Undiscovered Oil and Gas Resources, Alaska Federal Offshore, December 2000 Update

The Minerals Management Service (MMS) has revised its assessments of the undiscovered oil and gas resource potential of the Alaska Outer Continental Shelf (OCS). These assessments provide current estimates of both conventionally and economically recoverable resources to assist with the development of a new 5-Year Oil and Gas Leasing Program (mid-2002 through mid-2007). Analysis performed for the 5-Year Program weighs the positive economic value of marketable oil and gas against possible environmental consequences of development and production. These estimates update those prepared by the MMS as part of the 1995 National Oil and Gas Resource Assessment. Planning areas that were revised based on new data or information include the Beaufort Sea, Chukchi Sea, Hope Basin, Cook Inlet, and Gulf of Alaska. Other OCS planning areas did not have new geologic or geophysical data to evaluate, and their estimates remain unchanged from those prepared in 1995.

In 1998, the MMS Alaska OCS Region released Undiscovered Oil and Gas Resources, Alaska Federal Offshore, as of January 1995 (Sherwood, et al., OCS Monograph MMS 98-0054, henceforth referred to as the *monograph*). This monograph was the final in a series of three public releases, with increasing levels of detail. The first, Endowments of Undiscovered Conventionally Recoverable and Economically Recoverable Oil and Gas in the Federal Offshore as of January 1995 (Sherwood, et al., OCS Report MMS 96-0033), was a short report designed to quickly release the results of the 1995 assessment. This report was followed by the Internet release of the input data used by MMS for the assessments. As the final document in the series, the monograph is the most extensive.

The OCS Lands Act requires the Secretary of the Interior to develop a 5-Year Oil and Gas Leasing Program to meet the Nation's energy needs, and to ensure that resource development occurs in an orderly fashion, rather than in hasty response to a shortfall in energy resources. In preparation for the development of the new draft 5-Year Oil and Gas Leasing Program, the MMS Alaska Region reviewed the 1995 assessment to determine which estimates needed revision. This review concluded that new data and current perceptions of resource potential warranted updating ***conventionally recoverable*** oil and gas resource estimates for the Beaufort Sea, Chukchi Sea, and Cook Inlet. Hope Basin required minor changes to be consistent with the Chukchi Sea assessment. These four areas plus the Gulf of Alaska planning area were also reassessed to determine new estimates of ***economically recoverable*** resources. The economic estimates give the greatest insight into the areas most likely to be of interest for leasing and development in the near term (i.e., the period covered by the next 5-year program). Significant new data were not available for the other Alaska OCS planning areas (Navarin Basin, North Aleutian Basin, St. George Basin, Norton Basin, St. Matthew-Hall, Shumagin, and Kodiak). With scant industry interest and lacking new transportation infrastructure, these areas are unlikely candidates for development during the next leasing program. The estimates reported for these areas in the 1995 assessment documents are still considered viable for planning purposes.

The focus of this updated assessment is *undiscovered* oil and gas resources. Undrilled ***prospects***, identified and mapped by geophysicists and geologists, have a risk of not containing any oil or gas resources. In addition to this geologic risk, if the prospect does contain oil or gas, the quantities could be too low to produce commercially, so an additional economic risk must be taken into account. Uncertainty surrounds the location and size of possible prospects, the geologic and reservoir engineering factors influencing ability of the hydrocarbons to flow, recoverability, costs associated with exploration, development and production, and so forth.

Statistical methods have evolved specifically to handle both risk and uncertainty. The assessors portray their knowledge about uncertain variables as ranges of possible values and probabilities associated with these values. Subject matter specialists contribute their knowledge and expertise to developing values for the geologic, engineering, and economic variables. Computer models developed by MMS use these ranges of values and probabilities, along with estimates of the associated risk at various assessment levels (prospect, play, and basin), to develop estimates of the undiscovered resource potential. The results from running these models are also ranges of possible values and their associated probabilities of occurrence (probability distributions).

Two general types of estimates are prepared by MMS. *Undiscovered, conventionally recoverable resources* focus on geologic attributes. The resource potential is estimated without being constrained by economic considerations, such as the existence of transportation infrastructure to take the resources to market. The only constraint is that conventional recovery techniques are assumed. The reported resources are those that would be produced at the surface, but estimates of recovery efficiency are based on current, known techniques. Ranges of values imply that some improvement in efficiency is considered, but dramatic improvements from unknown future techniques are not included. The undiscovered, conventionally recoverable resources are computed using the GRASP model (Geologic Resource Assessment Program). The output from GRASP is the resource base used to estimate economically recoverable resources.

The estimates of risked, undiscovered, **conventionally recoverable** oil and gas resources, updated as of December 2000 are listed in the following table.

Undiscovered, economically recoverable resources do consider the costs associated with development and production. Often, these estimates are reported along with the basic economic assumptions, most commonly price. Now and in the past, MMS has reported economically recoverable resources both at a base case price and at a significantly higher price. The economic resources are computed using the PRESTO (Probabilistic Resource ESTimates – Offshore) computer program.

The estimates of risked, undiscovered, **economically recoverable** oil and gas resources, updated as of December 2000, for the **base case** set of economic assumptions (e.g., starting prices of $18 per barrel for oil and $2.11 per thousand cubic feet for gas) are listed in the following table.

The estimates of risked, undiscovered, **economically recoverable** oil and gas resources, updated as of December 2000, for the **high case** set of economic assumptions (e.g., starting prices of $30 per barrel for oil and $3.52 per thousand cubic feet for gas) are listed in the following table

COMMON ASSESSMENT TERMS:

Prospect *– an untested geologic feature having the potential for trapping and accumulating hydrocarbons.*

Pool *– a subsurface accumulation of liquid or gaseous hydrocarbons, typically within a single stratigraphic interval, that is hydraulically separated from any other hydrocarbon accumulation.*

Field *– a pool or grouping of related pools, sufficient large to be economically producible.*

Play *– a family of geologically related prospects, having similar hydrocarbon source, reservoir, and trapping mechanism.*

Basin *– a large downwarped region serving as a center of sediment deposition. It can contain numerous geologic plays.*

Province *– a large area or region unified geologically by a single dominant structural element or a number of contiguous elements. A province can be defined to contain a single basin or may contain several related or similar basins.*

Planning Area *– an administrative subdivision of an offshore area used as the initial basis for considering blocks to be offered for lease in the DOI offshore oil and gas leasing program.*

RESOURCE REPORTING LEVELS

Low Case Estimate *– an estimate of resources having a 95 percent chance of being that amount or greater*

Average Case Estimate *– the mean value or arithmetic average, derived by summing all values and dividing by the total number of values. The mean value is popular when a single estimate is needed because it combines both the magnitude and probability of the possible resource amount.*

High Case Estimate *- an estimate of resources having a 5 percent chance of being that amount or greater*

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AREA	OIL AND NGL (BBO)			GAS (TCFG)			BOE (BBO)			MPhc
	F95	MEAN	F05	F95	MEAN	F05	F95	MEAN	F05	
ALASKA OFFSHORE	16.54	24.86	35.42	55.05	122.58	226.80	27.98	46.72	71.87	1.00
ARCTIC SUBREGION	14.36	22.49	33.03	35.00	95.56	197.78	21.76	39.54	64.45	1.00
BERING SHELF SUBREGION	0.36	0.91	1.81	6.98	18.80	38.64	1.65	4.26	8.57	1.00
PACIFIC MARGIN SUBREGION	0.74	1.46	2.51	2.42	8.22	18.92	1.23	2.92	5.61	1.00
ARCTIC SUBREGION										
CHUKCHI SHELF	8.60	15.46	25.03	13.56	60.11	154.31	11.32	26.21	49.60	1.00
BEAUFORT SHELF	3.56	6.94	11.84	12.86	32.07	63.27	6.21	12.64	22.16	1.00
HOPE BASIN	0.00	0.09	0.28	0.00	3.38	11.06	0.00	0.69	2.25	0.61
BERING SHELF SUBREGION										
NAVARIN BASIN	0.00	0.50	1.21	0.00	6.15	18.18	0.00	1.59	4.41	0.88
N. ALEUTIAN BASIN	0.00	0.23	0.57	0.00	6.79	17.33	0.00	1.44	3.62	0.72
ST. GEORGE BASIN	0.00	0.13	0.41	0.00	3.00	9.72	0.00	0.67	2.14	0.94
NORTON BASIN	0.00	0.05 (NGL)	0.15	0.00	2.71	8.74	0.00	0.53	1.70	0.72
ST. MATTHEW-HALL	0.00	<0.01 (NGL)	<0.01	0.00	0.16	0.69	0.00	0.03	0.13	0.44
PACIFIC MARGIN SUBREGION										
COOK INLET	0.34	0.76	1.42	0.66	1.39	2.49	0.48	1.01	1.80	1.00
GULF OF ALASKA	0.18	0.63	1.43	0.94	4.18	10.59	0.36	1.37	3.27	0.99
SHUMAGIN-KODIAK	0.00	0.07 (NGL)	0.29	0.00	2.65	11.35	0.00	0.54	2.30	0.40

***BBO**, billions of barrels of oil and natural gas liquids; **TCFG**, trillions of cubic feet; **BOE,** total oil and gas in billions of energy-equivalent barrels (5,620 cubic feet of gas=1 energy-equivalent barrel of oil); reported **MEAN,** resource quantities at the mean in cumulative probability distributions; **F95**, the resource quantity having a 95-percent probability of being met or exceeded; **F05**, the resource quantity having a 5-percent probability of being met or exceeded; **MPhc**, marginal probability for hydrocarbons for basin, i.e., chance for the existence of at least one pool of undiscovered, conventionally recoverable hydrocarbons somewhere in the basin. Resource quantities shown are risked, that is, they are the product of multiplication of conditional resources and Mphc. Mean values for provinces may not sum to values shown for subregions or region because of rounding. All liquid resources in Norton basin, St. Matthew-Hall basin, and Shumagin-Kodiak shelf are natural gas liquids that would only be recovered by natural gas production.*

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RISKED, UNDISCOVERED, ECONOMICALLY RECOVERABLE OIL AND GAS

(Base Case: $18/bbl, $2.11/mcf)

AREA	OIL (BBO)			GAS (TCFG)			BOE (BBO)			MPhc
	F95	MEAN	F05	F95	MEAN	F05	F95	MEAN	F05	
ALASKA OFFSHORE	0.46	3.26	9.66	0.14	5.14	19.77	0.51	4.17	12.85	0.99
ARCTIC SUBREGION	0.00	2.76	9.22	0.00	3.55	14.52	0.00	3.40	11.92	0.76
BERING SHELF SUBREGION	0.00	0.03	0.22	0.00	0.99	10.82	0.00	0.20	2.11	0.06
PACIFIC MARGIN SUBREGION	0.13	0.46	1.01	0.08	0.60	1.69	0.14	0.57	1.31	0.97
ARCTIC SUBREGION										
CHUKCHI SHELF	0.00	0.97	7.20	N/A	N/A	N/A	0.00	0.97	7.20	0.14
BEAUFORT SHELF	0.00	1.78	6.64	0.00	2.93	9.68	0.00	2.30	8.36	0.68
HOPE BASIN	0.00	0.02	0.14	0.00	0.61	4.87	0.00	0.13	1.00	0.13
BERING SHELF SUBREGION										
NAVARIN BASIN	0.00	negl	0.00	0.00	0.04	0.00	0.00	negl	0.00	<0.01
N. ALEUTIAN BASIN	0.00	0.02	0.20	0.00	0.88	7.71	0.00	0.18	1.77	0.06
ST. GEORGE BASIN	0.00	negl	0.00	0.00	0.05	0.00	0.00	0.01	0.00	<0.01
NORTON BASIN	0.00	negl	0.00	0.00	0.02	0.00	0.00	negl	0.00	<0.01
ST. MATTHEW-HALL	N/E	N/E	N/E	N/E	N/E	N/E	N/E	N/E	N/E	N/E
PACIFIC MARGIN SUBREGION										
COOK INLET	0.06	0.45	0.99	0.10	0.60	1.28	0.00	0.56	1.22	0.97
GULF OF ALASKA	0.00	0.01	0.00	N/A	N/A	N/A	0.00	0.01	0.00	0.02
SHUMAGIN-KODIAK	0.00	negl	0.00	0.00	negl	0.00	0.00	negl	0.00	<0.01

ECONOMIC ASSUMPTIONS: *2000 base year, $18 per barrel oil price, $2.11 per thousand cubic feet (MCF) gas price, 0.66 gas value discount, flat real prices and costs, 3% inflation, 12% discount rate, 35% Federal tax rate; units of* ***BBO****, billions of barrels;* ***TCFG****, trillions of cubic feet;* ***BOE,*** *total oil and gas in billions of energy-equivalent barrels (5,620 cubic feet of gas=1 energy-equivalent barrel of oil). Oil resources include crude oil and natural gas liquids (NGL). Gas resources include nonassociated dry gas and associated solution gas. All provinces analyzed on a stand-alone basis. N/A refers to Not Available (lacking transportation infrastructure and/or market). N/E refers to Not Evaluated because of very low resource potential. Negl refers to negligible (less than significant figures listed. MPhc is marginal probability of economically recoverable hydrocarbons under the given conditions. Mean values for provinces may not sum to values shown for subregions and region because of rounding.*

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RISKED, UNDISCOVERED, ECONOMICALLY RECOVERABLE OIL AND GAS

(High Case: $30/bbl, $3.52/mcf)

AREA	OIL (BBO)			GAS (TCFG)			BOE (BBO)			MPhc
	F95	MEAN	F05	F95	MEAN	F05	F95	MEAN	F05	
ALASKA OFFSHORE	5.16	10.13	17.36	0.62	8.68	30.29	5.21	11.68	21.69	1.00
ARCTIC SUBREGION	4.55	9.40	16.62	0.21	5.71	21.55	4.31	10.41	20.19	1.00
BERING SHELF SUBREGION	0.00	0.04	0.39	0.00	1.52	14.39	0.00	0.315	2.96	0.10
PACIFIC MARGIN SUBREGION	0.29	0.69	1.32	0.14	1.45	4.71	0.31	0.95	2.06	1.00
ARCTIC SUBREGION										
CHUKCHI SHELF	1.42	6.11	10.96	N/A	N/A	N/A	1.42	6.11	10.96	0.95
BEAUFORT SHELF	1.00	3.24	7.76	0.64	4.20	10.67	1.11	3.99	9.66	1.00
HOPE BASIN	0.00	0.04	0.16	0.00	1.51	6.02	0.00	0.31	1.23	0.40
BERING SHELF SUBREGION										
NAVARIN BASIN	0.00	Negl	0.00	0.00	0.08	0.00	0.00	0.02	0.00	0.01
N. ALEUTIAN BASIN	0.00	0.04	0.39	0.00	1.27	13.56	0.00	0.26	2.80	0.08
ST. GEORGE BASIN	0.00	Negl	0.00	0.00	0.10	0.00	0.00	0.02	0.00	0.01
NORTON BASIN	0.00	Negl	0.00	0.00	0.07	0.00	0.00	0.01	0.00	0.01
ST. MATTHEW-HALL	N/E	N/E	N/E	N/E	N/E	N/E	N/E	N/E	N/E	N/E
PACIFIC MARGIN SUBREGION										
COOK INLET	0.21	0.62	1.16	0.46	1.00	1.69	0.29	0.79	1.46	0.99
GULF OF ALASKA	0.00	0.06	0.40	N/A	N/A	N/A	0.00	0.06	0.40	0.26
SHUMAGIN-KODIAK	0.00	0.01	0.12	0.00	0.45	3.85	0.00	0.09	0.00	0.06

ECONOMIC ASSUMPTIONS: *2000 base year, $30 per barrel oil price, $3.52 per thousand cubic feet (MCF) gas price, 0.66 gas value discount, flat real prices and costs, 3% inflation, 12% discount rate, 35% Federal tax rate; units of* ***BBO****, billions of barrels;* ***TCFG****, trillions of cubic feet;* ***BOE,*** *total oil and gas in billions of energy-equivalent barrels (5,620 cubic feet of gas=1 energy-equivalent barrel of oil). Oil resources include crude oil and natural gas liquids (NGL). Gas resources include nonassociated dry gas and associated solution gas. All provinces analyzed on a stand-alone basis. N/A refers to Not Available (lacking transportation infrastructure and/or market). N/E refers to Not Evaluated because of very low resource potential. Negl refers to negligible (less than significant figures listed. MPhc is marginal probability of economically recoverable hydrocarbons under the given conditions. Mean values for provinces may not sum to values shown for subregions and region because of rounding.*

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