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Mr. Chairman and Members of the Committee, I appreciate the opportunity to appear before you today to discuss the U.S. energy outlook to 2030, focusing on the role of the Outer Continental Shelf (OCS) in current and projected energy production.

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The Energy Outlook: The Big Picture

The full *Annual Energy Outlook 2009 (AEO2009)*, which will be issued later this month, includes over 35 cases. The reference case and other *AEO2009* cases provide the results discussed in this testimony.

Liquid Fuels Consumption and Import Dependence. For the first time in more than 20 years, the *AEO2009* reference case projects no growth in U.S. oil consumption, reflecting the combined effect of recently enacted Corporate Average Fuel Economy standards, requirements for increased use of renewable fuels, and an assumed rebound in oil prices as the world economy recovers. With overall liquid fuel demand in the *AEO2009* reference case growing by only 1 million barrels per day between 2007 and 2030, plus increased use of domestically-produced biofuels and rising domestic oil production spurred by higher prices, the net import share of total liquids supplied, including biofuels,

declines from 58 percent in 2007 to less than 40 percent in 2025 before increasing to 41 percent in 2030.

Natural Gas Consumption and Import Dependence. The reference case raises EIA's projection for U.S. production and consumption of natural gas compared to the previous *Annual Energy Outlook (AEO)*, reflecting increased availability of resources and higher demand for electric power generation, due in part to the apparent impact of concerns related to greenhouse gas emissions on power plant investment decisions. With growing production of natural gas from unconventional onshore sources, the OCS, and Alaska, the net import share of total natural gas use also declines, from 16 percent in 2007 to less than 3 percent in 2030.

Total Primary Energy Use and Energy-Related Carbon Dioxide Emissions. Recently-enacted efficiency regulations and higher energy prices in the *AEO2009* reference case, compared to the last *AEO*, slow the rise in U.S. energy use, which is projected to grow from 101.9 quadrillion Btu in 2007 to 113.6 quadrillion Btu in 2030. When combined with the increased use of renewables and a reduction in projected additions of new coal-fired conventional power plants, this slows the growth in energy-related greenhouse gas emissions. Energy-related carbon dioxide emissions grow at 0.3 percent per year from 2007 to 2030 in the *AEO2009* reference case, reaching a level of 6,414 million metric tons in 2030, compared with 6,851 million metric tons in the *Annual Energy Outlook 2008* reference case.

Oil Prices. The assumption of a higher world oil price path in the *AEO2009* reference case reflects tighter constraints on access to low-cost oil supplies in a setting where the

forces driving growth in long-term demand in countries outside of the Organization for Economic Cooperation and Development remain as strong as previously expected. The world crude oil price is projected to rise as the global economy rebounds and global demand once again grows more rapidly than non-Organization of Petroleum Exporting Countries liquids supply. In 2030, the average real price of crude oil is \$130 per barrel in 2007 dollars (\$189 per barrel in nominal dollars).

Renewable Energy Use. Total consumption of marketed renewable fuels—including wood, municipal waste, and biomass in the end-use sectors; hydroelectricity, geothermal, municipal waste, biomass, solar, and wind for electric power generation; ethanol for gasoline blending; and biomass-based diesel—grows by 3.3 percent per year in the AEO2009 reference case. This rapid growth reflects the renewable fuel standard provisions included in the Energy Independence and Security Act of 2007 and strong growth in the use of renewables for electricity generation that is spurred by renewable portfolio standards for electricity generators in many States.

As requested by the Committee, the remainder of my testimony focuses more specifically on projections for oil and natural gas production from onshore and offshore resources, the factors that drive the projections, and sensitivity analyses under alternative access and price assumptions.

Federal Offshore and Onshore Resources in Context

Resources on Federal lands, both offshore and onshore, are important to U.S. energy production. **Table 1** places onshore and offshore oil and natural gas production for 2007 in the context of total U.S. production and consumption. In 2007, roughly 32 percent of

U.S. oil production and 29 percent of domestic natural gas production were from Federal lands.

Table 1. Oil and Natural Gas Production from Federal Lands in Perspective, 2007

	Petroleum (million barrels)	Natural Gas (trillion cubic feet)
Production from Federal Lands	596	5.6
Onshore	105	2.8
Offshore	491	2.8
Other U.S. Production	1,253	13.5
Total U.S. Production	1,849	19.1
Total U.S. Consumption	7,548	23.0

Source: **Federal Onshore Production:** Minerals Management Service, Minerals Revenue Management, MRM WebStats, Federal Onshore Reported Royalty Revenues; **Total U.S. and Federal Offshore Oil Production and Total U.S. Petroleum Products Consumption:** Energy Information Administration (EIA), *Petroleum Supply Annual 2007*, DOE/EIA-0340(2007) (July 2008); **Total U.S. and Federal Offshore Natural Gas Production:** EIA, *Natural Gas Annual 2007*, DOE/EIA-0131(2007) (January 2009); **U.S. Natural Gas Consumption:** EIA, *Annual Energy Review 2007*, DOE/EIA-0384(2007) (June 2008).

Looking forward, production from Federal lands is expected to play an increasingly important role in total U.S. oil and natural gas production. Through 2030 the share of production from Federal lands is projected to increase to 47 percent for oil and 36 percent for natural gas (**Table 2**).

Table 2. Projected Oil and Natural Gas Production on Federal Lands Compared to Projected U.S. Total Production

Year	Crude Oil (million barrels)			Natural Gas (trillion cubic feet)		
	Offshore Federal	Onshore ^a Federal	Total U.S.	Offshore Federal	Onshore ^a Federal	Total U.S
2008	468	116	1,808	2.9	3.0	20.5
2010	714	118	2,051	3.0	3.0	20.4
2025	953	228	2,633	4.9	3.5	23.2
2030	986	276	2,690	4.7	3.8	23.6

^a Federal onshore production is not explicitly represented in the National Energy Modeling System. The volumes are estimated based on historical trends and the projected regional production from the reference case of the *Annual Energy Outlook 2009*.

Source: Energy Information Administration, *Annual Energy Outlook 2009*, DOE/EIA-0383(2009).

OCS Production: Historical Data and Near-Term Forecast

OCS areas in the Western and Central portions of the Gulf of Mexico (GOM) are an important source of oil and natural gas production. In 2007, the GOM OCS areas, which have been producing substantial volumes of oil since the 1970s, produced 1.3 million barrels per day, amounting to about 25 percent of total U.S. crude oil production and down from peak OCS production of 1.6 million barrels per day in 2003. There are small amounts (less than 70 thousand barrels per day) of additional production from the Pacific OCS. Dry natural gas production in the GOM OCS in 2007 was 2.8 trillion cubic feet, down from peak production of 5.1 trillion cubic feet in 1997.

In the near term, OCS production is expected to rise as projects already under development come into operation. By 2012, projected GOM OCS oil production is 2.1 million barrels per day of oil and 3.4 trillion cubic feet of natural gas. As discussed below, forward-looking OCS production estimates to 2015 and later years, beyond the commissioning of projects already under development, are necessarily less certain since they are sensitive to the actual resource available, future prices, and future access to resources. However, using information from the Department of Interior's Minerals Management Service (MMS) regarding undiscovered technically recoverable resources, EIA data and MMS estimates regarding known reserves (proved reserves and projected reserve appreciation in known deposits), and assumptions regarding access policies, EIA develops projections of offshore oil and natural gas production through 2030.

Consistent with the *AEO* practice of reflecting existing laws and regulations, the *AEO2009* reference case reflects the removal in 2008 of the moratoria for drilling in the

Atlantic, Pacific, and parts of the Eastern GOM OCS areas. Timing issues constrain the impacts of increased access in the near term. The MMS began the process of developing a leasing program that includes selected tracts from these areas after the moratoria were removed, with a timeline calling for the first leases to be offered in 2010. Once offered, leases must be bid on and awarded, and the winning bidders must develop and get approved exploration and development plans before any wells can be drilled. Thus, even if leasing were to begin next year, conversion of these newly-available resources to production would require some time. The *AEO2009* reference case assumes that the Pacific and Atlantic OCS regions are open for leasing starting in 2010 and that leasing begins in the Eastern GOM in 2022.

Based on the mean (50-percent probability) MMS estimate of undiscovered technically recoverable resources and estimates of known reserves and resources, the OCS areas that were until recently under moratoria in the Atlantic, Pacific, and Eastern GOM are estimated to hold about 20 percent of the total OCS technically recoverable oil resource (TROR)—18 billion barrels out of a total of more than 93 billion barrels, exclusive of past production as of January 1, 2007. The estimates of TROR in the GOM OCS areas open to leasing prior to 2008 and the Alaska OCS are 47 billion barrels and 27 billion barrels, respectively. According to MMS estimates, there is only a 5-percent chance that OCS areas formerly under moratoria have more than 27 billion barrels of TROR.

Based on the MMS mean estimate of undiscovered technically recoverable natural gas resources and estimates of known reserves and resources, total technically recoverable natural gas resources in the OCS are estimated at 456 trillion cubic feet as of January 1, 2007. Roughly 76 trillion cubic feet (or 17 percent) are estimated to be in areas formerly

under moratoria in the Atlantic, Pacific and Eastern GOM—nearly half or 37 trillion cubic feet in the Atlantic, 18 trillion cubic feet in the Pacific, and 21 trillion cubic feet in the Eastern GOM.

Assumptions about exploration, development, and production of economical fields, such as drilling schedules, costs, platform selection, reserves-to-production ratios, etc., in the Pacific, Atlantic, and Eastern GOM are generally based on data for fields in the Central GOM that are of similar water depth and size. In addition, it is assumed that local infrastructure issues and other potential non-Federal impediments are resolved. Lack of resolution of these issues would, of course, affect the projections.

Lower-48 offshore crude oil production is projected to increase from 1.4 million barrels per day in 2007 to 2.7 million barrels per day in 2030. Production from new OCS leases in the Pacific is projected to begin in 2015, with total Pacific production reaching nearly 0.5 million barrels per day in 2030. Crude oil production from the Atlantic region is projected to begin in 2019, reaching 0.2 million barrels per day by 2030. Crude oil production in all areas of the GOM rises from 1.3 million barrels per day to 2.1 million barrels per day between 2007 and 2030.

Estimates of production from the OCS areas previously under moratoria are higher than in a previous analysis presented in the *Annual Energy Outlook 2007* primarily because the *AEO2009* has significantly higher oil and natural gas prices and because the assumed initial flow rate of Pacific OCS fields in shallow waters was adjusted to better reflect the production potential from these oil-prone fields compared to more natural-gas-prone fields in similar water depth and size in the Central GOM.

Lower-48 offshore natural gas production is projected to increase from 3.0 trillion cubic feet in 2007 to 4.9 trillion cubic feet in 2030. By 2030, Pacific natural gas production is projected to reach nearly 0.3 trillion cubic feet and production from the Atlantic region is projected to reach 0.5 trillion cubic feet.

EIA's OCS Estimates: Discussion and Comparison with Historical Experience

One way to gain perspective on EIA's estimates of production in OCS areas formerly under moratoria is to consider how the relationship between projected production and MMS indicators of resource levels and characteristics in those areas compares to that for the GOM OCS area that was open prior to 2008.

TROR Comparisons. Oil reserves in the GOM OCS area open before 2008, which has already been leased and developed extensively, are about 4 billion barrels, with an additional 9 billion barrels of expected reserve appreciation in discovered fields. Adding the estimate of 34 billion barrels of undiscovered TROR, the mean estimate of total TROR in the GOM area open before 2008 is 47 billion barrels, which is more than 2.5 times the MMS mean estimate of 18 billion barrels of TROR in OCS areas formerly under moratoria.

Average Field Size Comparisons. Field size matters because larger fields are more attractive development targets than smaller ones. The average size across all existing GOM OCS oil and natural gas fields is 43 million barrels of oil equivalent. MMS has also developed field size distributions for undiscovered OCS fields that it used to prepare reports mandated under the Energy Policy Act of 2005. The MMS estimate of the average undiscovered field size in GOM OCS areas open to drilling prior to 2008 is 59

million barrels of oil equivalent, which is significantly greater than the average field size of 15 million barrels of oil equivalent for OCS areas formerly under moratoria.

Other Project Development Factors. Project development time frames and expected returns vary substantially across offshore projects depending upon such factors as: 1) size of the field; 2) relative proportion of oil, natural gas, and condensates in the field; 3) reservoir and oil characteristics; 4) water depth; 5) distance to nearest oil and/or natural gas pipelines; 6) whether there are other nearby fields to share in the expense of building new pipelines; and 7) the type of production system chosen for field development, e.g., anchored platform, tension-leg platform, tethered spar, or floating production storage, and offloading ship.

To the extent that information is available, the indicators of resource levels and characteristics for the OCS areas previously under moratoria are generally inferior to those for the GOM OCS open prior to 2008, as discussed above. This is reflected in EIA's view that, through 2030, access to the OCS areas formerly under moratoria adds only a fraction of the daily production volume provided by the GOM OCS area open prior to 2008.

EIA recognizes that all forward-looking production estimates are inherently uncertain. Some factors that could lead to higher daily production estimates for the OCS areas formerly under moratoria include the use of the 5-percent, or 1-in-20, probability estimate of TROR and the assumption of a more favorable field size distribution than that used by MMS in its recently published reports. Consideration of any long-term constraints on rig availability that reflect the prioritization of alternative offshore projects or the possibility

that non-Federal impediments to production would persist over time could result in lower daily production estimates.

AEO2009 Access Sensitivity Case

As part of the *AEO2009*, EIA prepared a restored moratoria sensitivity case. U.S. OCS crude oil production in 2030 is projected to be 565,000 barrels per day lower in the restored moratoria case than in the reference case—2.2 million barrels per day compared to 2.7 million barrels per day. Cumulative domestic production of crude oil from both onshore and offshore sources between 2010 and 2030 in the restored moratoria case is projected to be 2.1 billion barrels, or 4.2 percent, lower than in the *AEO2009* reference case.

As with oil, access to OCS resources affects the domestic supply of natural gas. However, because the volume of technically recoverable natural gas in the OCS areas previously under moratoria accounts for less than 5 percent of the total U.S. technically recoverable natural gas resource base, the volume impacts are smaller relative to the baseline supply level. Cumulatively, domestic natural gas production from both onshore and offshore sources between 2010 through 2030 is projected to be 1.3 percent lower in the restored moratoria case than in the *AEO2009* reference case. Natural gas production from the Lower-48 offshore in 2030 is projected to be 4.1 trillion cubic feet in the restored moratoria case compared to 4.9 trillion cubic feet in the *AEO2009* reference case. In contrast to the situation in oil, the reduction in offshore supply of natural gas in the restored moratoria case is partially offset by an increase in onshore production. Reduced OCS access in the restored moratoria case results in higher natural gas prices,

which increase the projection for U.S. onshore gas production by 0.2 trillion cubic feet in 2030 compared to the level in the reference case.

AEO2009 Low Price Sensitivity Case

The impact of access to OCS resources on domestic production is lessened in the low price case, where oil prices are assumed to remain near \$50 per barrel (2007 dollars) through 2030, rather than rising to \$110 per barrel by 2015 and \$130 per barrel (2007 dollars) by 2030 as assumed in the reference case. In 2030, total OCS crude oil production is projected to be 440,000 barrels per day higher in the low world oil price case than in the low oil price case with the OCS moratoria reinstated—2.1 million barrels per day compared with 1.7 million barrels per day. The observation that U.S. OCS production in 2030 under reference case prices with full restoration of the OCS moratoria, at 2.2 million barrels per day, is projected to be higher than U.S. OCS production in the low price case with no moratoria underlines the importance of prices as a determinant of future production.

The OCS is expected to remain a major contributor to domestic crude oil and natural gas supply under a variety of price and access assumptions. Although a significant volume of undiscovered technically recoverable oil and natural gas resources has been added with access to the Pacific, Atlantic, and parts of the Eastern GOM OCS, there is a great deal of uncertainty surrounding the resource estimates as well as the timing and cost to explore and develop these resources.

This concludes my statement, Mr. Chairman. I will be happy to answer any questions you and the other Members may have.