The Difficult Prospects For Exploration and Production in Pemex

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President Calderón on the sixty-ninth anniversary of the expropriation of Mexico's oil.

It was President José López Portillo who called on Mexicans in 1980 to "manage abundance." His administration left Mexico with 72 billion barrels of "proven" oil and gas reserves, but also with a financial crisis and foreign debt that would be paid for with two decades of oil exports.

Since 1984, when our oil reserves were reported at 72.5 billion barrels, the highest level in history, the figure has dropped year by year. After the numbers were questioned and the Securities and Exchange Commission (SEC) criteria adopted, in 1996, Petróleos Mexicanos (Pemex) began to talk about "total" reserves, or the sum of the "three Ps" (proven plus probable plus possible). In 1999, officials were still talking about the country's "enormous reserves," a total of 60 billion 3P reserves, including 24.7 billion barrels of proven reserves.

In the following years, there were new decreases and re-classifications, so that on January 1, 2006, Pemex reported 33.1 billion barrels of 3P reserves, of which 11.8 billion were proven, 11.6 billion were "probable" and 9.6 billion "possible."

In addition, the Vicente Fox administration added a new category: "prospective resources," calculated at about 54 billion barrels. This refers to the estimated amount of still undiscovered but inferred hydrocarbon deposits that are potentially recoverable. The estimation of their size is based on geological and geophysical information about the area under study and on analogies with areas where hydrocarbons have been produced. However, they are not considered reserves because no exploratory wells have been drilled to prove their existence.

In March 2007, under the administration of Felipe Calderón, the coun-

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TABLE 1
PROVEN CRUDE OIL RESERVES
(BILLIONS OF BARRELS)

1996	62.0[1]
1997	60.9[1]
1998	60.1[1]
1999	24.7[2]
2000	24.6
2001	25.7
2002	18.7[2]
2003	17.2
2004	16.0
2005	14.8
2006	13.7
2007	12.8

[1] "Total" reserves.
[2] New criteria for calculating the amounts were used.
Source: Pemex. Figures for January 1 each year.

try's oil discourse changed, putting an end to the pretension of abundance. The president expressed his concern about the fact that the ratio of proven reserves to the production of crude gives us a production limit of only 9.3 years. He warned that for decades we have pumped more oil than we have found and that it is necessary to reverse this trend to prevent the country from becoming a net importer of oil and its derivatives.

This somber tone is partially attributable to the recent fall in oil production which all indicators say will continue due to a decrease in the Cantarell field. Neither Calderón nor Pemex General Director Jesús Reyes Heroles any longer talk about total or 3P reserves, although they still play a part in the complex evaluation and calculation methodology applied internally at Pemex Exploration and Production (PEP).

In the annual publication *Las reservas de hidrocarburos de México (evaluación al 1 de enero de 2007)* (Mexico's Oil and Gas Reserves [Evaluation as of January 1, 2007]), which reports on exploration efforts and the incorporation of oil reserves in the previous year, PEP states that the country's proven crude oil reserves had reached 12.849 billion barrels by that date, 6 percent less than the previous year and enough to cover a little over nine years' production at the current rate of extraction. Nevertheless, this amount is only enough to put Mexico in fifteenth place in the ranking published by *Oil & Gas Journal*. Total proven oil and gas reserves come to 15.514 billion barrels.

PEP's reports on reserves and their respective methodologies are not easy to understand and analyze for the uninitiated. Nevertheless, there are many indications that the replacement rate for proven reserves is not improving. According to the January 1, 2007 annual report, in 2006, 966 million barrels of 3P (proven plus probable plus possible) crude oil were incorporated into the reserves as a result of new discoveries, but only 66 million barrels of these were proven reserves.

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If we analyze the results cited in the annual reports over the last five years, and only look at proven oil reserves, we can see that from 2002 to 2006, Pemex produced 6.030 billion barrels of crude, but incorporated only 360 million barrels of proven reserves in new discoveries. So, the replacement rate attributable to new discoveries barely reached six percent of what was extracted.

However, PEP assures the public that this figure of "new reserves incorporated due to discoveries" is not an appropriate indicator since every year probable and possible reserves which had been identified in previous years are reclassified as proven, after review, delimitation and development activities. The reports do not specify what kind of field and office work was done to make this reclassification possible, but it is linked to the drilling of delimitation and development wells.

Even with reclassification, the real replacement rate of proven reserves was 41 percent in 2006, a figure that surpassed 2005's 26.4 percent rate, but that is still considerably lower than the official directive (and international norm) of 100 percent. Put in simpler terms, four out of every 10 barrels extracted from the earth are replaced every year.

This "gap between 41 percent and 100 percent reflects insufficient investment in exploration, which in 2006

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came to 12.703 billion pesos, 17 percent less than in 2005 and 42 percent less than in 2004 in real terms," according to Jesús Reyes Heroles.[1] In general, investment earmarked for exploration in this decade has come to about U.S.$1 billion a year annually, while about U.S.$8 billion a year goes into gas and oil production.

Vinicio Suro Pérez, PEP's assistant director of Planning and Evaluation, has stated that between 2007 and 2012, an estimated average annual investment of at least U.S.$2 billion will be earmarked for exploration (that is, almost twice that of recent years), making a 77-percent replacement rate for proven reserves possible by 2012. This is practically the same as saying that the goal of a 100-percent replacement rate will not be achieved under this administration, and that therefore, net reserves will continue to drop for the rest of the president's term.

So, the oil reserve replacement rate has become a critical factor, undoubtedly the most critical factor that Pemex faces, because without oil fields to explore, the state-owned company would not be able to subsist as a producer and exporter of oil and gas. With proven oil and gas reserves due to last less than 10 years and a low replacement rate, Pemex's very survival could be at risk in the long run.

Table 2
Expected Decline of Cantarell
(in number of barrels per day)

2004	2,136,000[1]
2005	2,035,000[1]
2006	1,788,000[1]
2007	1,526,000
2008	1,373,000
2009	1,200,000
2010	1,000,000
2011	820,000
2012	713,000
2013	600,000
2014	531,000
2015	450,000
2016	430,000
2017	339,000

[1]Real figures.
Source: Pemex.

Prospects for Production

PEP is facing a drop not only in oil reserves, but also in production. This is particularly worrying considering the aforementioned large investments earmarked for it. Crude production, affected by a decline of the Cantarell field, dropped two percent in 2006, when 3.265 million barrels a day (b/d) were produced. The decline has continued and in the first months of 2007, production was close to 3.1 million b/d; everything indicates that it will be difficult to keep it above 3 million b/d in the short term.

In the case of Cantarell, PEP predicts that its production, which recently was at about 1.5 million b/d will drop to 1 million b/d by 2010 and 600,000 b/d by 2013. Based on the recovery factor in this field (about 34 percent), it is even very feasible that the drop in production could be quicker, compensated only partially by other deposits, like the new Ku-Maloob-Zaap heavy crude complex. Since other deposits have also registered decreases —Ku-Maloob-Zaap will be among them starting in 2010— it is not crazy to think that national production of crude, today at 3 million b/d, could drop to 2 million b/d within a few years. This would have a negative impact on the amount of crude available for export and Pemex's capacity to generate income.

A Matter of Investment?

It is particularly worrying that PEP has not had any important successes in exploring over the last decade. No giant oilfields have been discovered in the last two decades; at the same time, exploration and production costs will be larger and larger, above all if we go into deep waters. More investment is required to obtain the same production levels or the same number of discoveries.

Both Calderón and the PEP have publicly stated that underinvestment in exploration is a problem. But it is by no means certain that the Congress

will authorize additional funding to solve it. An additional difficulty is that the assignation of resources is irregular, varying from year to year. What is more, it is difficult to justify the assignation of public resources, our taxes, to risky activities that do not guarantee a return on our money.

It is also difficult to evaluate to what degree the poor results in exploration can be attributed to technological insufficiencies, bureaucratic methods of hiring drilling equipment or the lack of management capabilities and techniques. PEP is a vertical, tightly closed body, whose internal criteria and ways of operating are little known outside it. No one knows if it uses the best industrial practices and makes the best decisions, although it is a fact that regulation of oil jobs in Mexico, which dates from 1973, is obsolete, and for this reason there is no kind of external evaluation of PEP's industrial practices in exploration and production. In addition, more powerful technologies are needed to determine where to drill.

Another plausible theory is that no more big oil deposits will be discovered. However, this theory runs in the face of the supposition that large amounts of resources remain to be discovered, above all in the Gulf of Mexico. It should be taken into account that Mexico has been and continues to be a country with large oil deposits. Ever since President Lázaro Cárdenas's expropriation of the country's oil March 18, 1938, the exploitation of giant deposits (first Poza Rica, in Veracruz; then the Bermúdez Complex in Samaria and Jujo-Tecominoacán in Tabasco; Abkatún-Pol-Chuc, Cantarell and now Ku-Maloob-Zaap in the Campeche Sound) has been what has sustained national oil production. Thanks to the exploitation of giant deposits, Mexico has become one of the world's main oil producers and exporters. Nevertheless, rapid exploitation has been ruinous at a time when the reserves are not being replaced. The Abkatún-Pol-Chuc complex practically lasted only one six-year presidential term, that of Carlos Salinas de Gortari. The Ku-Maloob-Zaap field is just reaching high production levels, but will begin its decline before the end of this administration.

This gives us an idea of the difficulty Pemex will face in its efforts to maintain national crude oil production in the coming years. It is an enormous challenge that must be resolved in order to ensure the future sustainability of the national oil industry. VM

NOTES

[1] Jesús Reyes Heroles, speech on the 69th anniversary of the expropriation of Mexican oil in Veracruz on March 18, 2007, http:// elmundodelpetroleo.com/articulos.php?id_sec=8&id_art=80 (accessed April 19, 2007). [Editor's Note.]