OCS Report
MMS 2007-052

Outer Continental Shelf

Gulf of Mexico OCS Oil and Gas Scenario Examination: Exploration and Development Activity

U.S. Department of the Interior
Minerals Management Service
Gulf of Mexico OCS Region

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GULF OF MEXICO OCS OIL AND GAS SCENARIO EXAMINATION: EXPLORATION AND DEVELOPMENT ACTIVITY

In 1954, the Federal Government held the first offshore oil and natural gas lease sale. The Minerals Management Service (MMS) has held annual areawide lease sales in the Western and Central Planning Areas (WPA and CPA) since 1983. Following each lease sale, MMS determines whether a bid would be accepted and a lease issued. The leases were not issued until MMS had completed an extensive bid evaluation process to ensure that the Federal Government received a fair monetary return. The bid evaluation processes were usually completed by three months after each sale. Issued leases granted lessees the right to explore, develop, and produce oil and/or natural gas for a specific period and from a specific tract of Outer Continental Shelf (OCS) land. If a discovery was made within the initial period of the lease, the lease was extended for as long as oil and/or natural gas was producing in paying quantities, or approved drilling operations were conducted. The term of the lease may also be extended if a suspension of production or suspension of operations had been granted or directed. Lease terms are currently for 5 years for water depths less than 400 meters (1,312 feet), 8 years for 400 and 800 meters (1,312 and 2,624 feet), and 10 years for 800 meters (2,624 feet) or deeper. The leasing process is explained in greater detail in *Leasing Oil and Natural Gas Resources: Outer Continental Shelf* (USDOI, MMS, 2006a).

The majority of exploration activity occurs in the first 8 years following a lease sale. Drilling of development wells and installation of production structures begins shortly after exploration activity begins. Oil and gas production typically begins in the second or third year after a lease sale. The MMS assumed fields discovered as a result of a lease sale would reach the end of their economic life within 40 years of the lease sale.

The level of subsequent activity resulting from a lease sale has been correlated primarily to oil prices, resource potential, cost of development, and rig availability. The environmental and socioeconomic impacts from oil and gas activities resulting from a lease sale have been correlated with the level of activity.

Since the enactment of the National Environmental Policy Act in 1969, MMS has prepared environmental impact statements (EIS's) and environmental assessments (EA's) to analyze the potential impacts of proposed lease sales on the marine, coastal, and human environments. In order to describe the level of activity that could reasonably result from a proposed lease sale, MMS developed exploration and development activity scenarios. These scenarios provide a framework for detailed analyses of potential environmental and socioeconomic impacts of a proposed lease sale. In order to present the best reasonable projections possible, MMS continually updates models and formulas used to develop these scenarios. The experience of subject matter experts is incorporated into this process, along with the latest industry trends and historical data.

This paper focuses on the forecasts of oil and gas production, production structure installations, and wells drilled; however, MMS developed scenarios for other impact-producing factors from these primary forecasts. Vessel and helicopter trips scenarios were based on the forecasted number of wells and production structures. Pipeline scenarios were based on forecasted production structures. Estimates of employment and population changes were based partly on forecasted oil and gas production, wells drilled, and production structures. Oil-spill probabilities were estimated based on the amount of oil production forecasted.

To study cumulative impacts, MMS looked at the contribution of an individual sale to total OCS activity as a result of past and future lease sales (OCS Program). In previous EIS's and EA's, MMS has stated one lease sale accounts for only a small percentage of OCS activity in the Gulf of Mexico.

Examination of Past Exploration and Development Activity Scenarios

The MMS compared actual historic oil and gas production, installation of production facility structures (i.e., structures with production equipment), and exploration and development wells drilled with MMS's forecasts for WPA and CPA lease sales from the 1992-1997, 1997-2002, and 2002-2007 5-Year Programs (USDOI, MMS, 1991-1998 and 2002). Fourteen WPA lease sales (1992-2005) and 14 CPA lease sales (1993-2006) were included in this analysis. No activity occurred in 2006 as a result of

the last sale held in the 2002-2007 5-Year Program, WPA Lease Sale 200; therefore, Sale 200 was not included in this analysis. The last sale scheduled in the 2002-2007 5-Year Program, CPA Lease Sale 201, was cancelled and also was not included in this analysis.

Planning area boundaries were reconfigured for the 2007-2012 5-Year Program. For ease of analysis, this paper uses the planning area configurations that were in effect during the three 5-Year Programs studied.

This paper considered activity through the last full year of available data, which was 2006 (USDOI, MMS, 2007a). Two to fifteen years of actual historical activity has occurred per WPA lease sale analyzed and 1-14 years of actual historic activity has occurred per CPA lease sale analyzed. Actual historic data was lagged so that the first year of activity from each of the individual lease sales would take place in "Year 1" and not the actual calendar year. For future years where activity had not yet occurred (i.e., after 2006), data was extrapolated for each sale based on historical activity that had occurred for the sale and the average of historical activity that had occurred from the other 13 sales during those same years. It was assumed for this analysis that all production structures would be installed and all wells would be drilled during the time period analyzed, i.e., 15 years following a WPA lease sale and 14 years following a CPA lease sale. Beyond these 14/15 years, MMS assumed oil and gas production declined from the last extrapolated year to zero production in the 40th year following a lease sale. The sum of the extrapolated data and the actual historic data is referred to as the "adjusted total." This extrapolation method is less reliable for more recent lease sales that have fewer years of actual data. Sales 194 (2005), 196 (2006), and 198 (2006) are also skewed due to the impacts of Hurricanes Katrina and Rita.

Figures 1-4 compare adjusted and forecasted oil and gas production. All WPA and CPA lease sales studied fell in or below the forecasted range of oil and gas production. These figures also show MMS forecasted oil production more accurately than gas production, and forecasted CPA production more accurately than WPA production. For none of the studied lease sales did MMS underestimate oil or gas production.

Figures 5 and 6 compare adjusted and forecasted production structure installations. Of the WPA lease sales studied, a little over half fell short of the forecasted number of production structure installations. The remaining WPA lease sales fell within the forecasted range. The MMS forecasted the exact number of production structures, i.e., 12, installed for WPA Lease Sale 161 (1996). Of the CPA lease sales studied, a little under half fell below the forecasted number of production structure installations. Two CPA lease sales (Sale 152 in 1995 and Sale 157 in 1996) fell above the forecasted number of installations.

Figures 7 and 8 compare adjusted and forecasted number of wells drilled. For the WPA lease sales studied, a little over half fell short of the forecasted number of wells drilled. The remaining WPA lease sales fell within the forecasted range. All the CPA lease sales studied, except one, fell within or below the forecasted range of wells drilled. Sale 152 fell above the forecasted range of wells drilled.

Of the 14 WPA lease sales studied, none of the adjusted totals fell above the forecasted oil and gas production, production structure installations, or wells drilled. For about half of the WPA lease sales studied, the adjusted oil production, production structure installations, and wells drilled fell below the low end of the forecast. Adjusted gas production fell below the low end of the forecast range for all 14 WPA lease sales studied.

In addition, Figures 1-8 show that MMS did not project the impacts of some events, such as the impact of the 1995 OCS Deep Water Royalty Relief Act, the dramatic drop in oil prices in 1998, and Hurricanes Katrina and Rita in 2005. Because of these types of events, activity varied widely between lease sales.

Of the 14 CPA lease sales studied, the adjusted totals for two CPA lease sales fell above the forecasted range. These totals were production structure installations and wells drilled for Sale 152, and production structure installations for Sale 157. The forecasts for Sales 152 and 157 had not taken into account the significant impact the 1995 OCS Deep Water Royalty Relief Act (DWRRA; 43 U.S.C. §1337) would have on deepwater Gulf of Mexico activities (USDOI, MMS, 2006b). This legislation provided economic incentives for operators to develop leases in water depths greater than 200 meters (656 feet).

In summary, over half of the time the actual activity fell below the level of forecasted activity. When within the forecasted range, the majority of time the actual activity was at or near the low end of the forecasted range. In only three instances did actual activity exceed the high end of the forecasts.

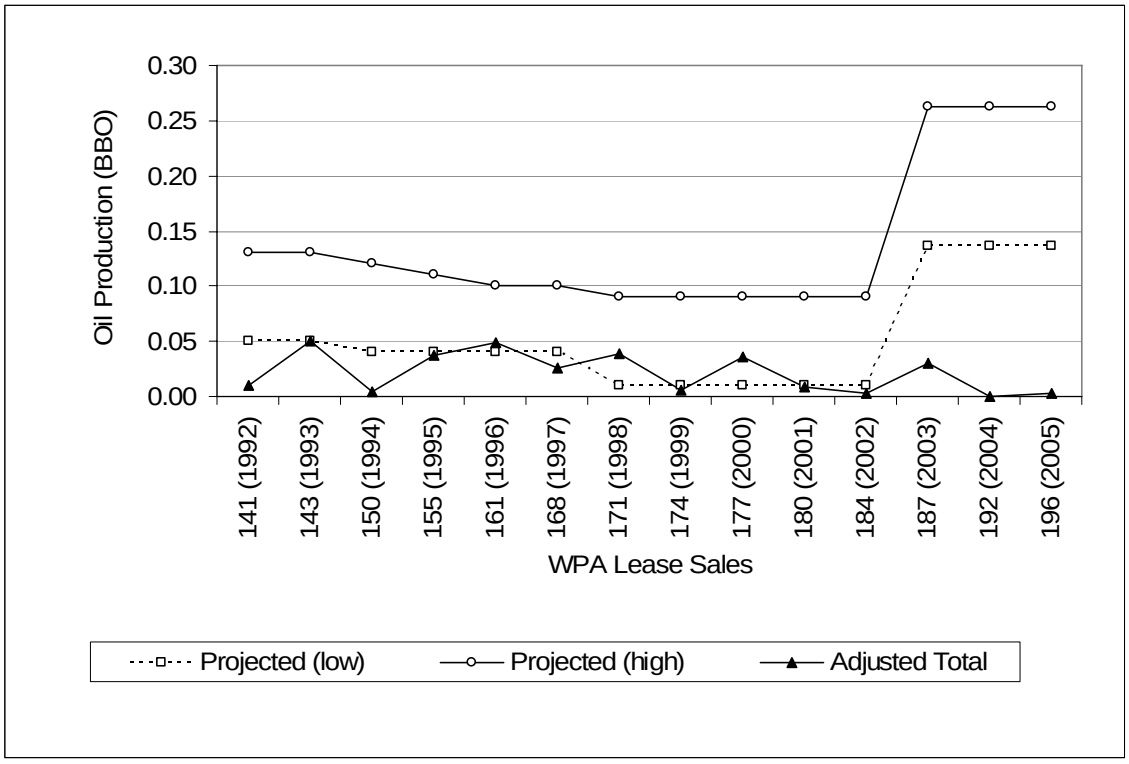

Figure 1. Comparison of Projected and Adjusted Oil Production Related to WPA Lease Sales.

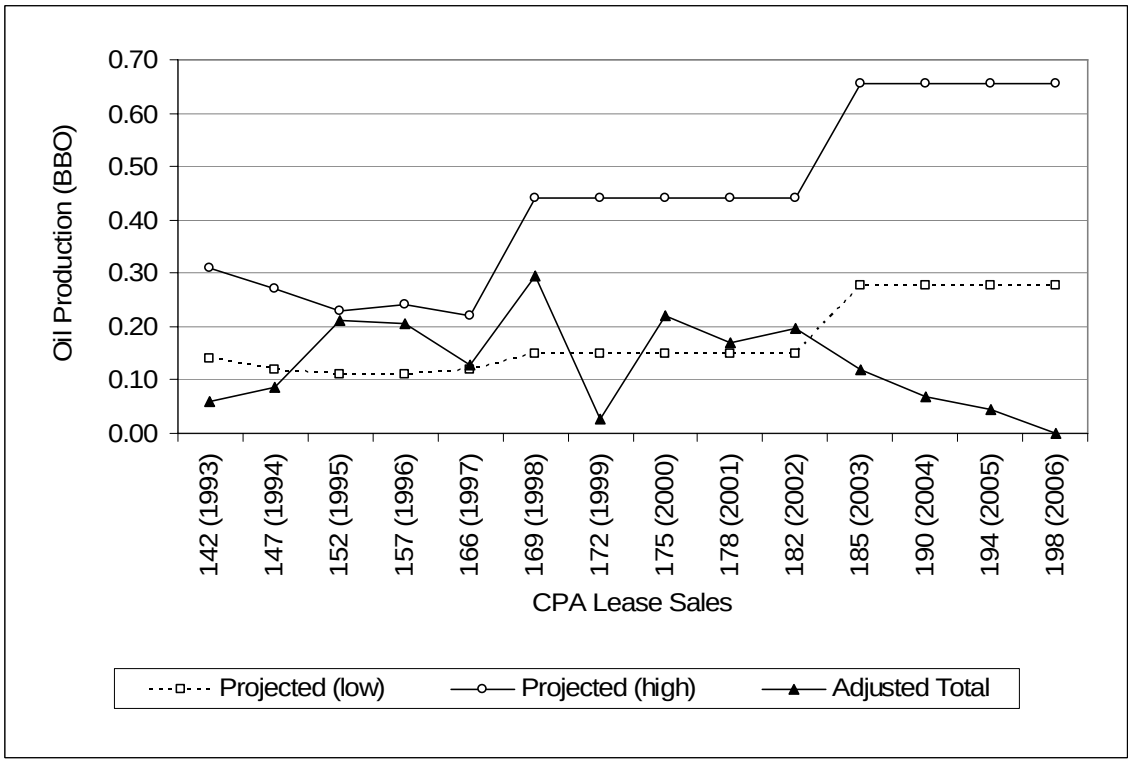

Figure 2. Comparison of Projected and Adjusted Oil Production Related to CPA Lease Sales.

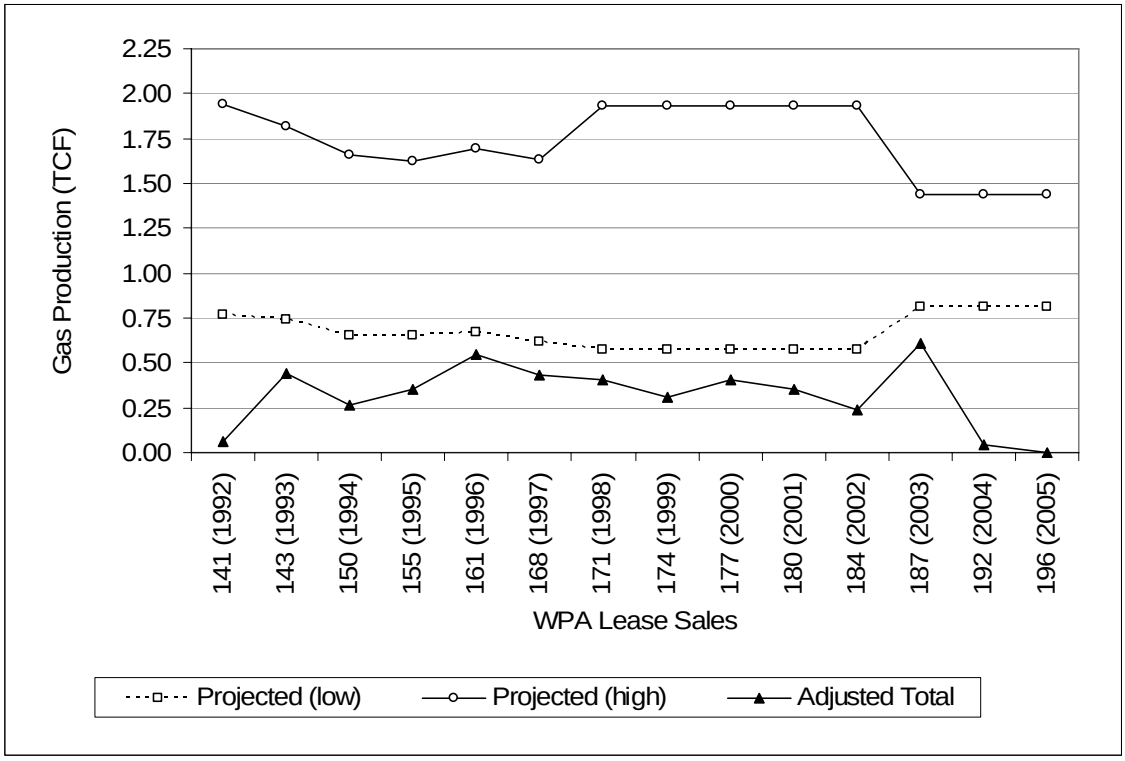

Figure 3. Comparison of Projected and Adjusted Gas Production Related to WPA Lease Sales.

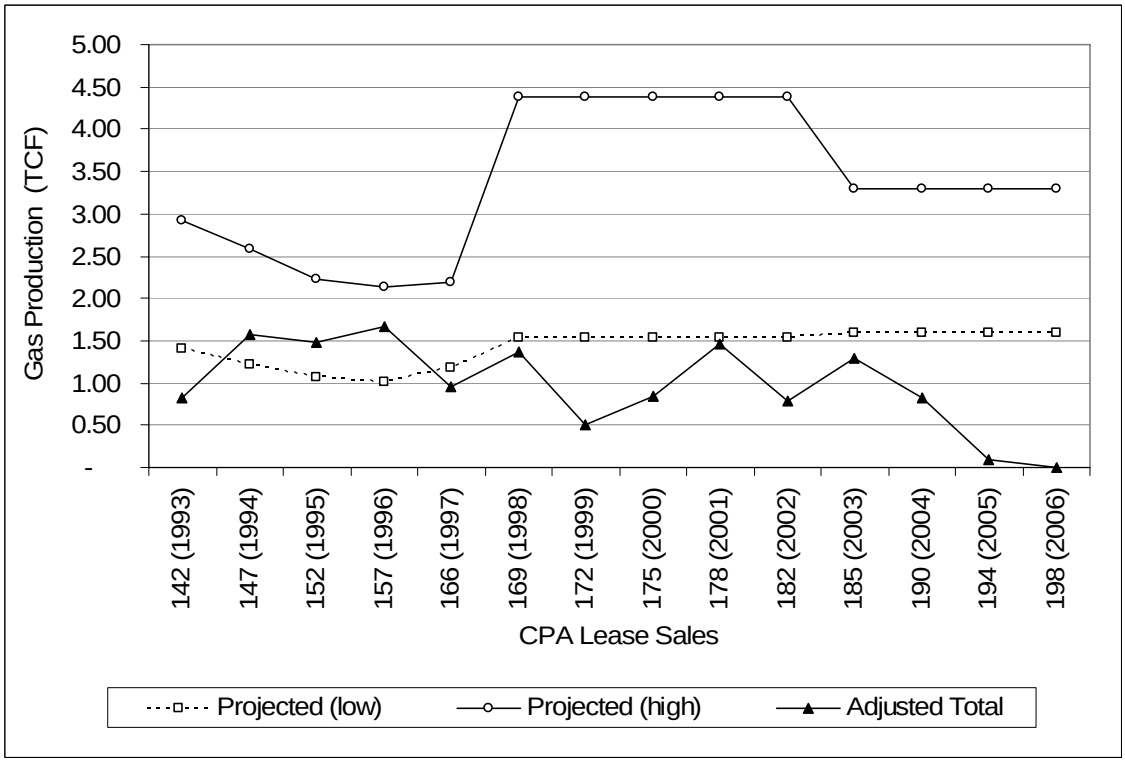

Figure 4. Comparison of Projected and Adjusted Gas Production Related to CPA Lease Sales.

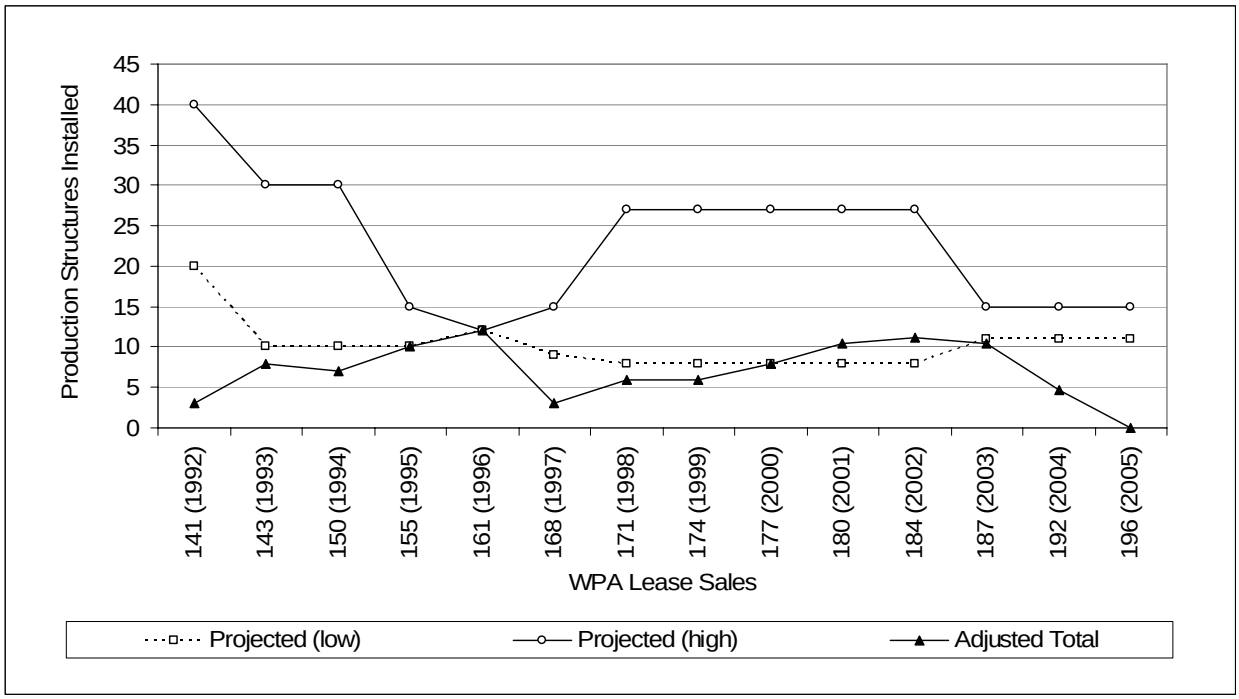

Figure 5. Comparison of Projected and Adjusted Production Structure Installations as a Result of WPA Lease Sales.

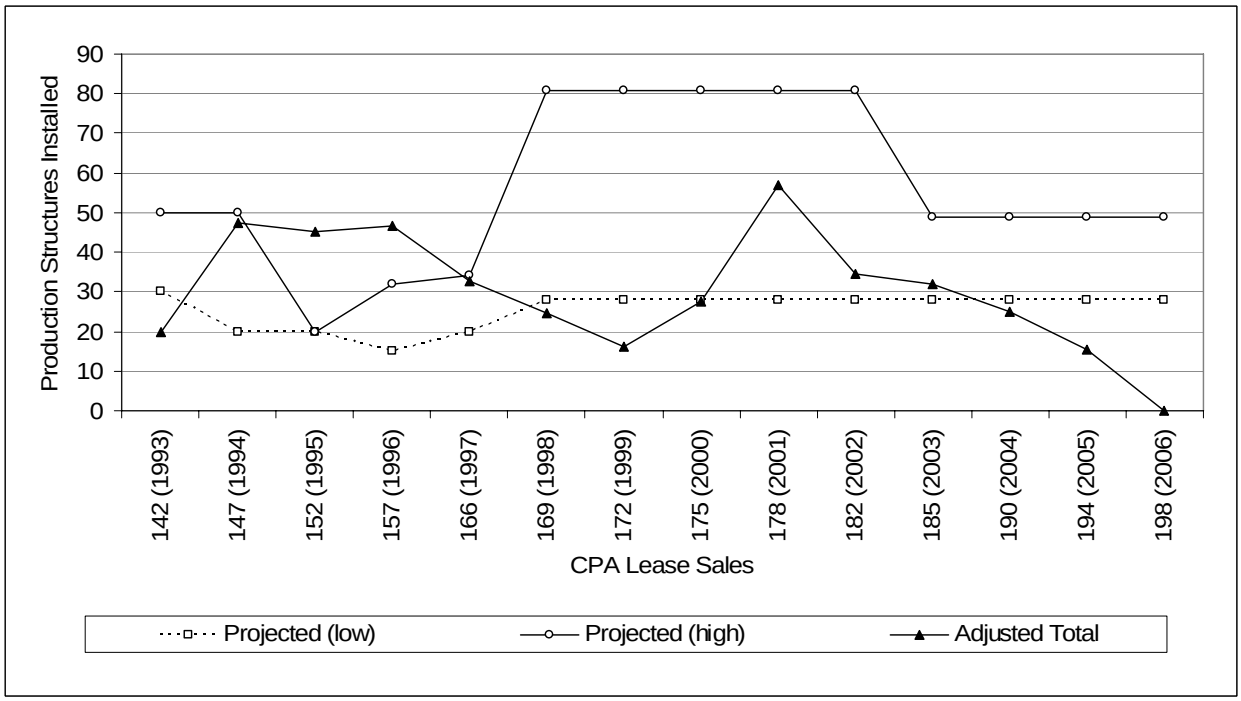

Figure 6. Comparison of Projected and Adjusted Production Structure Installations as a Result of CPA Lease Sales.

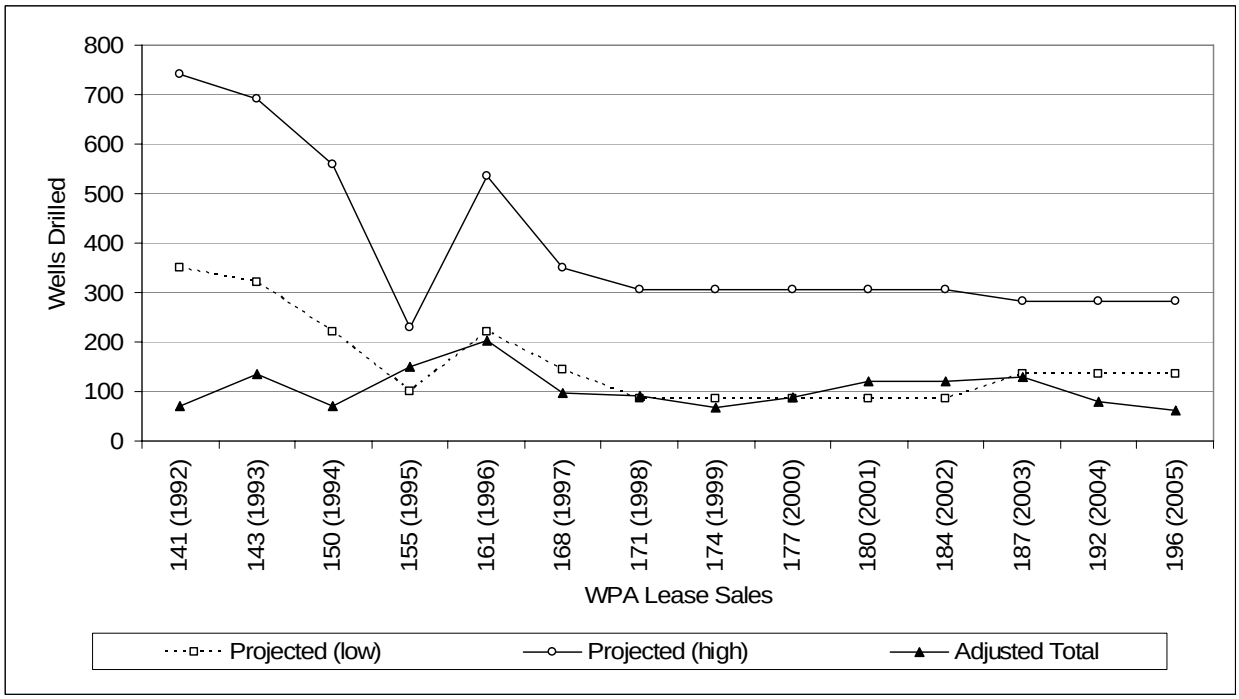

Figure 7. Comparison of Projected and Adjusted Wells Drilled as a Result of WPA Lease Sales.

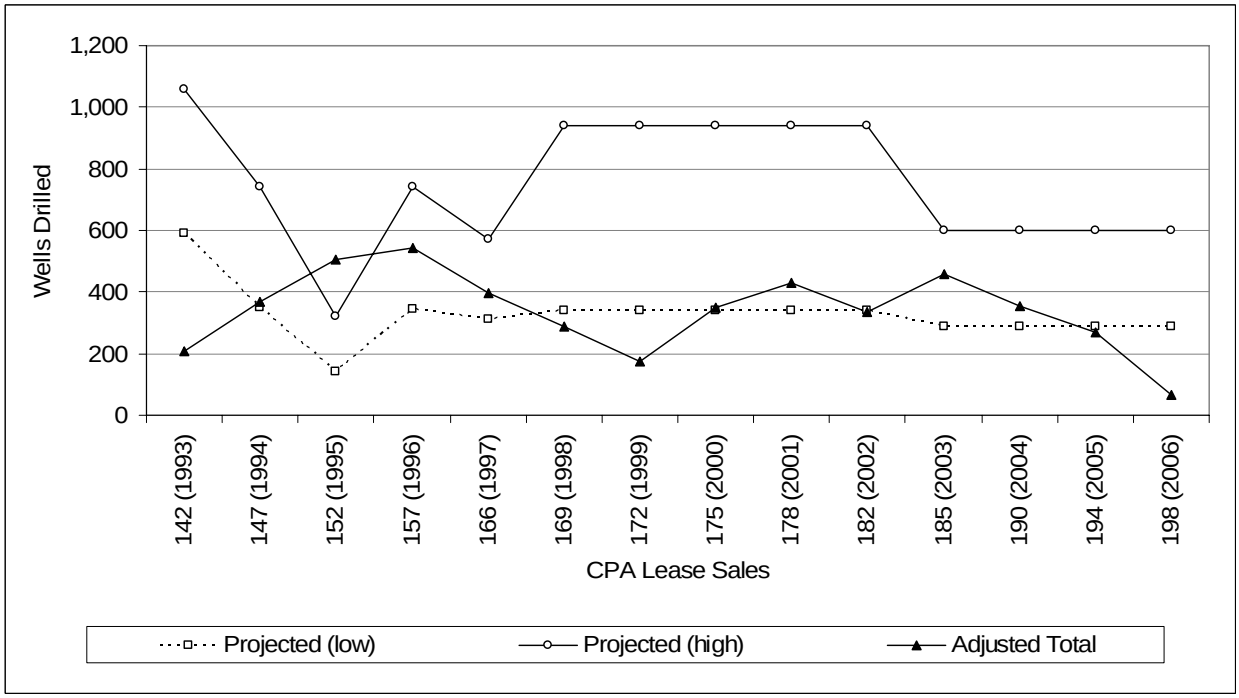

Figure 8. Comparison of Projected and Adjusted Wells Drilled as a Result of CPA Lease Sales.

Improving Future Exploration and Development Activity Scenarios

In order to present the best reasonable forecasts possible, MMS continually updates models and formulas used to develop exploration and development activity scenarios. The experience of subject matter experts is incorporated into the scenario-development process, along with the latest industry trends and historical data.

In late 2002, MMS contracted with Innovation & Information Consultants, Inc. (IIC, Inc.) to develop a model that would estimate oil and gas exploration and discovery, development, and production activity in the Gulf of Mexico. The Exploration, Development, and Production (EDP) model was delivered to MMS in 2004.

Documentation of the EDP model and its subcomponents can be found in Ashton et al. (2004). As stated in the model's documentation, the EDP model "incorporates actual historical data, and allows easy comparison between the actual historical data, and the future model years." As the model was developed, modifications were made so that the model more accurately portrayed historical precedent.

The EDP model is more robust than previous modeling methods. It relies on more factors (Upton and Ashton, 2005). Constraints include leasing policy, rig availability, and resource assessment. Inputs include prices, costs, field characteristics, reserve growth, and policy variables. The production function is based on historical production data by field size and location. Another improvement over previously used modeling methods is that the EDP model defines undiscovered resources by field instead of a Gulfwide undiscovered resource volume.

The first activity scenario developed with the EDP model was presented in the EIS for the WPA and CPA 2007-2012 lease sales published in April 2007 (USDOI, MMS, 2007b). These sales and their resulting activity have not yet taken place and, therefore, are not included in this analysis.

Contribution of an Individual Sale to the OCS Program

As stated in previous EIS's and EA's, one lease sale accounts for only a small percentage of OCS activity in the Gulf of Mexico. Table 1 shows that many lease sales contribute to the present level of OCS activity. In 1993 leases from 67 different sales contributed to annual production. In 2006, the number of sales contributing to annual production had grown to 92 sales. In 1993, leases from 25 different sales contributed to installations of production structures. In 2006, the number of sales contributing to installations of production structures had declined to 15 sales. In 1993, leases from 57 different sales contributed to wells drilled. In 2006, the number of sales contributing to wells drilled had grown to 70 sales.

Table 1

Number of Lease Sales Contributing to Annual Activity in the Gulf of Mexico

Year	Number of Sales Contributing to Production	Number of Sales Contributing to Production Structure Installations	Number of Sales Contributing to Wells Drilled
1993	67	25	57
1994	67	34	56
1995	69	24	66
1996	71	30	66
1997	74	25	70
1998	75	26	64
1999	78	21	64
2000	80	23	71
2001	83	33	75
2002	85	24	66
2003	88	24	75
2004	88	22	76
2005	88	17	72
2006	92	15	70

Figures 9-12 show the contributions of the 14 WPA and 14 CPA lease sales studied to the total annual oil and gas production. Figures 9 and 11 show that over half of WPA oil and gas production in 2006 was the result of sales prior to 1992. Figures 10 and 12 show that the majority of CPA oil and gas production in 2006 was the result of sales held prior to 1993.

Figures 13-16 show the contributions of the 14 WPA and 14 CPA lease sales studied to the annual installation of production structures and wells drilled. Unlike oil and gas production, the contribution of the studied lease sales to production structure installations and wells drilled surpassed the contribution from older sales.

Figures 9-16 also show the average contribution of an individual sale to total activity. The average annual contribution of an individual lease sale to total activity in a planning area remained below 10 percent, except for the WPA in 1996 (Figure 13). For all types of activity, the average annual contribution for both planning areas remained relatively stable.

Conclusion

Based on this analysis, over half of the time the actual activity fell below the level of forecasted activity. When within the forecasted range, the majority of time the actual activity was at or near the low end of the forecasted range. The analysis of potential environmental and socioeconomic impacts presented in past EIS's and EA's were based on these exploration and development activity scenarios that, in most cases, were overestimated. If the level of activity was overestimated, the environmental and socioeconomic impacts of a lease sale may have been overstated. In addition, a single lease sale accounts for only a small percentage of the total OCS activities.

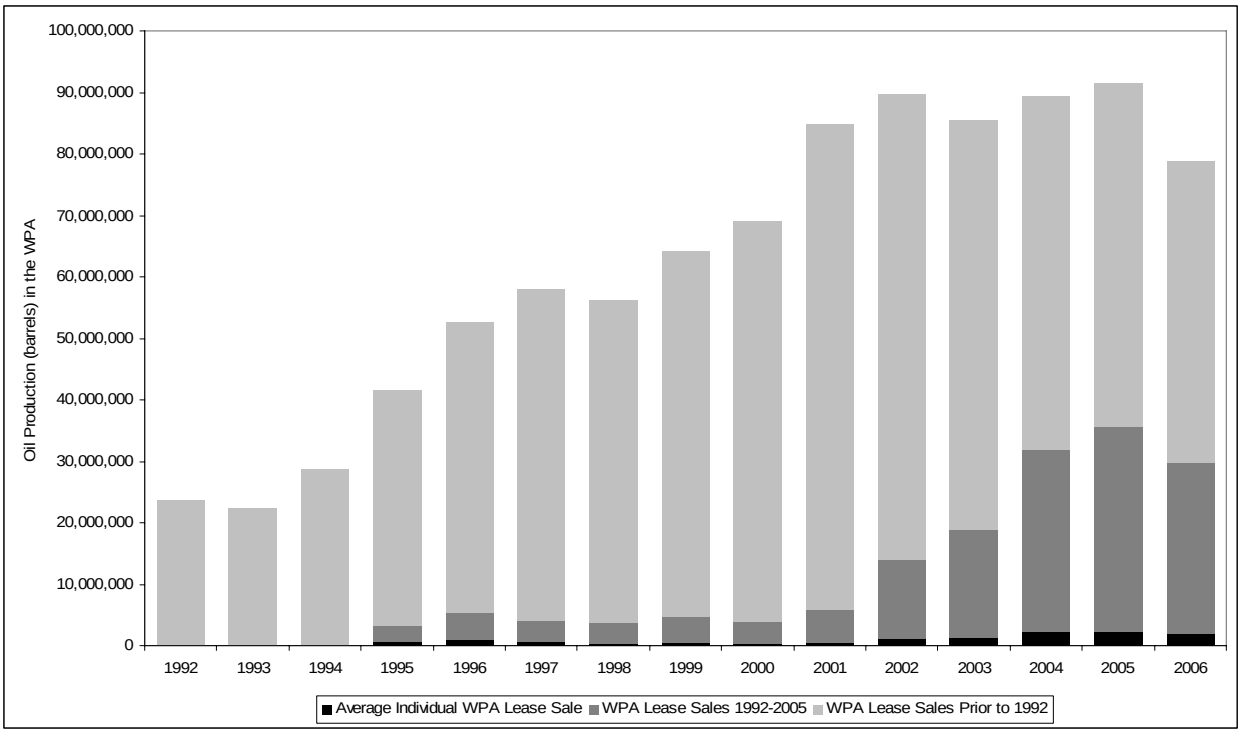

Figure 9. Contribution of Western Lease Sales to Oil Production in the WPA.

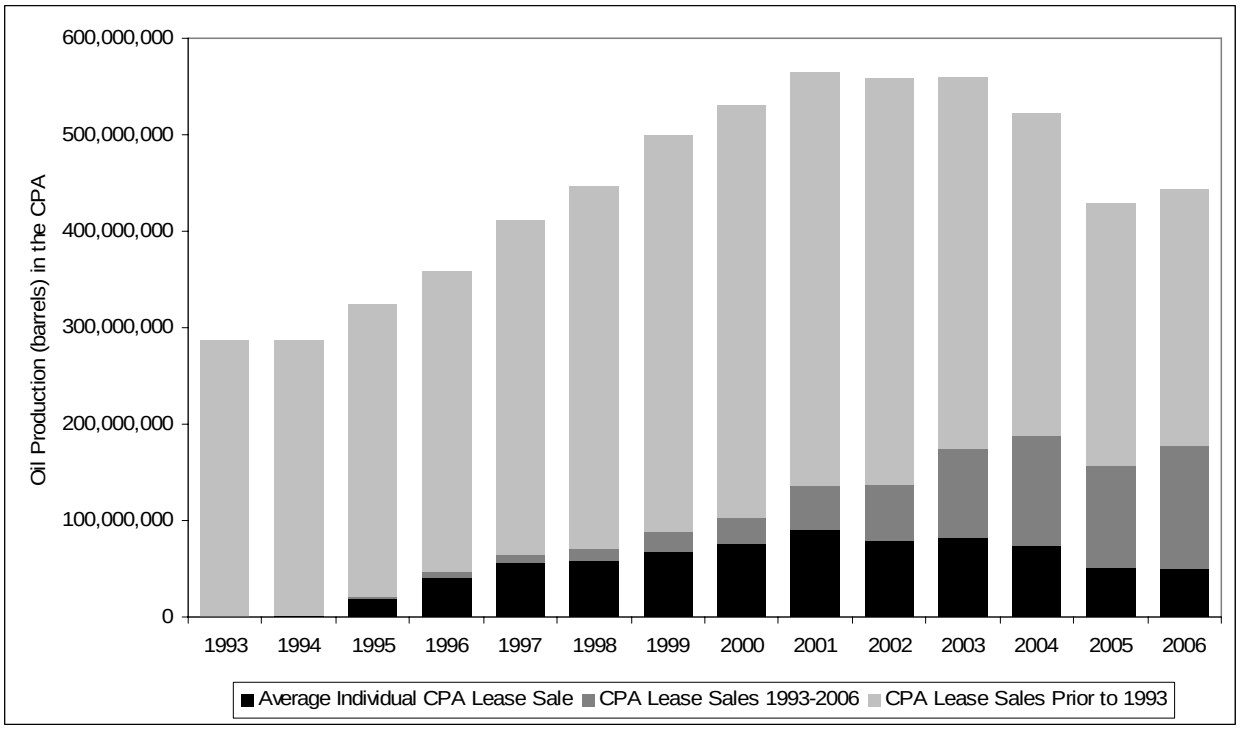

Figure 10. Contribution of Central Lease Sales to Oil Production in the CPA.

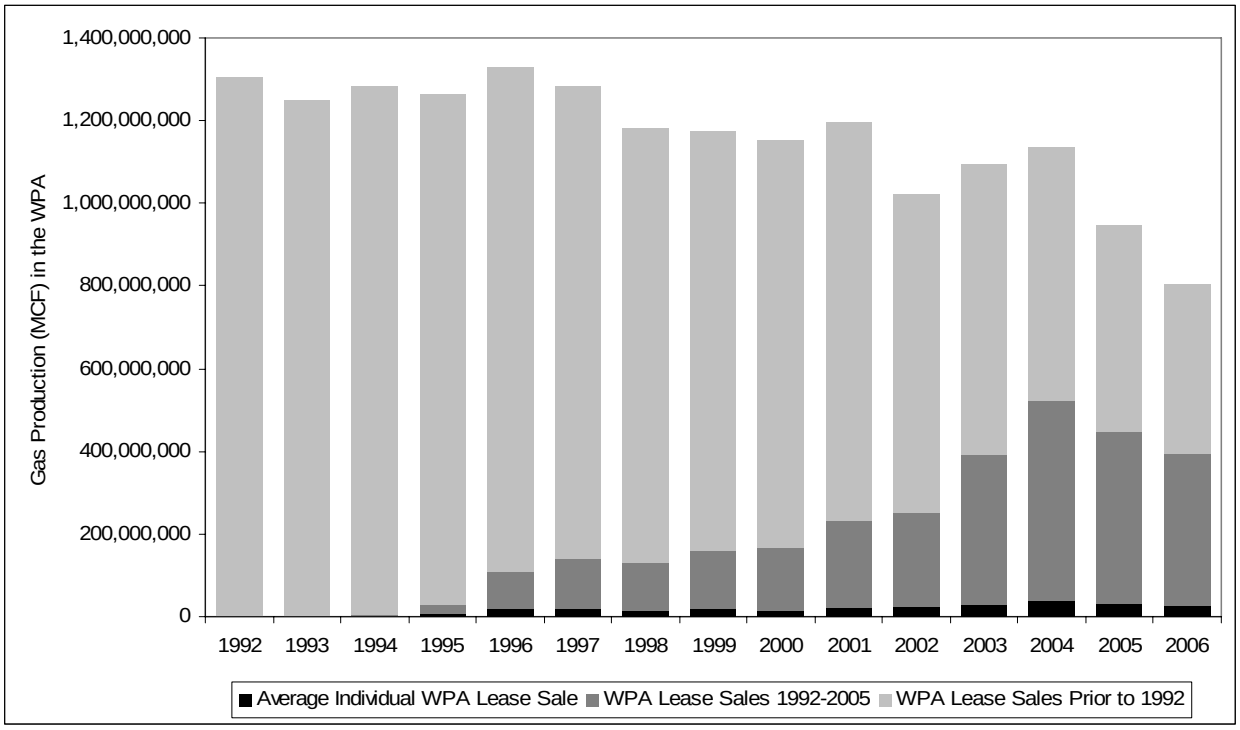

Figure 11. Contribution of Western Lease Sales to Gas Production in the WPA.

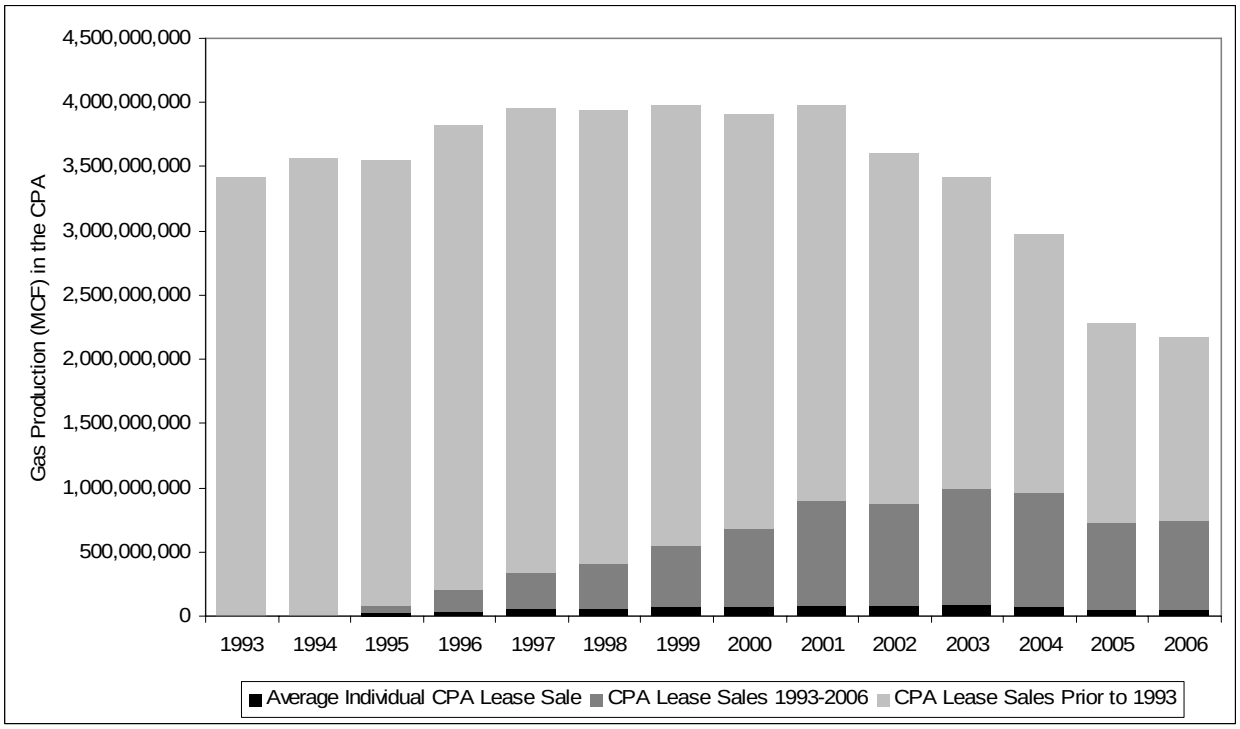

Figure 12. Contribution of Central Lease Sales to Gas Production in the CPA.

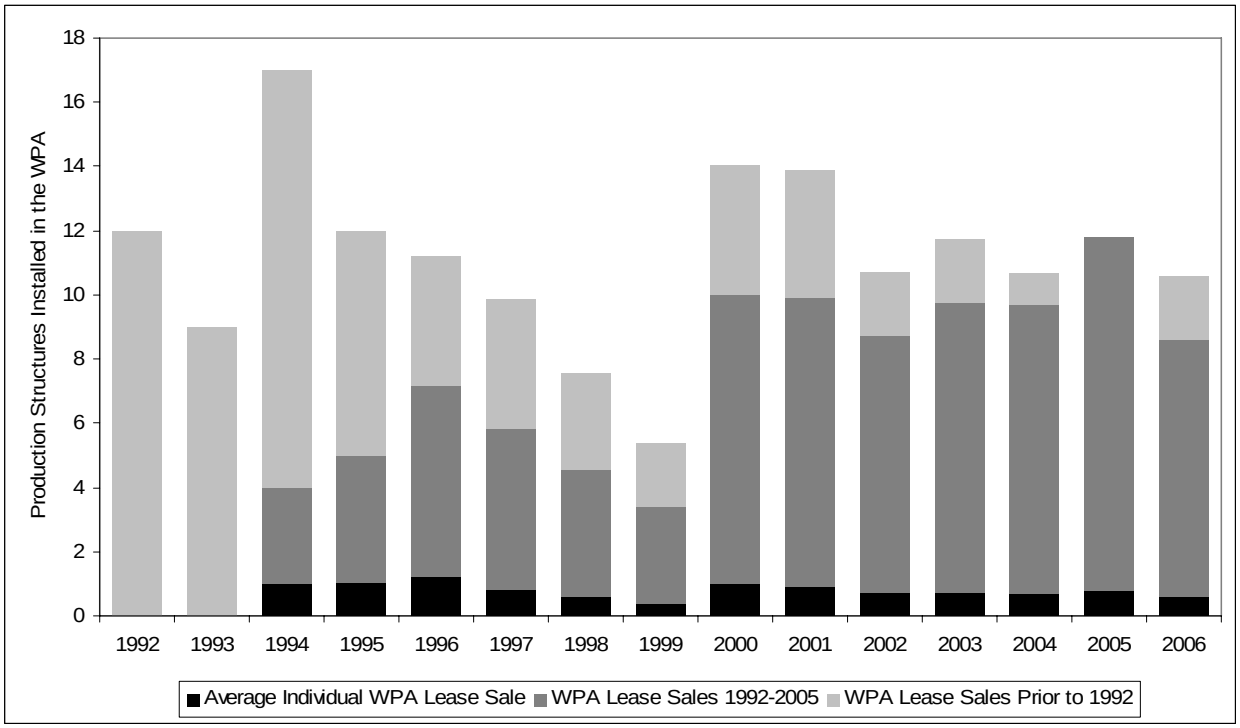

Figure 13. Contribution of Western Lease Sales to Production Structures Installed Annually in the WPA.

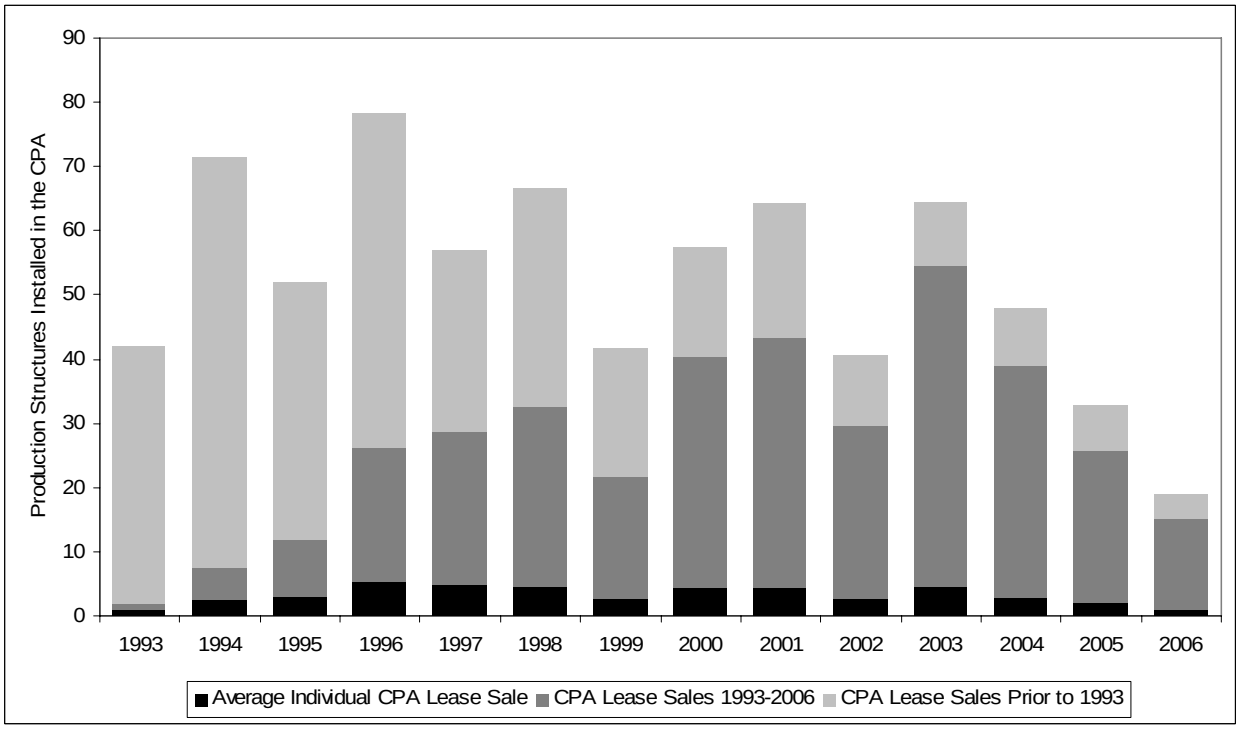

Figure 14. Contribution of Central Lease Sales to Production Structures Installed Annually in the CPA.

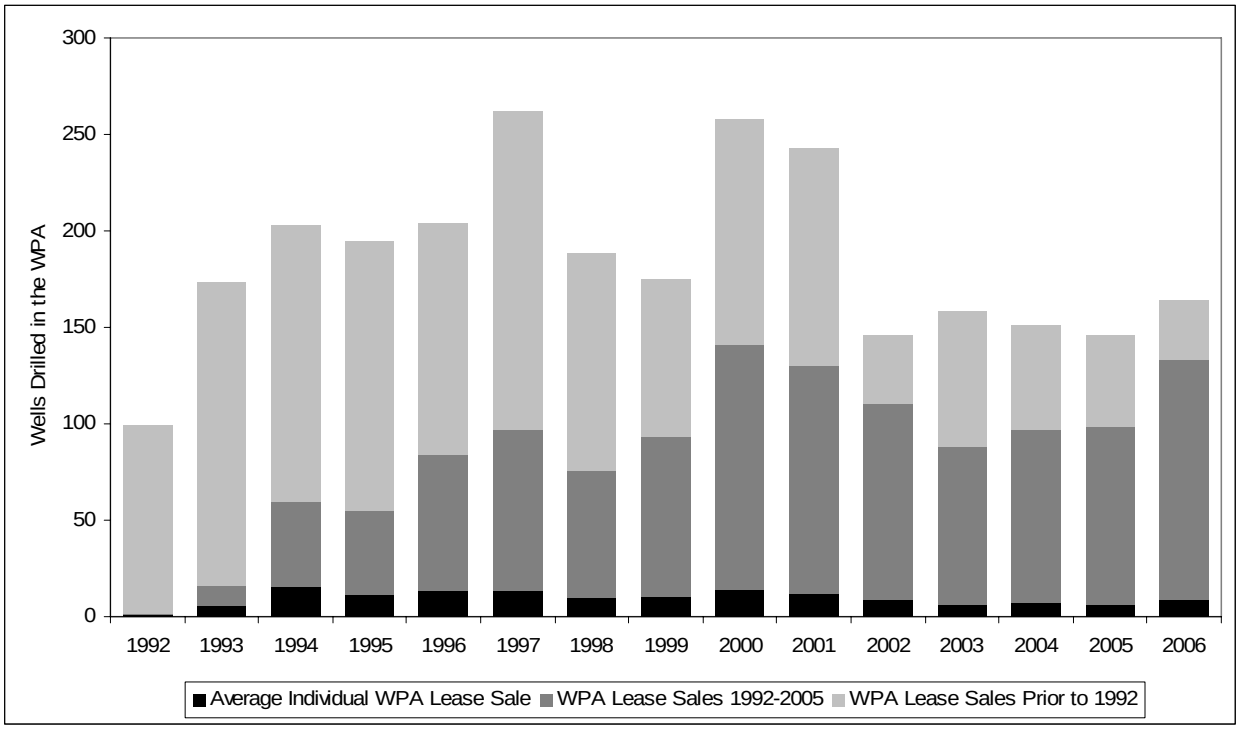

Figure 15. Contribution of Western Lease Sales to Wells Drilled Annually in the WPA.

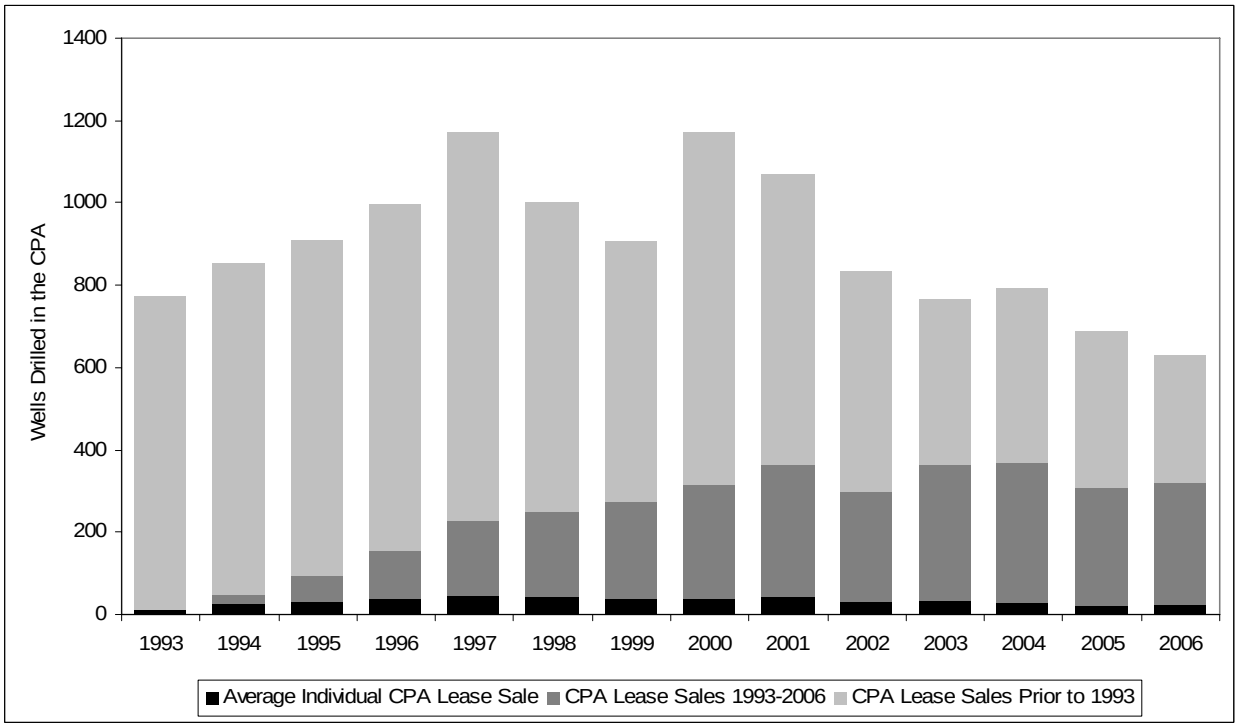

Figure 16. Contribution of Central Lease Sales to Wells Drilled Annually in the CPA.

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The Department of the Interior Mission

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

The Minerals Management Service Mission

As a bureau of the Department of the Interior, the Minerals Management Service's (MMS) primary responsibilities are to manage the mineral resources located on the Nation's Outer Continental Shelf (OCS), collect revenue from the Federal OCS and onshore Federal and Indian lands, and distribute those revenues.

Moreover, in working to meet its responsibilities, the **Offshore Minerals Management Program** administers the OCS competitive leasing program and oversees the safe and environmentally sound exploration and production of our Nation's offshore natural gas, oil and other mineral resources. The MMS **Minerals Revenue Management** meets its responsibilities by ensuring the efficient, timely and accurate collection and disbursement of revenue from mineral leasing and production due to Indian tribes and allottees, States and the U.S. Treasury.

The MMS strives to fulfill its responsibilities through the general guiding principles of: (1) being responsive to the public's concerns and interests by maintaining a dialogue with all potentially affected parties and (2) carrying out its programs with an emphasis on working to enhance the quality of life for all Americans by lending MMS assistance and expertise to economic development and environmental protection.