure 5.8 Possible reserves as of January 1, 2004, distributed by business unit in the Northeastern Offshore Region.

Table 5.6 Historical evolution of reserves by fluid type in the Northeastern Offshore Region.

Year	Category	Crude Oil MMbbl	Condensate MMbbl	Plant Liquids MMbbl	Dry Gas Equivalent MMboe	Total MMboe
2002	<b>Total</b>	<b>16,593.7</b>	<b>627.1</b>	<b>544.8</b>	<b>823.6</b>	<b>18,589.2</b>
	Proved	10,272.4	429.2	366.9	554.7	11,623.2
	Probable	4,597.0	130.3	122.3	184.9	5,034.5
	Possible	1,724.3	67.6	55.6	84.0	1,931.5
2003	<b>Total</b>	<b>15,299.9</b>	<b>448.3</b>	<b>439.8</b>	<b>759.1</b>	<b>16,947.0</b>
	Proved	9,354.8	319.3	304.9	526.3	10,505.3
	Probable	4,495.8	93.5	101.7	175.5	4,866.5
	Possible	1,449.2	35.5	33.2	57.3	1,575.2
2004	<b>Total</b>	<b>14,040.2</b>	<b>341.6</b>	<b>437.2</b>	<b>731.6</b>	<b>15,550.6</b>
	Proved	8,594.4	250.6	315.9	528.7	9,689.7
	Probable	4,122.6	65.8	89.4	149.7	4,427.5
	Possible	1,323.1	25.2	31.8	53.3	1,433.4

serve, with a reserve-production ratio of 39.5 years. It should be noted that the longevity evident in this ratio is a result of the production development concentrated in Ku, which will start to be modified once the intensive drilling of wells in Maloob and Zaap commences in the next few years. Additionally, once the pressure maintenance system is installed, the proved reserve should increase with the reclassification of probable reserves into this category.

### Reserves by Fluid Type

Table 5.6 shows the evolution of reserves over the last three years in the Northeastern Offshore Region by fluid type, in the proved, probable and possible categories. The remaining proved reserves are made up of 88.7 percent crude oil, 2.6 percent condensate, 3.3 percent plant liquids and 5.4 percent dry gas equivalent to liquid.

Probable reserves amount to 4,427.5 million barrels of oil equivalent. Of this amount, 93.1 percent is crude oil, 1.5 percent is condensate, 2.0 percent is plant liquids and 3.4 percent is dry gas equivalent to liquid. Possible reserves total 1,433.4 million barrels of oil equivalent, of which 92.3 percent is crude oil, 1.8 per-

cent is condensate, 2.2 percent is plant liquids and 3.7 percent is dry gas equivalent to liquid.

### 5.2 Southwestern Offshore Region

This region is located in the Southeast of the country in the waters of the Gulf of Mexico continental shelf and slope. It covers an area of 352,390 square kilometers and is limited in its continental portion by the states of Veracruz, Tabasco and Campeche to the south; the Northeastern Offshore Region to the east; the limits of the National territorial waters to the north; and the Northern Region to the north. Figure 5.9 shows the geographic location of this region.

Since 2003, this region has been organized into the Abkatún-Pol-Chuc and Litoral de Tabasco integral business units, which has resulted in a new organizational structure whose objective is to strengthen the integral management of the reserves throughout their productive life. It should be pointed out that these integral business units are also responsible for administering the reservoirs in addition to implementing reserve incorporation and delimitation programs associated with reserves already discovered. The region manages a



Figure 5.9 The Southwestern Offshore Region is in the continental shelf and slope waters of the Gulf of Mexico.

total of 48 fields of which 12 are being exploited and produce light oil and associated gas. The remaining 36 have remaining reserves, but are not in production; however, they are envisaged in development projects in the years ahead. Likewise, a regional exploration business unit that is essentially in charge of the exploratory phase of potential evaluation also constitutes the region.

The annual production of the region during 2003 was 145.1 million barrels of oil and 212.2 billion cubic feet of natural gas, thus providing 11.8 and 12.9 percent of the country's oil and gas output during the year. Figure 5.10 shows the geographic distribution of the integral business units that make up the Southwestern Offshore Region.

It should be mentioned that significant discoveries were still being made of non-associated gas and crude oil in 2003, with an amount that totaled 184.3 million barrels of oil equivalent in 3P reserves. This contribu-

tion, as the result of the discovery of 13 new fields, permits the integration of development projects where non-associated gas and light oil reservoirs are present. Thus, the exploration and production activities will continue to replace reserves through new reservoirs, and the reclassification of the volumes of those already found. There was the noteworthy commencement of production in the Citam and Sinán fields in October and November 2003, respectively, as a result of the activities scheduled in the Crudo Ligero Marino Project.

### 5.2.1. Evolution of Original Volumes

The original proved volume of the Southwestern Offshore Region as of January 1, 2004 is 15,765.8 million barrels of oil, and represents 11.1 percent of the total national proved (table 5.7). The original probable and possible volumes are 2,308.6 and 1,579.8 million barrels of oil, which means 2.8 and 3.1 percent of the country's probable and possible volumes, respectively.

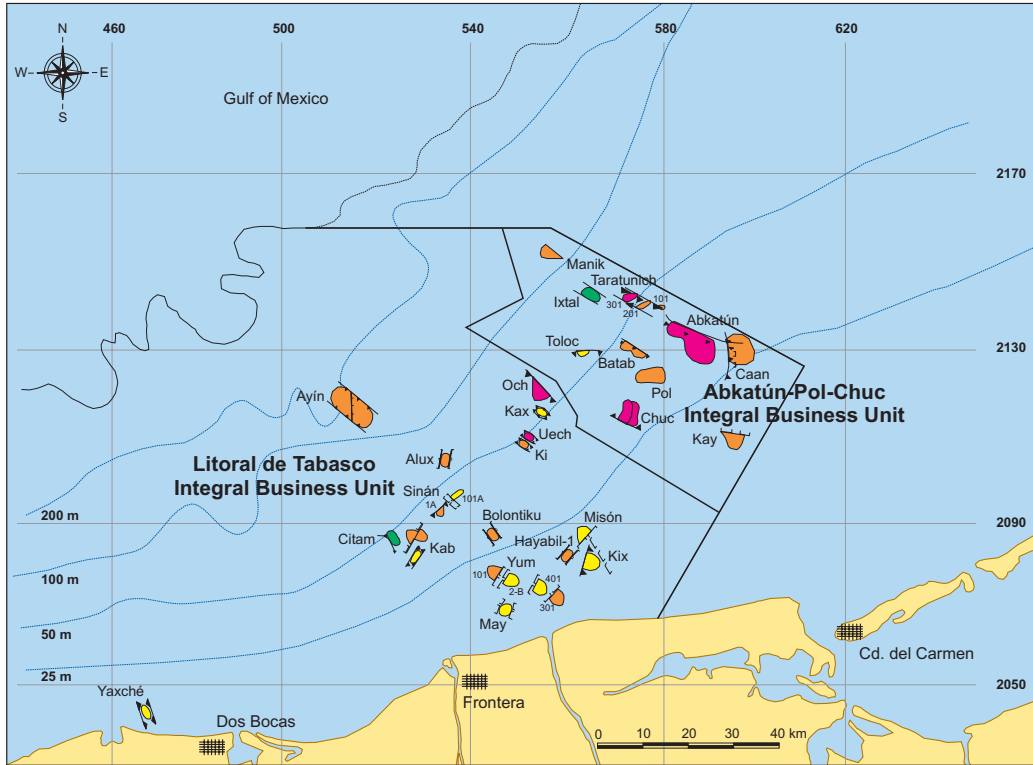


Figure 5.10 Geographic location of the integral business units of the Southwestern Offshore Region.

The Abkatún-Pol-Chuc business unit contains most of this original proved volume, with 83.2 percent of the regional total. In reference to the original proved vol-

ume of crude oil, the Litoral de Tabasco business unit concentrates 68.0 percent of the original proved volume, while such business unit contains 85.5 percent of the regional total of possible reserves, and Abkatún-Pol-Chuc holds the remaining 14.5 percent.

Table 5.7 Historical evolution over the last three years of the original volumes in the Southwestern Offshore Region.

Year	Category	Crude Oil MMbbl	Natural Gas Bcf
2002	<b>Total</b>	<b>18,934.6</b>	<b>20,887.7</b>
	Proved	15,603.8	16,222.2
	Probable	1,993.0	1,628.5
	Possible	1,337.8	3,037.0
2003	<b>Total</b>	<b>19,034.7</b>	<b>21,837.3</b>
	Proved	15,584.4	16,013.7
	Probable	2,131.1	2,181.4
	Possible	1,319.2	3,642.1
2004	<b>Total</b>	<b>19,654.3</b>	<b>22,344.8</b>
	Proved	15,765.8	16,174.0
	Probable	2,308.6	2,298.7
	Possible	1,579.8	3,872.1

In reference to the original proved volume of natural gas, the region contributes 16,174.0 billion cubic feet. This figure represents 9.6 percent of the national total. The original probable and possible volumes of natural gas are 2,298.7 and 3,872.1 billion cubic feet, respectively. The Abkatún-Pol-Chuc and Litoral de Tabasco business units respectively explain 82.4 and 17.6 percent of the regional original proved volume. In the probable category, the Litoral de Tabasco business unit contains the highest percentage with 80.9 percent, while Abkatún-Pol-Chuc contains the remaining

19.1 percent. Furthermore, the Litoral de Tabasco business unit concentrates most of the original possible volume with 92.6 percent, while the Abkatún-Pol-Chuc business unit provides 7.4 percent.

### **Crude Oil and Natural Gas**

The original volume of proved crude oil in this region reports a net increase of 181.4 million barrels of crude oil compared with the previous year, that is, an increase of 1.2 percent. The original volume increases were reported by the fields discovered during 2003. The original proved volume rose 16.4 million barrels in the Abkatún-Pol-Chuc business unit as a result of the drilling of the Etkal-1 and Homol-1 wells. Likewise, the Litoral de Tabasco reports increases of 165.6 million barrels caused by the exploratory drilling of the Amoca-1, Chuhuk-1, Nak-1 and Teekit-1 wells, which incorporated 134.0, 13.7, 5.0 and 12.9 million barrels of crude oil, respectively.

In reference to the original volume of proved natural gas, a net increase of 160.3 billion cubic feet was reported, which is equal to 1.0 percent of the volume reported as of January 1, 2003. Total incorporations are largely explained by the discoveries obtained from drilling exploratory wells that incorporated 189.6 billion cubic feet of natural gas in the Etkal, Homol, Amoca, Chuhuk, Isiw, Nak, Teekit, Uchak and Xaxamani fields. Nevertheless, there have been decreases of 29.3 billion cubic feet of natural gas as a result of updating the geological-geophysical characterization of the Kopó field.

The region's original volume of probable crude oil increased by 177.5 million barrels of crude oil compared with the figure reported on January 1, 2004. The entire increase can be attributed to the new discoveries made during 2003 by drilling the Etkal-1 and Homol-1 exploratory wells in the Abkatún-Pol-Chuc integral business unit of 71.9 million barrels of crude oil, and the Amoca-1, Chuhuk-1, Teekit-1 and Xaxamani-1 wells in the Litoral de Tabasco integral busi-

ness unit that contributed with 105.6 million barrels of crude oil.

The original volume of probable natural gas shows a net increase of 117.3 billion cubic feet of natural gas, compared with that evaluated at January 1, 2003. This is explained by the Etkal and Homol discoveries in the Abkatún-Pol-Chuc business unit, which incorporated 56.6 billion cubic feet. The Amoca, Chuhuk, Isiw, Teekit, and Xaxamani fields contributed with 60.6 billion cubic feet of original probable gas volume in the Litoral de Tabasco business unit.

In the case of original possible oil volume, there was an increase of 260.6 million barrels of crude oil in the region. This rise was mainly seen in the fields that incorporate volumes through exploratory drilling activities. It is important to note that these discoveries are located in the new Amoca, Nak, Namaca, Xaxamani and Yetic fields, which are included in the Litoral de Tabasco integral business unit.

The original possible gas volume as of January 1, 2004 is 3,872.1 billion cubic feet of natural gas, with an increase of 230.0 billion cubic feet of natural gas compared with that volume estimated at January 1, 2003, which is largely attributable to the new Amoca, Centli, Nak, Namaca, Xaxamani, Xicope and Yetic fields. All of which belong to the Litoral de Tabasco integral business unit.

The original volume of proved gas as of January 1, 2004 is 16,174.0 billion cubic feet, with 15,187.4 billion cubic feet being associated gas and the remaining being non-associated gas, corresponding to 93.6 and 6.1 percent of the total proved volume, respectively. Additionally, 17.7 percent of the non-associated gas is found in the dry gas reservoirs, mainly located in the Tertiary, and the remaining 82.3 percent corresponds to gas-condensate reservoirs.

Regarding the original volume of probable natural gas, the total is 2,298.7 billion cubic feet, of which 1,508.1

billion cubic feet is associated gas and 790.7 billion cubic feet is non-associated. Of the total non-associated gas, 376.2 billion cubic feet is found in dry gas reservoirs, while the gas-condensate makes up 414.5 billion cubic feet. In terms of percentages, 47.6 and 52.4 percent is associated with reservoirs of this kind, respectively.

In reference to the original volume of possible gas, this amounts to 3,872.1 billion cubic feet, with 55.3 percent in non-associated gas reservoirs and 44.7 percent in associated gas reservoirs. A breakdown of the original volumes of non-associated gas in dry gas and wet gas reservoirs shows that 639.1 billion cubic feet is in dry gas reservoirs and 1,504.0 billion is in gas-condensate reservoirs.

### 5.2.2 Evolution of Reserves

The 1P or proved reserves as of January 1, 2004, amount to 1,188.7 million barrels of crude oil and corresponds to 8.4 percent of the country's proved reserves. Proved natural gas reserves as of January 1, 2004 totals 2,093.6 billion cubic feet of natural gas, representing 10.1 percent of Mexico's proved gas reserves. Likewise, the 2P and 3P oil reserves are estimated at 2,001.1 and 2,942.3 million barrels of crude oil and 3,701.4 and 6,159.8 billion cubic feet of natural gas. Figures 5.11 and 5.12 show the variations in crude oil and natural gas reserves over the last three years.

In reference to proved reserves, developed reserves at a regional level total 521.6 million barrels of crude oil and 612.5 billion cubic feet of natural gas, while undeveloped ones amount to 667.1 million barrels of crude oil and 1,481.1 billion cubic feet of natural gas. The figures of the proved undeveloped reserves represent 56.1 and 70.7 percent of the region's total, respectively.

Of the proved oil reserves, the composition of light and superlight oil is 72.6 and 9.8 percent of the re-

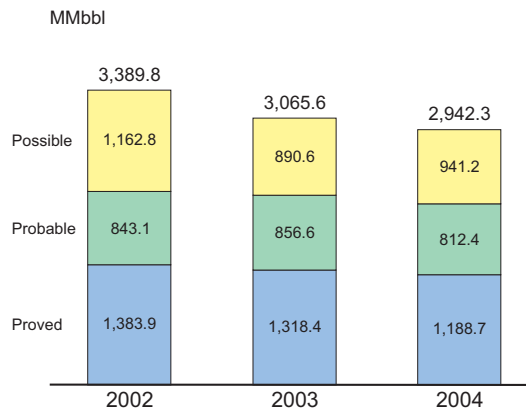


Figure 5.11 Historical evolution of the remaining crude oil reserves in the Southwestern Offshore Region in the last three years.

gional total, while heavy oil is 17.6 percent. In natural gas, 72.7 percent consists of associated gas and the remaining 27.3 percent is non-associated gas, with 444.8 billion cubic feet located in gas-condensate reservoirs, while the dry gas amounts to 127.0 billion cubic feet. Tables 5.8 and 5.9 show the composition of the 2P and 3P reserves classified as heavy, light and superlight crude oil, as well as the associated and non-associated gas at a business unit level.

Probable crude oil reserves, as of January 1, 2004 amount to 812.4 million barrels of crude oil, and correspond to 6.9 percent of the national total, while probable gas reserves represent 7.9 percent of the national total, that is, an amount of 1,607.8 billion cubic feet of

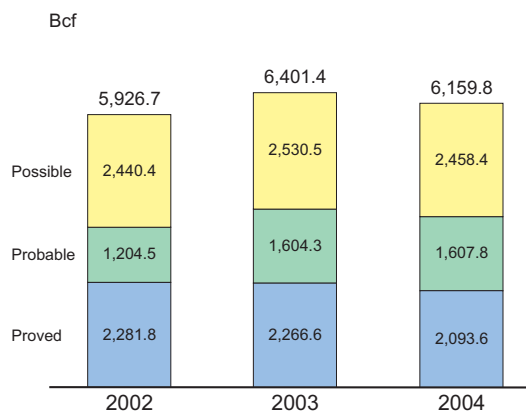


Figure 5.12 Historical evolution of the remaining natural gas reserves in the Southwestern Offshore Region in the last three years.

Table 5.8 Composition of 2P reserves by business unit of the Southwestern Offshore Region.

Business Unit	Crude Oil			Natural Gas	
	Heavy MMbbl	Light MMbbl	Superlight MMbbl	Associated Bcf	Non-associated Bcf
<b>Total</b>	<b>365.0</b>	<b>1,416.2</b>	<b>219.9</b>	<b>2,463.3</b>	<b>1,238.0</b>
Abkatún-Pol-Chuc	71.2	815.6	11.6	1,239.8	384.2
Litoral de Tabasco	293.8	600.6	208.3	1,223.6	853.8

natural gas. Possible oil reserves as of January 1, 2004 stand at 941.2 million barrels of crude oil that is 11.1 percent of the national total. Possible natural gas reserves total 2,458.4 billion cubic feet, which is 10.8 percent of Mexico's total.

### Crude Oil and Natural Gas

As of January 1, 2004, proved oil reserves decreased by 129.7 million barrels of crude oil, which means a variation of 9.8 percent compared with the values in 2003. Nevertheless, an increase of 68.0 million barrels of crude oil associated with exploration, development and revision activities was reported in the region. The first corresponds to the incorporation of 39.8 million barrels of crude oil derived from the discovery of the Amoca, Chuhuk, Nak, Teekit and Homol fields. The development increases are explained by the drilling of the Kanaab-104 well that reclassified 14.9 million barrels of crude oil from probable to proved. Additionally, there is another 12.7 million barrels of crude oil in the Och, Batab, Chuc and Taratunich block 201 caused by the revision of the pressure-production performance. The decreases are basically explained by the production during the period of 145.1

million barrels of crude oil, and declines in the Abkatún, Kax, Pol, Taratunich block 301 and Chuc wells that amounted to 52.6 million barrels of crude oil. The decreases in Abkatún, Kax, Pol and Taratunich block 301 are the result of updating the production forecast and the water-oil contact, thus diminishing production expectations, and there was a reduction in the Chuc field caused by an adjustment to its historical production. The most important integral business unit is Abkatún-Pol-Chuc, which furnishes 52.4 percent of the regional total, with 623.0 million barrels of crude oil.

In reference to probable natural gas reserves, the region presents a reduction of 173.0 billion cubic feet compared with that reported as of January 1, 2003. The above is explained by the fact that production during 2003 totaled 212.2 billion cubic feet of natural gas. Furthermore, there is a decrement of 99.7 billion cubic feet in the Abkatún, Kax, Pol, Taratunich block 301 and Chuc fields for the reasons explained above. Additionally, there is a reduction in Sinán of 51.8 billion cubic feet, because of the updating of the gas recovery factor. The increases caused by incorporating reserves due to the exploratory activity total 71.9

Table 5.9 Composition of 3P reserves by business unit of the Southwestern Offshore Region.

Business Unit	Crude Oil			Natural Gas	
	Heavy MMbbl	Light MMbbl	Superlight MMbbl	Associated Bcf	Non-associated Bcf
<b>Total</b>	<b>605.2</b>	<b>1,700.5</b>	<b>636.6</b>	<b>3,480.7</b>	<b>2,679.0</b>
Abkatún-Pol-Chuc	147.1	838.9	14.0	1,341.0	436.9
Litoral de Tabasco	458.1	861.6	622.6	2,139.7	2,242.1

billion cubic feet in the Amoca, Chuhuk, Isiw, Nak, Teekit, Uchak, Xaxamani, Xicope and Homol fields. Additionally, an increase of 103.2 billion cubic feet of natural gas was reported mainly in the Abkatún, Caan, Batab, Taratunich block 201 and Chuc fields, as a result of the revision and updating of the pressure-production performance. Kanaab contributes 7.9 billion cubic feet due to the reclassification of reserves from probable to proved. In terms of the distribution of proved gas reserves by business unit, Litoral de Tabasco and Abkatún-Pol-Chuc account for 43.2 and 56.8 percent of the region's reserves, respectively.

Probable oil reserves as of January 1, 2004, show a net decrease of 44.1 million barrels of crude oil, which is 5.2 percent less than that estimated as of January 1, 2003. Nevertheless, regional increases were reported that add up to 56.4 million barrels of crude oil, explained by the incorporation of 42.4 million barrels of crude oil from the new discoveries at Amoca, Chuhuk, Teekit, Xaxamani, Etkal and Homol. Furthermore, the revision and updating works carried out in the Chuc and Taratunich block 201 fields during 2003 provided increments of 11.6 million barrels of crude oil. The most important decrements amount to 100.5 million barrels of crude oil, especially in the Kanaab field with the reclassification of reserves from probable to proved, as well as the Abkatún and Misón fields where the former decreased its production expectations due to of the water-oil contact and the pressure-production performance, while Misón updated its volume and structural configuration due to the drilling of the exploratory well Nak-1. The probable oil reserves are concentrated in the Litoral de Tabasco integral business unit, with 66.1 percent of the regional total.

In reference to probable gas reserves, there was a net increase of 3.5 billion cubic feet compared with January 1, 2003. The increases occurred in the Amoca, Chuhuk, Isiw, Teekit, Xaxamani, Etkal and Homol discoveries, which incorporated a total of 75.8 billion cubic feet of natural gas. Additionally, the Chuc,

Taratunich block 201, Sinán, Citam and Yum also explain increases of 65.8 billion cubic feet, and they are the result of revision and updating work carried out in 2003. Furthermore, the Abkatún, Caan, Misón and Kanaab fields explain reductions of 128.0 billion cubic feet corresponding to revisions and updates of the Misón geological-geophysical model, the revision of pressure-production behavior and the updating of water-oil contact in Abkatún and Caan and the reclassification of reserves from probable to proved in Kanaab as a result of drilling the Kanaab-104 well. At an integral business unit level, the probable gas reserves are mostly found in the Litoral de Tabasco, which accounts for 72.9 percent of the region's probable gas reserves.

During 2003, possible crude oil reserves increased by 50.6 million barrels. The regional increases amount to 79.3 million, with 53.2 million barrels of crude oil explained by the incorporations caused by exploratory activity, especially in the Amoca, Xaxamani, Nak and Yetic fields. Furthermore, there is an increase in the Misón field, which explains a rise of 25.6 million barrels on its own, caused by the updating of the geological-geophysical model because of the drilling of the Nak-1 well. The regional decreases amount to 28.7 million barrels of crude oil, which is largely explained by reductions in the Abkatún field after revising the pressure-production behavior and updating the water-oil contact through the numerical flow simulation model. The possible reserves are located in the Litoral de Tabasco business unit, with 89.2 percent of the Southwestern Offshore Region's total.

Regarding possible gas reserves as of January 1, 2004, there was a net decrement of 72.1 billion cubic feet compared with the figure reported as of January 1, 2003. The annual balance shows an increase of 136.8 billion cubic feet of natural gas. There are noteworthy incorporations from new discoveries that jointly contribute 71.3 billion cubic feet in the Amoca, Centli, Nak, Namaca, Xaxamani, Xicope and Yetic fields. Furthermore, the Misón, Sinán and Citam fields add 59.1 bil-

Table 5.10 Distribution of remaining gas reserves by business unit of the Southwestern Offshore Region as of January 1, 2004.

Category	Business Unit	Natural Gas	Gas to be	Dry Gas
		Bcf	Delivered to Plant Bcf	Bcf
Proved	Total	2,093.6	1,694.3	1,354.5
	Abkatún-Pol-Chuc	1,189.7	892.8	698.9
	Litoral de Tabasco	903.8	801.4	655.6
Probable	Total	1,607.8	1,378.2	1,143.5
	Abkatún-Pol-Chuc	434.3	321.4	251.6
	Litoral de Tabasco	1,173.5	1,056.8	891.9
Possible	Total	2,458.4	2,156.4	1,760.6
	Abkatún-Pol-Chuc	153.9	113.7	89.0
	Litoral de Tabasco	2,304.5	2,042.7	1,671.6

lion cubic feet of natural gas, caused by the updating of the geological-geophysical model in Misón and the revisions made to the Sinán and Citam fields. The most important decrements arose in the Abkatún, Chukúa and Kopó fields, the first due to the updating of the pressure-production performance through the simulation model and in the Chukúa and Kopó fields caused by updating of the geological-geophysical model as a result of the Pixán-1 and Kopó-101 exploratory well drilling activities.

In terms of possible natural gas reserves distribution, the Litoral de Tabasco business unit contains 93.7 percent of the region's reserves. Table 5.10 shows the composition of the reserves in the proved, probable and possible categories, and it also distinguishes between gas to be delivered to plant and dry gas.

### Oil Equivalent

As of January 1, 2004, the region has proved reserves of 1,680.5 million barrels of oil equivalent, that is, 8.9 percent of the national total. As can be seen in figure 5.13, the Abkatún-Pol-Chuc and Litoral de Tabasco integral business units contain 52.9 and 47.1 percent of the region's total, respectively. Figure 5.14 summarizes the variation of 3P reserves during 2003 in oil equivalent,

compared with the figures reported as of January 1, 2001, 2002 and 2003.

Proved reserves decreased 164.1 million barrels of oil equivalent as against January 1, 2003, largely because of the effect of producing 193.4 million barrels of oil equivalent in 2003. Additionally, there were decreases of 83.4 million barrels, basically in the Abkatún, Kax, Pol, Taratunich block 301, Chuc and Sinán fields, which in the first four is due to the updating of production forecasts and water-oil contacts; in Chuc as a result of the adjustment of historical production and in Sinán

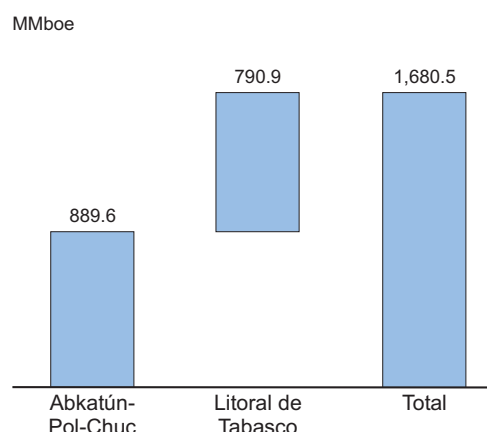


Figure 5.13 Proved reserves as of January 1, 2004, distributed by business unit in the Southwestern Offshore Region.

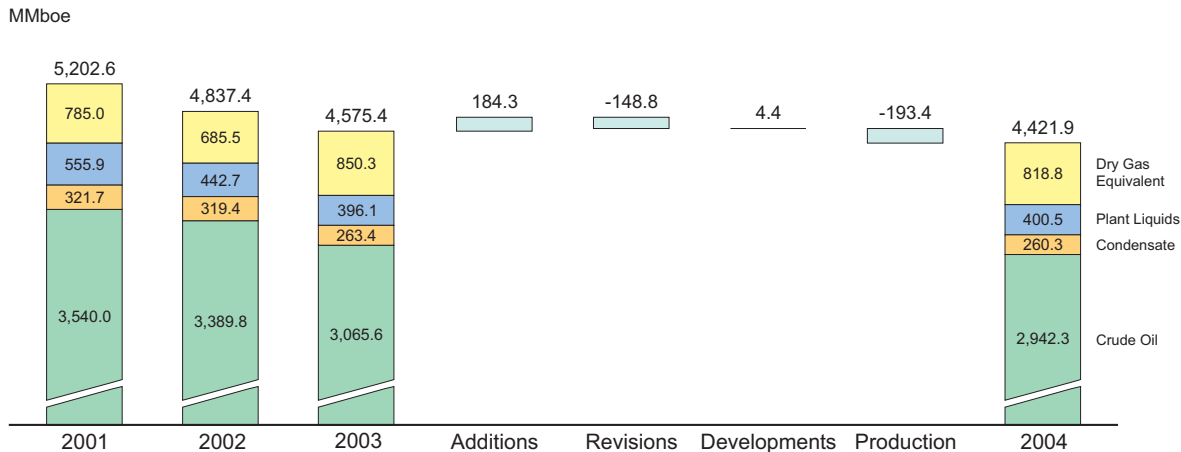


Figure 5.14 Elements of change in the total reserves of the Southwestern Offshore Region.

by the updating of the gas recovery factor. Nevertheless, there are increases of 112.6 million barrels of oil equivalent, with the significant incorporation of the Amoca, Chuhuk, Nak, Teekit, Isiw, Uchak, Xaxamani, Xicope, Yetic and Homol fields with 55.4 million barrels, plus additions of 40.6 million barrels, mainly in the Och, Batab, Chuc, Taratunich block 201 fields, with the revision of pressure-production performance carried out during 2003, and Kanaab increased 16.6 million barrels of oil equivalent due to the reclassification of reserves from probable to proved with the drilling of the Kanaab-104 well.

Probable reserves as of January 1, 2004 amount to 1,192.1 million barrels of oil equivalent, or 7.4 percent of the country's reserves (figure 5.15). In comparison with the previous year, this is a decrease of 38.7 million barrels of oil equivalent. The regional balance indicates increases of 92.8 million barrels of crude oil, distributed in the incorporations of 59.6 million barrels of crude oil in the Amoca, Chuhuk, Isiw, Teekit, Xaxamani, Etkal and Homol fields. Additionally, the Chuc, Taratunich block 201, Sinán, Citam and Yum fields give increases of 29.0 million barrels of oil equivalent as a result of revision and updating work carried out in 2003. The regional decreases at a probable reserves level amount to 131.4 million barrels of oil equivalent, which is basically explained by reductions in Abkatún and Caan due to the updating of the pressure-production performance, while Misón updated

the geological-geophysical model due to the results of the Nak-1 well and the reclassification of reserves from probable to proved in Kanaab by the above-mentioned well.

Possible reserves in oil equivalent as of January 1, 2004 stand at 1,549.1 million barrels, or 11.8 percent of the country's reserves (figure 5.16). In 2003, there was a net increase of 49.3 million barrels of crude oil in comparison with the previous year in the region. The increases are mostly explained in the Amoca, Centli, Nak, Namaca, Xaxamani, Xicope and Yetic discoveries that jointly add 69.4 million barrels of crude oil and the Misón field due to the updating of the geological-geophysical model by drilling well Nak-1.

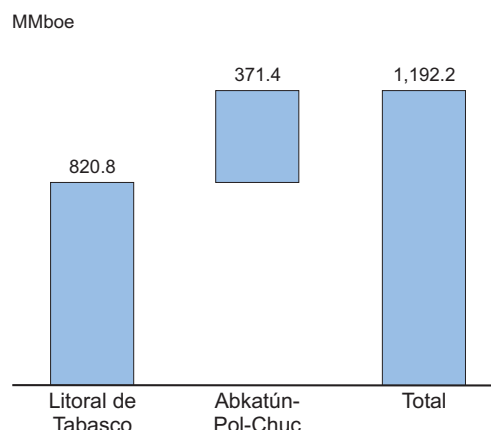


Figure 5.15 Probable reserves as of January 1, 2004, distributed by business unit in the Southwestern Offshore Region.

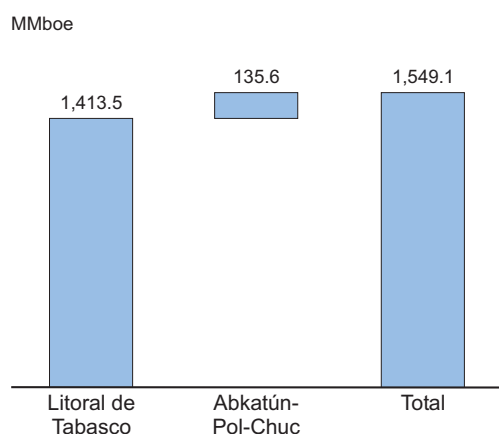


Figure 5.16 Possible reserves as of January 1, 2004, distributed by business unit in the Southwestern Offshore Region.

### Reserve-Production Ratio

The region's proved reserve-production ratio is 8.7 years considering a constant production rate of 193.4 million barrels of oil equivalent. If the 2P reserves are used, this ratio 14.9 years, and 22.9 years with 3P. The business unit with the lowest proved reserve-production ratio is Abkatún-Pol-Chuc with 5.2 years, and the one with the highest ratio is Litoral de Tabasco with 35.4 years. The Abkatún-Pol-Chuc business unit is the country's fourth most important gas producer.

For 2P reserves, the reserve-production ratios of the Abkatún-Pol-Chuc and Litoral de Tabasco business units are estimated at 7.4 and 72.2 years. The same situation can be observed in the case of 3P reserves, with a reserve-production ratio of 3P-production of 8.2 and 135.6 years, respectively.

### Reserves by Fluid Type

Table 5.11 shows the distribution of reserves by fluid type over the last three years in the proved, probable and possible categories in the Southwestern Offshore Region. Remaining proved reserves are made up of 70.7 percent crude oil, 5.4 percent condensate, 8.3 percent plant liquids and 15.5 percent dry gas equivalent to liquid.

Probable reserves total 1,192.2 million barrels of oil equivalent, of which 68.1 percent is crude oil, 5.3 percent is condensate, 8.1 percent is plant liquids and 18.4 percent is dry gas equivalent to liquid. Possible reserves total 1,549.1 million barrels of oil equivalent, of which 60.8 percent is crude oil, 6.8 percent is condensate, 10.6 percent is plant liquids and 21.9 percent is dry gas equivalent to liquid.

Table 5.11 Historical evolution of reserves by fluid type in the Southwestern Offshore Region.

Year	Category	Crude Oil	Condensate	Plant Liquids	Dry Gas Equivalent	Total
		MMbbl	MMbbl	MMbbl	MMboe	MMboe
2002	<b>Total</b>	<b>3,389.8</b>	<b>319.4</b>	<b>442.6</b>	<b>685.5</b>	<b>4,837.4</b>
	Proved	1,383.9	120.0	166.2	258.6	1,928.7
	Probable	843.1	65.6	91.0	139.3	1,139.1
	Possible	1,162.8	133.8	185.4	287.6	1,769.6
2003	<b>Total</b>	<b>3,065.6</b>	<b>263.4</b>	<b>396.2</b>	<b>850.2</b>	<b>4,575.4</b>
	Proved	1,318.4	99.2	149.1	277.9	1,844.6
	Probable	856.6	62.9	94.8	216.7	1,230.9
	Possible	890.6	101.3	152.3	355.6	1,499.8
2004	<b>Total</b>	<b>2,942.3</b>	<b>260.3</b>	<b>400.5</b>	<b>818.8</b>	<b>4,421.9</b>
	Proved	1,188.7	91.2	140.2	260.4	1,680.5
	Probable	812.4	63.1	96.8	219.9	1,192.2
	Possible	941.2	106.0	163.5	338.5	1,549.1

### 5.3 Northern Region

Because of its geographic position, this region is located in the North and Center of Mexico, as can be seen in figure 5.17, including a continental and an offshore part and covering an area of almost 2 million square kilometers. It is limited by the United States of America to the north; the 500 meters isobath of the Gulf of Mexico to the east; the Pacific Ocean to the west; and Río Tesechoacán to the south, also the upper limit of the Southern region.

As can be seen from figure 5.18, a new organization of business units was carried out in the Northern Region as of 2003. These changes are the result of a resource optimization program implemented by Pemex Exploración y Producción at a nationwide level, thus modifying both the number of integral business units and their geographic distribution, in addition to consolidating the entire potential evaluation exploratory activity of the region into a single business unit known

as regional exploration. Consequently, there are now three integral business units called Burgos, Poza Rica-Altamira and Veracruz. It should be mentioned that the task of extending the fields already discovered and incorporating reserves in the areas close to the producing fields is also the responsibility of these integral business units.

During 2003, the Northern Region produced 26.5 million barrels of oil and 491.5 billion cubic feet of natural gas, which means 2.2 and 29.9 percent of the country's oil and gas production, respectively. The cumulative production is 5,514.6 million barrels of crude oil and 16,547.9 billion cubic feet of natural gas.

Furthermore, in 2003, production activity was restarted in the Paleocanal de Chicontepec by increasing the production of oil and gas, the implementation of improvements in the drilling and fracturing techniques and strategies to lower extraction costs. The purpose of these activities is, among other things, to capture



Figure 5.17 The Northern Region consists of a continental and an offshore part.



Figure 5.18 Geographic location of the integral business units of the Northern Region.

the economic value of the reserves that have already been discovered, in addition to optimizing operations in an area that will undoubtedly be exploited more intensively in the future.

It should also be mentioned that the reserves incorporated by new fields like Nejo, Pirineo, Vistoso and Lobina, among others, make it possible to extend the region's oil development to new areas.

### 5.3.1. Evolution of Original Volumes

Proved oil reserves as of January 1, 2004 amount to 39,032.6 million barrels, that is, 27.4 percent of the national total. The original probable and possible volumes are 79,509.8 and 47,210.3 million barrels of oil, respectively, thus contributing 96.2 and 93.6 percent of the country's probable and possible volumes (table 5.12). As mentioned in previous years, the distribution of original proved, probable and possible oil vol-

umes, in the Northern Region is largely concentrated in the Poza Rica-Altamira integral business unit.

Similarly, the original proved volume of natural gas as of January 1, 2004 totals 59,886.9 billion cubic feet, equivalent to 35.6 percent of the national total. The original probable and possible volumes are estimated at 33,345.7 and 25,530.3 billion cubic feet, which when put in a national context means 91.5 and 84.5 percent of the total, respectively, with the Poza Rica-Altamira integral business unit accounting for most of the hydrocarbons of this kind, with 73.0 percent of the region's natural gas.

At the same time, of the original proved volume of natural gas, 44,917.2 billion cubic feet is associated gas and 14,969.8 billion cubic feet is non-associated. Of the latter, 66.3 percent corresponds to wet gas and 33.7 percent to dry gas. The original probable volume of natural gas is distributed into 30,378.9 billion cubic feet of associated gas and 2,966.9 billion cubic feet of

Table 5.12 Historical evolution over the last three years of the original volumes in the Northern Region.

Year	Category	Crude Oil MMbbl	Natural Gas Bcf
2002	<b>Total</b>	<b>168,056.1</b>	<b>106,998.8</b>
	Proved	100,899.6	78,646.2
	Probable	29,111.0	11,594.2
	Possible	38,045.5	16,758.4
2003	<b>Total</b>	<b>165,357.8</b>	<b>114,959.8</b>
	Proved	38,907.5	58,047.9
	Probable	79,451.0	34,316.5
	Possible	46,999.3	22,595.3
2004	<b>Total</b>	<b>165,752.7</b>	<b>118,763.0</b>
	Proved	39,032.6	59,886.9
	Probable	79,509.8	33,345.7
	Possible	47,210.3	25,530.5

non-associated gas, of which 65.0 percent is wet gas and 35.0 percent is dry gas. Finally, the figure for the original possible volume of natural gas is 21,392.2 billion cubic feet of associated gas and 4,138.3 billion cubic feet of non-associated gas, of which 66.2 percent is wet gas and 33.8 percent is dry gas.

### Crude Oil and Natural Gas

As of January 1, 2004, the original proved volumes of oil in the Northern Region tended to increase slightly compared with the previous year, because of the discoveries made in the Poza Rica-Altamira integral business unit, with 125.1 million barrels. Based upon these modifications, the original proved oil volumes at a regional level have risen from 38,907.5 million barrels reported as of January 1, 2003 to 39,032.6 million barrels of crude oil as of January 1, 2004.

The original volume of proved natural gas as of January 1, 2004 increased by 1,839.0 billion cubic feet of gas, compared with that figure reported in 2003. This is basically explained by discoveries made in the region amounting to 647.3 billion cubic feet of natural gas, of which 261 billion cubic feet of natural gas is located in the Burgos integral business unit, 26.4 bil-

lion cubic feet of natural gas in the Poza Rica-Altamira integral business unit and 359.9 billion cubic feet of natural gas in Veracruz, among other factors. As of January 1, 2004, the associated gas fields of the Poza Rica-Altamira integral business unit accounted for 73.0 percent of the proved volumes, while the non-associated gas producing integral business units, Burgos and Veracruz, hold the remaining 27.0 percent. It should be mentioned that the Burgos reservoirs are mostly wet gas, that is, 71.4 percent, while the remainder corresponds to dry gas. In contrast, the fields in the Veracruz integral business unit are 68.5 percent dry gas and the rest are wet gas.

The original volume of probable oil reported of January 1, 2003 increased by 58.8 million barrels of crude oil, from 79,451.0 million barrels of crude oil reported on January 1, 2003 to 79,509.8 million barrels of crude oil as of January 1, 2004. This change is essentially due to the incorporation of 64.9 million barrels of crude oil as a result of discoveries.

The original volume of probable natural gas decreased 970.8 billion cubic feet compared with that estimated as of January 1, 2003. This volume diminished from the 34,316.5 billion cubic feet of natural gas reported at January 1, 2003 to 33,345.7 billion cubic feet of natural gas as of January 1, 2004. This decline is largely explained by the reclassification of reserves in fields like Tajín, Corralillo, Coapechaca Agua Fría and Remolino, with 156.5, 53.5, 68.7, 6.5 and 1,437.6 billion cubic feet of natural gas, respectively. On the other hand, the exploratory activity in the Burgos integral business unit incorporated 590.7 billion cubic feet of natural gas, with Nejo and Patriota standing out with 183.7 and 103.8 billion cubic feet of natural gas, respectively.

The original volume of possible crude oil as of January 1, 2004 increased by 211.1 million barrels of crude oil compared with that reported last year, due to the

incorporations made in Burgos. The Poza Rica-Altamira integral business unit contains almost the entire original possible volume.

The original volume of possible natural gas increased 2,935.0 billion cubic feet compared with the volume estimated as of January 1, 2003, basically because of the discoveries in the Burgos integral business unit of 1,294.8 billion cubic feet of natural gas and 74.5 billion cubic feet in the Poza Rica-Altamira integral business unit with the Lobina discovery. The Poza Rica-Altamira integral business unit contains 86.2 percent of the region's original possible gas volume.

### 5.3.2 Evolution of Reserves

Figures 5.19 and 5.20 show the variations in crude oil and natural gas reserves over the last three years. The 1P reserves as of January 1, 2004 amount to 959.4 million barrels, while the 2P and 3P total 7,259.8 and 13,195.5 million barrels, respectively. In terms of gas, the 1P reserves total 4,157.4 billion cubic feet, and the 2P and 3P have been estimated at 20,249.4 and 38,973.7 billion cubic feet of natural gas, respectively. Tables 5.13 and 5.14 show the composition at a business unit level of the reserves classified as heavy, light and superlight crude oil, as well as the breakdown of associated and non-associated gas.

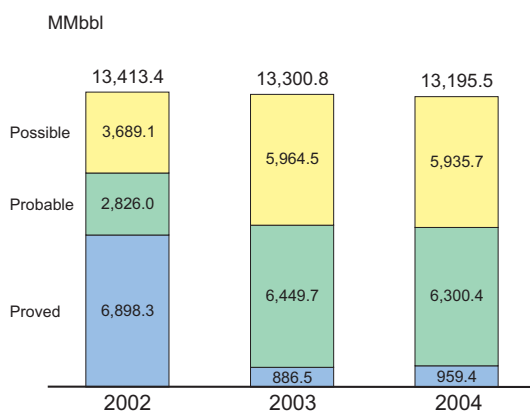


Figure 5.19 Historical evolution of the remaining crude oil reserves in the Northern Region in the last three years.

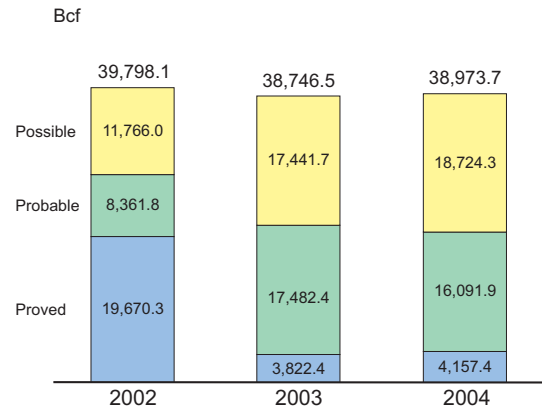


Figure 5.20 Historical evolution of the remaining natural gas reserves in the Northern Region in the last three years.

Proved reserves as of January 1, 2004 amount to 959.4 million barrels of crude oil, that is, it represents 6.8 percent of the country proved reserves. The Poza Rica-Altamira integral business unit contains all of the reserves in this category, with 99.8 percent of the region's total. In reference to proved reserves of natural gas as of January 1, 2004, as can be seen in table 5.15, they total 4,157.4 billion cubic feet of natural gas, representing 20.0 percent of the national figure. At a regional level, the Burgos integral business unit contains the highest amount in this category, with 45.7 percent.

Proved developed reserves at a regional level are 344.7 million barrels of crude oil and 2,179.6 billion cubic feet of natural gas, while the undeveloped reserves amount to 614.7 million barrels of crude oil and 1,977.8 billion cubic feet of natural gas. The proved developed reserves of oil and gas represent 3.7 and 19.4 percent of the country's total, respectively. The undeveloped reserves of oil and gas represent 14.0 and 21.0 percent of Mexico's total.

Probable oil reserves as of January 1, 2004 amounts to 6,300.4 million barrels of crude oil, or 53.3 percent of the national total. Almost all the data mentioned at a regional level are covered by the reserves in the Poza Rica-Altamira integral business unit. Probable reserves of natural gas total 16,091.9 billion cubic feet of natural gas, or 78.6 percent of Mexico's total. These re-

Table 5.13 Composition of 2P reserves by business unit of the Northern Region.

Business Unit	Crude Oil			Natural Gas	
	Heavy MMbbl	Light MMbbl	Superlight MMbbl	Associated Bcf	Non-associated Bcf
<b>Total</b>	<b>1,892.2</b>	<b>4,235.4</b>	<b>1,132.2</b>	<b>16,085.2</b>	<b>4,164.2</b>
Burgos	0.0	0.0	1.5	7.2	3,308.5
Poza Rica-Altamira	1,891.4	4,235.4	1,130.7	15,996.4	410.5
Veracruz	0.8	0.0	0.0	81.6	445.1

erves are concentrated in the Poza Rica-Altamira integral business unit, with 90.8 percent.

As of January 1, 2004, crude oil possible reserves are 5,935.7 million barrels, and correspond to 70.2 percent of the country's total. The Poza Rica-Altamira integral business unit concentrates almost all of the possible oil reserves, with 99.8 percent of the region's total. Possible reserves of natural gas stand at 18,724.3 billion cubic feet of natural gas, or 82.6 percent of Mexico's total. The last category of reserves increased 7.3 percent compared with the previous year. At a regional level and following the oil pattern, natural gas is concentrated in the Poza Rica-Altamira integral business unit, with 89.6 percent.

The region's 3P oil reserves are composed of 59.2 percent light oil, 26.0 percent heavy oil and 14.8 percent superlight oil reserves. The 3P natural gas reserves are 83.0 percent associated gas and 17.0 percent non-associated gas. Of the non-associated gas, 61.9 percent comes from wet gas reservoirs and 38.1 percent from dry gas reservoirs.

### Crude Oil and Natural Gas

Proved oil reserves as of January 1, 2004 amount to 959.4 million barrels, which represents a slight net increase of 72.8 million barrels compared with the figure as of January 1, 2003. The increases are mostly due to the effects of incorporating the Lobina field, which added 10.6 million barrels of oil, and fields like Tajín, Corralillo and Coapechaca of the Paleocanal de Chicontepec that added a total of 86.7 million barrels. The decreases are caused by the production of 26.5 million barrels of crude oil and the revision of the behavior of fields such as Tamaulipas-Constituciones with 13.3 million barrels.

Proved natural gas reserves in the Northern Region increased by 335 billion cubic feet of gas compared with the figure reported on January 1, 2003. This variation is due to the reclassification of 190.0 billion cubic feet of natural gas reserves from probable to proved in some fields like the Paleocanal de Chicontepec and the exploratory activity that made a significant contribution at a regional level with the incorporation of

Table 5.14 Composition of 3P reserves by business unit of the Northern Region.

Business Unit	Crude Oil			Natural Gas	
	Heavy MMbbl	Light MMbbl	Superlight MMbbl	Associated Bcf	Non-associated Bcf
<b>Total</b>	<b>3,427.8</b>	<b>7,816.5</b>	<b>1,951.2</b>	<b>32,365.6</b>	<b>6,608.1</b>
Burgos	0.0	0.0	8.2	42.4	5,054.3
Poza Rica-Altamira	3,420.2	7,816.5	1,943.0	32,219.4	973.6
Veracruz	7.6	0.0	0.0	103.8	580.2

*Table 5.15 Distribution of remaining gas reserves by business unit of the Northern Region as of January 1, 2004.*

Category	Business Unit	Natural Gas	Gas to be	Dry Gas
		Bcf	Delivered to Plant Bcf	Bcf
<b>Proved</b>	<b>Total</b>	<b>4,157.4</b>	<b>3,813.7</b>	<b>3,565.3</b>
	Burgos	1,900.7	1,852.8	1,793.2
	Poza Rica-Altamira	1,800.8	1,506.1	1,329.8
	Veracruz	455.9	454.9	442.4
<b>Probable</b>	<b>Total</b>	<b>16,091.9</b>	<b>14,341.9</b>	<b>12,940.1</b>
	Burgos	1,414.9	1,386.6	1,333.6
	Poza Rica-Altamira	14,606.2	12,884.5	11,536.1
	Veracruz	70.9	70.8	70.4
<b>Possible</b>	<b>Total</b>	<b>18,724.3</b>	<b>17,015.1</b>	<b>15,372.1</b>
	Burgos	1,781.1	1,747.6	1,684.2
	Poza Rica-Altamira	16,786.0	15,118.2	13,540.1
	Veracruz	157.2	149.3	147.7

262.1 billion cubic feet of natural gas. The Burgos integral business unit stands out in discoveries in the Nejo, Pirineo and Viernes fields that added 17.0, 15.0 and 10.4 billion cubic feet of natural gas and the discoveries in Veracruz in the Vistoso, Apértura and Madera fields with 89.0, 35.3 and 20.5 billion cubic feet of natural gas, respectively. The most important decreases in the area occurred because of the production of 491.5 billion cubic feet of natural gas in 2003, and in fields like Mecayucan, Poza Rica, Arenque and Tamaulipas-Constituciones with 22.0, 10.0, 9.6 and 3.4 billion cubic feet of natural gas, respectively, the first as a result of drilling development wells, and the last three because of the revision of the pressure-production performance.

Probable oil reserves as of January 1, 2004 stand at 6,300.4 million barrels. This means a reduction of 149.3 million barrels of crude oil compared with that reported as of January 1, 2003, which is partly the result of reclassifying reserves from probable to proved, caused by the well drilling and economic evaluation activities in the Agua Fría, Coapechaca, Corralillo and Tajín fields that explain decreases of 145.3 million barrels of crude

oil, in addition to the 7.4 million barrel decline in the Poza Rica field due to the revision of the pressure-production behavior. It is also important to mention the increases made by discoveries in the Nejo and Lobina fields that incorporated 0.7 and 17.5 million barrels of crude oil, respectively and the fields like Arenque and Coyol that increased 1.4 and 1.3 million barrels, respectively, caused by the revision of their behavior.

In reference to probable natural gas reserves, there is a reduction of 1,390.5 billion cubic feet compared with January 1, 2003. As in the case of oil, the decrease is largely explained by the reclassification of reserves in the Tajín, Corralillo, Coapechaca and Agua Fría fields, which reduced the reserves by 285.2 billion cubic feet of gas. Additionally, the Remolino field reclassified 1,437.6 billion cubic feet of natural gas from probable to possible due to the change in the project development date. Other declines also occurred in the Enlace field which decreased 28.0 billion cubic feet of natural gas as a result of development well results, and in the Poza Rica field with a reduction of 22.7 billion cubic feet of natural gas caused by the revision of the pressure-production behavior. There are also discoveries,

such as the Lobina field, that contribute with 12.6 billion cubic feet of natural gas, and the Uloa well, which as a new reservoir in the Lizamba field that added 19.1 billion cubic feet of natural gas.

The region's possible oil reserves as of January 1, 2004 amount to 5,935.7 million barrels of oil, that is, 28.8 million barrels less than in 2003. The most important decreases are concentrated, as in the other categories, in the Paleocanal de Chicontepec with 106.0 million barrels, and in other fields like Toteco-Cerro Azul, Ébano-Pánuco and Tamaulipas-Constituciones with 2.7, 2.5 and 1.3 million barrels of crude oil, respectively, caused in the first two cases by the revision of their pressure-production behavior. However, there were also increases that center on the discovery of the Lobina field, with 52.7 million barrels; in the Poza Rica field with 30.0 million barrels of crude oil caused by the revision of the pressure-production behavior and in the Agua Fría field with 2.9 million barrels of crude oil due to the drilling of development wells and the reclassification of reserves.

Possible natural gas reserves as of January 1, 2004, totals 18,724.3 billion cubic feet, which means an increase of 1,282.6 billion cubic feet of natural gas compared with the previous year. The fields with the greatest contribution in terms of adding reserves are Remolino with 1,437.6 billion cubic feet of natural gas,

caused by the reclassification of reserves probable to possible, Poza Rica with 55.7 billion cubic feet of natural gas due to the behavior revision as a result of production forecasts through declination curve analysis, and the Lobina field where the new discovery added 38.0 billion cubic feet of natural gas. The most important declines occurred in the Enlace and Mojarreñas fields of the Burgos integral business unit, where reserves of natural gas fell 91.4 and 77.2 billion cubic feet, respectively, as a result of drilling development wells in the first case and the revision of the pressure-production behavior in the second.

### Oil Equivalent

Figure 5.21 shows the variation in 3P reserves during 2003 in oil equivalent, compared with the figures reported in 2001 and 2002. As can be seen, as of January 1, 2004, there is an increase of 95.2 million barrels of oil equivalent, compared with the previous year. There was the noteworthy discovery of new fields, with an amount of 328.2 million barrels of oil equivalent, with the Burgos integral business unit providing the most of the amount incorporated, 59 percent, followed by Poza Rica-Altamira with 27.8 percent and Veracruz with 13.1 percent.

As of January 1, 2004, the region has proved reserves of 1,768.6 million barrels of oil equivalent, that is, 9.4

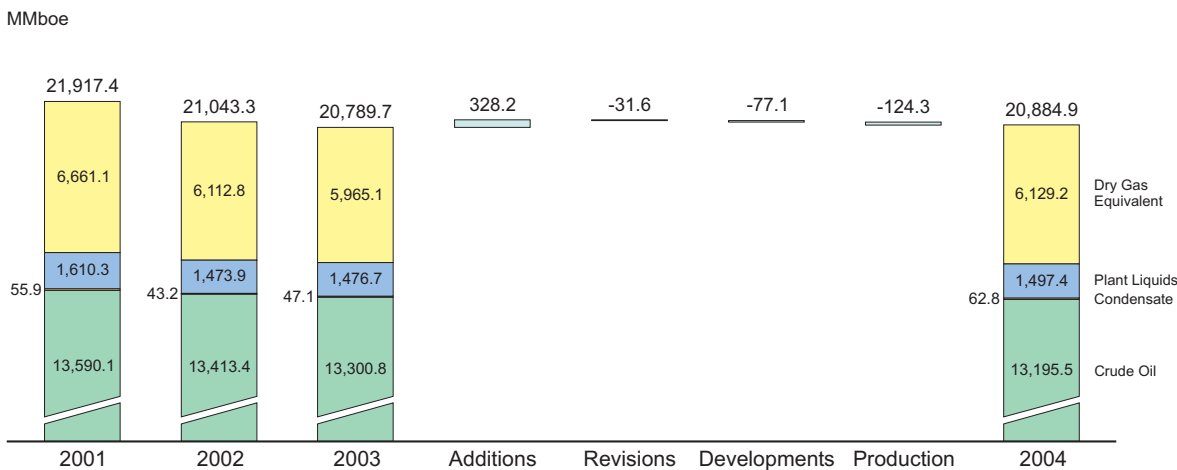


Figure 5.21 Element of change in the total reserves of the Northern Region.

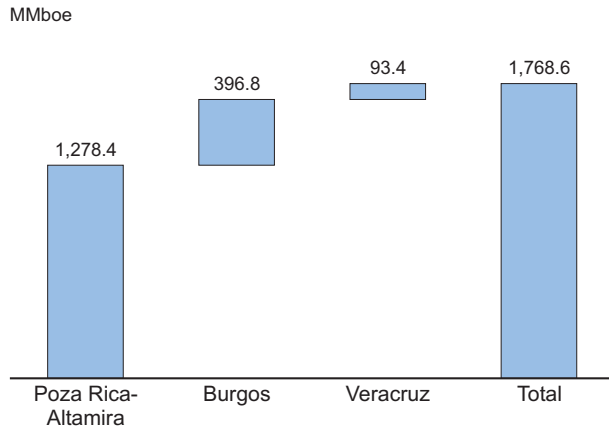


Figure 5.22 Proved reserves as of January 1, 2004, distributed by business unit in the Northern Region.

percent of the national total. Figure 5.22 highlights the Poza Rica-Altamira integral business unit with 72.3 percent of the region's total. Compared with 2003, proved reserves increased 140.4 million barrels of oil equivalent, even though the production in the same year totaled 124.3 million barrels of oil equivalent. The most important increases are due to the reclassification of reserves in Tajín, Corralillo, Coapechaca and Agua Fría fields from the Paleocanal de Chicontepec with 71.3, 44.1, 15.5 and 4.9 million barrels of oil equivalent, and the discovery of the Lobina field that incorporated 12.1 million barrels of oil equivalent. The reductions were mostly caused by the Tamaulipas-Constituciones, Arenque, Cacalilao and Coyotes fields where there were decreases of 16.3, 7.5, 4.0 and 2.6

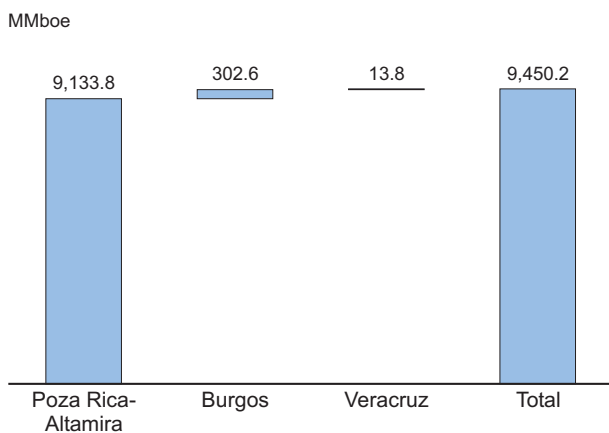


Figure 5.23 Probable reserves as of January 1, 2004, distributed by business unit in the Northern Region.

million barrels of oil equivalent, respectively, due to behavior revisions and by the Mecayucan field where the reserves fell by 5.1 million barrels of oil equivalent due to the drilling of development wells.

Probable reserves as of January 1, 2004 amount to 9,450.2 million barrels of oil equivalent, or 59.0 percent of the country's reserves in this category (figure 5.23). The balance shows that there is a decrease of 374.8 million barrels of oil equivalent, compared with the figure reported in 2003. The negative effect is largely supported by the revision of the Remolino field's behavior, which represents 308.5 million barrels of oil equivalent. Other decreases are explained by fields like Tajín, Corralillo and Coapechaca with 78.6, 48.9 and 33.0 million barrels of oil equivalent, respectively, due to the reclassification of their reserves by development wells. Other noteworthy decreases are found in the Humapa fields with 21.4 million barrels of oil equivalent, caused by the behavior revision and Lobina with 19.8 million barrels of oil equivalent, due to new discoveries.

Possible oil equivalent reserves as of January 1, 2004, stand at 9,666.1 million barrels, that is, there was an increase of 329.6 million barrels of oil equivalent compared with the figure reported last year. At a nationwide level, the region's reserves in this category represent 73.6 percent of the total (figure 5.24). The increases are largely supported by the Remolino field that totals 297.6 million barrels of oil equivalent, as a result of the revision behavior and the incorporation of new fields that contribute 328.2 million barrels of oil equivalent at a regional level. The most important decreases are represented by the Ahuatepec, Tajín, Coapechaca and Cocuite fields, which among others, declined 34.0, 31.6, 25.2 and 28.7 million barrels of oil equivalent, respectively. In the first, the decrease was due to the revision of behavior, in the second and third, because of the drilling of development wells and the reclassification of reserves, and in the case of the fourth, the drilling of development wells that turned out to be unproductive.

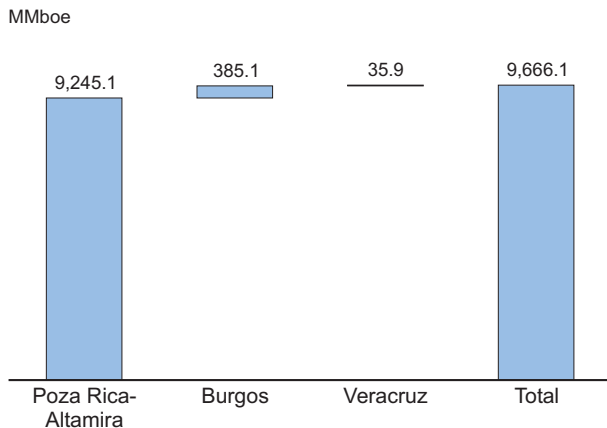


Figure 5.24 Possible reserves as of January 1, 2004, distributed by business unit in the Northern Region.

### Reserve-Production Ratio

The region’s proved reserve-production ratio is 14.2 years considering a constant rate of 124.3 million barrels of oil equivalent. If the 2P reserves are used in this ratio, the number of years is 90.3, and 168.0 years for the case of 3P. If this ratio is analyzed in the non-associated gas business units with their production, it is evident that the best proved reserve-production ratio is 6.0 and 5.2 years is for the Veracruz and Burgos integral business units, respectively. The Poza Rica-

Altamira integral business unit has a proved reserve-production ratio of 40.0.

The high 2P reserve-production ratio of Poza Rica-Altamira integral business unit of 325.5 years is due to the size of its probable reserves. The Veracruz and Burgos business units producing non-associated gas have a 2P reserve-production ratio of 6.9 and 9.1 years, respectively. The same situation prevails in the case of the 3P reserve-production ratio as in the case of proved and 2P reserves: the Poza Rica-Altamira integral business unit has a 2P reserve-production ratio of more than 600 years. The Veracruz and Burgos business units have a 3P reserve-production ratio of 9.2 and 14.1 years, respectively.

### Reserves by Fluid Type

Table 5.16 shows the distribution of reserves by fluid type over the last three years in the proved, probable and possible categories in the Northern Region. The remaining proved reserves are made up of 54.2 percent crude oil, 1.3 percent condensates, 5.7 percent plant liquids and 38.8 percent dry gas equivalent to liquid.

Table 5.16 Historical evolution of reserves by fluid type in the Northern Region.

Year	Category	Crude Oil	Condensate	Plant Liquids	Dry Gas Equivalent	Total
		MMbbl	MMbbl	MMbbl	MMboe	MMboe
2002	<b>Total</b>	<b>13,413.4</b>	<b>43.2</b>	<b>1,473.9</b>	<b>6,112.8</b>	<b>21,043.3</b>
	Proved	6,898.3	21.8	746.4	2,996.8	10,663.3
	Probable	2,826.0	9.0	311.7	1,305.2	4,451.8
	Possible	3,689.1	12.4	415.9	1,810.8	5,928.2
2003	<b>Total</b>	<b>13,300.8</b>	<b>47.1</b>	<b>1,476.7</b>	<b>5,965.1</b>	<b>20,789.7</b>
	Proved	886.5	19.3	101.1	621.3	1,628.2
	Probable	6,449.7	12.2	704.2	2,658.9	9,825.0
	Possible	5,964.5	15.6	671.4	2,684.9	9,336.5
2004	<b>Total</b>	<b>13,195.5</b>	<b>62.8</b>	<b>1,497.4</b>	<b>6,129.2</b>	<b>20,884.9</b>
	Proved	959.4	22.4	101.3	685.5	1,768.6
	Probable	6,300.4	18.4	643.3	2,488.0	9,450.2
	Possible	5,935.7	22.0	752.8	2,955.6	9,666.1

The values reported for probable reserves show a total of 9,450.2 million barrels of oil equivalent, of which 66.7 percent is crude oil, 0.2 percent is condensates, 6.8 percent is plant liquids and 26.3 percent is dry gas equivalent to liquid. Possible reserves total 9,666.1 million barrels of oil equivalent, of which 61.4 percent is crude oil, 0.2 percent is condensates, 7.8 percent is plant liquids and 30.6 percent is dry gas equivalent to liquid.

#### 5.4 Southern Region

This region is located in the Southern portion of the Mexican Republic and geographically covers the states of Guerrero, Oaxaca, Veracruz, Tabasco, Campeche, Chiapas, Yucatán and Quintana Roo (figure 5.25), where a new organization scheme in effect since June 2003 has streamlined the original number of seven producing business units to five integral business units. The new integral business units are Bellota-Jujo, Macuspana, Cinco Presidentes, Samaria-Luna and

Muspac, (figure 5.26). Furthermore, in this reorganization, the three original exploration business units are now a single regional business unit, whose function is to expand border exploration, while leaving extensions and exploratory opportunities close to the discovered fields to the integral business units. As of January 1, 2004, the region administers a total of 125 fields with remaining reserves.

Production in 2003 was 176.4 million barrels of oil and 594.9 billion cubic feet of natural gas, which means 14.3 and 36.2 percent of the country's oil and gas production, respectively. This shows that the efforts made in the Southern Region to keep its position as an important hydrocarbon producer in the country is still bearing fruits, even though a significant number of fields have now entered the maturity phase. Nevertheless, it should be mentioned that in 2004, with investment aimed at the more profitable opportunities, the decline in hydrocarbon production in recent years will be a lessened through specific actions and deci-



Figure 5.25 Geographical coverage of the Southern Region. It covers the states of Guerrero, Oaxaca, Veracruz, Tabasco, Campeche, Chiapas, Yucatán and Quintana Roo.

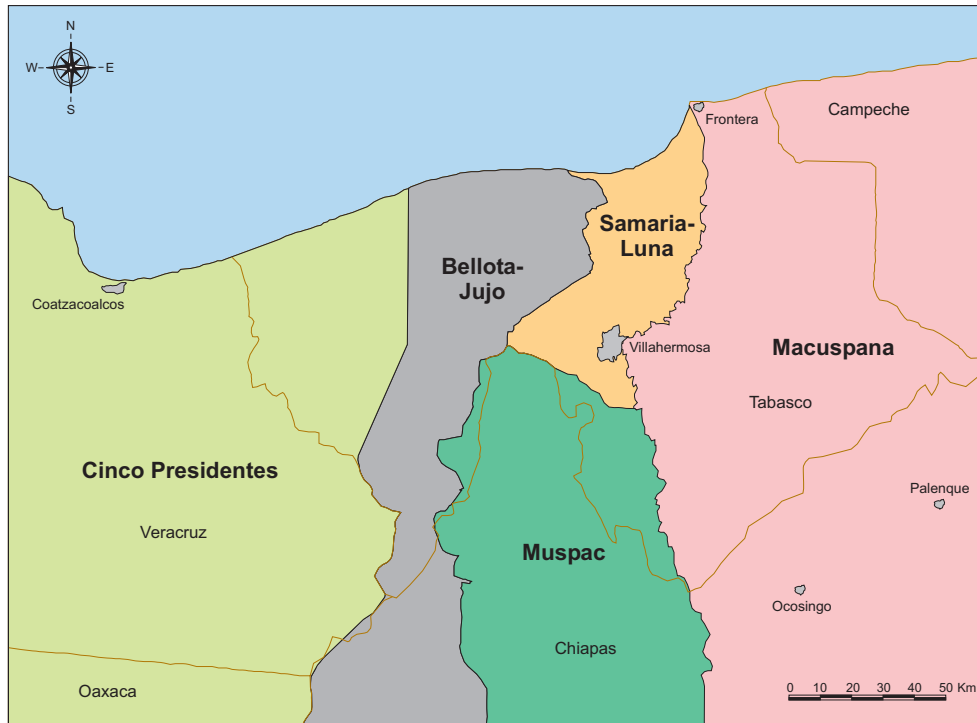


Figure 5.26 Geographic location of the integral business units of the Southern Region.

sions focused on maintaining pressure in the most important fields: Antonio J. Bermúdez complex and Jujo-Tecominoacán.

#### 5.4.1. Evolution of Original Volumes

The original proved volume of the Southern Region as of January 1, 2004 is 36,430.0 million barrels of oil, that is, 25.6 percent of the proved national total (table 5.17). The original probable and possible volumes have been estimated at 634.5 and 76.2 million barrels of oil, which is comparatively much lower than the national total but which reflects the above-mentioned maturity in most of the fields. Most of this original proved volume is located in the Samaria-Luna and Bellota-Jujo integral business units, which concentrate 62.1 percent of the regional total. In terms of original probable volumes of oil, the Bellota-Jujo integral business unit provides the largest proportion, with 46.7 percent of the region’s total. The Samaria-Luna integral business unit provides 75.7 percent of the regional total of original possible volume of oil.

In reference to the original volumes of proved natural gas, the region still plays a major role with 68,582.7 billion cubic feet, which is equal to 40.8 percent of the country’s total. In terms of the original volume of natural gas, the probable and possible classifications have been estimated at 772.0 and 417.2 billion cubic feet, respectively. The original proved natural gas volume is mostly concentrated in the Muspac and Samaria-Luna integral business units, with 59.5 percent of the region’s original proved natural gas volume. The Muspac and Bellota-Jujo integral business units account for 75.5 percent of the probable category. Finally, the original possible volume of natural gas is concentrated in the Macuspana and Samaria-Luna integral business units, with 99.4 percent.

Furthermore, 64.4 percent of the region’s total proved gas volume, or 44,186.4 billion cubic feet, corresponds to associated gas, while the remaining, 24,396.3 billion cubic feet is non-associated gas, that is, 35.6 percent. Of this non-associated gas, 69.9 percent, or 17,046.1 billion cubic feet comes from gas-condensate reservoirs, while 24.2 percent, 5,895.9 billion cubic feet, is found in

Table 5.17 Historical evolution over the last three years of the original volumes in the Southern Region.

Year	Category	Crude Oil MMbbl	Natural Gas Bcf
2002	<b>Total</b>	<b>38,427.2</b>	<b>72,618.6</b>
	Proved	36,969.3	70,117.2
	Probable	1,016.7	1,548.2
	Possible	441.3	953.2
2003	<b>Total</b>	<b>37,612.2</b>	<b>70,825.7</b>
	Proved	36,776.6	69,190.8
	Probable	502.6	789.0
	Possible	333.0	846.0
2004	<b>Total</b>	<b>37,140.6</b>	<b>69,771.9</b>
	Proved	36,430.0	68,582.7
	Probable	634.5	772.0
	Possible	76.2	417.2

wet gas reservoirs. Finally, dry gas corresponds to 5.9 percent, or 1,454.4 billion cubic feet.

It is important to remember that associated gas is a natural gas that is in contact and/or dissolved in crude oil, while non-associated gas is found in reservoirs that do not contain crude oil at original pressure and temperature conditions.

### Crude Oil and Natural Gas

The original volume of proved crude oil as of January 1, 2004 shows a net decrease of 346.6 million barrels of crude oil compared with the figure reported last year, that is, less than one percent. This difference arises from diverse factors like the updating of the numerical simulation models in the Jujo-Tecominoacán and Chiapas-Copanó fields, the new petrophysical evaluation in Caparrosos-Pijije-Escuintle, which together with the recently discovered Shishito field, provides an increase of 357.8 million barrels of crude oil. However, this is insufficient to offset the reductions identified in the Magallanes, Puerto Ceiba, Luna and Juspi fields that jointly decreased by 707.1 million barrels, the sharpest decline being in Puerto Ceiba with 262.6 million barrels,

caused by the drilling of wells, and 247.2 million barrels in Magallanes after updating the geological model and the petrophysical evaluation. Table 5.17 shows the evolution in the original volumes of oil and gas for the last three years.

The original volume of proved natural gas shows a net decrease of 608.1 billion cubic feet of natural gas, that is, less than one percent compared with that reported as of January 1, 2003. As in the case of oil, there are sharp reductions in the Magallanes, Juspi, Luna and Puerto Ceiba fields, where the reduction was 685.2, 365.0, 353.0 and 154.8 billion cubic feet, respectively. These decreases are caused by the updating of the geological model and a new petro-

physical interpretation in the Magallanes field; in Juspi because of the cancellation of the original volume at the Lower Cretaceous level since the results obtained from the Juspi-1A well prove the invasion of water at that level; in the Luna field, the results of the numerical simulation of reservoirs are indicative of a lower volume in the Upper Jurassic Kimmeridgian reservoir and finally, in the case of the Puerto Ceiba field, the reduction is caused by the adverse results obtained from drilling the Puerto Ceiba -135 and 121-C wells that were invaded by water in the Upper Jurassic Kimmeridgian and reached the salt dome, respectively. Nevertheless, it is necessary to emphasize the most important increases in the Chiapas-Copanó, Caparrosos-Pijije-Escuintle and Vernet fields of 595.4, 220.7 and 81.4 billion cubic feet of natural gas due to updating of the reservoir numerical simulation model for the first field; the new petrophysical evaluation made in the second and the reclassification of the probable volume to proved arising from the major workovers of the Lotatal-1A well in the Vernet field.

The region's original volume of probable oil is 634.5 million barrels of crude oil, that is, 131.8 million barrels of crude oil more than the figure reported on Janu-

ary 1, 2003. The addition of this probable volume is due to the proved to probable reclassification of the volume in the Puerto Ceiba and Juspi fields, with 193.1 and 24.9 million barrels of crude oil, in addition to the volume incorporated with the discovery of the Shishito field with 80.4 million barrels. However, it is important to note that there were decreases in the Bellota, Cerro Nanchital and Luna fields with 52.5, 32.9 and 20.4 million barrels, respectively. These reductions are caused by the updating of the original volume of crude oil and gas in the Bellota field, as well as the seismic reinterpretation and revaluation of the original volume of the Cerro Nanchital field, and the updating of the numerical flow simulation model of the Luna field.

The original volume of probable natural gas shows a net decrease of 17.0 billion cubic feet of natural gas as of January 1, 2004, which corresponds to 2.2 percent of the amount reported in 2003. These decreases are basically in the Luna, Bellota and Vernet fields with 107.0, 83.1 and 77.5 billion cubic feet of natural gas, respectively. These reductions are caused by the numerical flow simulation study in the first field, the revaluation of the original crude oil and gas volume in the second and the reclassification of the volume from probable to proved as a result of the major workover carried out in the Lotatal-1A well in the Vernet field.

On the other hand, and as in the case of oil, the increases in the original volume of probable gas are in the Puerto Ceiba, Juspi, Shishito and Girdaldas fields, with 113.8, 81.6, 40.9 and 84.4 billion cubic feet of natural gas, respectively. These increases are supported by the development of the Puerto Ceiba field, the reclassification of the volume from proved to probable in the Upper Cretaceous in Juspi, the discovery of the Shishito field and the incorporation of the 6 and 8 sands of the Girdaldas field into the probable category.

The original volume of possible oil amounts to 76.2 million barrels, which is 256.8 million barrels of crude oil under the figure reported in 2003. The reductions by 283.0 and 29.1 million barrels are due to the revalua-

tions of the original oil and gas volume in the Cárdenas and Bellota fields. On the other hand, the drilling of the Naranja-1 well of the Sen field has made it possible to add 57.7 million barrels as possible volume.

As of January 1, 2004, the original volume of possible natural gas is 417.2 billion cubic feet, which means a net decrease of 428.8 billion cubic feet of natural gas compared with that of the previous year, that is, 50.7 percent less than that in 2003. This is mostly attributable to decreases reported in the Cárdenas and Bellota fields, which among others, reduced their possible volumes by 526.3 and 47.8 billion cubic feet of natural gas, respectively. The scarce increases mostly occurred in the Sen field with 166.4 billion cubic feet, for the above-mentioned reasons.

#### **5.4.2 Evolution of Reserves**

Proved reserves as of January 1, 2004 amounts to 3,377.1 million barrels of crude oil, which means 23.9 percent of the country's proved reserves. Proved natural gas reserves total 9,805.3 billion cubic feet, which is 47.3 percent of Mexico's total proved reserves. Once again, these reserve volumes are indicative of the relevance of the Southern Region in the context of hydrocarbon supply.

In reference to the breakdown of proved reserves, the developed ones total 2,244.1 million barrels of crude oil and 5,881.3 billion cubic feet of natural gas, while the undeveloped amount to 1,133.1 million barrels of crude oil and 3,924.0 billion cubic feet of natural gas. These values represent 23.8 and 24.2 percent of the total proved developed and undeveloped oil reserves of the country, while in reference to Mexico's proved developed and undeveloped reserves of natural gas, the figures are 52.3 and 41.3 percent, respectively. It is important to mention that the Antonio J. Bermúdez complex in the Jujo-Tecominoacán field has the region's most important proved undeveloped reserves, with 601.7 and 240.4 million barrels of crude oil and

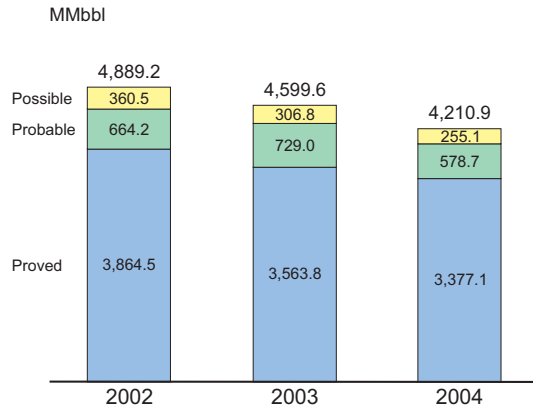


Figure 5.27 Historical evolution of the remaining crude oil reserves in the Southern Region in the last three years.

1,716.3 and 1,086.2 billion cubic feet of natural gas, respectively. According to the authorized investment projects, there are plans to drill more than 40 development wells in the Antonio J. Bermúdez complex and about 20 wells in the Jujo-Tecominoacán field, in order to raise the production and increase the economic value of both fields.

As of January 1, 2004, the 2P reserves totaled 3,955.8 million barrels of crude oil and 11,300.1 billion cubic feet of natural gas. 3P reserves totaled 4,210.9 million barrels of crude oil and 12,321.9 billion cubic feet of natural gas. The Figures 5.27 and 5.28 show the variations in crude oil and natural gas reserves over the last three years. Tables 5.18 and 5.19 show the composition

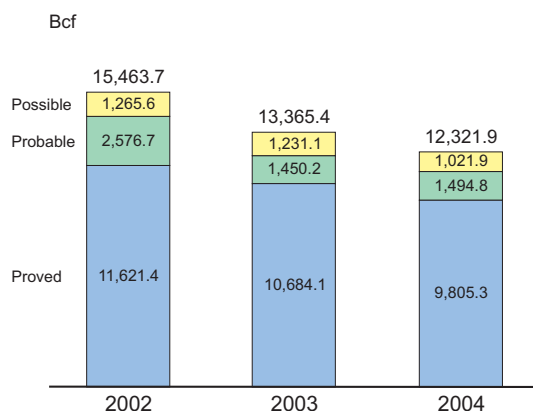


Figure 5.28 Historical evolution of the remaining natural gas reserves in the Southern Region in the last three years.

at a business unit level of the reserves classified as heavy, light and superlight crude oil, and in terms of associated and non-associated gas. This classification is shown for both 2P and 3P reserves. It should be noted that the non-associated gas includes gas corresponding to gas-condensate, wet gas and dry gas reservoirs. If the gas reserves only include wet gas and dry gas reservoirs, the amounts associated exclusively with this type of reservoir are 459.5 and 206.1 billion cubic feet of natural gas, respectively, for the 2P category. In the case of the 3P category, 473.7 and 244.9 billion cubic feet correspond to wet gas and dry gas, respectively.

In terms of proved oil reserves, the light and superlight oil types predominate the region's composition with 98.7 percent, while the contribution of heavy oil is marginal, just 1.3 percent. Referring to the proved natural gas reserves, 71.1 percent is associated gas and the remaining is non-associated. The most important associated gas fields are Jujo-Tecominoacán, Samaria and Cunduacán, while the non-associated gas fields are Muspac, Chiapas-Copanó and Catedral. The last three fields are gas-condensate reservoirs, while the largest wet gas or dry gas reservoirs are Usumacinta, Narvéez and José Colomo.

Probable oil reserves as of January 1, 2004 amount to 578.7 million barrels of crude oil, or 4.9 percent of the national total. Probable gas reserves total 1,494.8 billion cubic feet, which is 7.3 percent of Mexico's total. Possible reserves contribute with 255.1 million barrels of crude oil, which represents 3.0 percent of the national total, while the possible gas reserves stand at 1,021.9 billion cubic feet, that is, 4.5 percent of the national total. These figures reflect the maturity reached by these fields, but they are also indicative of the possibility of extending the current reserves through different exploitation strategies.

### Crude Oil and Natural Gas

Proved reserves as of January 1, 2004 amount to 3,377.1 million barrels of crude oil, that is, there is a reduction

Table 5.18 Composition of 2P reserves by business unit of the Southern Region.

Business Unit	Crude Oil			Natural Gas	
	Heavy MMbbl	Light MMbbl	Superlight MMbbl	Associated Bcf	Non-associated Bcf
<b>Total</b>	<b>65.0</b>	<b>3,107.6</b>	<b>783.3</b>	<b>7,757.9</b>	<b>3,542.2</b>
Bellota-Jujo	4.0	1,043.0	226.6	2,853.9	85.3
Cinco Presidentes	7.2	300.3	0.0	346.1	45.4
Macuspana	0.0	34.4	48.6	14.0	1,094.3
Muspac	30.4	211.3	106.3	683.8	2,279.3
Samaria-Luna	23.3	1,518.6	401.7	3,860.0	37.8

of 186.6 million barrels compared with the previous year. The production of 176.4 million barrels in 2003 largely explains this decrease. The remaining 10.2 million barrels are caused by the net reduction of reserves due to the breakthrough of water in the Carmito, Samaria, Iride and Cunduacán fields, among others, and the suspension of carbon dioxide and methane gas injection in Artesa and Jacinto, respectively. These fields reported reductions of 6.6, 26.1, 12.3, 7.9, 6.9 and 8.1 million barrels of oil, respectively. Nevertheless, there were also significant increases in fields such as Puerto Ceiba, Chiapas-Copanó, Sen and Caparroso-Pijije-Escuintle, where the proved reserves increased 27.2, 11.5, 11.2 and 5.5 million barrels of crude oil, respectively. These changes are due to the development of the Puerto Ceiba field; the updating of the reservoir numerical simulation studies carried out in the Chiapas-Copanó field; the reclassification of reserves from probable to proved in the Sen field because of the drilling of the Naranja-1 well,

and the revision of the pressure-production performance in Caparroso-Pijije-Escuintle.

The region's proved natural gas reserves amount to 9,805.3 billion cubic feet, with significant increase in 2003 in the Chiapas-Copanó, Sen, Juspi and Caparroso-Pijije-Escuintle fields with 243.9, 35.8, 29.2 and 24.4 billion cubic feet of natural gas, respectively. Nevertheless, the increases could not offset the reductions caused by production and pressure-production performance revisions on other fields. Thus, in 2003 production totaled 594.9 billion cubic feet of natural gas, and there were reductions especially in the Paredón, Jujo-Tecominoacán and Carmito fields with 341.8, 76.7 and 60.7 billion cubic feet, respectively. The first two have been updated by numerical flow simulation models carried out in 2003, while in the third field, the decrease was due to breakthrough of water in the Cretaceous reservoir.

Table 5.19 Composition of total reserves by business unit of the Southern Region.

Business Unit	Crude Oil			Natural Gas	
	Heavy MMbbl	Light MMbbl	Superlight MMbbl	Associated Bcf	Non-associated Bcf
<b>Total</b>	<b>73.1</b>	<b>3,305.0</b>	<b>832.9</b>	<b>8,129.1</b>	<b>4,192.9</b>
Bellota-Jujo	4.0	1,046.9	227.4	2,945.0	85.3
Cinco Presidentes	7.2	448.7	1.0	461.1	103.9
Macuspana	4.6	34.7	62.0	18.3	1,406.0
Muspac	30.9	256.0	119.8	777.3	2,559.8
Samaria-Luna	26.3	1,518.6	422.6	3,927.4	37.8

The distribution of crude oil and natural gas, in the proved category, is mainly concentrated in the Samaria-Luna and Bellota-Jujo integral business units that jointly hold 85.0 and 64.2 percent of total oil and gas reserves of the region, with the Antonio J. Bermúdez complex and Jujo-Tecominoacán standing out, and which jointly account for 2,330.3 million barrels of crude oil and 4,798.7 billion cubic feet of natural gas, that is, they have 69.0 and 48.9 percent of the region's oil and natural gas reserves.

Probable oil reserves as of January 1, 2004 of 578.7 million barrels of crude oil reported a net decrease of 150.4 million barrels of crude oil, that is, 20.6 percent less than the figure reported as January 1, 2003. The most significant reductions were reported in the Magallanes and Jujo-Tecominoacán fields with 139.0 and 41.9 million barrels of crude oil, respectively. In the Magallanes field, the new interpretation of the geological, petrophysical, evaluation study of the original volume and reserves justifies this reduction. In the case of the Jujo-Tecominoacán field, the decrement is produced by the updating of the numerical flow simulation model carried out in 2003. It should also be mentioned that probable reserves increases were made in the Sitio Grande, Shishito, Samaria (Tertiary reservoir) and San Ramón fields, with 62.3, 17.2, 10.8 and 12.1 million barrels of crude oil, respectively. The reasons for this increase are explained by the Sitio Grande field due to the reclassification of reserves from possible to probable because of an enhanced recovery maintenance project will soon commence through the injection of carbon dioxide; the discovery of the Shishito field; the reclassification of viscous crude oil reserves from proved to probable in Samaria field (Tertiary reservoir); and finally, because of the unsatisfactory results in the recent workovers in the San Ramón field that led to the reclassification of reserves from proved to probable. In terms of the distribution of the reserves of this kind, the Bellota-Jujo and Samaria-Luna integral business units concentrate 60.1 percent of the regional total.

In reference to probable natural gas reserves as of January 1, 2004, a total of 1,494.8 billion cubic feet of natural gas is reported, which means an increase of 44.6 billion cubic feet of natural gas compared with the figure reported last year. The increase in reserves in the Jujo-Tecominoacán and Sitio Grande fields offset the reduction arising in other fields. The Jujo-Tecominoacán field raised its probable gas reserves by 294.1 billion cubic feet of gas as a result of updating the numerical flow simulation study. Furthermore, the increase of 122.3 billion cubic feet of natural gas in the Sitio Grande field is a consequence of the reclassification of reserves from possible to probable, due to the commencement of an enhanced recovery project by means of carbon dioxide injection. Nevertheless, these increments did not affect the net volume of the probable reserves because there were considerable decreases in the Magallanes, Sen, Chiapas-Copanó and Muspac fields that add up to 235.1 billion cubic feet of natural gas. In Magallanes, the results of the evaluation of reserves based on a new geological and petrophysical model led to a decrease of 112.9 billion cubic feet. In the Sen and Chiapas-Copanó fields, the reclassification of reserves from probable to proved is a consequence of this reduction of 44.6 and 44.5 billion cubic feet; the breakthrough of water in Muspac led to a decrease of 33.2 billion cubic feet. At an integral business unit level, the probable reserves are concentrated in Muspac and Macuspana, which jointly account for 58.8 percent of the region's probable reserves, that is, 879.5 billion cubic feet of natural gas.

There is net decrease of 51.7 million barrels of crude oil in possible oil reserves as of January 1, 2004 compared with that estimated last year, even though there were increases of 84.6 and 20.9 million barrels of crude oil in the Magallanes and Sen fields, respectively. This decline is mostly in the Sitio Grande and Puerto Ceiba fields with 70.8 and 50.2 million barrels of crude oil, respectively. In the case of Sitio Grande, a reclassification of reserves from possible to probable caused this decrease. Because of the development program in the

Puerto Ceiba field, and based upon the results of the drilling of the well 135, the possible area and therefore the reserves were reduced, as a consequence of the low structural position of the well. In terms of distribution, the region's possible oil reserves are centered in the Cinco Presidentes and Muspac integral business units with 208.1 million barrels of crude oil, corresponding to 81.6 percent of the regional total.

Finally, possible natural gas reserves as of January 1, 2004, total 1,021.9 billion cubic feet, a decrease of 209.2 billion cubic feet of natural gas compared with the figure reported in 2003. The decrements are mostly caused in the Sitio Grande, Carmito, Bellota and Palangre fields, with 139.4, 80.4, 42.4 and 16.3 billion cubic feet, respectively. In the Sitio Grande field, the reduction is due to the reclassification of the reserves from possible to probable due to the commencement of an enhanced recovery project; while the breakthrough of water led to the decrease in the reserves

of the Carmito field. The decrease in the Bellota and Palangre fields was caused by the updating of the evaluation of the secondary gas caps.

Table 5.20 shows the distribution of the gas reserves in the proved, probable and possible categories, and it also illustrates the natural gas, gas to be delivered to plant and dry gas.

### Oil Equivalent

Figure 5.29 shows the variation in 3P reserves as of January 1, 2004 in oil equivalent, compared with 2001, 2002 and 2003. Proved reserves as of January 1, 2004 total 5,756.3 million barrels of oil equivalent, corresponding to 30.5 percent of the national total and showing a total variation of 342.8 million barrels of oil equivalent, compared with that reported last year. This decrease is explained by the production of 317.6 million barrels during 2003, the incorporation of new res-

*Table 5.20 Distribution of remaining gas reserves by business unit of the Southern Region as of January 1, 2004.*

Category	Business Unit	Natural Gas Bcf	Gas to be Delivered to Plant Bcf	Dry Gas Bcf
<b>Proved</b>	<b>Total</b>	<b>9,805.3</b>	<b>9,250.9</b>	<b>7,181.0</b>
	Bellota-Jujo	2,671.4	2,536.0	1,926.4
	Cinco Presidentes	316.9	254.8	216.8
	Macuspana	707.5	695.2	659.4
	Muspac	2,484.5	2,229.6	1,693.3
	Samaria-Luna	3,625.0	3,535.4	2,685.1
<b>Probable</b>	<b>Total</b>	<b>1,494.8</b>	<b>1,399.9</b>	<b>1,124.1</b>
	Bellota-Jujo	267.8	256.4	194.7
	Cinco Presidentes	74.7	53.2	45.0
	Macuspana	400.8	400.5	354.5
	Muspac	478.7	424.9	328.7
	Samaria-Luna	272.8	264.9	201.2
<b>Possible</b>	<b>Total</b>	<b>1,021.9</b>	<b>939.8</b>	<b>762.0</b>
	Bellota-Jujo	91.0	87.6	66.6
	Cinco Presidentes	173.5	101.5	85.8
	Macuspana	316.0	315.9	279.3
	Muspac	374.0	367.6	279.2
	Samaria-Luna	67.5	67.2	51.1

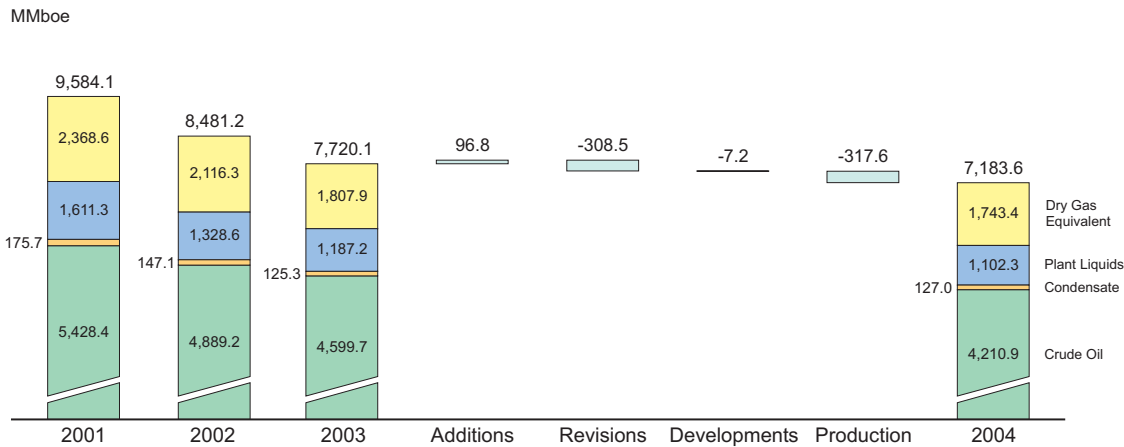


Figure 5.29 Elements of change in the total reserves of the Southern Region.

ervoirs with 33.4 million barrels; while the field developments led to additions of 67.4 million barrels and revision reductions of 126.0 million barrels. The fields that most affected this reduction were Paredón, Jujo-Tecominoacán and Carmito with 83.1, 17.1 and 14.5 million barrels of oil equivalent, respectively. Although there were increases in the Chiapas-Copanó, Puerto Ceiba and Shishito of 74.0, 32.6 and 21.2 million barrels of oil equivalent, respectively, they could not offset the reductions in the other fields. Figure 5.30 shows the participation of each integral business unit in the regional total, with Samaria-Luna and Bellota-Jujo containing 77.6 percent of this total.

Probable reserves as of January 1, 2004 amount to 935.1 million barrels of oil equivalent, or 5.8 percent

of the country’s reserves (figure 5.31). In comparison with the figure reported last year, this is a decrease of 107.3 million barrels of oil equivalent, which is mostly explained by the Magallanes field where there was a decrement of 153.1 million barrels of oil equivalent.

Possible oil equivalent reserves as of January 1, 2004 amount to 492.1 million barrels, which corresponds to 3.7 percent of the country’s total reserves (figure 5.32). In comparison to 2003, this figure shows a decrease of 86.4 million barrels of oil equivalent. Sitio Grande is the field with the most marked decrease, with 105.4 million barrels of oil equivalent, which is explained by the reclassification of the reserves from possible to probable as a result of the commencement of the enhanced recovery project.

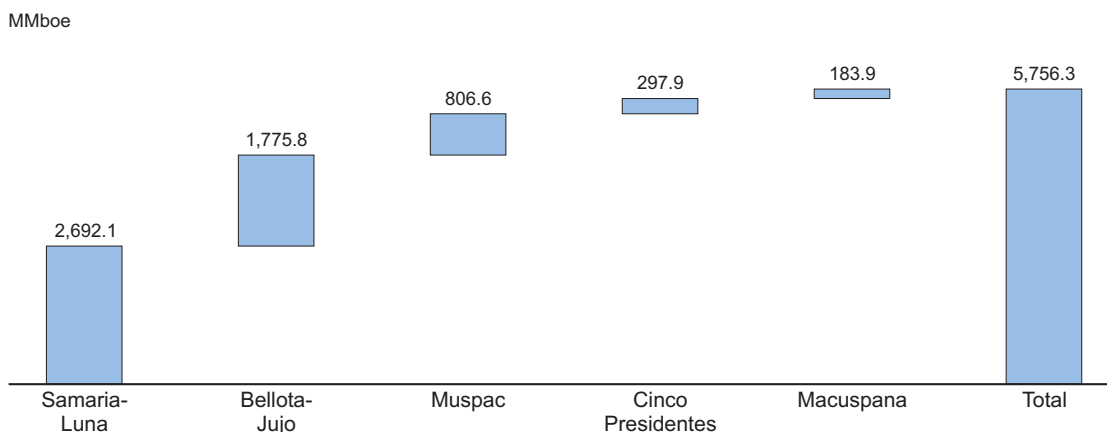


Figure 5.30 Proved reserves as of January 1, 2004, distributed by business unit in the Southern Region.

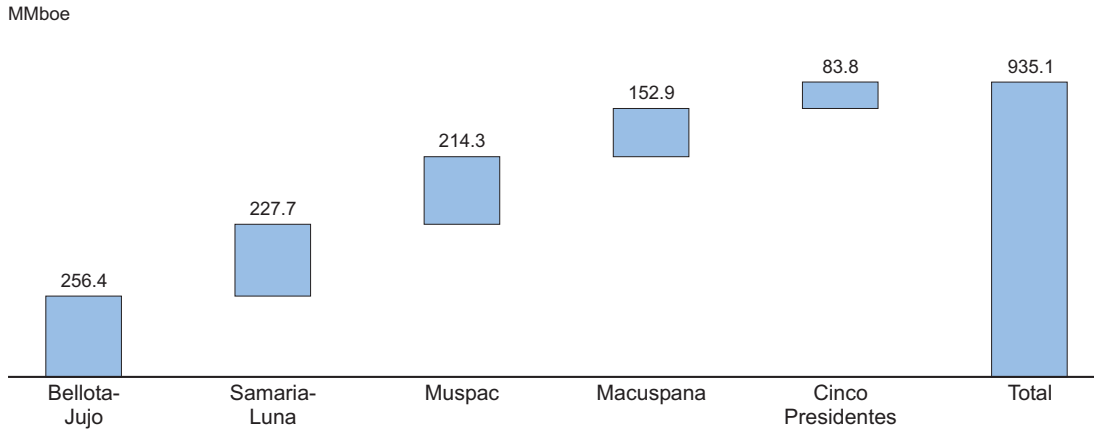


Figure 5.31 Probable reserves as of January 1, 2004, distributed by business unit in the Southern Region.

This magnitude is offset by the increases in the Magallanes and Sen fields of 90.8 and 36.0 million barrels of oil equivalent, respectively. In the case of the Magallanes field, the new geological interpretation led to the reclassification of the reserves from probable to possible, while in Sen, the drilling of well Naranja-1 and the seismic interpretation incorporated block VI into this category.

### Reserve-Production Ratio

The region's proved reserve-production ratio is 19.1 years, considering a constant production of 176.4 million barrels of oil in 2003. If the ratio is estimated by using the 2P reserves, the number of years is 22.2, and 23.9 years with the 3P reserves. The integral busi-

ness unit with the lowest proved reserve-production ratio is Muspac with 15.6 years, and the one with the highest ratio is the Samaria-Luna integral business unit with 23.7 years. In terms of natural gas, the region has a proved reserve-production ratio of 16.5 years, considering a constant production rate of 594.9 billion cubic feet. The reserve-production ratio for the 2P reserves is 19.0 years, while the period for the 3P reserves is 20.7 years. The proved reserve-production ratio for oil equivalent is 18.1 years, if a production rate of 317.6 million barrels is considered. The ratio is 21.1 years for the oil equivalent 2P reserves and finally, 22.6 years for the 3P reserves.

If this analysis is made for the dry gas and wet gas reservoirs, and considering a production in this kind

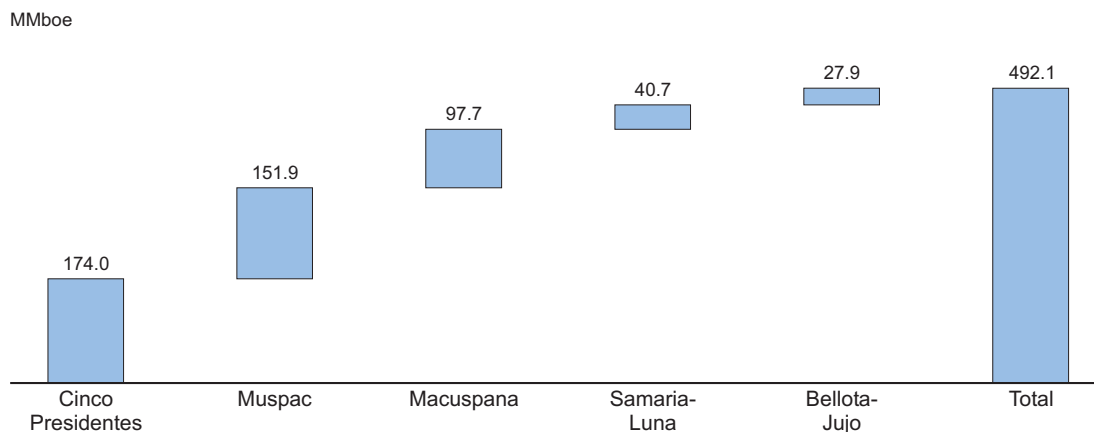


Figure 5.32 Possible reserves as of January 1, 2004, distributed by business unit in the Southern Region.

Table 5.21 Historical evolution of reserves by fluid type in the Southern Region.

Year	Category	Crude Oil MMbbl	Condensate MMbbl	Plant Liquids MMbbl	Dry Gas Equivalent MMboe	Total MMboe
2002	<b>Total</b>	<b>4,889.2</b>	<b>147.0</b>	<b>1,328.6</b>	<b>2,116.3</b>	<b>8,481.2</b>
	Proved	3,864.5	123.9	1,031.4	1,602.5	6,622.3
	Probable	664.3	16.6	201.9	354.2	1,237.0
	Possible	360.4	6.5	95.4	159.6	621.9
2003	<b>Total</b>	<b>4,599.6</b>	<b>125.3</b>	<b>1,187.2</b>	<b>1,807.9</b>	<b>7,720.1</b>
	Proved	3,563.8	112.7	966.9	1,455.8	6,099.1
	Probable	729.0	5.1	117.6	190.8	1,042.5
	Possible	306.8	7.5	102.8	161.4	578.5
2004	<b>Total</b>	<b>4,210.9</b>	<b>127.0</b>	<b>1,102.3</b>	<b>1,743.4</b>	<b>7,183.6</b>
	Proved	3,377.1	112.6	885.9	1,380.7	5,756.3
	Probable	578.7	10.6	129.8	216.1	935.1
	Possible	255.1	3.9	86.6	146.5	492.1

of reservoir in 2003 of 51.1 billion cubic feet and reserves of 615.2, 665.6 and 718.6 billion cubic feet, the ratio for the proved reserves is 12.0 years, 13.0 years for 2P and 14.1 years for 3P.

### Reserves by Fluid Type

Table 5.21 shows the distribution of reserves by fluid type in the last three years, in the proved, probable and possible categories. Proved reserves are made up of 58.6 percent crude oil, 2.0 percent condensate, 15.4 percent plant liquids and 24.0 percent dry gas equivalent to liquid. Of the above figures, a large

amount of the plant liquids reserves is recovered in the processing centers, which means that significant volumes of associated and non-associated gas with high humidity contents reach the petrochemical plants.

Probable reserves total 935.2 million barrels of oil equivalent, of which 61.9 percent is crude oil, 1.1 percent is condensate, 13.9 percent is plant liquids and 23.1 percent is dry gas equivalent to liquid. Possible reserves amount to 492.2 million barrels of oil equivalent, of which 51.8 percent is crude oil, 0.8 percent condensates, 17.6 percent plant liquids and 29.8 percent dry gas equivalent to liquid.