Committee on Resources,

Subcommittee on Energy & Mineral Resources

energy - - Rep. Barbara Cubin, Chairman
U.S. House of Representatives, Washington, D.C. 20515-6208 - - (202) 225-9297

Witness Statement

STATEMENT
OF
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BEFORE THE
SUBCOMMITTEE ON ENERGY AND MINERALS
COMMITTEE ON RESOURCES
UNITED STATES HOUSE OF REPRESENTATIVES
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Madame Chairman and members of the subcommittee, thank you for this opportunity to present, on behalf of the U.S. Geological Survey (USGS), testimony regarding our assessment of oil and gas resources nationally, in the 1002 Area of the Arctic National Wildlife Refuge, and of Federal lands as called for in the recently enacted Energy Act of 2000. My testimony will address these subjects in this order.

Within the Federal Government, the USGS is responsible for assessing undiscovered oil and gas resources of all onshore and State offshore areas of the Nation. The Minerals Management Service (MMS) provides estimates for Federal offshore crude oil and natural gas resources. In February 1995, the USGS released the *National Assessment of United States Oil and Gas Resources*. Currently, we are updating that assessment in selected regions thought to have high potential for undiscovered natural gas, including coal-bed methane and gas hydrate. This update will be completed in 2004, with interim products available in early 2002. The updated assessment will include allocations of undiscovered oil and gas resources to Federal lands. Additionally, the USGS is completing a National Coal Resource Assessment during 2001. To date, coal resource assessments of the Colorado Plateau and of the Northern Rocky Mountains and Great Plains have been released, and coal resource assessments of the Appalachian and Illinois Basins, and Gulf Coast Region will be available later in 2001. USGS coal assessments also identify volumes of coal under Federally owned lands, and of Federally owned coal under privately owned lands, where present.

1995 National Assessment of United States Oil and Gas Resources

The 1995 USGS assessment of the Nation's undiscovered oil and gas was published in digital format on a CD-ROM (USGS Digital Data Series-30) and in a non-technical summary, as USGS Circular 1118. The Assessment was conducted in collaboration with State Geological Surveys, with MMS, and with industry geologists under the auspices of the American Association of Petroleum Geologists. Additional cooperation with the Bureau of Land Management, National Park Service, U.S. Forest Service, and Bureau of Indian Affairs was essential for the USGS to generate information regarding oil and gas resources on Federal lands. The current update of the 1995 assessment is being conducted with many of the same partners.

Assuming existing technology, there are approximately 112 billion barrels of technically recoverable oil onshore and in State waters, according to the USGS's most recent assessment. Technically recoverable resources are those that may be recoverable using current technology without regard to cost. Economically recoverable resources are that part of the technically recoverable resource for which economic factors are included and which can be recovered at a given market price. This includes measured (proved) reserves, future additions to reserves in existing fields (reserve growth), and undiscovered resources. The technically recoverable conventional resources of natural gas in measured reserves, future additions to reserves in existing fields, and undiscovered accumulations equal approximately 716 trillion cubic feet of gas.

In addition to conventional gas resources, the USGS has made an assessment of technically recoverable resources in continuous-type (largely unconventional) accumulations. We estimate about 308 TCFG (trillion cubic feet of gas) of technically recoverable natural gas in continuous-type deposits in sandstones, shales, and chalks, and almost 50 TCFG of technically recoverable gas in coal beds. The total technically recoverable oil and gas resource base onshore and in State waters of the United States is displayed in the table below.

Results of the USGS 1995 National Oil and Gas Assessment

Below is a table of the results of the USGS 1995 assessment:

-- Natural Gas

---- OIL ---- ---- GAS ---- Liquids --

(billion barrels) (trillion cu. ft.) (billion barrels)

Resource Category 1995 1995 1995

Undiscovered resources

Conventional Accumulations 30 259 7

Unconventional Accumulations

Sedimentary reservoirs 2 308 2

Coal-bed methane NA 50 NA

Anticipated Reserve Growth 60 322 13

TOTAL 92 939 22

Proved Reserves (in 1994) 20 135 7

TOTAL 112 1,074 29

The estimates presented in this testimony reflect USGS understanding as of January 1, 1994, and are shown on a map of the United States in Figure 1. They are intended to capture the range of uncertainty, to provide indicators of the relative potential of various petroleum provinces, and to provide a useful guide in

considering possible effects of future oil- and gas-related activities within the United States.

The geographic information system (GIS) coverages contained in this assessment and related databases provide the capability to estimate oil and gas resource potential on specific tracts of land, including those owned and/or managed by the Federal Government. This process is called allocation, based on expert opinion, and is accomplished using a methodology that takes into consideration all geologic information available about the basin.

1995 National Oil and Gas Assessment and Onshore Federal Lands (1998)

In January 1998, the USGS published an Open-File Report (OFR 95-0075-N) that reported estimates of volumes of undiscovered oil and gas on Federal lands. Estimates of oil in undiscovered conventional fields range from 4.4 to 12.8 billion barrels (BBO), with a mean value of 7.5 BBO. Estimates of technically recoverable gas in undiscovered conventional fields range from 34.0 to 96.8 trillion cubic feet (TCF), with a mean value of 57.9 TCF. Almost 85 percent of the assessed natural gas in undiscovered conventional accumulations was non-associated gas, that is, gas in gas fields rather than gas in oil fields. Estimates of technically recoverable resources in conventional (continuous type) accumulations for oil are from 0.2 to 0.6 BBO, with a mean value of 0.3 BBO, and for gas, from 72.3 to 202.4 TCF, with a mean value of 127.1 TCF. These ranges of estimates correspond to 95 percent probability (19 in 20 chance) and 5 percent probability (1 in 20 chance) respectively, of a least those amounts occurring.

An economic evaluation was applied to these technically recoverable estimates. Our study concluded that at $30 per barrel for oil and $3.34 per thousand cubic feet of gas, 3.3 BBO oil and 13.6 TCF in undiscovered conventional fields can be found, developed, and produced. In addition, at these estimated prices, 0.2 BBO oil and 11.4 TCF in continuous-type accumulations and 11.8 TCF of coalbed gas can be developed.

Estimated volumes of undiscovered oil, gas, and natural gas liquids in onshore Federal lands, as of January 1994 are displayed in the table below.

Technically Recoverable			Economically Recoverable*		
F_{95}	Mean	F_{05}	$18/bbl	$30/bbl	
			$2/mcf	$3.34/mcf	
Conventional					
Oil (BBO)**	4.4	7.5	12.8	1.6	3.3
Gas (TCF)	34.0	57.9	96.8	9.7	13.6
NGL (BBL)	1.1	1.8	2.7	0.7	0.9
Unconventional					
Oil (BBO)	0.2	0.3	0.6	0.1	0.1
Gas (TCF)	72.4	127.1	202.4	6.1	11.4
NGL (BBL)	0.1	1.5	2.6	0.0	0.1
Coalbed methane	13.0	16.1	19.6	7.0	11.8

(TCF)

* Includes cost of finding, developing, and producing the resource. Based on mean

values of technically recoverable estimate.

** BBO=billion barrels oil; TCF = trillion cubic feet; BBL = billion barrels liquid, mcf =

thousand cubic feet.

Applications of the USGS 1995 National Oil and Gas Resource Assessment

The results of the USGS National Oil and Gas Resource Assessment have been used by the Energy Information Administration for its *Annual Energy Outlook,* by the California Energy Commission and Canadian Energy Board to model inter-regional natural gas supply and demand and the resulting economic impacts, and by numerous petroleum companies as a basis for evaluating risk associated with exploration and development of domestic oil and gas resources.

Many Federal agencies use the information in the USGS National Oil and Gas Assessment for land-use planning, energy policy formulation, and economic forecasting. Customers include the Department of the Interior, Bureau of Land Management, National Park Service, U.S. Forest Service, Bureau of Indian Affairs, Energy Information Administration, and the Department of Energy, among others. In addition, most State Geological Surveys and/or State Divisions of Oil and Gas use the USGS assessment for regional and local resource evaluation and lease planning purposes. Many private sector organizations also use the digital oil and gas assessment results, including environmental protection advocacy groups, petroleum exploration companies, and utility companies (including natural gas and electricity utilities).

USGS Resource Assessment of the 1002 Area of the Arctic National Wildlife Refuge

The Alaska National Interest Lands Conservation Act established the Arctic National Wildlife Refuge (ANWR) as a wildlife refuge in 1980. In section 1002 of that Act, Congress deferred a decision regarding future management of the 1.5-million-acre coastal plain ("1002 Area") in recognition of the area's potential for oil and gas resources and its importance as wildlife habitat. A report on the resources (including petroleum) of the 1002 Area was submitted in 1987 to Congress by the Department of the Interior (DOI). Since completion of that report, numerous wells have been drilled and oil fields discovered near ANWR on State lands, new geologic and geophysical data have become available, seismic processing and interpretation capabilities have improved, and the economics of North Slope oil development have evolved.

Anticipating the need for scientific information and considering the decade-old perspective of the petroleum resource estimates included in the 1987 Report to Congress, the USGS reexamined the geology of the ANWR 1002 Area and prepared a new petroleum resource assessment that was released in 1998.

Based on this 1998 USGS assessment, the total quantity of technically recoverable oil within the entire assessment area is estimated to be between 5.7 and 16.0 billion barrels (95-percent and 5- percent probability range), with a mean value of 10.4 billion barrels. The entire assessment area includes Federal, State, and Native areas. Technically recoverable oil within the ANWR 1002 Area (excluding State and Native areas) is estimated to be between 4.3 and 11.8 billion barrels (95- and 5-percent probability range), with a mean value of 7.7 billion barrels. These estimates reflect new data and techniques and thus should not be directly compared to results of the 1995 National Oil and Gas Resource Assessment.

According to the 1998 USGS assessment, volumes of oil are expected to occur in a number of

accumulations rather than a single large accumulation, such as the giant Prudhoe Bay field. However, most of that oil is estimated to occur in accumulations that are sufficiently large to be of potential economic interest. At the mean, nearly 80 percent of the oil is thought to occur in the western part of the 1002 Area, which is closest to existing infrastructure developed on State lands. We estimate that the western portion of the 1002 Area contains between 3.4 and 10.2 billion barrels of oil (BBO) (95- and 5-percent probability), with a mean of 6.4 BBO. We estimate that the eastern area contains between 0 and 3.2 BBO (95- and 5-percent probability), with a mean of 1.2 BBO.

As part of our 1998 assessment, the USGS conducted an economic analysis that considers the cost of producing estimated technically recoverable volumes of oil from the 1002 Area. Our study estimates the market price that would have to be paid to find, develop, produce, and transport a specific volume of oil to the West Coast of the United States. Figure 2 summarizes estimated volumes of economically recoverable oil as a function of the market price of that oil. This graph assumes constant 1996 dollars and the expectation that production will repay all operating costs, including taxes and transport to market, all investment expenditures, and provide an after-tax rate of return of at least 12 percent on the investment.

Comparison with Previous Assessments

Among previous assessments of ANWR 1002 Area petroleum resources, only the 1987 USGS assessment of in-place resources is directly comparable to our 1998 assessment. The technically and economically recoverable petroleum resource estimates cannot be compared directly because different methods were used in preparing those parts of the 1987 Report to Congress. The current assessment shows an overall increase in estimated in-place oil resource when compared to the 1987 assessment. Ranges are 11.6 to 31.5 BBO versus 4.8 to 29.4 BBO, (95- and 5-percent probabilities) and mean values are 20.7 BBO versus 13.8 BBO (current assessment compared to 1987 assessment). The increase is a consequence of improved resolution of reprocessed seismic data, which allowed the identification of many more potential petroleum accumulations in parts of the area, as well as information available regarding recent nearby oil discoveries.

Another significant change is in the geographic distribution of resources. In the 1987 assessment, about 75 percent of the mean estimated in-place oil was thought to occur in the southeastern section of the 1002 Area and only 25 percent was thought to occur in the northwestern area. In the current assessment, nearly 85 percent of the in-place oil is thought to occur in the northwestern area and only about 15 percent is within the deformed area. The reason for this change in interpretation is largely related to improved resolution of the seismic data, especially in the northwestern area where, in various plays, it allowed the identification of many more potential petroleum accumulations than were previously thought to exist. The southeastern area--with only a single well offshore and complex geology onshore--carries great uncertainty. Further, part of that area considered oil prospective in 1987 is now considered prospective only for gas because of new understanding of the thermal history of the rocks.

Sec. 604 Energy Act of 2000

The Secretary of the Interior is charged with conducting an inventory of energy resources and the restrictions and impediments to their development on Federal Lands in Section 604 of the Energy Act of 2000, signed into law on November 9, 2000. The exact text is given below:

SEC. 604. SCIENTIFIC INVENTORY OF OIL AND GAS RESERVES.

IN GENERAL.--The Secretary of the Interior, in consultation with the Secretaries of Agriculture and

Energy, shall conduct an inventory of all onshore Federal lands. The inventory shall identify--

(1) the United States Geological Survey reserve estimates of the oil and gas resources underlying these lands; and

(2) the extent and nature of any restrictions or impediments to the development of such resources.

(b) REGULAR UPDATE.--Once completed the USGS reserve estimates and the surface availability data as provided in subsection (a)(2) shall be regularly updated and made publicly available.

(c) INVENTORY.--The inventory shall be provided to the Committee on Resources of the House of Representatives and to the Committee on Energy and Natural Resources of the Senate within 2 years after the date of the enactment of this section.

(d) AUTHORIZATION OF APPROPRIATIONS.--There are authorized to be appropriated such sums as may be necessary to implement this section.

It is our understanding that the role of the USGS will be to assess the oil and gas resources of oil and gas-bearing basins with Federal land ownership, consistent with the USGS assessment and allocation methodology. Then, USGS geologists will allocate resource estimates to those specific land parcels owned by the Federal government. The USGS resource estimates will be combined with reserve volumes from the DOE/EIA, and will be incorporated into a geographic information system (GIS) that shows the spatial distribution of those potential resources and known reserves. The resource and reserve GIS will be integrated with a GIS of restrictions and impediments constructed by BLM and USFS. The USGS has met several times with representatives of the Bureau of Land Management (BLM), the US Forest Service, the US Department of Energy and their Energy Information Administration and the staff of this committee to discuss plans to produce this inventory.

The USGS intends to use some of the resource estimates from the 1995 National Oil and Gas Assessment, for which there are not significant new data, and will update resource estimates for the gas-prone areas of the country for which we have new data and are developing improved assessment methods.

Madame Chairman, this concludes my remarks. I would be happy to respond to any questions.

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