The variation on hydrocarbon reserves in 2004 shown in this chapter is focused on a global point of view and shows the distribution of reserves in each region and for each category of reserves. The historic development in recent years and their composition by fluid type are shown in each one. Additionally, in order to more accurately report the nature of the reservoirs and their reserves, the classification of the reserves is shown according to oil quality and the origin of the gas, that is, associated or non-associated. A distinction is made in the case of the latter in terms of the reservoir type: dry gas, wet gas or gas-condensate.

The evaluation and classification of reserves used by Pemex Exploración y Producción agrees with the definitions of the Securities and Exchange Commission (SEC) of the United States concerning the estimates of proved reserves and their breakdown into proved developed and undeveloped. The criteria of the Society of Petroleum Engineers (SPE) and the World Petroleum Congresses (WPC) are used for the probable and possible reserves. This makes it possible to maintain methodological uniformity and ensure statistical consistency for their analysis and comparison.

It is important to establish that the dynamics of hydrocarbon reserves are a consequence of the field exploitation strategies and their associated investment, and the behavior of the reservoirs, operation and maintenance costs, as well as hydrocarbon prices. All the above translates into investment projects with commercially exploitable production forecasts from which the magnitude of the reserves is obtained. Well drilling, new development projects, enhanced recovery projects, the results of exploratory activity and the production of all the wells contribute to updating reserves.

This chapter also gives Mexico’s position in the international sphere concerning the category of proved reserves for both dry gas and total liquids that include crude oil, condensate and plant liquids.

3.1 Hydrocarbon Prices

The value of reserves, or the investment projects value associated with them, is determined by considering the sales prices of the hydrocarbons to be produced, plus the operation and development costs necessary to carry out such exploitation. Specifically, the value of each reserve category requires using forecasts for oil and gas production, hydrocarbon sales prices, and the operation and development costs. With these elements, the economic limit of the exploitation of such reserves is obtained, that is, the point in time is determined when income and expenditure are matched, where the income is simply a forecast of production multiplied by the price of the hydrocarbon in question. Therefore, the reserves are the volumes of production of each well until the economic limit is reached. Hence the importance of hydrocarbon prices, together with the other elements mentioned.

The variations in the price of sour wet gas and the Mexican crude oil mixture for the last three years are shown in Figure 3.1, where an upward trend in the price of crude oil in 2004 is evident, reaching a maximum of 38.9 dollars per barrel in October, followed by a drop and closing the year at 28.5 dollars per barrel. The annual average was 30.9 dollars per barrel. In reference to sour wet gas, the prices in 2004 were higher than in the previous year, with an average of 4.9 dollars per thousand cubic feet, and peak-
Estimation as of January 1, 2005

Figure 3.1 Historic evolution of prices for the Mexican crude oil mix and sour wet gas over the last three years.

ing at the end of the year at 6.7 dollars per thousand cubic feet.

3.2 Oil Equivalent

Oil equivalent is the way of representing the total hydrocarbon inventory. It includes crude oil, condensate, plant liquids and dry gas equivalent to liquid. The latter is obtained by relating the heat value of the dry gas, in our case the average residual gas in the Ciudad Pemex, Cactus and Nuevo Pemex Gas Processing Complexes (GPC), with the heat value content of the crude oil corresponding to the Maya type; the result is an equivalence that is normally expressed in barrels of oil per million cubic feet of dry gas.

The ways in which the handling and transporting facilities of natural gas from each region to the gas processing complexes were operated for the period of analysis are considered in the evaluation of the oil equivalent, in addition to the process to which the gas produced from wells was submitted at these petrochemical plants. During the operation, there are monthly records of the gas shrinkage and yields at the Pemex Exploración y Producción facilities, with an identification of the behavior of gas in terms of its volume in the surface pipelines and on arriving at the plant for processing. Similarly, the volumes of condensate are also measured in different facilities, and jointly with the volume of natural gas that make it possible to define how the gas shrinks and how the condensate increases. In a like fashion, there are monthly records of the shrinkage and yields of the gas delivered by Pemex Exploración y Producción at the gas processing complexes in order to obtain dry gas and plant liquids.

3.2.1 Behavior of Gas at PEP Handling and Transport Facilities

The natural gas is transported from the separation batteries, if it is associated gas, or from the well if it is non-associated gas, to the petrochemical plants when it is wet gas and/or contains impurities. The sweet dry gas is sent directly to the commercialization pipelines.
At some of the facilities, a fraction of the well gas is used as compression fuel and for transportation; this portion is known as self-consumption. The case may also arise when there are no facilities available for the handling and transporting of associated gas, or the facilities are insufficient and consequently the gas produced, or part of it, is flared, thus reducing the gas sent to the processing complexes or for commercialization.

The gas sent to the processing complexes undergoes temperature and pressure changes in transit, which gives rise to liquid condensation in the pipelines and this reduces the volume. The remaining gas after this potential third reduction, after self-consumption and flaring, is what is actually delivered to the plants. Furthermore, another product called condensate is obtained that is also delivered to the gas processing complexes in liquid phase.

These reductions in the handling and transportation of gas to the processing complexes are quantitatively expressed by means of two factors: the handling efficiency shrinkage factor, $hesf$, which includes flared gas and self-consumption and the transport liquefiables shrinkage factor, $tlsf$, which represents the volume decrease caused by condensation in the pipelines. The transport liquids recovery factor, $crf$, relates the condensate obtained with the gas sent to the plants.

The updating of the natural gas shrinkage and condensate recovery factors is carried out on a monthly basis by using operation information at a field level in

![Image](image_url)
the Northeastern Offshore, Southwestern Offshore and Southern regions, and the group of fields with shared processing for the Northern Region. The regionalization of the gas and condensate production sent to more than one gas-processing complex is also considered. The performance over the last three years of these three factors for each Pemex Exploración y Producción region is shown in Figure 3.2. The utilization of gas, shown in the handling efficiency shrinkage factor graph for the Northeastern Offshore Region, reveals a noteworthy increase from January to September due to the start-up of new compression facilities in Akal, thus avoiding flaring, the decrease noted in October and November was due to releases. The Southwestern Offshore Region showed two decreases in March and August due to releases. The Northern and Southern regions have shown the most constant behavior, with good gas utilization indexes.

In reference to liquefiables shrinkage, also shown in Figure 3.2, the performance is basically constant for the Northern and Southern regions. The Southwestern Offshore Region reported less liquefiable shrinkage and its curve showed an upward movement in 2004; the Northeastern Offshore Region reported various curve changes during the year, with an annual average shrinkage of 3 percentage points in 2004 compared with the previous year. The condensate yield in the Northern Region increased substantially from an annual average of 58.2 barrels per million cubic feet in 2003 to 74.3 barrels per million cubic feet in 2004. The Northern and Southwestern Offshore regions showed slight decreases in the condensate recovery factor in 2004 compared with the previous year. The factor for the Southern Region was practically constant.

3.2.2 Behavior of Gas in Processing Complexes

The gas produced by the four Pemex Exploración y Producción regions is delivered to the processing complexes in Cactus, Ciudad Pemex, La Venta, Mata Pionche, Nuevo Pemex, Poza Rica, Reynosa, Arenque, and to the new Burgos GPC as of March 2004. The gas received at the petrochemical plants undergoes a sweetening process if the gas is sour; and then absorption and cryogenic processes, when the gas is wet. The plant liquids, which are liquefied hydrocarbons and dry gas are obtained by means of these processes. The gas reductions in these processes are expressed quantitatively as two factors: the impurities shrinkage factor, isf, that considers the effect of removing non-hydrocarbon compounds from the gas, and the plant liquefiables shrinkage factor, plsf, which considers the effect of separating liquefiable hydrocarbons from the wet gas. The liquids obtained are related to the wet gas by means of the plant liquids recovery factor, plrf.

These factors are updated every month with the operation information furnished by all the gas processing complexes mentioned in the above paragraph and their behavior is shown in Figure 3.3. It should be noted that the start-up of the new Burgos GPC will make it possible to improve gas utilization in the Burgos Integral Business Unit of the Northern Region. The upper graph of Figure 3.3 shows the behavior of the impurities shrinkage factor of the Cactus, Ciudad Pemex, Mata Pionche, Nuevo Pemex, Poza Rica and Arenque GPC that receive sour gas. The La Venta, Reynosa and Burgos GPC receive sweet wet gas; consequently, they are not shown. The behavior of the liquefiable shrinkage factor in all the gas processing complexes is shown in the middle part of Figure 3.3. In reference to the plant liquids recovery factor, the lower part of Figure 3.3, the incremental behavior shown by the Poza Rica GPC was caused by the utilization of natural gas rich in ethane as gas for gas lift in the wells in the Poza Rica area. This situation did not arise in the closing months of the year. The La Venta GPC showed a decrease of 14.6 barrels per million cubic feet on average in 2004 compared with the previous year caused by a reduction in the gas load flow rate from the offshore regions.
3.3 Remaining Total Reserves

As of January 1, 2005, the aggregation of remaining proved, probable and possible reserves, 3P, also known as total reserves, amounted to 46,914.1 million barrels of oil equivalent. Figure 3.4 shows the integration of reserves in their different categories, where 37.6 percent are proved reserves, 33.8 percent are probable reserves and 28.6 percent are possible reserves.

The regional distribution of total reserves is shown in Table 3.1. The oil equivalent figures are: 44.3 percent in the Northern Region, 31.5 percent in the Northeastern Offshore Region, 14.6 percent in the Southern Region and 9.6 percent in the Southwestern Offshore Region.

The distribution by fluids of total reserves, Table 3.1, shows that crude oil accounted for 71.0 percent of the total, dry gas, 19.9 percent, plant liquids, 7.3 percent and the condensate 1.8 percent. This means that most of Mexico’s hydrocarbon reservoirs are oil fields, therefore, the natural gas is mostly associated.

Total crude oil reserves amounted to 33,312.2 million barrels as of January 1, 2005, with heavy oil accounting for 52.2 percent of the national total, light oil 37.4 percent, and superlight 10.4 percent. The Northeastern Offshore Region provides more than three fourths of the nation’s total heavy oil, while the Northern Region furnishes 62.3 percent of the light oil and 57.5 percent of the total superlight oil. This contribution by the Northern Region is associated with the Chicontepec reserves, which can be seen in the classification of total crude oil reserves by specific gravity in Table 3.2.
Estimation as of January 1, 2005

Figure 3.4 Integration by category of the remaining total oil equivalent reserves of Mexico.

Total reserves of natural gas as of January 1, 2005 amount to 63,878.8 billion cubic feet, with 62.0 percent located in the Northern Region. The gas reserves to be delivered to plant are estimated at 56,526.5 billion cubic feet and the dry gas reserve is 48,649.4 billion cubic feet. This information and its historic evolution can be seen in Table 3.1. The total reserves of natural gas classified by association with oil in the reservoir is shown in Table 3.2, where the 3P reserves of associated gas represent 77.4 percent, because most of the reservoirs in the country are oil reservoirs. The total non-associated gas reserve accounts for 22.6 percent, with the Northern Region providing 49.9 percent, most of which is located in wet gas reservoirs; the Southern Region contains 28.6 percent, with mostly gas-condensate reservoirs; and the Southwestern Offshore Region with 21.1 percent, where the reserves are mostly located in the gas-condensate reservoirs. The Northeastern Offshore Region with 0.4 percent in dry gas reservoirs completes this volume.

Table 3.1 Historic distribution by fluid and region of remaining total reserves.

<table>
<thead>
<tr>
<th>Year</th>
<th>Region</th>
<th>Remaining Hydrocarbon Reserves</th>
<th>Remaining Gas Reserves</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Crude Oil MMbbl</td>
<td>Condensate Oil MMbbl</td>
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<tr>
<td>2002</td>
<td>Total</td>
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<td>Northeastern Offshore</td>
<td>16,593.7</td>
<td>627.1</td>
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<td></td>
<td>Southwestern Offshore</td>
<td>3,389.8</td>
<td>319.4</td>
</tr>
<tr>
<td></td>
<td>Northern</td>
<td>13,413.4</td>
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<td>Southern</td>
<td>4,889.2</td>
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<td>2003</td>
<td>Total</td>
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<td>Southwestern Offshore</td>
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<td>Southern</td>
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<td>2004</td>
<td>Total</td>
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<td>Northern</td>
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<td>Southern</td>
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<td>2005</td>
<td>Total</td>
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<td>Northern</td>
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<td>Southern</td>
<td>4,023.4</td>
<td>119.9</td>
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Table 3.2 Classification of total reserves, or 3P, of crude oil and natural gas.

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<tr>
<th>Year</th>
<th>Region</th>
<th>Heavy</th>
<th>Light</th>
<th>Superlight</th>
<th>Associated</th>
<th>G-C*</th>
<th>Wet Gas</th>
<th>Dry Gas</th>
<th>Total</th>
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<tr>
<td></td>
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<td>MMbbl</td>
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<td>Bcf</td>
<td>Bcf</td>
<td>Bcf</td>
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<td>Bcf</td>
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<tr>
<td>2002</td>
<td>Total</td>
<td>20,602.0</td>
<td>13,794.6</td>
<td>3,889.5</td>
<td>55,049.1</td>
<td>6,573.1</td>
<td>5,482.5</td>
<td>2,000.3</td>
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<td>7,916.5</td>
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<td>0.0</td>
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<td>508.0</td>
<td>2,350.1</td>
<td>531.7</td>
<td>3,982.5</td>
<td>1,903.7</td>
<td>0.0</td>
<td>40.5</td>
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<td>4,182.6</td>
<td>6,855.9</td>
<td>2,375.0</td>
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<td>90.6</td>
<td>3,815.8</td>
<td>982.8</td>
<td>9,725.5</td>
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<td>495.4</td>
<td>573.4</td>
<td>5,738.1</td>
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<td>2003</td>
<td>Total</td>
<td>19,159.2</td>
<td>13,636.9</td>
<td>3,469.8</td>
<td>52,010.9</td>
<td>5,719.4</td>
<td>4,264.1</td>
<td>3,438.5</td>
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<td>466.1</td>
<td>1,941.4</td>
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<td>7,901.9</td>
<td>1,972.7</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
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<td>Southwestern Offshore</td>
<td>605.2</td>
<td>1,700.5</td>
<td>636.6</td>
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<td>1,928.8</td>
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<td>7,816.5</td>
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<td>32,365.6</td>
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<td>4,089.2</td>
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<td>832.9</td>
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<td>3,474.2</td>
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<td>4,192.9</td>
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<td>2005</td>
<td>Total</td>
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<td>12,472.1</td>
<td>3,466.8</td>
<td>49,431.5</td>
<td>5,470.7</td>
<td>4,688.9</td>
<td>4,287.6</td>
<td>14,447.3</td>
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<td>0.0</td>
<td>57.8</td>
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<td>Southwestern Offshore</td>
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<td>1,665.7</td>
<td>676.9</td>
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<td>1,992.3</td>
<td>32,373.3</td>
<td>0.0</td>
<td>4,482.0</td>
<td>2,728.0</td>
<td>7,210.0</td>
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<td>Southern</td>
<td>273.6</td>
<td>2,952.2</td>
<td>797.6</td>
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<td>3,452.1</td>
<td>206.9</td>
<td>472.0</td>
<td>4,131.0</td>
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</table>

* G-C: Gas-Condensate Reservoirs

Figure 3.5 shows the historic evolution of the total oil equivalent reserves of the country in the last three years. The evaluation as of January 1, 2005 decreased 2.3 percent compared with the previous year. A large part of the reduction is explained by the production of 1,610.8 million barrels of oil equivalent in 2004, where the Northeastern Offshore Region produced 60.6 percent. Discoveries contributed 916.2 million barrels of oil equiva-
lent, which replaces 56.9 percent of the production. Delimitations contributed 317.4 million barrels of oil equivalent, which added to the discoveries, means an addition of 1,233.6 million barrels of oil equivalent and raises the replacement rate to 76.6 percent. The development and revision items justify the reserve reduction by 0.2 and 1.4 percent, respectively.

When associating the remaining reserves with the annual production, a reserve-production ratio of 29.1 years is obtained for the total reserves, with the addition of proved plus probable reserves (2P), 20.8 years and 11.0 years for proved reserves. This ratio does not envisage a decrease in production, or increases in reserves caused by new discoveries in the future, or variations in the hydrocarbon prices and in the operation and transport costs.

### 3.3.1 Remaining Proved Reserves

Mexico’s proved hydrocarbon reserves are evaluated in accordance with the definition made by the *Securities and Exchange Commission* (SEC) of the United States, with remaining reserves as of January 1, 2005 amounting to 17,649.8 million barrels of oil equivalent. Table 3.3 shows the distribution by region and by fluid, where for this year, the Northeastern Offshore Region accounts for 49.9 percent of the total oil equivalent; the Southern Region reaches 28.9 percent, while the Northern Region provides 11.3 percent and the Southwestern Offshore Region furnishes the remaining 9.9 percent. In terms of composition, crude oil contributes 73.0 percent of the total proved reserves, dry gas accounts for 16.1 percent, while plant liquids and condensate represent 7.9 and 2.9 percent, respectively.

#### Table 3.3 Distribution by fluid and region of remaining proved reserves.

<table>
<thead>
<tr>
<th>Year</th>
<th>Region</th>
<th>Remaining Hydrocarbon Reserves</th>
<th>Remaining Gas Reserves</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Crude Oil (MMbbl)</td>
<td>Condensate (MMbbl)</td>
</tr>
<tr>
<td>2002</td>
<td>Total</td>
<td>22,419.0</td>
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<td>Northeastern Offshore</td>
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<td>Southwestern Offshore</td>
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<td>Northern</td>
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<td>Southern</td>
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<td>2003</td>
<td>Total</td>
<td>15,123.6</td>
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<td>Northeastern Offshore</td>
<td>9,354.8</td>
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<td>Southwestern Offshore</td>
<td>1,318.4</td>
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</tr>
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<td></td>
<td>Northern</td>
<td>886.5</td>
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<td>Southern</td>
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<td>2004</td>
<td>Total</td>
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<td>Northern</td>
<td>959.4</td>
<td>22.4</td>
</tr>
<tr>
<td></td>
<td>Southern</td>
<td>3,377.1</td>
<td>112.6</td>
</tr>
<tr>
<td>2005</td>
<td>Total</td>
<td>12,882.2</td>
<td>518.7</td>
</tr>
<tr>
<td></td>
<td>Northeastern Offshore</td>
<td>7,678.8</td>
<td>304.0</td>
</tr>
<tr>
<td></td>
<td>Southwestern Offshore</td>
<td>1,213.6</td>
<td>84.9</td>
</tr>
<tr>
<td></td>
<td>Northern</td>
<td>1,048.5</td>
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<td>Southern</td>
<td>2,941.3</td>
<td>105.2</td>
</tr>
</tbody>
</table>
Hydrocarbon Reserves of Mexico

Table 3.4 Classification of proved reserves, or 1P, of crude oil and natural gas.

<table>
<thead>
<tr>
<th>Year</th>
<th>Region</th>
<th>Crude Oil</th>
<th>Natural Gas</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Heavy</td>
<td>Light</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MMbbl</td>
<td>MMbbl</td>
</tr>
<tr>
<td>2002</td>
<td>Total</td>
<td>12,412.9</td>
<td>7,672.6</td>
</tr>
<tr>
<td></td>
<td>Northeastern Offshore</td>
<td>10,009.9</td>
<td>262.5</td>
</tr>
<tr>
<td></td>
<td>Southwestern Offshore</td>
<td>182.2</td>
<td>1,180.0</td>
</tr>
<tr>
<td></td>
<td>Northern</td>
<td>2,163.6</td>
<td>3,261.5</td>
</tr>
<tr>
<td></td>
<td>Southern</td>
<td>57.2</td>
<td>3,030.7</td>
</tr>
<tr>
<td>2003</td>
<td>Total</td>
<td>9,809.3</td>
<td>4,462.9</td>
</tr>
<tr>
<td></td>
<td>Northeastern Offshore</td>
<td>9,304.0</td>
<td>50.8</td>
</tr>
<tr>
<td></td>
<td>Southwestern Offshore</td>
<td>180.1</td>
<td>1,021.6</td>
</tr>
<tr>
<td></td>
<td>Northern</td>
<td>269.1</td>
<td>598.5</td>
</tr>
<tr>
<td></td>
<td>Southern</td>
<td>56.1</td>
<td>2,791.9</td>
</tr>
<tr>
<td>2004</td>
<td>Total</td>
<td>9,086.5</td>
<td>4,215.2</td>
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<td>Northeastern Offshore</td>
<td>8,522.8</td>
<td>71.7</td>
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<td>Southwestern Offshore</td>
<td>209.0</td>
<td>863.0</td>
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<td>Northern</td>
<td>311.6</td>
<td>627.7</td>
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<td></td>
<td>Southern</td>
<td>43.1</td>
<td>2,652.8</td>
</tr>
<tr>
<td>2005</td>
<td>Total</td>
<td>8,198.3</td>
<td>3,839.3</td>
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<td>Northeastern Offshore</td>
<td>7,624.4</td>
<td>54.4</td>
</tr>
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<td></td>
<td>Southwestern Offshore</td>
<td>216.2</td>
<td>818.0</td>
</tr>
<tr>
<td></td>
<td>Northern</td>
<td>338.8</td>
<td>655.5</td>
</tr>
<tr>
<td></td>
<td>Southern</td>
<td>18.9</td>
<td>2,311.4</td>
</tr>
</tbody>
</table>

* G-C: Gas-Condensate Reservoirs

As of January 1, 2005, the proved crude oil reserves totaled 12,882.2 million barrels, heavy oil being the dominant fluid with 63.6 percent of the national total, light oil with 29.8 percent and superlight oil with 6.6 percent. The Northeastern Offshore Region provides 93.0 percent of the total heavy oil, the Southern Region has 60.2 percent of the light oil and 72.3 percent of the superlight oil. Table 3.4 shows the classification of the proved reserves of crude oil by density.

Table 3.3 shows the historic evolution of Mexico’s proved natural gas reserves. As of January 1, 2005, these reserves amounted to 20,432.5 billion cubic feet. The gas reserves to be delivered to plant is estimated at 18,244.3 billion cubic feet, a little less than half of which is in the Southern Region, and the dry gas reserve is 14,807.5 billion cubic feet. Table 3.4 shows the proved reserves of natural gas classified as associated with oil and non-associated. This year, the associated gas reserves account for 68.7 percent, while the remaining 31.3 percent is non-associated gas. The Southern and Northeastern Offshore regions provide 45.7 and 30.9 percent of the proved associated gas reserves respectively. The greatest contribution of non-associated gas reserves lies in the Northern and Southern regions, with 46.5 and 38.6 percent, respectively; the Southwestern Offshore Region provides 14.7 percent, the Northeastern Offshore Region has the remaining 0.2 percent. The Southern Region and the Southwestern Offshore Region have more than three fourths of the proved non-associated gas reserves in gas-condensate reservoirs, while in the Northern Re-
region, more than half of these reserves are in wet gas reservoirs.

The evolution of the proved oil equivalent reserves of the country in the last three years is shown in Figure 3.6, where as of January 1, 2005, the amount decreased 6.6 percent compared with the previous year. The additions and developments increased the proved reserves by 368.5 and 208.1 million barrels of oil equivalent, respectively. The production in 2004, some 1,610.8 million barrels of oil equivalent and the revisions with 211.2 million barrels of oil equivalent explain the decreases in this category of reserves.

The distribution of proved reserves as of January 1, 2005 is shown in Figure 3.7. The developed proved reserves account for 64.2 percent of the total and the remaining 35.8 percent is made up of undeveloped.

In the international sphere, Mexico is ranked 14th in reference to the proved reserves of oil plus condensate plus plant liquids. In terms of dry gas, Mexico is in the 34th place. Table 3.5 shows the proved reserves of crude oil and natural gas of the most important producing countries.

3.3.1.1 Remaining Developed Proved Reserves

As of January 1, 2005, Mexico’s developed proved reserves totaled 11,345.7 million barrels of oil equivalent, which means a decrease of 5.7 percent compared with the previous year. This decrease is explained by the production of 1,610.8 million barrels of oil equivalent in 2004. The additions, developments and revisions add up to 927.5 million barrels of oil equivalent, which replaced more than half of the above-mentioned production.

The distribution by region and by fluid type of the developed proved reserves is shown in Table 3.6, where it can be seen that during the year, crude oil accounted for 77.0 percent, dry gas 14.1 percent, plant liquids 6.7 percent and condensate 2.2 percent. The Northeastern Offshore Region provides 57.6 percent of the oil equivalent, the Southern Region has 27.7 percent and the Northern and Southwestern Offshore regions have 8.8 and 5.9 percent, respectively.
### Table 3.5 Proved crude oil and dry gas reserves of the most important producing countries.

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Country</th>
<th>Crude Oil(^a) MMbbl</th>
<th>Dry Gas Bcf</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Saudi Arabia</td>
<td>259,400</td>
<td>1,680,000</td>
</tr>
<tr>
<td>2</td>
<td>Canada</td>
<td>178,800</td>
<td>940,000</td>
</tr>
<tr>
<td>3</td>
<td>Iran</td>
<td>125,800</td>
<td>910,000</td>
</tr>
<tr>
<td>4</td>
<td>Iraq</td>
<td>115,000</td>
<td>234,500</td>
</tr>
<tr>
<td>5</td>
<td>Kuwait</td>
<td>99,000</td>
<td>212,100</td>
</tr>
<tr>
<td>6</td>
<td>United Arab Emirates</td>
<td>97,800</td>
<td>189,044</td>
</tr>
<tr>
<td>7</td>
<td>Venezuela</td>
<td>77,226</td>
<td>176,000</td>
</tr>
<tr>
<td>8</td>
<td>Russia</td>
<td>60,000</td>
<td>160,500</td>
</tr>
<tr>
<td>9</td>
<td>Libya</td>
<td>39,000</td>
<td>151,000</td>
</tr>
<tr>
<td>10</td>
<td>Kuwait</td>
<td>35,255</td>
<td>110,000</td>
</tr>
<tr>
<td>11</td>
<td>United States of America</td>
<td>21,891</td>
<td>90,300</td>
</tr>
<tr>
<td>12</td>
<td>China</td>
<td>18,250</td>
<td>75,000</td>
</tr>
<tr>
<td>13</td>
<td>Qatar</td>
<td>15,207</td>
<td>73,624</td>
</tr>
<tr>
<td>14</td>
<td>Mexico</td>
<td>14,803</td>
<td>14,807</td>
</tr>
<tr>
<td>15</td>
<td>Algeria</td>
<td>11,800</td>
<td>11,800</td>
</tr>
</tbody>
</table>

\(^a\) Includes condensates and liquids from natural gas.

Source: Mexico, Pemex Exploración y Producción. Other countries, Oil & Gas Journal, December 20, 2004

### Table 3.6 Historic distribution by fluid and region of the remaining developed proved reserves.

<table>
<thead>
<tr>
<th>Year</th>
<th>Region</th>
<th>Remaining Hydrocarbon Reserves</th>
<th>Remaining Gas Reserves</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Crude Oil MMbbl</td>
<td>Condensate MMbbl</td>
</tr>
<tr>
<td>2002</td>
<td>Total</td>
<td>11,412.7</td>
<td>350.9</td>
</tr>
<tr>
<td></td>
<td>Northeastern Offshore</td>
<td>7,659.5</td>
<td>235.7</td>
</tr>
<tr>
<td></td>
<td>Southwestern Offshore</td>
<td>705.3</td>
<td>50.0</td>
</tr>
<tr>
<td></td>
<td>Northern</td>
<td>378.1</td>
<td>11.4</td>
</tr>
<tr>
<td></td>
<td>Southern</td>
<td>2,669.7</td>
<td>53.9</td>
</tr>
<tr>
<td>2003</td>
<td>Total</td>
<td>10,549.0</td>
<td>300.3</td>
</tr>
<tr>
<td></td>
<td>Northeastern Offshore</td>
<td>7,002.0</td>
<td>179.5</td>
</tr>
<tr>
<td></td>
<td>Southwestern Offshore</td>
<td>675.4</td>
<td>41.3</td>
</tr>
<tr>
<td></td>
<td>Northern</td>
<td>314.9</td>
<td>11.7</td>
</tr>
<tr>
<td></td>
<td>Southern</td>
<td>2,556.6</td>
<td>67.7</td>
</tr>
<tr>
<td>2004</td>
<td>Total</td>
<td>9,436.7</td>
<td>240.8</td>
</tr>
<tr>
<td></td>
<td>Northeastern Offshore</td>
<td>6,326.3</td>
<td>136.9</td>
</tr>
<tr>
<td></td>
<td>Southwestern Offshore</td>
<td>521.6</td>
<td>27.4</td>
</tr>
<tr>
<td></td>
<td>Northern</td>
<td>344.7</td>
<td>16.6</td>
</tr>
<tr>
<td></td>
<td>Southern</td>
<td>2,244.1</td>
<td>59.9</td>
</tr>
<tr>
<td>2005</td>
<td>Total</td>
<td>8,735.4</td>
<td>254.8</td>
</tr>
<tr>
<td></td>
<td>Northeastern Offshore</td>
<td>5,973.2</td>
<td>152.5</td>
</tr>
<tr>
<td></td>
<td>Southwestern Offshore</td>
<td>488.5</td>
<td>30.2</td>
</tr>
<tr>
<td></td>
<td>Northern</td>
<td>408.5</td>
<td>18.6</td>
</tr>
<tr>
<td></td>
<td>Southern</td>
<td>1,862.5</td>
<td>53.5</td>
</tr>
</tbody>
</table>
The developed proved natural gas reserves as of January 1, 2005 totaled 11,265.8 billion cubic feet, as can be seen in Table 3.6. The reserves of gas to be delivered to plant amount to 10,188.3 billion cubic feet, with the Southern Region providing almost half; while the dry gas reserve totals 8,324.8 billion cubic feet, with the Southern Region producing 46.3 percent of this total.

As of January 1, 2005, the developed proved reserves of crude oil totaled 8,735.4 million barrels. Heavy oil accounted for 70.5 percent of the national total, light oil 24.3 percent and superlight 5.2 percent. The Northeastern Offshore Region provides 96.4 percent of the total heavy oil, the Southern Region has 66.3 percent of the light oil and 96.6 percent of the superlight oil. The classification of developed proved crude oil reserves by density is shown in Table 3.7.

The developed proved reserves of natural gas, classified by association with crude oil in the reservoir are also shown in Table 3.7. For this year, the developed proved associated gas reserve accounts for 60.5 percent, while the non-associated gas represents 39.5 percent. Most of the developed reserves of associated gas are in the Southern Region and the Northeastern Offshore Region, with 47.4 and 32.0 percent, respectively. In reference to the developed reserves of non-associated gas, the Northern Region has 53.3 percent, in wet and dry gas reservoirs, and the remaining 46.7 percent is located in the Southern Region, mostly in gas-condensate reservoirs.
3.3.1.2 Undeveloped Proved Reserves

As of January 1, 2005, Mexico’s undeveloped proved reserves totaled 6,304.1 million barrels of oil equivalent, which means a decrease of 8.2 percent compared with the previous year. The recoveries plus the delimitations added 311 million barrels of oil equivalent and the revisions item reduced this reserve by 740.6 million barrels of oil equivalent, additionally, developments reduced these reserves by 132.5 million barrels of oil equivalent.

The distribution by fluid and region of the undeveloped proved reserves is shown in Table 3.8. In reference to oil equivalent in 2005, the Northeastern Offshore Region contributes 36.0 percent, the Southern Region provides 31.1 percent and the Southwestern Offshore and Northern regions furnish 17.2 and 15.7 percent, respectively. Crude oil accounts for 65.8 percent, dry gas 19.8 percent, plant liquids 10.3 percent and the condensate makes up the remaining 4.3 percent.

Undeveloped proved natural gas reserves, as of January 1, 2005 amounted to 9,166.7 billion cubic feet, Table 3.8. The gas to be delivered to plant is 8,056.0 billion cubic feet, of which 38.9 percent of the total is concentrated in the Southern Region. The dry gas reserve totals 6,482.7 billion cubic feet, of which 40.3 percent is concentrated in the Southern Region.

The undeveloped proved crude oil reserves as of January 1, 2005 amounted to 4,146.8 million barrels, with heavy oil representing 49.2 percent of the total, light oil with 41.4 percent and the superlight with 9.4 percent. The Northeastern Offshore Region provides 82.6 percent. 

<table>
<thead>
<tr>
<th>Year</th>
<th>Region</th>
<th>Crude Oil MMbbl</th>
<th>Condensate MMbbl</th>
<th>Plant Liquids MMbbl</th>
<th>Dry Gas Equivalent MMboe</th>
<th>Total MMbbl</th>
<th>Natural Gas Bcf</th>
<th>Gas to be Delivered to Plant Bcf</th>
<th>Dry Gas Bcf</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>Total</td>
<td>11,006.4</td>
<td>344.0</td>
<td>1,447.6</td>
<td>3,723.8</td>
<td>16,521.9</td>
<td>26,139.3</td>
<td>22,852.3</td>
<td>19,367.4</td>
</tr>
<tr>
<td></td>
<td>Northeastern Offshore</td>
<td>2,612.8</td>
<td>193.5</td>
<td>161.1</td>
<td>243.6</td>
<td>3,211.1</td>
<td>2,373.7</td>
<td>1,670.4</td>
<td>1,266.9</td>
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<td>Southwestern Offshore</td>
<td>678.6</td>
<td>70.0</td>
<td>97.0</td>
<td>152.7</td>
<td>998.3</td>
<td>1,307.2</td>
<td>1,028.2</td>
<td>793.9</td>
</tr>
<tr>
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<td>Northern</td>
<td>6,520.2</td>
<td>10.4</td>
<td>691.8</td>
<td>2,588.7</td>
<td>9,811.1</td>
<td>17,086.3</td>
<td>15,049.3</td>
<td>13,463.7</td>
</tr>
<tr>
<td></td>
<td>Southern</td>
<td>1,194.7</td>
<td>70.1</td>
<td>497.7</td>
<td>738.9</td>
<td>2,501.4</td>
<td>5,372.2</td>
<td>5,104.4</td>
<td>3,842.8</td>
</tr>
<tr>
<td>2003</td>
<td>Total</td>
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<td>250.3</td>
<td>646.2</td>
<td>1,233.0</td>
<td>6,704.1</td>
<td>9,297.5</td>
<td>8,043.0</td>
<td>6,413.0</td>
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<td>133.1</td>
<td>229.8</td>
<td>855.4</td>
<td>2,117.5</td>
<td>1,520.3</td>
<td>1,195.0</td>
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<td>Southwestern Offshore</td>
<td>643.0</td>
<td>57.9</td>
<td>87.0</td>
<td>170.8</td>
<td>958.7</td>
<td>1,321.2</td>
<td>1,105.4</td>
<td>888.3</td>
</tr>
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<td>571.6</td>
<td>7.6</td>
<td>52.2</td>
<td>282.4</td>
<td>913.8</td>
<td>1,829.9</td>
<td>1,587.7</td>
<td>1,468.9</td>
</tr>
<tr>
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<td>1,007.2</td>
<td>45.0</td>
<td>373.9</td>
<td>550.1</td>
<td>1,976.1</td>
<td>4,028.9</td>
<td>3,829.6</td>
<td>2,860.9</td>
</tr>
<tr>
<td>2004</td>
<td>Total</td>
<td>4,682.9</td>
<td>236.1</td>
<td>648.0</td>
<td>1,299.2</td>
<td>6,866.2</td>
<td>9,492.0</td>
<td>8,290.1</td>
<td>6,756.8</td>
</tr>
<tr>
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<td>Northeastern Offshore</td>
<td>2,268.2</td>
<td>113.7</td>
<td>141.8</td>
<td>237.3</td>
<td>2,761.0</td>
<td>2,109.1</td>
<td>1,581.9</td>
<td>1,234.0</td>
</tr>
<tr>
<td></td>
<td>Southwestern Offshore</td>
<td>667.1</td>
<td>63.8</td>
<td>98.3</td>
<td>190.1</td>
<td>1,019.2</td>
<td>1,481.1</td>
<td>1,226.6</td>
<td>988.5</td>
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<td></td>
<td>Northern</td>
<td>614.7</td>
<td>5.9</td>
<td>57.2</td>
<td>315.8</td>
<td>993.5</td>
<td>1,977.8</td>
<td>1,766.1</td>
<td>1,642.3</td>
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<tr>
<td></td>
<td>Southern</td>
<td>1,133.1</td>
<td>52.7</td>
<td>350.7</td>
<td>566.1</td>
<td>2,092.5</td>
<td>3,924.0</td>
<td>3,715.6</td>
<td>2,892.1</td>
</tr>
<tr>
<td>2005</td>
<td>Total</td>
<td>4,146.8</td>
<td>263.9</td>
<td>646.9</td>
<td>1,246.5</td>
<td>6,304.1</td>
<td>9,167.6</td>
<td>8,056.0</td>
<td>6,482.7</td>
</tr>
<tr>
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<td>Northeastern Offshore</td>
<td>1,705.5</td>
<td>151.5</td>
<td>156.7</td>
<td>255.4</td>
<td>2,269.2</td>
<td>2,166.6</td>
<td>1,687.0</td>
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</tr>
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<td>Southwestern Offshore</td>
<td>725.1</td>
<td>54.7</td>
<td>100.8</td>
<td>201.0</td>
<td>1,081.5</td>
<td>1,557.1</td>
<td>1,278.5</td>
<td>1,045.3</td>
</tr>
<tr>
<td></td>
<td>Northern</td>
<td>640.1</td>
<td>6.0</td>
<td>61.4</td>
<td>288.2</td>
<td>995.6</td>
<td>1,876.1</td>
<td>1,647.7</td>
<td>1,498.9</td>
</tr>
<tr>
<td></td>
<td>Southern</td>
<td>1,076.1</td>
<td>51.7</td>
<td>328.1</td>
<td>501.9</td>
<td>1,957.8</td>
<td>3,566.9</td>
<td>3,442.8</td>
<td>2,610.1</td>
</tr>
</tbody>
</table>
The classification of the undeveloped proved natural gas reserves by association with crude oil in the reservoir is also shown in Table 3.9. As of January 1, 2005, the undeveloped proved reserves of associated gas contributed 78.7 percent and non-associated gas was 21.3 percent. The Southern Region contributes 44.0 percent of the undeveloped associated gas reserves. The Southwestern Offshore Region has 48.1 percent of the non-associated gas reserves, mostly in gas-condensate reservoirs; the Northern Region has 31.0 percent in wet and dry gas reservoirs, and the Southern Region has 20.3 percent in gas-condensate and dry gas reservoirs.

### Table 3.9 Classification of undeveloped proved crude oil and natural gas reserves.

<table>
<thead>
<tr>
<th>Year</th>
<th>Region</th>
<th>Crude Oil</th>
<th>Natural Gas</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td>904.4</td>
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* G-C: Gas-Condensate Reservoirs

### 3.3.2. Probable Reserves

The probable reserves as of January 1, 2005 totaled 15,836.1 million barrels of oil equivalent. The distribution by region and by type is shown in Table 3.10. In terms of oil equivalent, the Northern Region provides 58.8 percent, the Northeastern Offshore Region 27.3 percent, the Southwestern Offshore Region 7.5 percent and the Southern Region 6.4 percent. In this evaluation, 73.4 percent is oil, 19.4 percent is dry gas, 6.2 percent is plant liquids and the remaining 1.0 percent is condensate.
Mexico’s probable natural gas reserves, as of January 1, 2005 amounted to 20,703.4 billion cubic feet, as shown in Table 3.10. The probable gas reserves to be delivered to plant are 18,113.2 billion cubic feet, of which 77.6 percent of the total is concentrated in the Northern Region. The dry gas reserve totals 15,945.0 billion cubic feet, of which 79.4 percent is concentrated in the Northern Region.

The probable crude oil reserves as of January 1, 2005 are 11,621.2 million barrels of crude oil; heavy oil accounts for 49.3 percent of the national total, light oil 38.5 percent and superlight 12.2 percent. The Northeastern Offshore Region provides 69.9 percent of the heavy oil, the Northern Region has 79.1 and 79.6 percent of the light oil and superlight oil, respectively. The classification by specific gravity of probable reserves of crude oil is shown in Table 3.11.

The probable reserves of natural gas classified as associated and non-associated with oil are shown in Table 3.11. In 2005, the probable reserves of associated gas account for 82.5 percent and the probable reserves of non-associated gas represent 17.5 percent. 83.9 percent of the probable reserves of associated gas are concentrated in the Northern Region. In reference to the reserves of non-associated gas, 48.8 percent of such are located in the Northern Region, with most of them coming from wet gas reservoirs; 27.7 percent in the Southern Region and 23.4 percent in the Southwestern Offshore Region. The most important sources in these two regions are gas-condensate reservoirs.

<table>
<thead>
<tr>
<th>Year</th>
<th>Region</th>
<th>Remaining Hydrocarbon Reserves</th>
<th>Remaining Gas Reserves</th>
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<td>MMbbl</td>
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<tr>
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<td>Southern</td>
<td>606.1</td>
<td>10.5</td>
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Table 3.10 Historic distribution by fluid and region of probable reserves.
Table 3.11 Classification of probable crude oil and natural gas reserves.

<table>
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<th>Year</th>
<th>Region</th>
<th>Crude Oil</th>
<th>Natural Gas</th>
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<td>Light</td>
</tr>
<tr>
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<td></td>
<td>MMbbl</td>
<td>MMbbl</td>
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<td>Southwestern Offshore</td>
<td>133.8</td>
<td>621.2</td>
</tr>
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<td>Northern</td>
<td>890.3</td>
<td>1,511.7</td>
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<tr>
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<td>Southern</td>
<td>19.8</td>
<td>530.0</td>
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<td>Total</td>
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<td>4,899.1</td>
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<td>Southwestern Offshore</td>
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<td>Northern</td>
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<td>Total</td>
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<td>Southern</td>
<td>13.5</td>
<td>454.0</td>
</tr>
</tbody>
</table>

*G-C: Gas-Condensate Reservoirs

The behavior of Mexico’s probable oil equivalent reserves over the last three years is shown in Figure 3.8. There was a decrease of 169.0 million barrels of oil equivalent in the year, which is 1.1 percent compared with the previous year. The additions contributed 309.8, million barrels of oil equivalent, but were insufficient to offset the reductions caused by the revision of existing fields of 389.5 million barrels of oil equivalent, and the developments of 89.2 million barrels of oil equivalent.

3.3.3. Possible Reserves

Mexico’s possible oil equivalent reserves as of January 1, 2005 totaled 13,428.2 million barrels, which are shown in Table 3.12 by regional distribution and by fluid type. The Northern Region accounts for 70.7 percent of the total of these reserves, the Northeastern Offshore Region 12.3 percent, the Southwestern Offshore Region 11.6 percent and the Southern Region 5.4 percent. Crude oil accounts for 65.6 percent, dry gas 25.6 percent, plant liquids 7.7 percent and the condensate 1.1 percent.

Possible natural gas reserves, as of January 1, 2005, amounted to 22,742.8 billion cubic feet, see Table 3.12. The gas to be delivered to plant is 20,169.1 billion cubic feet, of which 82.2 percent of the total is located in the Northern Region. The possible dry gas reserves amount to 17,896.9 million cubic feet, with 83.6 percent in the Northern Region where Chicontepec once again explains the hydrocarbon volume.
In 2005, the possible crude oil reserves amount to 8,808.9 million barrels, which are classified by specific gravity in Table 3.13; light oil accounts for 47.2 percent of this total, heavy oil 39.2 percent and superlight oil 13.6 percent. The Northern Region has 85.9 percent of the possible light oil reserves, 67.2 percent of the superlight reserves and 42.9 percent of the heavy oil reserves.

Table 3.12 Historic distribution by fluid and region of possible reserves.

<table>
<thead>
<tr>
<th>Year</th>
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<th>Remaining Gas Reserves</th>
</tr>
</thead>
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<td>Crude Oil MMbbl</td>
<td>Condensate MMbbl</td>
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<td>Total</td>
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Table 3.13 Classification of possible crude oil and natural gas reserves.

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<th>MMbbl</th>
<th>MMbbl</th>
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<th>Bcf</th>
<th>Bcf</th>
<th>Bcf</th>
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</tr>
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</tr>
<tr>
<td></td>
<td>Southern</td>
<td>241.2</td>
<td>186.7</td>
<td>48.1</td>
<td>412.4</td>
<td>599.6</td>
<td>38.8</td>
<td>13.7</td>
<td>652.2</td>
</tr>
</tbody>
</table>

*G-C*: Gas-Condensate Reservoirs

The classification of natural gas by association with crude oil in the reservoir is shown in Table 3.13. The possible reserves of associated gas in 2005 contribute 80.6 percent, while the non-associated gas is 19.4 percent. The Northern Region accounts for 88.1 percent of the possible associated gas reserves. The re-
Regional distribution of the possible non-associated gas shows that the Northern Region has 55.8 percent, coming mostly from wet gas reservoirs; the Southwestern Offshore Region 28.5 percent and the Southern Region 14.8 percent. In both regions the gas-condensate reservoirs contribute most of these reserves. The Northwestern Offshore Region has the remaining 0.9 percent.

The evolution of Mexico’s possible oil equivalent reserves over the last three years is shown in Figure 3.9. As of January 1, 2005, there is an increase of 287.5 million barrels of oil equivalent compared with the previous year. The additions item contributed 555.4 million barrels of oil equivalent, developments were negative with 201.4 million barrels of oil equivalent and the revisions reduced 66.4 million barrels of oil equivalent.