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# **Outer Continental Shelf Moratoria Areas: Impact of Various Assumptions on Oil and Natural Gas Production Potential**

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## EXECUTIVE SUMMARY

In recent years, public policy decision makers have considered a variety of policy options and potential actions to potentially open up for leasing and development some areas in the U.S. Outer Continental Shelf (OCS) previously under leasing moratoria. This assessment updates a June 2006 report for the Department of Energy Office of Fossil Energy (DOE/FE)<sup>1</sup> that concluded that, based on Department of the Interior Minerals Management Service (MMS) estimates for mean undiscovered oil and gas resources in the OCS moratoria areas at that time, U.S. crude oil production could increase by over 1.0 million barrels per day by 2025, and U.S. natural gas production could increase by nearly 1.4 trillion cubic feet (Tcf) per year.

Using the same model and analytical approach as used for the June 2006 report, this effort represents an update which assesses the sensitivity of various key inputs and assumptions on the level and timing of potential future crude oil and natural gas production from the OCS areas in the United States that have traditionally been under leasing moratoria by Congressional and/or Presidential directive. The update accounts for several factors such as current and forecast oil and gas prices and exploration, development, and production costs that are considerably higher today than they were when the June 2006 analyses were conducted. Finally, the public policy situation with regard to leasing in OCS moratoria areas has changed since June 2006; this factor has also been taken into consideration in these sensitivity analyses. In particular, leasing is currently being planned for several selected areas that were previously under leasing moratoria.

Overall, eight different cases were assessed as part of these sensitivity analyses:

1. A new Reference Case based on the new offshore cost assumptions. This case was assessed for both the MMS mean and high resource cases.
2. A variation on Case 1, doubling the time between leasing and first development.
3. A variation on Case 1, but including the assumption that the resource base in the newly developed areas will increase over time. This was considered for only the MMS mean resource case.
4. A variation on Case 3, again doubling the time between leasing and first development.
5. A variation on Case 1, but under the slower pace of development and production.
6. A variation on Case 5, but also doubling the time between leasing and first development.
7. A variation on Case 3, but under the slower pace of development and production.
8. A variation on Case 7, but also doubling the time between leasing and first development.

The cases were considered assuming two alternative price scenarios:

- The 2008 EIA AEO Reference Case price outlook<sup>2</sup>
- The 2009 EIA AEO Reference Case price outlook (Early Release)<sup>3</sup>

<sup>1</sup> Advanced Resources International, Incorporated, "Estimate of the Potential Economic Benefits From the Leasing and Development of Oil and Gas Resources in OCS Moratoria Areas," prepared for: U.S. Department of Energy Office of Fossil Energy, June 6, 2006 (<http://www.adv-es.com/pdf/ARI%20Eco%20Benefits%20-%20Dev%20of%20OCS%20Moratoria%20Areas%20June%206%202006.pdf>)

<sup>2</sup> Energy Information Administration, Annual Energy Outlook 2008, DOE/EIA-0383(2008), June 2008 (<http://www.eia.doe.gov/oiaf/archive/aeo08/index.html>)

<sup>3</sup> Energy Information Administration, Annual Energy Outlook 2009, DOE/EIA-0383(2009), December 2008 (Early Release) (<http://www.eia.doe.gov/oiaf/aeo/>)

A comparison of these price forecasts is provided below:

|  | <b><u>2010</u></b> | <b><u>2020</u></b> | <b><u>2030</u></b> |
|--|--------------------|--------------------|--------------------|
| <b><u>CRUDE OIL (\$/Bbl) -- Light Sweet</u></b>  |                    |                    |                    |
| AEO 2008 Reference (2006\$)                      | \$74.03            | \$59.70            | \$70.45            |
| AEO 2009 Reference (2007\$)                      | \$77.97            | \$115.64           | \$130.50           |
| <b><u>NATURAL GAS - Henry Hub (\$/MMBtu)</u></b> |                    |                    |                    |
| AEO 2008 Reference (2006\$)                      | \$6.90             | \$5.95             | \$7.22             |
| AEO 2009 Reference (2007\$)                      | \$6.52             | \$7.43             | \$9.25             |

Based on all the cases considered, the overall findings for this set of sensitivity analyses can be summarized as follows:

- Incremental oil production from the areas previously under leasing moratoria could range from 0.51 to 1.60 million barrels per day in 2025, with an average under all eight cases of 0.93 million barrels per day.
- Incremental natural gas production from these areas could range from 0.69 to 2.3 Tcf per year by 2025, with an average of 1.3 Tcf per year for the eight cases considered.
- Cumulative oil production from these areas by 2025 could range from 0.8 to 3.8 billion barrels, with an average under all eight cases of 1.9 billion barrels.
- Cumulative natural gas production from these areas could range from 3.3 to 15.7 Tcf by 2025, with an average of 7.6 Tcf for the eight cases.

The range in outcomes for the eight cases considered is illustrated in Figures ES-1 and ES-2, below, for crude oil and natural gas production potential, respectively.

The economic benefits associated with this production potential include:

- The oil and gas industry could spend from \$94 to \$298 billion dollars in the U.S. by 2025 to develop these resources.
- Between now and 2025, the reduction in the U.S. trade imbalance due to decreased crude oil imports offset by this production could range from \$44 to \$372 billion; this assumes that domestically produced crude oil serves to offset imports on a one-to-one basis.
- The U.S. would collect an additional \$11 to \$83 billion in royalties by 2025 from OCS production.<sup>4</sup>
- An additional \$1 to \$5 billion in federal income taxes would be collected from OCS production between now and 2025.
- The economic activity generated by this development would result in the addition of 18,000 to 190,000 domestic, high-paying jobs by 2025.

<sup>4</sup> No assumption is made about how federal royalty revenues may be shared or allocated with coastal states.

Figure ES-1. Range of Outcomes for Incremental Crude Oil Production  
(Production in Million Barrels Per Day)

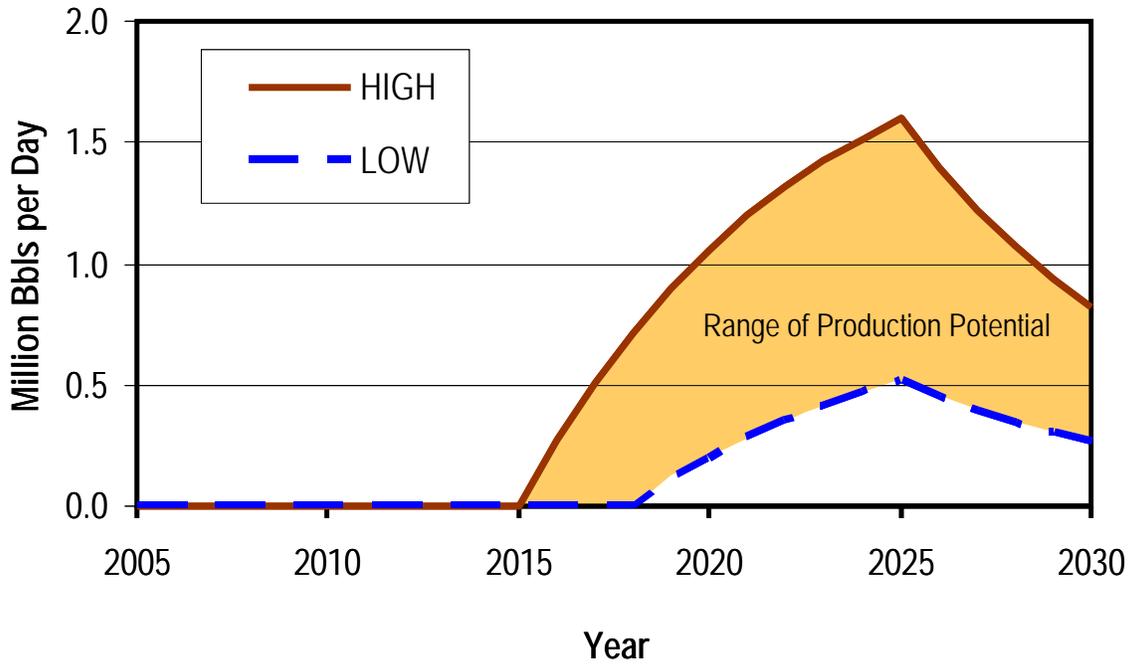
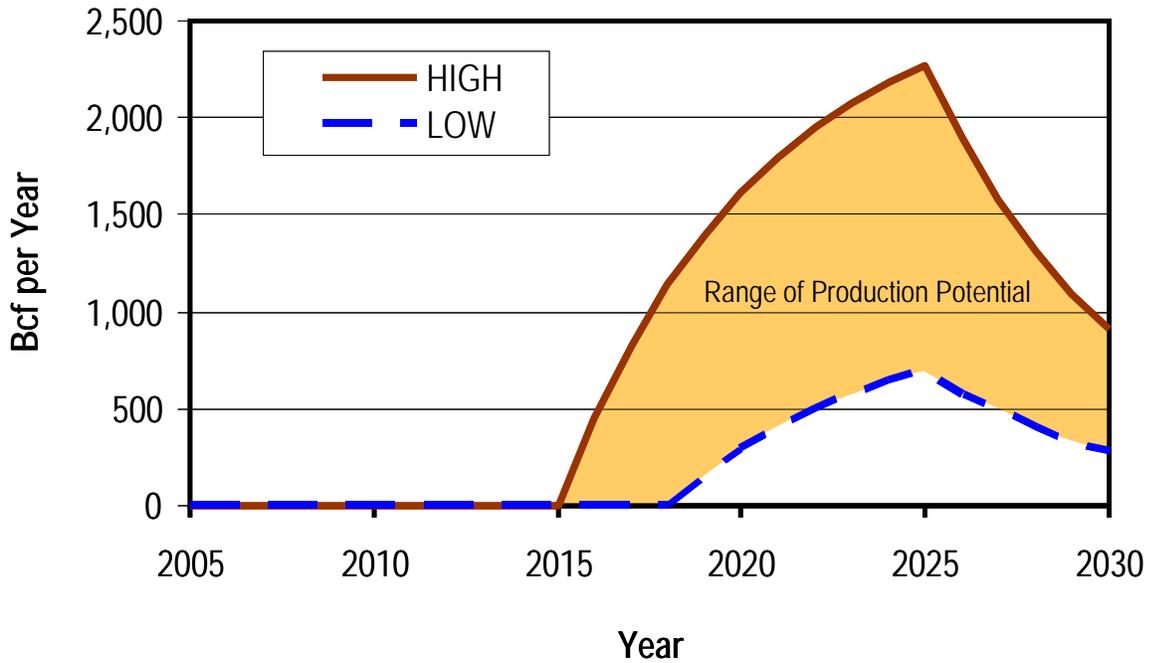


Figure ES-2. Range of Outcomes for Incremental Natural Gas Production  
(Production in Bcf/Year)



## BACKGROUND

A variety of policy options and potential actions has been considered by the U.S. Congress and by the Minerals Management Service (MMS) to potentially open up for leasing and development areas in the U.S. Outer Continental Shelf (OCS) traditionally under leasing moratoria. Over the last several years, a variety of legislative proposals have been introduced in Congress with the intent to open up additional areas of the OCS for leasing and potential development. In September 2008, Congress let lapse a 27-year old annual moratorium on drilling offshore. In 2006, Congress passed legislation that opened 8.3 million acres in the Gulf of Mexico to offshore oil and gas drilling, though the bill did not go as far as some of the broader proposals that had been under consideration to lift the long-standing bipartisan ban on offshore leasing.

In its draft five year leasing plan,<sup>5</sup> MMS is proposing to consider leasing in some areas previously not included in its five-year OCS leasing plans. MMS is currently soliciting information from interested and affected parties during the preparation of a new proposed 5-year OCS oil and gas leasing program, applicable from mid-2010 to mid-2015 (approximate dates) to succeed the current one covering the period July 2007 to June 30, 2012.

In June 2006, Advanced Resources International prepared a report for DOE/FE entitled “Estimate of the Potential Economic Benefits From the Leasing and Development of Oil and Gas Resources in OCS Moratoria Areas,”<sup>6</sup> that concluded that, based on the MMS estimates for mean undiscovered oil and gas resources in the OCS moratoria areas in question, U.S. crude oil production could increase by over 1.0 million barrels per day by 2025, and U.S. natural gas production could increase by nearly 1.4 trillion cubic feet (Tcf) per year. Since this study, several other assessments have been conducted on this topic.<sup>7,8</sup>

Since the June 2006 Advanced Resources’ study, the U.S. energy marketplace has changed dramatically, and the policy debate associated with leasing OCS areas traditionally under moratoria has evolved accordingly. Moreover, in this context, a number of factors that may influence the future pace and level of production in OCS areas traditionally under moratoria need to be reevaluated. Consequently, this white paper re-examines some of these factors that may influence the future pace and level of production in OCS areas traditionally under moratoria, to determine the extent to which they may impact the estimates from the June 2006 report.

## OVERVIEW OF APPROACH

Using the same model and analytical approach used for the June 2006 report, this effort involves assessing the sensitivity of various key inputs and assumptions on the level and timing of potential future crude oil and natural gas production from OCS areas that have traditionally been under leasing moratoria by Congressional and/or Presidential directive.

As part of this updated assessment, various adjustments were made to the original approach and model to account for the fact that two years have gone by since the last assessment, implying that, in some cases, implementation of various activities, such as leasing, initial development, and

<sup>5</sup> <http://www.mms.gov/5-year/>

<sup>6</sup> Advanced Resources International, Incorporated, “Estimate of the Potential Economic Benefits From the Leasing and Development of Oil and Gas Resources in OCS Moratoria Areas,” prepared for: U.S. Department of Energy, Office of Fossil Energy, June 6, 2006 (<http://www.adv-res.com/pdf/ARI%20Eco%20Benefits%20--%20Dev%20%20of%20OCS%20Moratoria%20Areas%20June%206%202006.pdf>)

<sup>7</sup> Energy Information Administration, “Impacts of Increased Access to Oil and Natural Gas Resources in the Lower 48 Federal Outer Continental Shelf,” (<http://www.eia.doe.gov/oiaf/aeo/otheranalysis/ongr.html>)

<sup>8</sup> ICF International, *Strengthening Our Economy: The Untapped U.S. Oil and Gas Resources*, report prepared for the American Petroleum Institute, December 5, 2008 ([http://www.api.org/Newsroom/upload/Access\\_Study\\_Final\\_Report\\_12\\_8\\_08.pdf](http://www.api.org/Newsroom/upload/Access_Study_Final_Report_12_8_08.pdf))

production, would also need to be delayed. Moreover, the updated analyses account for the fact that current and forecast oil and gas prices, along with exploration, development, and production costs, are considerably higher today than they were when the June 2006 analyses were conducted. Finally, the public policy situation with regard to leasing in OCS moratoria areas has changed considerably since June 2006; this factor has also been taken into consideration in these sensitivity analyses.

### **Accounting for Potential Leasing in the North Aleutian Basin and Previously Restricted Areas in the Eastern Gulf of Mexico**

Since the June 2006 study, MMS, in response to requests by the Governor of Alaska and many local and tribal entities, announced a planned lease sale for the North Aleutian Basin Planning Area in 2011 under its 2007-2012 Oil and Gas Outer Continental Shelf Leasing Program.<sup>9</sup> Consequently, potential production from this area will not be included in this revised assessment.

In addition, the Gulf of Mexico Energy Security Act of 2006 (GOMESAct)<sup>10</sup> requires that 8.3 million acres, included in both the Central Gulf Planning Area and the Eastern Gulf Planning Area, be offered for oil and gas leases. Approximately 2 million acres in the Central Gulf was first offered for lease after enactment of the law was and was included in Lease Sale 205 in October 2007. Approximately .5 million acres in the Eastern Gulf received additional environmental review and is being offered in Lease Sale 224 in March 2008.

For purposes of this assessment, the resource potential associated with these changes was estimated as the difference between the estimated resources reported in the Eastern Gulf of Mexico by MMS in its February 2006 Report to Congress (mean resources of 3.98 million barrels of oil and 22.16 Tcf of natural gas),<sup>11</sup> less the amount currently reported by MMS as the oil and gas resources in OCS areas unavailable for leasing and development in the Central and Eastern Gulf (mean resources of 3.65 million barrels of oil and 21.46 Tcf of natural gas).<sup>12</sup> This change amounts to an estimate of 330 million barrels of oil and 0.7 Tcf gas to areas to the leasable areas of the Gulf of Mexico.<sup>13</sup> Potential production from this area is the basis for a downward adjustment in the estimate of production potential in moratoria areas for the Central and Eastern Gulf.

These two changes result only a minor change to the original production forecasts. Specifically:

- Under the mean resource scenario, based on the January 2006 Congressional Budget Office (CBO) price forecast (the original basis for projections in the 2006 Advanced Resources' study), this amounts to:
  - Incremental crude oil production of 60,000 barrels per day in 2025
  - Incremental natural gas production of 69 Bcf/year by 2025
- Under the high resource scenario, at the January 2006 CBO price forecast, this amounts to:
  - Incremental crude oil production of 80,000 barrels per day in 2025
  - Incremental natural gas production of 108 Bcf/year by 2025.

<sup>9</sup> "MMS to Evaluate North Aleutian Basin for OCS Lease Sale," MMS press release issued April 8, 2008 (<http://www.mms.gov/alaska/latenews/newsrel/news%20releases%202008/nab%20214%20call%20030508.pdf>)

<sup>10</sup> <http://www.mms.gov/ooc/press/2008/FactSheet-MMSGOMSecurityActMARCH202008.htm>

<sup>11</sup> Minerals Management Service, *Report to Congress: Comprehensive Inventory of U.S. OCS Oil and Natural Gas Resources*, prepared for the U.S. Congress under requirements of the Energy Policy Act of 2005 – Section 357, February 2006; page 72

(<http://www.mms.gov/revaldiv/PDFs/FinalInvRptToCongress050106.pdf>)

<sup>12</sup> <http://www.mms.gov/revaldiv/PDFs/OilandGasResources0507.pdf>

<sup>13</sup> [http://www.doi.gov/news/07\\_News\\_Releases/070430a\\_factsheet.html](http://www.doi.gov/news/07_News_Releases/070430a_factsheet.html)

This impact on potential annual and cumulative oil and gas production is summarized below:

| Analysis Case   | Incremental Production by 2025 |             | Cumulative Production through 2025 |             | Difference |             |               |             |
|---|--------------------------------|-------------|------------------------------------|-------------|------------|-------------|---------------|-------------|
|   | Crude Oil                      | Natural Gas | Crude Oil                          | Natural Gas | Crude Oil  | Natural Gas | Crude Oil     | Natural Gas |
|   | (MMB/day)                      | (Bcf/year)  | (Million Bbl)                      | (Bcf)       | (MMB/day)  | (Bcf/year)  | (Million Bbl) | (Bcf)       |
| <b>2006 CASES</b>   |                                |             |                                    |             |            |             |               |             |
| <b>2006 Cases (CBO 1/06 CBO Prices) -- as published in report</b> |                                |             |                                    |             |            |             |               |             |
| Mean Resource   | 1.01                           | 1,394       | 2,758                              | 11,746      |            |             |               |             |
| High Resource*  | 1.61                           | 2,238       | 4,339                              | 18,431      |            |             |               |             |
| <b>Less Aleutian Basin</b>  |                                |             |                                    |             |            |             |               |             |
| Mean Resource   | 0.02                           | 45          | 89                                 | 601         |            |             |               |             |
| High Resource*  | 0.05                           | 89          | 214                                | 1,171       |            |             |               |             |
| <b>Less New Central &amp; Eastern Gulf</b>                        |                                |             |                                    |             |            |             |               |             |
| Mean Resource   | 0.03                           | 23          | 152                                | 308         |            |             |               |             |
| High Resource*  | 0.03                           | 19          | 163                                | 328         |            |             |               |             |
| <b>Revised Estimate of 2006 Case</b>                              |                                |             |                                    |             |            |             |               |             |
| Mean Resource   | 0.96                           | 1,326       | 2,517                              | 10,836      | 0.06       | 69          | 241           | 909         |
| High Resource*  | 1.53                           | 2,130       | 3,962                              | 16,932      | 0.08       | 108         | 377           | 1,498       |

This results in a lower baseline from which to compare the sensitivity analyses that provide the basis for this white paper.

### Accounting for Higher Offshore Costs

In the June 2006 report, Advanced Resources used MMS estimates<sup>14</sup> as the basis for its characterization of economically recoverable resources in the OCS moratoria areas. These estimates reflected information and economic considerations current as of January 1, 2003.

Since that time, significantly higher oil and gas prices; along with corresponding higher demand for oil and gas exploration rigs and services, has resulted in considerable increases in oil and gas development and production costs. For example, U.S. offshore finding costs have increased by 39% between 2003-2005 and 2004-2006.<sup>15</sup> Similarly, total U.S. offshore production costs have increased by 38% between 2003-2005 and 2004-2006.<sup>16</sup>

As further evidence of this trend, according to the American Petroleum Institute,<sup>17</sup> offshore drilling costs have increased by over 150% in just the last three years, and offshore operations and maintenance (O&M) costs have increased by almost 70%, according to the Energy Information Administration (EIA).<sup>18</sup>

Unfortunately, while an update is in progress, MMS has not published revised estimates of economically recoverable resources in the OCS moratoria areas since its 2006 assessment. Therefore, to account for these cost increases, the previous estimates of economically recoverable resources were adjusted to reflect the impact of these increased costs on production potential in the OCS moratoria areas. Specifically, this analysis assumed a \$25 per BOE shift in the cost-

<sup>14</sup> Minerals Management Service, *Assessment of Undiscovered Technically Recoverable Oil and Gas Resources of the Nation's Outer Continental Shelf*, 2006 MMS Fact Sheet RED-2006-01b, February 2006 (<http://www.mms.gov/revdiv/PDFs/2006NationalAssessmentBrochure.pdf>)

<sup>15</sup> Energy Information Administration, *Performance Profiles of Major Energy Producers – 2006*, DOE/EIA-0206(06), December 2007 (<http://www.eia.doe.gov/emeu/perfpro/020606.pdf>)

<sup>16</sup> *ibid*

<sup>17</sup> American Petroleum Institute, 2006 Joint Association Survey on Drilling Costs, April 2008 (<http://www.eia.doe.gov/emeu/perfpro/020606.pdf>)

<sup>18</sup> Energy Information Administration, *Oil and Gas Lease Equipment and Operating Costs 1988 Through 2006*, June 18, 2007 ([http://www.eia.doe.gov/pub/oil\\_gas/natural\\_gas/data\\_publications/cost\\_indices\\_equipment\\_production/current/coststudy.html](http://www.eia.doe.gov/pub/oil_gas/natural_gas/data_publications/cost_indices_equipment_production/current/coststudy.html))

supply curves (for both oil and natural gas) presented in the 2006 MMS assessment,<sup>19</sup> to reflect these increases in costs.

Based on this, similar to the June 2006 ARI report, the portion of technically recoverable resources estimated to be economic in the moratoria areas is assumed to be the same as that for the overall region and/or planning area. Technically recoverable resource estimates for the OCS moratoria areas were also based on an assessment by MMS.<sup>20</sup> These proportions of economic to technically recoverable resources are summarized, by region, as follows:

**Mean Undiscovered Technically and Economically Recoverable Resources for the Entire OCS as Adjusted for Higher Offshore Costs**

| Region    | Oil (Billion Barrels) |                         |                          |              |              | Gas (Trillion Cubic Feet) |                           |                            |              |               |
|-----------|-----------------------|-------------------------|--------------------------|--------------|--------------|---------------------------|---------------------------|----------------------------|--------------|---------------|
|           | Mean                  | Mean                    | Mean                     | %            | %            | Mean                      | Mean                      | Mean                       | %            | %             |
|           | Tech. Recov.          | Econ. Recov. @ \$60/Bbl | Econ. Recov. @ \$100/Bbl | @ \$60/Bbl   | @ \$100/Bbl  | Tech. Recov.              | Econ. Recov. @ \$9.00/Mcf | Econ. Recov. @ \$12.00/Mcf | @ 9.00/Mcf   | @ \$12.00/Mcf |
| Alaska    | 21.9                  | 2.8                     | 14.2                     | 12.8%        | 64.8%        | 132.1                     | 7.2                       | 52.7                       | 5.5%         | 39.9%         |
| Atlantic  | 3.7                   | 1.8                     | 2.5                      | 48.6%        | 67.6%        | 37.0                      | 9.7                       | 16.1                       | 26.2%        | 43.5%         |
| GOM       | 41.7                  | 32.7                    | 37.5                     | 78.4%        | 89.9%        | 232.5                     | 140.5                     | 178.1                      | 60.4%        | 76.6%         |
| Pacific   | <u>10.5</u>           | <u>6.5</u>              | <u>8.0</u>               | <u>61.9%</u> | <u>76.2%</u> | <u>18.3</u>               | <u>10.1</u>               | <u>12.6</u>                | <u>55.2%</u> | <u>68.9%</u>  |
| Total OCS | 77.8                  | 43.8                    | 62.2                     | 56.3%        | 79.9%        | 419.9                     | 167.5                     | 259.5                      | 39.9%        | 61.8%         |

Source: MMS, *Report to Congress: Comprehensive Inventory of U.S. OCS Oil and Natural Gas Resources*, Energy Policy Act of 2005, Section 357, February 2006

Economic values have been adjusted to reflect the ~ \$25/bbl effective price change associated w/ higher oil field costs

These revised estimates of economically recoverable resources were used for all of the sensitivity analyses considered in this report.

## New Oil and Gas Price Outlook

The June 2006 ARI assessment was developed primarily based the oil and gas price forecasts of the CBO as of January 2006, though alternative price scenarios based on the 2006 EIA Annual Energy Outlook (AEO) were also considered. Since that time, oil and gas prices have more than doubled, and forecasts of future prices have increased by even greater factors. This assessment examined the impact of two alternative price scenarios on potential future production from the OCS moratoria areas. The two price scenarios considered included:

- The 2008 EIA AEO Reference Case price outlook<sup>21</sup>
- The 2009 EIA AEO Reference Case price outlook (Early Release)<sup>22</sup>

<sup>19</sup> Minerals Management Service, *Assessment of Undiscovered Technically Recoverable Oil and Gas Resources of the Nation's Outer Continental Shelf*, 2006 MMS Fact Sheet RED-2006-01b, February 2006 (<http://www.mms.gov/revaldiv/PDFs/2006NationalAssessmentBrochure.pdf>)

<sup>20</sup> Minerals Management Service, *Report to Congress: Comprehensive Inventory of U.S. OCS Oil and Natural Gas Resources*, prepared for the U.S. Congress under requirements of the Energy Policy Act of 2005 – Section 357, February 2006 (<http://www.mms.gov/revaldiv/PDFs/FinalInvRptToCongress050106.pdf>)

<sup>21</sup> Energy Information Administration, *Annual Energy Outlook 2008*, DOE/EIA-0383(2008), June 2008 (<http://www.eia.doe.gov/oiaf/archive/aeo08/index.html>)

<sup>22</sup> Energy Information Administration, *Annual Energy Outlook 2009*, DOE/EIA-0383(2009), December 2008 (Early Release) (<http://www.eia.doe.gov/oiaf/aeo/>)

A comparison of these price forecasts is provided below:

|  | <u>2010</u> | <u>2020</u> | <u>2030</u> |
|--|-------------|-------------|-------------|
| <b><u>CRUDE OIL (\$/Bbl) -- Light Sweet</u></b>  |             |             |             |
| <u>June 2006 Study</u>                           |             |             |             |
| January 2006 CBO (2006\$)                        | \$52.29     | \$52.75     | \$52.75     |
| <u>October 2008 Sensitivity Analyses</u>         |             |             |             |
| AEO 2008 Reference (2006\$)                      | \$74.03     | \$59.70     | \$70.45     |
| AEO 2009 Reference (2007\$)                      | \$77.97     | \$115.64    | \$130.50    |
| <br>   |             |             |             |
| <b><u>NATURAL GAS - Henry Hub (\$/MMBtu)</u></b> |             |             |             |
| <u>June 2006 Study</u>                           |             |             |             |
| January 2006 CBO (2006\$)                        | \$8.53      | \$8.63      | \$8.63      |
| <u>October 2008 Sensitivity Analyses</u>         |             |             |             |
| AEO 2008 Reference (2006\$)                      | \$6.90      | \$5.95      | \$7.22      |
| AEO 2009 Reference (2007\$)                      | \$6.52      | \$7.43      | \$9.25      |

Estimates of economically recoverable resources at an oil price of \$60 per barrel, and a natural gas price of \$9 per Mcf, were used for the AEO 2008 Reference Case assessment, and an oil price of \$80 per barrel, and a natural gas price of \$12 per Mcf were used for the AEO 2009 Reference Case assessment.

### **Resource Base**

The June 2006 Advanced Resources' analysis estimated the potential economic benefits associated with leasing in all of the areas under moratoria, and considered some specific areas under consideration in proposed legislation at that time.<sup>23</sup> This update takes into consideration areas that are now available for leasing, such as the North Aleutian basin and the Central and Western Gulf. It is recognized that not all of the existing moratoria areas may eventually be opened up to leasing – this analysis merely lays out the economic benefits that could result if they were. Specifically, the areas considered included:

- Offshore Atlantic planning areas of North Atlantic, Mid-Atlantic, South Atlantic, and the Straits of Florida
- Offshore Eastern Gulf of Mexico (including the areas proposed, but not offered, as part of Lease Sale 181), plus the areas formerly previously under moratoria and are now being considered for leasing (as described above).
- Areas unavailable for leasing in the Offshore Pacific, which includes the OCS off the coasts of California, Oregon and Washington.

The resource potential associated with these specific areas is summarized below, with estimates presented for both the mean and high (5% probability of resource being this value or larger) estimates, as summarized below:

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<sup>23</sup> The "Offshore State Options Act of 2005," introduced in the Fall of 2005 by Representative Richard Pombo (R-CA)

## Undiscovered Technically Recoverable Oil and Natural Gas Resources in Moratoria Areas of the U.S. OCS<sup>24,25</sup>

| <u>Moratoria Area</u>          | Crude Oil<br>(Billion Barrels) |                           | Natural Gas<br>(Tcf) |              |
|--------------------------------|--------------------------------|---------------------------|----------------------|--------------|
|                                | <u>Mean</u>                    | <u>High</u> <sup>26</sup> | <u>Mean</u>          | <u>High</u>  |
| Atlantic Offshore              | 3.82                           | 7.57                      | 36.99                | 66.46        |
| Central/Eastern Gulf of Mexico | 3.65                           | 5.18                      | 21.46                | 25.92        |
| <u>Pacific Offshore</u>        | <u>10.37</u>                   | <u>13.94</u>              | <u>18.02</u>         | <u>24.12</u> |
| <b>Total Moratoria Areas</b>   | <b>17.84</b>                   |                           | <b>76.47</b>         |              |

The basis of the resource estimates for the areas traditionally under leasing moratoria is based on geological and geophysical data that is nearly three decades old. Nearly all of the seismic data providing the basis for these assessments is the result of two-dimensional data shot, and limited exploration drilling that occurred, in the 1970s. Clearly, history has shown that as exploration and development drilling takes place in a basin, and as resource is reevaluated with improved technologies, resource estimates tend to grow over time. For example, the MMS estimates of total crude oil resources in the Federal OCS increased 279% between 1987 and 2003. This represents a compound annual growth rate of 6.23% over this 17 year period.<sup>27</sup>

Based on this, several cases in these sensitivity analyses examine the impact on potential future production if the resource base in the OCS moratoria areas grows over time at a rate consistent with that which has occurred in the Gulf of Mexico OCS over the last 17 years. The impact of this growth rate was examined as applied to the MMS mean resource estimates.

### Timing of Oil and Gas Leasing and Development

In the June 2006 Advanced Resources' assessment, leasing varied somewhat by region and distance from shore, depending on whether or not leasing was currently taking place in the area, and on the relative likelihood that coastal states in the region would be willing to opt-out under the terms set forth in the proposed legislation being considered at that time. Specifically:

- In the North Aleutian Basin, leasing was assumed to begin in 2007, based on the current interest by the state of Alaska to consider potential leasing in this area. As described above, leasing is now planned in this basin.
- In the Atlantic OCS, it was assumed that some leasing would begin in 2012. This is despite the fact that a few states may choose to recommend leasing more quickly. This was not changed in these sensitivity analyses.

<sup>24</sup> The high resource case refers to the estimated volume of resource for which there is a 5% probability (1 in 20 chances) that there is that amount or more hydrocarbon resources remaining to be discovered. In developing the high case estimates for the Central/Eastern GOM, the ratio of the total Eastern GOM (EGOM) 5th Percentile undiscovered technically recoverable resource (UTRR) estimate to the total EGOM mean UTRR was assumed, since over 90% of the unavailable UTRR is in the EGOM.

<sup>25</sup> U.S. Department of Interior, Minerals Management Service, *Planning Area Resources Addendum to Assessment of Undiscovered Technically Recoverable Oil and Gas Resources of the Nation's Outer Continental Shelf, 2006*; MMS Fact Sheet RED-2006-02, July, 2006 (<http://www.mms.gov/revaldiv/PDFs/NA2006BrochurePlanningAreaInsert.pdf>)

<sup>26</sup> Because the high case (5% probability) estimates are based on statistical cumulative probability distributions, they cannot be summed.

<sup>27</sup> Much of the logic and analyses contributing to these findings is attributable to David Morehouse of the Energy Information Administration

- In the Eastern Gulf of Mexico Planning Area, leasing was assumed to begin in 2012. This was not changed in these sensitivity analyses for the remaining areas unavailable for leasing in the Eastern and Central Gulf.<sup>28</sup>
- In the Pacific OCS Planning areas, leasing was assumed to begin in 2012. This was not changed in these sensitivity analyses.

In the 2006 analysis, it was assumed that it would take three years between the year of first leasing and the year of first production. This is a fairly aggressive assumption, which implies that a reasonably functioning offshore leasing program is established in each region by the time leasing begins (similar to that currently in place in the Gulf of Mexico), and that all litigation regarding leasing is resolved.

Some have expressed alternative (both shorter and longer) leasing and development schedules. As an alternative assumption, for purposes of these sensitivity analyses, alternative forecasts were developed assuming six years between the year of first leasing and the year of first production for all Planning Areas except the Central Gulf of Mexico.

### **Pace of Development and Production**

Once leasing was assumed to take place, and initial development has commenced, an important assumption is the pace at which the economic resource base gets developed. In the June 2006 study, the pace of development assumed varied by region, but was somewhat aggressive. This pace was determined as a function of the size of the resource and the leasing history in the region, and is summarized below.

#### **Number of Years to Fully Develop Economic Resource Originally Assumed**

|                       |          |
|-----------------------|----------|
| Atlantic OCS          | 25 years |
| Central & Eastern GOM | 20 years |
| Pacific OCS           | 30 years |

For the present analyses, an alternative slower pace case was also considered, as follows:

#### **Number of Years to Fully Develop Economic Resource Under Slower Resource Case**

|                       |          |
|-----------------------|----------|
| Atlantic OCS          | 35 years |
| Central & Eastern GOM | 30 years |
| Pacific OCS           | 40 years |

For all regions, the timing of production was estimated based a reserves-to-production ratio of 8-to-1 for crude oil and 6-to-1 for natural gas, based on historical reserves-to-production ratios in the Gulf of Mexico. This also has remained unchanged in these sensitivity analyses.

## **SUMMARY OF RESULTS**

Overall, eight different cases were assessed as part of these sensitivity analyses. These eight cases are summarized as follows:

1. A new Reference Case based on the new offshore cost assumptions. This case was assessed for both the MMS mean and high resource cases.

<sup>28</sup> This is despite the fact that the Gulf of Mexico Energy Security Act (GOMESAct) established a moratorium through 2022 in the vast majority of the Eastern Planning Area and a small portion of the Central Planning Area.

2. A variation on Case 1, doubling the time between leasing and first development.
3. A variation on Case 1, but including the assumption that the resource base in the newly developed areas will increase over time. This was considered for only the MMS mean resource case.
4. A variation on Case 3, again doubling the time between leasing and first development.
5. A variation on Case 1, but under the slower pace of development and production.
6. A variation on Case 5, but also doubling the time between leasing and first development.
7. A variation on Case 3, but under the slower pace of development and production.
8. A variation on Case 7, but also doubling the time between leasing and first development.

### Effect of Higher Costs and More Recent Forecasts for Oil and Gas Prices

The Reference Case (Case 1) is based on the new offshore cost assumptions, but no other modifications. Assuming the MMS estimates for mean undiscovered oil and gas resources in the areas in question, by 2025, U.S. crude oil production could increase by about 0.87 million barrels per day for the AEO 2008 Reference Case scenario, and 1.07 million barrels per day by 2025 for the AEO 2009 Reference Case. U.S. natural gas production could increase by nearly 1.15 Tcf per year by 2025 in the AEO 2008 Reference Case, and 1.58 Tcf per year in the AEO 2009 Reference Case. Depending on future prices, this could result in cumulative oil production through 2025 of from 2.1 to 2.6 billion barrels and from 7.9 to 10.9 Tcf of natural gas.

Relative to the 2006 analyses assuming the 2006 CBO price outlook, estimated incremental production by 2025 is a little less (0.09 million barrels per day and 179 Bcf per year) for the AEO Reference Case, and a little higher (0.11 million barrels per day and 250 Bcf per year) for the AEO 2009 Reference Case.

These results are summarized in the following table:

| Analysis Case   | Incremental Production by 2025 |                           | Cumulative Production through 2025 |                      | Difference   |                           |                                    |                      |         |
|---|--------------------------------|---------------------------|------------------------------------|----------------------|--|---------------------------|------------------------------------|----------------------|---------|
|   | Crude Oil<br>(MMB/day)         | Natural Gas<br>(Bcf/year) | Crude Oil<br>(Million Bbl)         | Natural Gas<br>(Bcf) | Incremental Production by 2025                       |                           | Cumulative Production through 2025 |                      |         |
|   |                                |                           |                                    |                      | Crude Oil<br>(MMB/day)                               | Natural Gas<br>(Bcf/year) | Crude Oil<br>(Million Bbl)         | Natural Gas<br>(Bcf) |         |
| <b>2006 CASES</b>   |                                |                           |                                    |                      |  |                           |                                    |                      |         |
| 2006 Cases (CBO 1/06 CBO Prices) -- as published in report              |                                |                           |                                    |                      |  |                           |                                    |                      |         |
|   | Mean Resource                  | 1.01                      | 1,394                              | 2,758                |  |                           |                                    |                      |         |
|   | High Resource*                 | 1.61                      | 2,238                              | 4,339                |  |                           |                                    |                      |         |
| Less Aleutian Basin   |                                |                           |                                    |                      |  |                           |                                    |                      |         |
|   | Mean Resource                  | 0.02                      | 45                                 | 89                   |  |                           |                                    |                      |         |
|   | High Resource*                 | 0.05                      | 89                                 | 214                  |  |                           |                                    |                      |         |
| Less New Central & Eastern Gulf   |                                |                           |                                    |                      |  |                           |                                    |                      |         |
|   | Mean Resource                  | 0.03                      | 23                                 | 152                  |  |                           |                                    |                      |         |
|   | High Resource*                 | 0.03                      | 19                                 | 163                  |  |                           |                                    |                      |         |
| Revised Estimate of 2006 Case   |                                |                           |                                    |                      |  |                           |                                    |                      |         |
|   | Mean Resource                  | 0.96                      | 1,326                              | 2,517                | 0.06   | 69                        | 241                                | 909                  |         |
|   | High Resource*                 | 1.53                      | 2,130                              | 3,962                | 0.08   | 108                       | 377                                | 1,498                |         |
| <b>2009 CASES</b>   |                                |                           |                                    |                      |  |                           |                                    |                      |         |
| <b>1. NEW OIL PRICES -- New Offshore Costs (Revised REFERENCE CASE)</b> |                                |                           |                                    |                      |  |                           |                                    |                      |         |
| AEO 2008 Reference Case   |                                |                           |                                    |                      | Relative to 2006 case less areas planned for leasing |                           |                                    |                      |         |
|   | Mean Resource                  | 0.87                      | 1,147                              | 2,089                | 7,944  | (0.09)                    | (179)                              | (429)                | (2,893) |
|   | High Resource*                 | 1.29                      | 1,613                              | 3,089                | 11,173   | (0.24)                    | (517)                              | (872)                | (5,760) |
| AEO 2009 Reference Case   |                                |                           |                                    |                      |  |                           |                                    |                      |         |
|   | Mean Resource                  | 1.07                      | 1,576                              | 2,570                | 10,914   | 0.11                      | 250                                | 52                   | 78      |
|   | High Resource*                 | 1.60                      | 2,267                              | 3,832                | 15,698   | 0.07                      | 136                                | (129)                | (1,234) |

*It is important to note that estimates were developed for several sensitivities assuming the MMS high resource case. However, as stated in footnote 26, since production forecasts for each MMS region are based on statistical cumulative probability distributions, and only the mean estimates can be summed, the sum of the regions is not statistically correct. We decided to present the*

numbers here merely to illustrate that the incremental production for the MMS high resource case could approach, but would not likely be equal to, the sum of the individual regions.

### Effect of Longer Time between Leasing and First Development

The time between leasing and first development is doubled (from three to six years), for all regions. For this case, assuming the MMS mean undiscovered resource estimates, by 2025, U.S. crude oil production could increase by about 0.72 million barrels per day for the AEO 2008 Reference Case scenario, and 0.88 million barrels per day by 2025 for the AEO 2009 Reference Case. U.S. natural gas production could increase by nearly 0.99 Tcf per year by 2025 in the AEO 2008 Reference Case, and 1.36 Tcf per year in the AEO 2009 Reference Case. Depending on future prices, this could result in cumulative oil production through 2025 of from 1.2 to 1.5 billion barrels and from 4.6 to 6.4 Tcf of natural gas.

Relative to Case 1, estimated incremental production by 2025 is less (0.15 million barrels per day and 161 Bcf per year) for the AEO 2008 Reference Case, and the difference is even greater (0.19 million barrels per day and 221 Bcf per year lower) for the AEO 2009 Reference Case.

These results are summarized in the table below.

| Analysis Case   | Incremental Production by 2025 |             | Cumulative Production through 2025 |             | Difference |             |               |             |
|---|--------------------------------|-------------|------------------------------------|-------------|------------|-------------|---------------|-------------|
|   | Crude Oil                      | Natural Gas | Crude Oil                          | Natural Gas | Crude Oil  | Natural Gas | Crude Oil     | Natural Gas |
|   | (MMB/day)                      | (Bcf/year)  | (Million Bbl)                      | (Bcf)       | (MMB/day)  | (Bcf/year)  | (Million Bbl) | (Bcf)       |
| <b>2009 CASES</b>   |                                |             |                                    |             |            |             |               |             |
| <b>1. NEW OIL PRICES -- New Offshore Costs (Revised REFERENCE CASE)</b>                             |                                |             |                                    |             |            |             |               |             |
| <b>AEO 2008 Reference Case</b>  |                                |             |                                    |             |            |             |               |             |
| Mean Resource   | 0.87                           | 1,147       | 2,089                              | 7,944       |            |             |               |             |
| High Resource*  | 1.29                           | 1,613       | 3,089                              | 11,173      |            |             |               |             |
| <b>AEO 2009 Reference Case</b>  |                                |             |                                    |             |            |             |               |             |
| Mean Resource   | 1.07                           | 1,576       | 2,570                              | 10,914      |            |             |               |             |
| High Resource*  | 1.60                           | 2,267       | 3,832                              | 15,698      |            |             |               |             |
| <b>2. NEW OIL PRICES -- New Offshore Costs -- Longer time between leasing and first development</b> |                                |             |                                    |             |            |             |               |             |
| <b>AEO 2008 Reference Case</b>  |                                |             |                                    |             |            |             |               |             |
| Mean Resource   | 0.72                           | 986         | 1,186                              | 4,644       | (0.15)     | (161)       | (903)         | (3,299)     |
| High Resource*  | 1.06                           | 1,387       | 1,754                              | 6,532       | (0.23)     | (226)       | (1,335)       | (4,641)     |
| <b>AEO 2009 Reference Case</b>  |                                |             |                                    |             |            |             |               |             |
| Mean Resource   | 0.88                           | 1,355       | 1,459                              | 6,381       | (0.19)     | (221)       | (1,111)       | (4,533)     |
| High Resource*  | 1.32                           | 1,949       | 2,176                              | 9,178       | (0.28)     | (318)       | (1,656)       | (6,520)     |

### Effect of Resource Growth

Case 3 is the same as Case 1, but including the assumption that the resource base in the newly developed areas will increase over time. This was considered for only the MMS mean resource case. By 2025, U.S. crude oil production could increase by about 1.03 million barrels per day for the AEO 2008 Reference Case scenario, and 1.26 million barrels per day for the AEO 2009 Reference Case. U.S. natural gas production could increase by nearly 1.36 Tcf per year by 2025 in the AEO 2008 Reference Case, and 1.87 Tcf per year in the AEO 2009 Reference Case. Depending on future prices, this could result in cumulative oil production through 2025 of from 2.3 to 2.9 billion barrels and from 8.9 to 12.2 Tcf of natural gas.

Relative to Case 1, estimated incremental oil production by 2025 is about 0.15 million barrels per day greater, and natural gas production is about 213 Bcf per year greater for the AEO 2008 Reference Case. The difference is even greater in the AEO 2009 Reference Case, amounting to 0.19 million barrels per day of oil and 293 Bcf per year of natural gas.

These results are summarized in the table below.

| Analysis Case   | Incremental Production by 2025 |             | Cumulative Production through 2025 |             | Difference                     |             |                                    |             |
|---|--------------------------------|-------------|------------------------------------|-------------|--------------------------------|-------------|------------------------------------|-------------|
|   | Crude Oil                      | Natural Gas | Crude Oil                          | Natural Gas | Incremental Production by 2025 |             | Cumulative Production through 2025 |             |
|   | (MMB/day)                      | (Bcf/year)  | (Million Bbl)                      | (Bcf)       | Crude Oil                      | Natural Gas | Crude Oil                          | Natural Gas |
| <b>2008 CASES</b>   |                                |             |                                    |             |                                |             |                                    |             |
| <b>1. NEW OIL PRICES -- New Offshore Costs (Revised REFERENCE CASE)</b> |                                |             |                                    |             |                                |             |                                    |             |
| <b>AEO 2008 Reference Case</b>  |                                |             |                                    |             |                                |             |                                    |             |
| Mean Resource   | 0.87                           | 1,147       | 2,089                              | 7,944       |                                |             |                                    |             |
| High Resource*  | 1.49                           | 2,067       | 3,564                              | 14,317      |                                |             |                                    |             |
| <b>AEO 2008 High Price Case</b>   |                                |             |                                    |             |                                |             |                                    |             |
| Mean Resource   | 1.07                           | 1,576       | 2,570                              | 10,914      |                                |             |                                    |             |
| High Resource*  | 1.83                           | 2,842       | 4,377                              | 19,684      |                                |             |                                    |             |
| <b>3. NEW OIL PRICES -- New Offshore Costs -- Add Resource Growth</b>   |                                |             |                                    |             |                                |             |                                    |             |
| <b>AEO 2008 Reference Case</b>  |                                |             |                                    |             |                                |             |                                    |             |
| Mean Resource   | 1.03                           | 1,360       | 2,321                              | 8,864       | 0.15                           | 213         | 232                                | 921         |
| <b>AEO 2008 High Price Case</b>   |                                |             |                                    |             |                                |             |                                    |             |
| Mean Resource   | 1.26                           | 1,869       | 2,855                              | 12,179      | 0.19                           | 293         | 285                                | 1,265       |

### Effect of Slower Pace of Development

Case 5 is the same as Case 1, except that a much slower pace of development and production is assumed for all areas. For the MMS mean resource case, by 2025, incremental U.S. crude oil production could decrease to about 0.62 million barrels per day for the AEO 2008 Reference Case scenario, and 0.77 million barrels per day for AEO 2009 Reference Case. U.S. natural gas production could decrease to 0.80 Tcf per year by 2025 in the AEO 2008 Reference Case, and 1.11 Tcf per year in the AEO 2009 Reference Case. Depending on future prices, this could result in cumulative oil production through 2025 of from 1.5 to 2.5 billion barrels and from 5.6 to 7.7 Tcf of natural gas.

Relative to Case 1, estimated incremental oil production by 2025 is about 0.25 million barrels per day less, and natural gas production is about 344 Bcf per year less for the AEO 2008 Reference Case. The difference is even greater in the AEO 2009 Reference Case, amounting to 0.30 million barrels per day of oil and 471 Bcf per year of natural gas.

These results are summarized in the table below.

| Analysis Case   | Incremental Production by 2025 |             | Cumulative Production through 2025 |             | Difference                     |             |                                    |             |
|---|--------------------------------|-------------|------------------------------------|-------------|--------------------------------|-------------|------------------------------------|-------------|
|   | Crude Oil                      | Natural Gas | Crude Oil                          | Natural Gas | Incremental Production by 2025 |             | Cumulative Production through 2025 |             |
|   | (MMB/day)                      | (Bcf/year)  | (Million Bbl)                      | (Bcf)       | Crude Oil                      | Natural Gas | Crude Oil                          | Natural Gas |
| <b>2009 CASES</b>   |                                |             |                                    |             |                                |             |                                    |             |
| <b>1. NEW OIL PRICES -- New Offshore Costs (Revised REFERENCE CASE)</b> |                                |             |                                    |             |                                |             |                                    |             |
| <b>AEO 2008 Reference Case</b>  |                                |             |                                    |             |                                |             |                                    |             |
| Mean Resource   | 0.87                           | 1,147       | 2,089                              | 7,944       |                                |             |                                    |             |
| High Resource*  | 1.29                           | 1,613       | 3,089                              | 11,173      |                                |             |                                    |             |
| <b>AEO 2009 Reference Case</b>  |                                |             |                                    |             |                                |             |                                    |             |
| Mean Resource   | 1.07                           | 1,576       | 2,570                              | 10,914      |                                |             |                                    |             |
| High Resource*  | 1.60                           | 2,267       | 3,832                              | 15,698      |                                |             |                                    |             |
| <b>5. NEW OIL PRICES -- New Offshore Costs -- Slower Development</b>    |                                |             |                                    |             |                                |             |                                    |             |
| <b>AEO 2008 Reference Case</b>  |                                |             |                                    |             |                                |             |                                    |             |
| Mean Resource   | 0.62                           | 803         | 1,496                              | 5,564       | (0.25)                         | (344)       | (593)                              | (2,380)     |
| High Resource*  | 0.92                           | 1,134       | 2,209                              | 7,856       | (0.37)                         | (479)       | (880)                              | (3,317)     |
| <b>AEO 2009 Reference Case</b>  |                                |             |                                    |             |                                |             |                                    |             |
| Mean Resource   | 0.77                           | 1,105       | 1,843                              | 7,654       | (0.30)                         | (471)       | (726)                              | (3,260)     |
| High Resource*  | 1.14                           | 1,596       | 2,745                              | 11,053      | (0.45)                         | (671)       | (1,087)                            | (4,645)     |

Moreover, doubling the time from leasing to first development decreases production potential even more (Case 6). Similar results are obtained when applied to the case where resources are assumed to grow over time (Cases 7 and 8).

A summary of all eight sensitivity runs considered in this analysis are summarized in the Appendix A to this document.

## Conclusions

Based on all the cases considered, the overall findings for this set of sensitivity analyses can be summarized as follows:

- Incremental oil production from the areas previously under leasing moratoria could range from 0.51 to 1.60 million barrels per day in 2025, with an average under all eight scenarios of 0.93 million barrels per day.
- Incremental natural gas production from these areas could range from 0.69 to 2.3 Tcf per year by 2025, with an average of 1.3 Tcf per year for the eight scenarios considered.
- Cumulative oil production from these areas by 2025 could range from 0.8 to 3.8 billion barrels, with an average under all eight scenarios of 1.9 billion barrels.
- Cumulative natural gas production from these areas could range from 3.3 to 15.7 Tcf by 2025, with an average of 7.6 Tcf for the eight scenarios.

The economic benefits associated with this production potential include:

- The oil and gas industry could spend from \$94 to \$298 billion dollars in the U.S. by 2025 to develop these resources.
- Between now and 2025, the reduction in the U.S. trade imbalance due to decreased crude oil imports offset by this production could range from \$44 to \$372 billion; this assumes that domestically produced crude oil serves to offset imports on a one-to-one basis.
- The U.S. would collect an additional \$11 to \$83 billion in royalties by 2025 from OCS production.<sup>29</sup>
- An additional \$1 to \$5 billion in federal income taxes would be collected from OCS production between now and 2025.
- The economic activity generated by this development would result in the addition of 18,000 to 190,000 domestic, high-paying jobs by 2025.

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<sup>29</sup> No assumption is made about how federal royalty revenues may be shared or allocated with coastal states.

## APPENDIX A

### SUMMARY OF ESTIMATES OF PRODUCTION POTENTIAL AND ASSOCIATED ECONOMIC BENEFITS FOR ALL CASES CONSIDERED

|   |                | Incremental Production<br>by 2025 |       | Cumulative Production<br>through 2025 |        | Cumulative<br>Investment<br>to 2025<br>(\$MM) | Value of<br>Avoided Oil<br>Imports to<br>2025<br>(\$MM) | Cum.<br>Federal<br>Royalties to<br>2025<br>(\$MM) | Cum. Federal<br>Inc. Taxes to<br>2025<br>(\$MM) | Direct Jobs by<br>2025 | Total Jobs by<br>2025 |
|---|----------------|-----------------------------------|-------|---------------------------------------|--------|---|---|---|---|------------------------|-----------------------|
| <b>2009 CASES</b>   |                |                                   |       |                                       |        |   |   |   |   |                        |                       |
| <b>1. NEW OIL PRICES -- New Offshore Costs (Revised REFERENCE CASE)</b>   |                |                                   |       |                                       |        |   |   |   |   |                        |                       |
| <b>AEO 2008 Reference Case</b>  |                |                                   |       |                                       |        |   |   |   |   |                        |                       |
|   | Mean Resource  | 0.87                              | 1,147 | 2,089                                 | 7,944  | \$158,758                                     | \$111,372   | \$27,041  | \$2,526   | 67,701                 | 161,501               |
|   | High Resource* | 1.29                              | 1,613 | 3,089                                 | 11,173 | \$231,160                                     | \$161,615   | \$39,452  | \$3,664   | 97,353                 | 217,326               |
| <b>AEO 2009 Reference Case</b>  |                |                                   |       |                                       |        |   |   |   |   |                        |                       |
|   | Mean Resource  | 1.07                              | 1,576 | 2,570                                 | 10,914 | \$202,357                                     | \$253,793   | \$56,384  | \$3,248   | 84,856                 | 196,591               |
|   | High Resource* | 1.60                              | 2,267 | 3,832                                 | 15,698 | \$298,140                                     | \$372,317   | \$83,456  | \$4,773   | 123,164                | 264,225               |
| <b>2. NEW OIL PRICES -- New Offshore Costs -- Longer time between leasing and first development</b>                       |                |                                   |       |                                       |        |   |   |   |   |                        |                       |
| <b>AEO 2008 Reference Case</b>  |                |                                   |       |                                       |        |   |   |   |   |                        |                       |
|   | Mean Resource  | 0.72                              | 986   | 1,186                                 | 4,644  | \$132,615                                     | \$62,206  | \$15,592  | \$1,451   | 105,163                | 248,879               |
|   | High Resource* | 1.06                              | 1,387 | 1,754                                 | 6,532  | \$192,996                                     | \$89,500  | \$22,741  | \$2,104   | 150,939                | 334,299               |
| <b>AEO 2009 Reference Case</b>  |                |                                   |       |                                       |        |   |   |   |   |                        |                       |
|   | Mean Resource  | 0.88                              | 1,355 | 1,459                                 | 6,381  | \$169,202                                     | \$136,279   | \$31,393  | \$1,867   | 132,211                | 303,275               |
|   | High Resource* | 1.32                              | 1,949 | 2,176                                 | 9,178  | \$249,197                                     | \$198,289   | \$46,449  | \$2,742   | 191,593                | 406,857               |
| <b>3. NEW OIL PRICES -- New Offshore Costs -- Add Resource Growth</b>   |                |                                   |       |                                       |        |   |   |   |   |                        |                       |
| <b>AEO 2008 Reference Case</b>  |                |                                   |       |                                       |        |   |   |   |   |                        |                       |
|   | Mean Resource  | 1.03                              | 1,360 | 2,321                                 | 8,864  | \$187,329                                     | \$123,367   | \$30,117  | \$2,811   | 25,871                 | 65,676                |
| <b>AEO 2009 Reference Case</b>  |                |                                   |       |                                       |        |   |   |   |   |                        |                       |
|   | Mean Resource  | 1.26                              | 1,869 | 2,855                                 | 12,179 | \$238,823                                     | \$279,615   | \$62,500  | \$3,615   | 31,630                 | 79,307                |
| <b>4. NEW OIL PRICES -- New Offshore Costs -- Add Resource Growth-- Longer time between leasing and first development</b> |                |                                   |       |                                       |        |   |   |   |   |                        |                       |
| <b>AEO 2008 Reference Case</b>  |                |                                   |       |                                       |        |   |   |   |   |                        |                       |
|   | Mean Resource  | 0.87                              | 1,199 | 1,418                                 | 5,565  | \$161,186                                     | \$74,201  | \$18,668  | \$1,736   | 63,333                 | 153,054               |
| <b>AEO 2009 Reference Case</b>  |                |                                   |       |                                       |        |   |   |   |   |                        |                       |
|   | Mean Resource  | 1.07                              | 1,648 | 1,744                                 | 7,646  | \$205,669                                     | \$162,101   | \$37,509  | \$2,234   | 78,985                 | 185,990               |
| <b>5. NEW OIL PRICES -- New Offshore Costs -- Slower Development</b>  |                |                                   |       |                                       |        |   |   |   |   |                        |                       |
| <b>AEO 2008 Reference Case</b>  |                |                                   |       |                                       |        |   |   |   |   |                        |                       |
|   | Mean Resource  | 0.62                              | 803   | 1,496                                 | 5,564  | \$112,959                                     | \$79,777  | \$19,249  | \$1,793   | 47,936                 | 116,559               |
|   | High Resource* | 0.92                              | 1,134 | 2,209                                 | 7,856  | \$164,531                                     | \$115,603   | \$28,091  | \$2,604   | 68,962                 | 156,829               |
| <b>AEO 2009 Reference Case</b>  |                |                                   |       |                                       |        |   |   |   |   |                        |                       |
|   | Mean Resource  | 0.77                              | 1,105 | 1,843                                 | 7,654  | \$144,102                                     | \$182,079   | \$40,252  | \$2,308   | 60,157                 | 142,025               |
|   | High Resource* | 1.14                              | 1,596 | 2,745                                 | 11,053 | \$212,396                                     | \$266,720   | \$59,566  | \$3,395   | 87,361                 | 190,879               |

**APPENDIX A**  
**SUMMARY OF ESTIMATES OF PRODUCTION POTENTIAL AND ASSOCIATED ECONOMIC**  
**BENEFITS FOR ALL CASES CONSIDERED**  
**(Continued)**

|   |                | Incremental Production by<br>2025 | Cumulative Production<br>through 2025 |              | Cumulative<br>Investment<br>to 2025 | Value of<br>Avoided Oil<br>Imports to<br>2025 | Cum. Federal<br>Royalties to<br>2025 | Cum. Federal<br>Inc. Taxes to<br>2025 | Direct<br>Jobs by<br>2025 | Total<br>Jobs by<br>2025 |                |
|---|----------------|-----------------------------------|---------------------------------------|--------------|-------------------------------------|---|--------------------------------------|---------------------------------------|---------------------------|--------------------------|----------------|
|   |                |                                   |                                       |              | (\$MM)                              | (\$MM)  | (\$MM)                               | (\$MM)                                |                           |                          |                |
| <b><u>2009 CASES</u></b>  |                |                                   |                                       |              |                                     |   |                                      |                                       |                           |                          |                |
| <b><u>6. NEW OIL PRICES -- New Offshore Costs -- Longer time between leasing and first development -- Slower Development</u></b>                      |                |                                   |                                       |              |                                     |   |                                      |                                       |                           |                          |                |
| <b>AEO 2008 Reference Case</b>  |                |                                   |                                       |              |                                     |   |                                      |                                       |                           |                          |                |
|   | Mean Resource  | 0.51                              | 691                                   | 849          | 3,253                               | \$94,344                                      | \$44,562                             | \$11,098                              | \$1,030                   | 74,411                   | 179,490        |
|   | High Resource* | 0.76                              | 975                                   | 1,254        | 4,593                               | \$137,353                                     | \$64,023                             | \$16,191                              | \$1,495                   | 106,868                  | 241,096        |
| <b>AEO 2009 Reference Case</b>  |                |                                   |                                       |              |                                     |   |                                      |                                       |                           |                          |                |
|   | Mean Resource  | 0.63                              | 950                                   | 1,046        | 4,475                               | \$120,473                                     | \$97,781                             | \$22,406                              | \$1,326                   | 93,662                   | 218,922        |
|   | High Resource* | 0.94                              | 1,372                                 | 1,558        | 6,462                               | \$177,507                                     | \$142,063                            | \$33,147                              | \$1,951                   | 135,826                  | 293,723        |
| <b><u>7. NEW OIL PRICES -- New Offshore Costs -- Add Resource Growth -- Slower Development</u></b>  |                |                                   |                                       |              |                                     |   |                                      |                                       |                           |                          |                |
| <b>AEO 2008 Reference Case</b>  |                |                                   |                                       |              |                                     |   |                                      |                                       |                           |                          |                |
|   | Mean Resource  | 0.73                              | 953                                   | 1,662        | 6,208                               | \$133,277                                     | \$88,370                             | \$21,438                              | \$1,996                   | 18,417                   | 47,661         |
| <b>AEO 2009 Reference Case</b>  |                |                                   |                                       |              |                                     |   |                                      |                                       |                           |                          |                |
|   | Mean Resource  | 0.90                              | 1,311                                 | 2,048        | 8,542                               | \$170,058                                     | \$200,609                            | \$44,617                              | \$2,569                   | 22,555                   | 57,643         |
| <b><u>8. NEW OIL PRICES -- New Offshore Costs -- Add Resource Growth-- Longer time between leasing and first development - Slower Development</u></b> |                |                                   |                                       |              |                                     |   |                                      |                                       |                           |                          |                |
| <b>AEO 2008 Reference Case</b>  |                |                                   |                                       |              |                                     |   |                                      |                                       |                           |                          |                |
|   | Mean Resource  | 0.62                              | 840                                   | 1,015        | 3,898                               | \$114,662                                     | \$53,155                             | \$13,287                              | \$1,232                   | 44,892                   | 110,592        |
| <b>AEO 2009 Reference Case</b>  |                |                                   |                                       |              |                                     |   |                                      |                                       |                           |                          |                |
|   | Mean Resource  | 0.77                              | 1,156                                 | 1,251        | 5,362                               | \$146,428                                     | \$116,311                            | \$26,771                              | \$1,587                   | 56,060                   | 134,540        |
|   | <b>HIGH</b>    | <b>1.60</b>                       | <b>2,267</b>                          | <b>3,832</b> | <b>15,698</b>                       | <b>\$298,140</b>                              | <b>\$372,317</b>                     | <b>\$83,456</b>                       | <b>\$4,773</b>            | <b>191,593</b>           | <b>406,857</b> |
|   | <b>LOW</b>     | <b>0.51</b>                       | <b>691</b>                            | <b>849</b>   | <b>3,253</b>                        | <b>\$94,344</b>                               | <b>\$44,562</b>                      | <b>\$11,098</b>                       | <b>\$1,030</b>            | <b>18,417</b>            | <b>47,661</b>  |
|   | <b>AVERAGE</b> | <b>0.93</b>                       | <b>1,302</b>                          | <b>1,895</b> | <b>7,568</b>                        | <b>\$173,147</b>                              | <b>\$144,821</b>                     | <b>\$33,642</b>                       | <b>\$2,336</b>            | <b>82,079</b>            | <b>187,789</b> |