OCS Report
BOEM 2014-656

Outer Continental Shelf

Estimated Oil and Gas Reserves Gulf of Mexico OCS Region December 31, 2011

U.S. Department of the Interior
Bureau of Ocean Energy Management
Gulf of Mexico OCS Region

ON COVER- In 2011, ExxonMobil announced oil and gas discoveries at the Hadrian Prospect in Keathley Canyon in about 7,000 feet of water. Shown is the semi-submersible rig, Maersk Developer, used to drill the Hadrian wells. Photo courtesy ExxonMobil.

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ABBREVIATIONS AND ACRONYMS

AAPG	American Association of Petroleum Geologists
AL	Alabama
Bbbl	Billion barrels
Bbl	barrels
BBO	billion barrels of oil
BBOE	billion barrels of oil equivalent
Bcf	billion cubic feet
BOE	barrels of oil equivalent
BOEM	Bureau of Ocean Energy Management
BOEMRE	Bureau of Ocean Energy Management, Regulation and Enforcement
CFR	Code of Federal Regulations
DOCD	Development Operations Coordination Document
DOI	U.S. Department of the Interior
DPP	Development and Production Plan
^{0}F	degrees Fahrenheit
FL	Florida
ft	feet
GOM	Gulf of Mexico
GOMR	Gulf of Mexico Region
GOR	gas oil ratio
LA	Louisiana
MMbbl	million barrels
MMBOE	million barrels of oil equivalent
MMcf	million cubic feet
MMS	Minerals Management Service
MS	Mississippi
N	north
OAP	Offshore Atlas Project
OCS	Outer Continental Shelf
PDN	proved developed non-producing
PDP	proved developed producing
psia	pounds per square inch absolute
PU	proved undeveloped
P/Z	pressure/gas compressibility factor
RE	Resource Evaluation
SCF/STB	standard cubic feet per stock tank barrel
SPE	Society of Petroleum Engineers
SPE-PRMS	Society of Petroleum Engineers Petroleum Resources Management System
SPEE	Society of Petroleum Evaluation Engineers
Tcf	trillion cubic feet
TVDSS	true vertical depth subsea
TX	Texas
U.S.	United States
USGS	United States Geological Survey
WPC	World Petroleum Council

ABSTRACT

This publication presents the Bureau of Ocean Energy Management (BOEM) estimates of oil and gas reserves in the Gulf of Mexico Outer Continental Shelf. As of December 31, 2011, it is estimated that the *Original Reserves* are 21.91 billion barrels of oil and 192.4 trillion cubic feet of gas from 1,292 fields. *Original Reserves* are the total of the *Cumulative Production* and the *Reserves*. This number includes 10 fields that moved from *Resources* to *Reserves* during 2011. It also includes the 510 fields that have produced and expired. C*umulative Production* from the fields accounts for 17.59 billion barrels of oil and 181.1 trillion cubic feet of gas.

Reserves are estimated to be 4.32 billion barrels of oil and 11.3 trillion cubic feet of gas. These reserves are recoverable from 782 active fields. *Reserves* in this report are proved plus probable (2P) reserves estimates. The reserves must be discovered, recoverable, commercial and remaining. *Reserves*, starting with the 2011 report, now include *Reserves Justified for Development.*

In addition to the *Reserves* discussed above, there are an estimated 4.69 billion barrels of oil and 12.1 trillion cubic feet of gas resources that are not presented in the tables and figures of this report. These resources can be found in oil and gas fields where the lessee has not made a formal commitment to develop the project; in leases that have not yet qualified and have not been placed in a field; and in fields that expired, relinquished, or terminated without production. As additional drilling and development occur, additional hydrocarbon volumes may become reportable.

The estimates of reserves for this report were completed in April 2014 and represent the combined efforts of engineers, geoscientists, paleontologists, petrophysicists, and other personnel of the BOEM Gulf of Mexico Region, Office of Resource Evaluation, in New Orleans, Louisiana. Reserves estimates are derived for individual reservoirs from geologic and engineering calculations. For any field spanning State and Federal waters, reserves are estimated for the Federal portion only.

INTRODUCTION

This report supersedes the *Estimated Oil and Gas Reserves, Gulf of Mexico OCS Region, December 31, 2010* (Kazanis et al., 2014). It presents estimated Original Reserves, Cumulative Production, and Reserves as of December 31, 2011, for the Gulf of Mexico (GOM). **Figure 1** represents the percentages of Cumulative Production, Reserves, and Contingent Resources in the GOM. The Contingent Resources are not presented in subsequent tables and figures of this report. Estimates of reserves growth (an observed phenomenon that occurs when there is an incremental increase through time in the estimates of reserves) and Undiscovered Resources are not included in this report.

As of December 31, 2011, the 1,292 oil and gas fields in the federally regulated part of the Gulf of Mexico Outer Continental Shelf (GOM OCS) contained Original Reserves estimated to be 21.91 billion barrels of oil (BBO) and 192.4 trillion cubic feet (Tcf) of gas. Cumulative Production from the fields accounts for 17.59 BBO and 181.1 Tcf of gas. Reserves are estimated to be 4.32 BBO and 11.3 Tcf of gas for the 782 active fields. Oil Reserves have decreased 1.6 percent and the gas Reserves have decreased 4.2 percent since the 2010 report.

Additionally, the Contingent Resources are an estimated 4.69 BBO and 12.1 Tcf of gas. These resources can be found in oil and gas fields where the lessee has not made a formal commitment to develop the project; in leases that have not yet qualified and have not been placed in a field; and in fields that expired, relinquished, or terminated without production. As additional drilling and development occur, additional hydrocarbon volumes may become reportable.

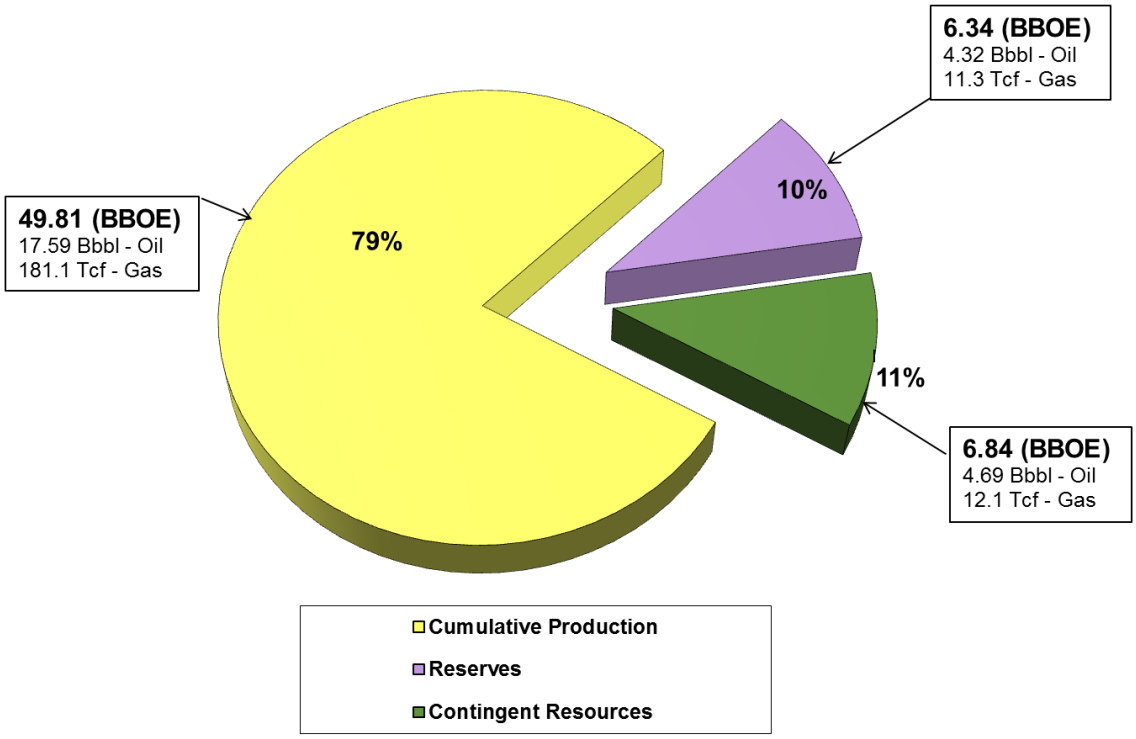

Figure 1. BOEM GOM production, reserves, and resources.

BACKGROUND

Classification of Resources and Reserves

The BOEM classification framework is shown in **Figure 2**. Definitions for each resource class are presented in **Appendix A**. At the point in time a discovery is made, the identified accumulation of hydrocarbons is classified as a Contingent Resource, since a development project has not yet been identified. When the lessee makes a formal commitment to develop and produce the accumulation, it is classified as a Reserves Justified for Development. During the period when infrastructure is being constructed and installed, the accumulation is classified as Proved Undeveloped Reserves. After the equipment is in place and production of the accumulation has begun, the status becomes Proved Developed Producing Reserves. *Reserves* in this report are proved plus probable (2P) reserves estimates. The reserves must be discovered, recoverable, commercial and remaining. *Reserves*, starting with the 2011 report, now include *Reserves Justified for Development.* All hydrocarbons produced and sold are included in the Cumulative Production category. Should a project be abandoned, at any phase of development, any estimates of remaining hydrocarbon volumes could be re-classified to Contingent Resources.

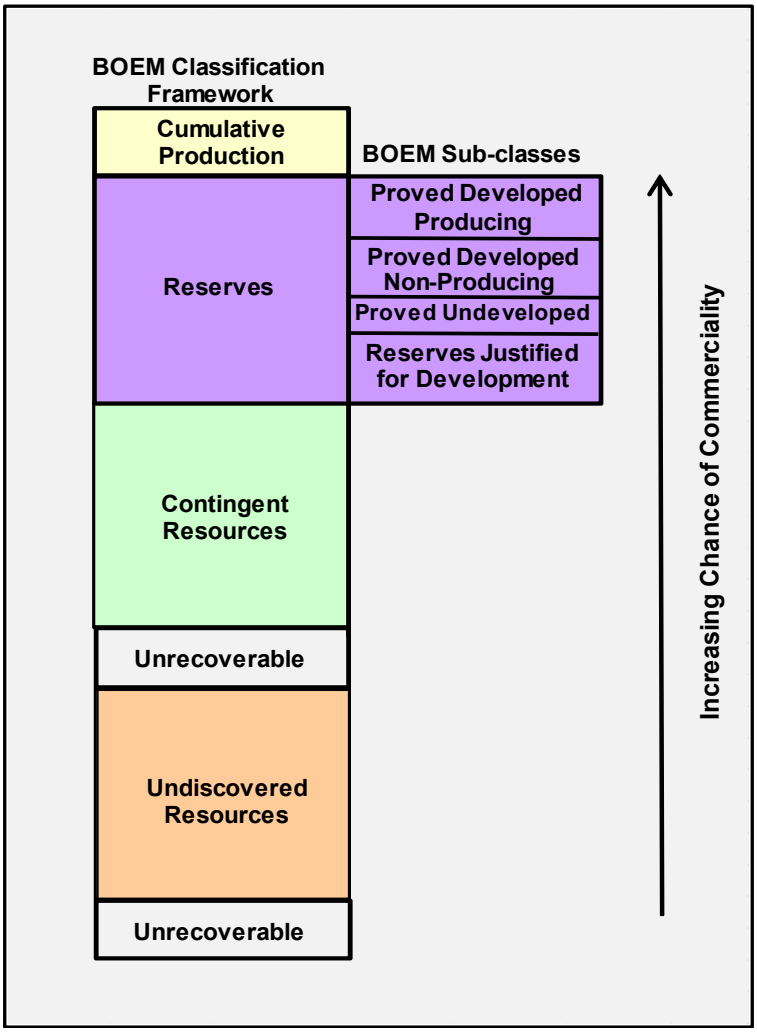

Figure 2. BOEM resource classification framework.

Methods Used for Estimating Reserves

The Reserves inventory component of the Resource Evaluation (RE) Program assigns new producible leases to fields and establishes field limits. The RE Program also develops independent estimates of natural gas and oil in discovered OCS fields by conducting field reserve studies and reviews of fields, sands, and reservoirs. The Program periodically revises the estimates of natural gas and oil volumes to reflect new discoveries, development, and annual production. This report, *Estimated Oil and Gas Reserves, Gulf of Mexico OCS Region, December 31, 2011*, is based on field studies completed at the reservoir and sand levels. All of the reservoir level data have been linked to the sand, pool, play, chronozone, and series level to support the Offshore Atlas Project (OAP).

Additional reports address GOM reserves. Minerals Management Service (MMS) OCS Report, *Atlas of Gulf of Mexico Gas and Oil Sands as of January 1, 1999* (Bascle et al., 2001) provides a detailed geologic reporting of oil and gas reserves. A brief summary of the Atlas is available on the BOEM's Web site at http://www.boem.gov/BOEM-Newsroom/Library/Publications/Gulf-of-Mexico-OCS-Region-Publications.aspx%23ATLASES%23ATLASES#ATLASES. The MMS OCS Report, *2000 Assessment of Conventionally Recoverable Hydrocarbon Resources of the Gulf of Mexico and Atlantic Outer Continental Shelf as of January 1, 1999* (Lore et al., 2001) also known as the National Assessment, and its update, *Assessment of Undiscovered Technically Recoverable Oil and Gas Resources of the Nation's Outer Continental Shelf, 2006* (Lore, 2006*)* address reserves, reserves appreciation, and undiscovered resources. For more information visit BOEM's Web site at http://www.boem.gov/Oil-and-Gas-Energy-Program/Resource-Evaluation/Resource-Assessment/index.aspx

Reserve estimates from geological and engineering analyses have been completed for the 1,292 fields. The accuracy of the reserve estimate improves as more reservoir data becomes available to geoscientists and engineers. Well logs, well file data, seismic data, and production data are periodically analyzed to improve the accuracy of the reserve estimate. As a field is depleted and/or abandoned, the Reserves of productive reservoirs are assigned a value equal to the amount produced and any unrecovered reserve volumes may be converted to Contingent Resources. Currently, there are 510 expired, depleted fields.

Methods used for estimating reserves can be categorized into three groups: analog, volumetric, and performance. Reserve estimates in this report are based primarily on volumetric and performance methods. Reserve estimates are reported deterministically, providing a single "best estimate" based on known geological, engineering, and economic data.

Production data are the metered volumes of raw liquids and gas reported to BOEM by Federal unit and lease operators. Metered volumes from production platforms and/or leases are allocated to individual wells and reservoirs on the basis of periodic well test gauges. These procedures introduce approximations in both production and remaining reserves data.

Oil and gas volume measurements and reserves are corrected to reference standard conditions of 60°F and one atmosphere (14.73 pounds per square inch absolute [psia]). Prior to September 1998, gas was reported at 15.025 psia. BOEM has converted all historical gas production volumes to the 14.73 pressure base.

RESERVES AND RELATED DATA BY PLANNING AREA

The GOM OCS is divided into three planning areas for administrative purposes (**Figure 3**). Each planning area is subdivided into protractions, which in turn are divided into numbered blocks. Fields in the GOM are identified by the protraction area name and block number of discovery – for example, East Cameron Block 271 (EC 271) Field. As the field is developed, the limits may expand into adjacent blocks and areas. These adjacent blocks are then identified as part of the original field and are given that field name. Statistics in this report are presented as area totals compiled under each field name. All of the data associated with EC 271 Field are therefore included in the East Cameron totals, although part of the field extends into the adjacent area of Vermilion. There are four exceptions: Tiger Shoal and Lighthouse Point, included in South Marsh Island; Coon Point, included in Ship Shoal; and Bay Marchand, included in South Timbalier.

Through December 31, 2011, there were 782 fields active in the federally regulated part of the GOM. A list, updated quarterly, of the active and expired fields can be found in the *OCS Operations Field Directory*. Included are the 510 expired, depleted fields, abandoned after having produced 7.5 percent barrels oil equivalent (BOE) of the total cumulative oil and gas production. One hundred eleven fields expired, relinquished, or terminated without production. These fields may be included in the *Indicated Hydrocarbon List*. Reserves data are presented as area totals in **Table 1.**

Table 1.Estimated oil and gas reserves for 1,292 fields by area, December 31, 2011.

Area(s) (Fig. 3)	Number of fields				Original Reserves			Cumulative Production through 2011			Reserves		
	Active prod	Active nonprod	Expired depleted	Expired nonprod	Oil (MMbbl)	Gas (Bcf)	BOE (MMbbl)	Oil (MMbbl)	Gas (Bcf)	BOE (MMbbl)	Oil (MMbbl)	Gas (Bcf)	BOE (MMbbl)
Western Planning Area													
Alaminos Canyon	5	0	0	5	408	577	510	86	146	112	322	431	398
Brazos	13	2	23	3	10	3,723	673	10	3,642	658	0	81	15
East Breaks	14	2	5	4	289	2,297	698	236	2,008	593	53	289	105
Galveston	20	2	28	3	64	2,254	465	60	2,143	441	4	111	24
Garden Banks	4	0	3	2	45	342	107	31	312	87	14	30	20
High Island and Sabine Pass	56	2	70	10	425	15,602	3,201	402	15,287	3,123	22	315	78
Matagorda Island	11	1	17	2	24	5,332	973	24	5,219	952	1	113	21
Mustang Island	8	0	21	5	9	1,801	329	8	1,765	322	1	36	7
N.& S.Padre Island	7	1	11	0	0	636	113	0	618	110	0	18	3
West Cameron and Sabine Pass	10	1	15	1	35	2,924	555	34	2,910	552	1	14	3
Western Planning Area (Other)*	0	0	0	1	0	0	0	0	0	0	0	0	0
Western Planning Area Subtotal	***148***	***11***	***193***	***36***	***1,309***	***35,488***	***7,624***	***891***	***34,050***	***6,950***	***418***	***1,438***	***674***
Central Planning Area													
Atwater Valley	6	0	0	5	48	593	154	21	441	99	28	152	55
Chandeleur	4	0	10	0	0	384	69	0	379	68	0	5	1
East Cameron	31	4	32	0	354	11,059	2,322	342	10,865	2,275	12	194	47
Eugene Island	58	3	28	3	1,725	20,415	5,358	1,651	19,829	5,179	74	586	179
Ewing Bank	14	0	4	2	375	727	505	322	643	436	54	84	69
Garden Banks	21	2	9	4	774	4,228	1,526	619	3,559	1,252	155	669	274
Grand Isle	12	2	9	1	1,023	5,181	1,945	978	4,888	1,848	44	293	97
Green Canyon	31	5	7	21	2,882	4,004	3,594	1,518	2,800	2,016	1,364	1,204	1,578
Main Pass and Breton Sound	49	6	35	4	1,197	7,189	2,476	1,105	6,715	2,300	92	474	176
Mississippi Canyon	36	7	8	11	3,701	10,498	5,568	2,372	7,966	3,789	1,329	2,532	1,779
Mobile	11	5	18	2	0	2,462	439	0	2,149	383	0	313	56
Ship Shoal	49	2	18	3	1,459	12,787	3,735	1,398	12,329	3,592	61	458	143
South Marsh Island	32	10	9	0	979	15,149	3,675	923	14,515	3,506	56	634	169
South Pass	9	1	3	1	1,122	4,553	1,932	1,081	4,425	1,869	40	128	63
South Pelto	7	0	2	0	165	1,217	381	156	1,153	361	9	64	20
South Timbalier	37	6	19	1	1,619	10,430	3,474	1,551	10,033	3,336	68	397	138
Vermilion	47	5	33	1	588	16,780	3,573	559	16,476	3,490	29	304	83
Viosca Knoll	24	1	27	7	636	3,717	1,298	535	3,336	1,129	101	381	169
West Cameron and Sabine Pass	45	7	42	0	199	18,800	3,544	189	18,233	3,433	10	567	111
West Delta	18	2	4	3	1,489	5,796	2,520	1,382	5,619	2,381	108	177	139
Central Planning Area (Other)**	6	8	0	5	270	977	444	0	683	122	269	294	322
Central Planning Area Subtotal	***547***	***76***	***317***	***74***	***20,605***	***156,946***	***48,532***	***16,702***	***147,036***	***42,864***	***3,903***	***9,910***	***5,668***
Eastern Planning Area Subtotal***	***0***	***0***	***0***	***1***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
GOM Total:	***695***	***87***	***510***	***111***	***21,914***	***192,434***	***56,156***	***17,593***	***181,086***	***49,814***	***4,321***	***11,348***	***6,342***
	1,292												

*Western Planning Area (Other) includes Corpus Christi, portions of Keathley Canyon, and Port Isabel.
**Central Planning Area (Other) includes Lund,Walker Ridge, and portions of Destin Dome, Desoto Canyon, Keathley Canyon, Lloyd Ridge, and others.
***Eastern Planning Area includes portions of DeSoto Canyon, Destin Dome, Lloyd Ridge, and others.

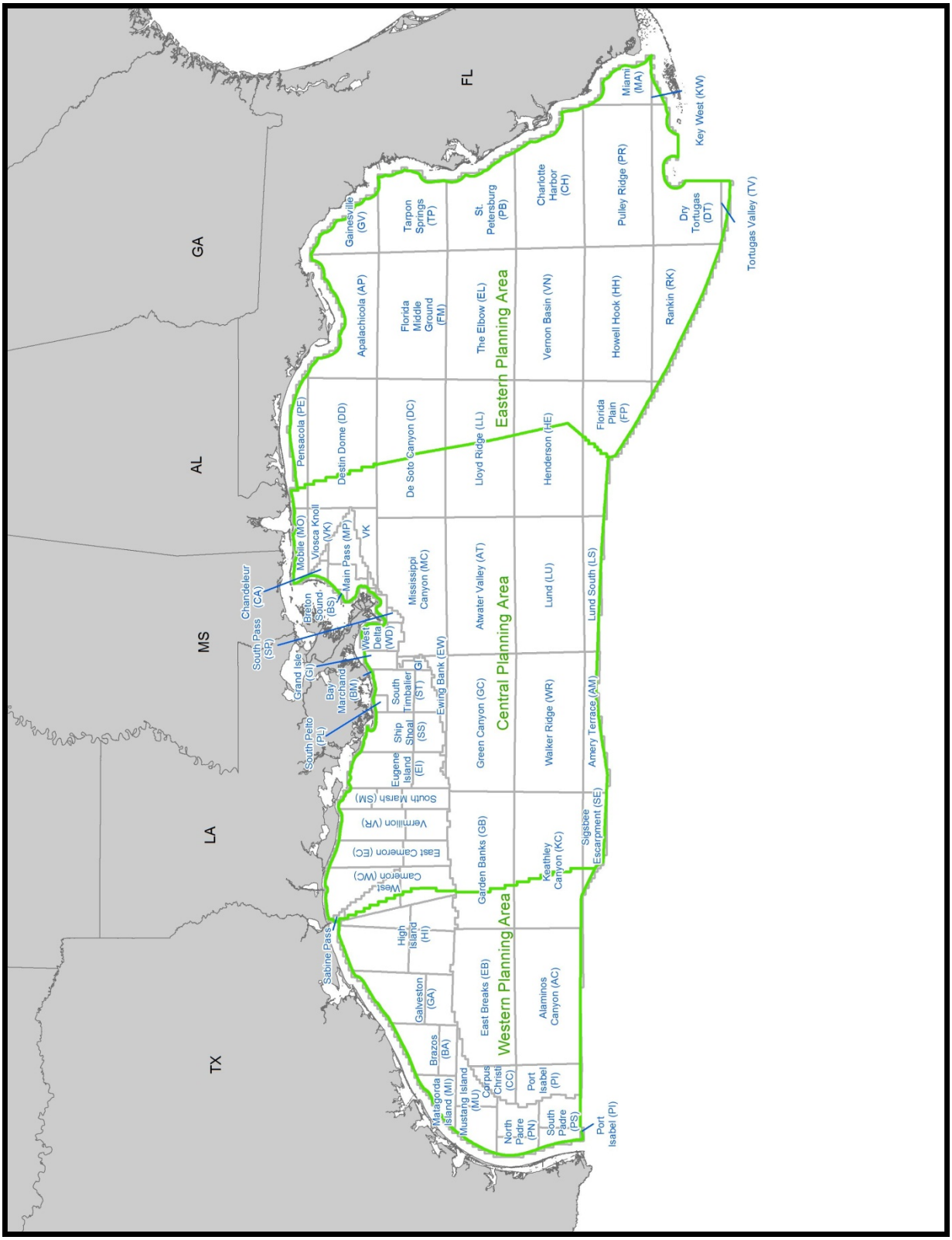

Figure 3. BOEM GOM OCS Planning Areas and Protraction Areas.

FIELD-SIZE DISTRIBUTION

Reserve sizes are expressed in terms of BOE. Gas reserves are converted to BOE and added to the liquid reserves for the convenience of comparison. The conversion factor of 5,620 standard cubic feet of gas equals 1 BOE is based on the average heating values of domestic hydrocarbons. A geometric progression, developed by the United States Geological Survey (USGS) (Attanasi, 1998), was selected for field-size (deposit-size) distribution ranges (**Table 2**).

In this report, fields are classified as either oil or gas; some fields do produce both products, making a field type determination difficult. Generally, fields with a gas/oil ratio (GOR) less than 9,700 standard cubic feet per stock tank barrel (SCF/STB) are classified as oil producers.

Table 2. Description of deposit-size classes.

Class	Deposit-size range*	Class	Deposit-size range*	Class	Deposit-size range*
1	0.031 - 0.062	10	16 - 32	18	4,096 - 8,192
2	0.062 - 0.125	11	32 -64	19	8,192 - 16,384
3	0.125 - 0.25	12	64 - 128	20	16,384 - 32,768
4	0.25 - 0.50	13	128 - 256	21	32,768 - 65,536
5	0.50 - 1.00	14	256 - 512	22	65,536 - 131,072
6	1 - 2	15	512 - 1,024	23	131,072 - 262,144
7	2 - 4	16	1,024 - 2,048	24	262,144 - 524,288
8	4 - 8	17	2,048 - 4,096	25	524,288 - 1,048,576
9	8 - 16	*Million Barrels of Oil Equivalent (MMBOE)			

The field-size distribution based on Original Reserves (in BOE) for 1,292 proved fields is shown in **Figure 4(a)**. Of the 1,292 oil and gas fields, there are 246 oil fields represented in **Figure 5(a)** and 1,046 gas fields shown in **Figure 6(a)**. The Western Gulf of Mexico field-size distributions are displayed on **Figures 4(b)**, **5(b)**, and **6(b)**. **Figures 4(c)**, **5(c)**, and **6(c)** present the Central GOM field-size distributions of Original Reserves.

Analysis of the 1,292 oil and gas fields indicates that the GOM is historically a gas-prone basin. The GOR, based on original reserves of the 246 oil fields, is 2,541 SCF/STB. The yield (condensate divided by gas), based on original reserves for the 1,046 gas fields, is 24.7 barrels (Bbl) of condensate per million cubic feet (MMcf) of gas.

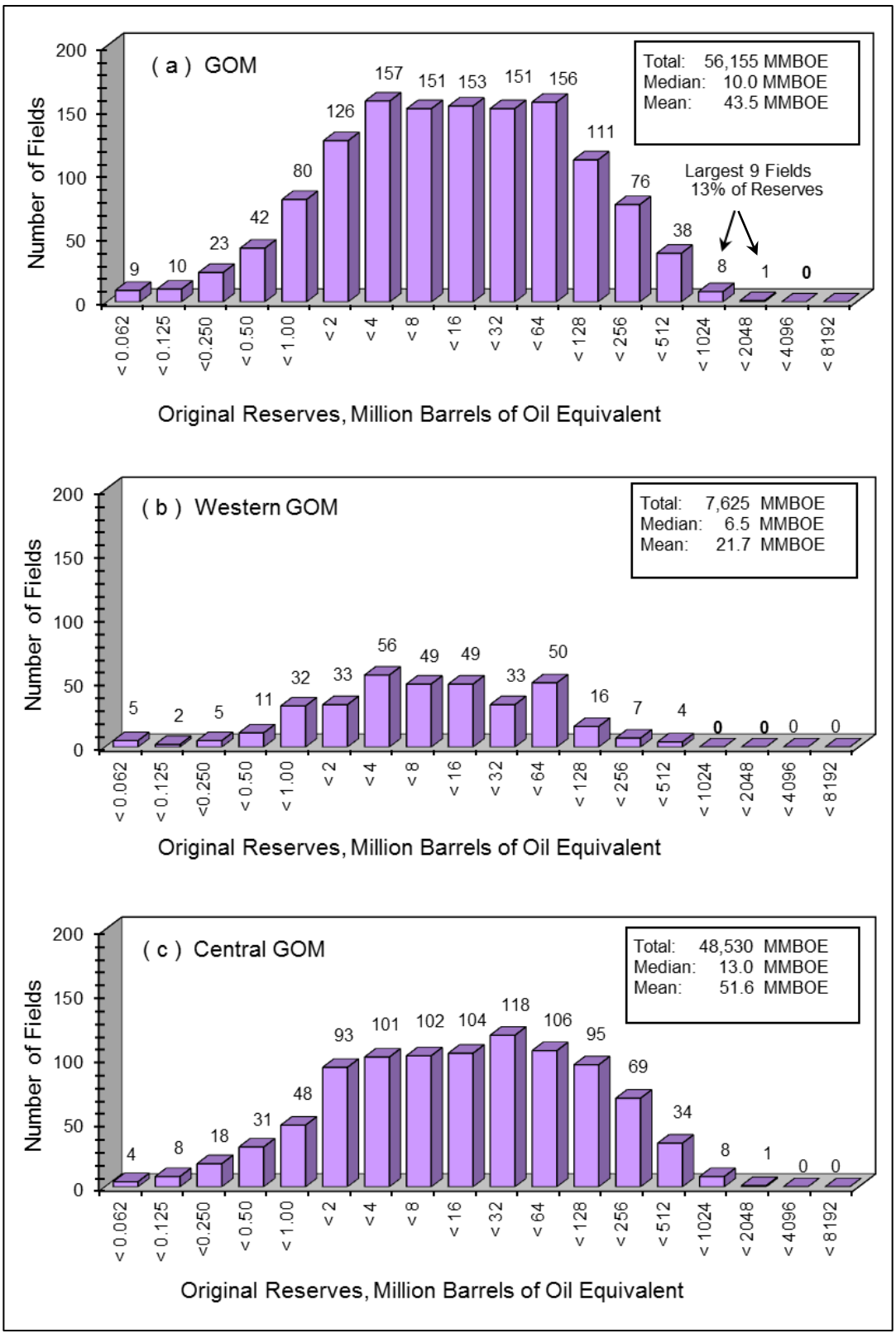

Figure 4. Field-size distribution: (a) GOM, 1,292 fields; (b) Western GOM, 352 fields; (c) Central GOM, 940 fields.

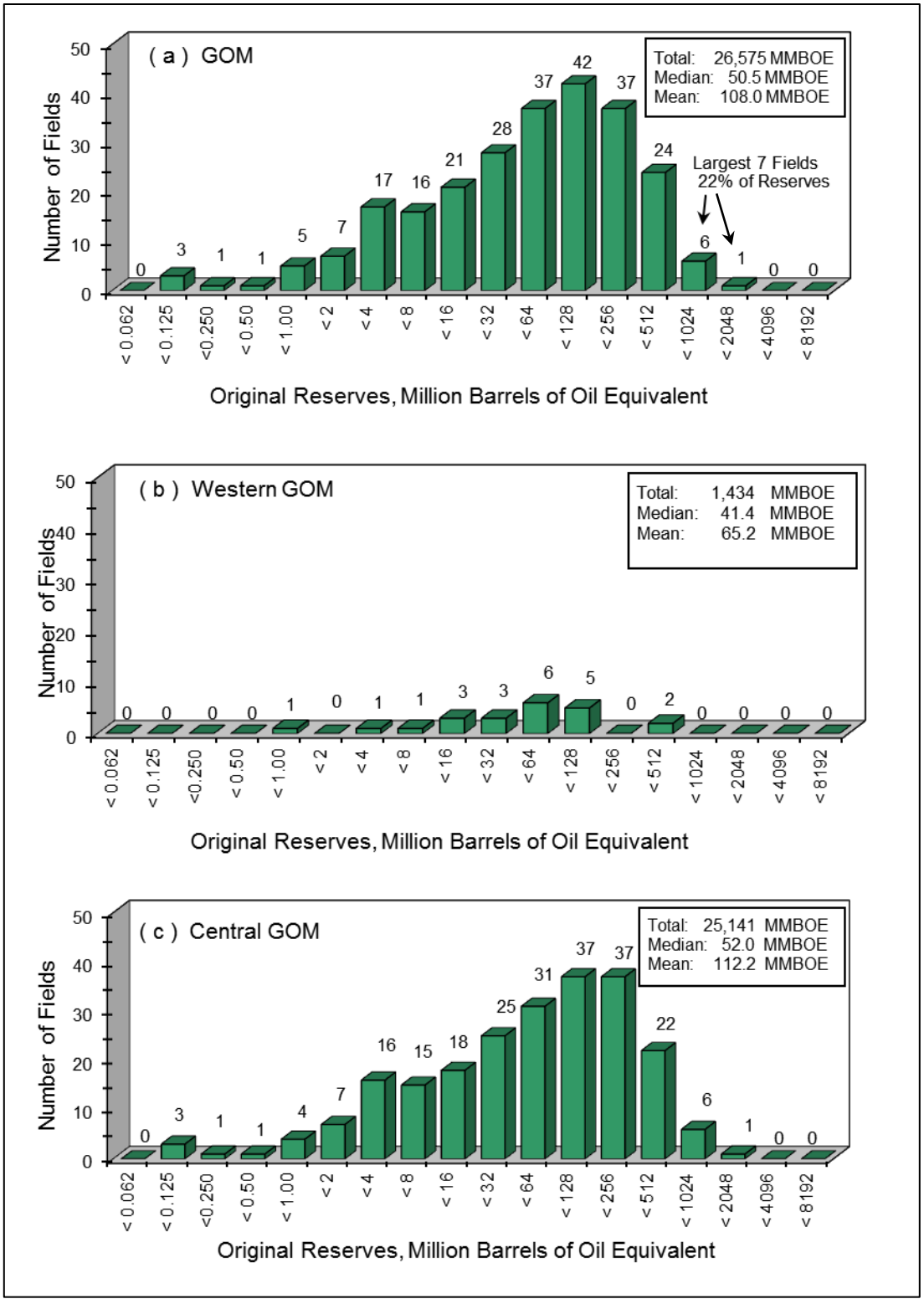

Figure 5. Field-size distribution of oil fields: (a) GOM, 246 fields; (b) Western GOM, 22 fields; (c) Central GOM, 224 fields.

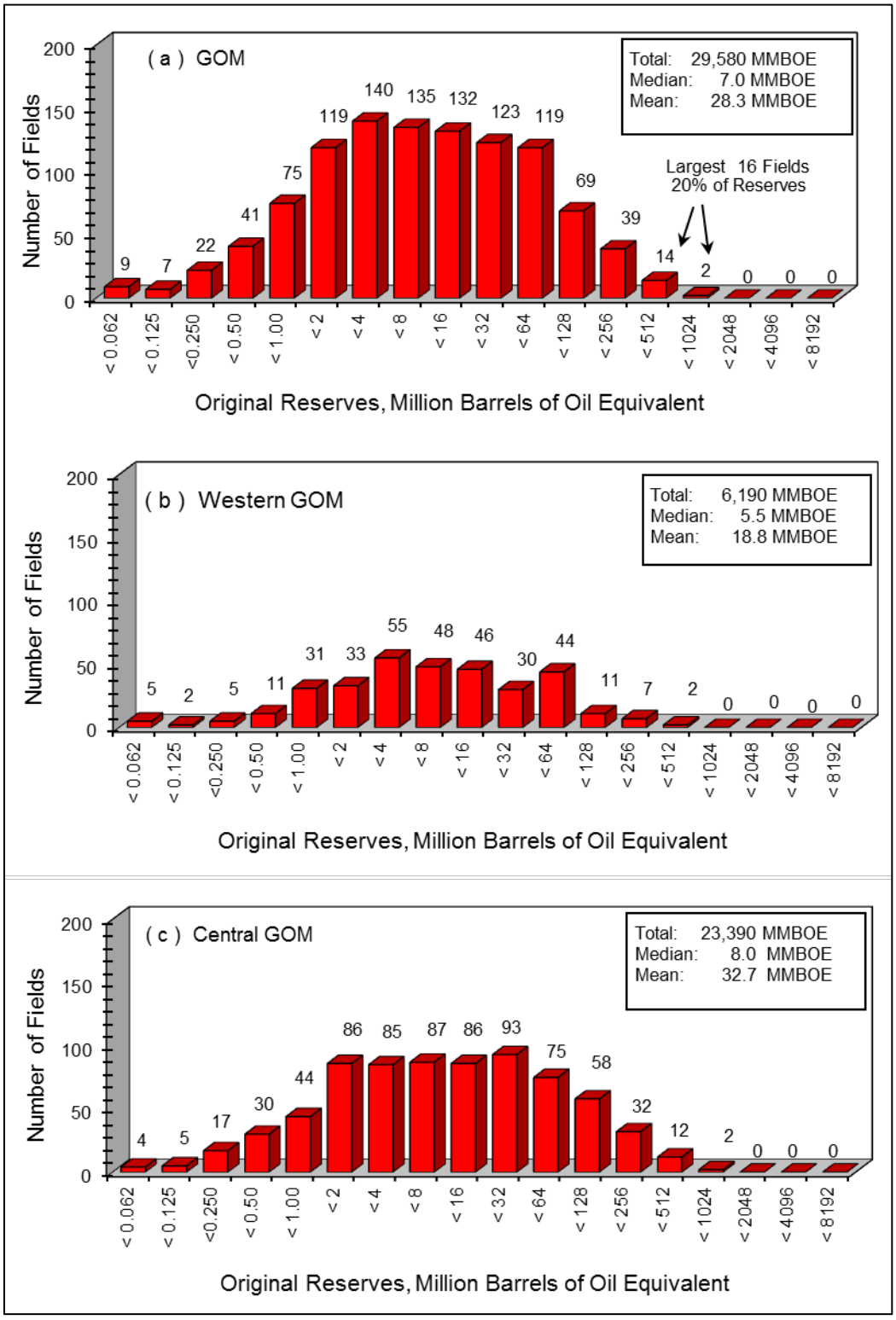

Figure 6. Field-size distribution of gas fields: (a) GOM, 1,046 fields; (b) Western GOM, 330 fields; (c) Central GOM, 716 fields.

Figure 7 shows the cumulative percent distribution of Original Reserves in billion barrels of oil equivalent (BBOE), by field size rank. All 1,292 fields in the GOM OCS are included in this figure. A phenomenon often observed in hydrocarbon-producing basins is a rapid drop-off in size from that of largest known field to smallest. Twenty-five percent of the Original Reserves are contained in the 28 largest fields. Fifty percent of the Original Reserves are contained in the 90 largest fields. Ninety percent of the Original Reserves are contained in the 430 largest fields.

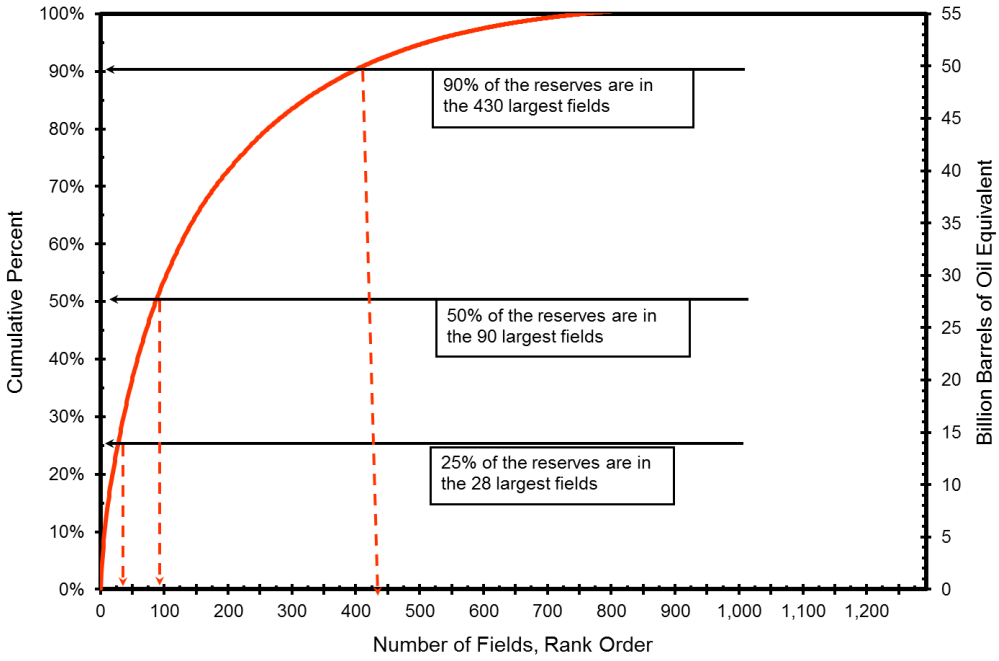

Figure 7. Cumulative percent total reserves versus rank order of field size for 1,292 fields.

Table 3 shows the distribution of the number of fields and reserves by water depth. A field's water depth is determined by averaging the water depth where the wells are drilled in the field. Reserves, reported in MMBOE, are associated with the 1,292 fields. Reserves located in greater than or equal to 1,500 ft of water accounts for 71 percent of the total GOM Reserves.

Table 3. Field and reserves distribution by water depth.

Water Depth Range (Feet)	Number of Fields	Reserves (MMBOE)
< 500	1,078	1,600
500 - 999	54	59
1,000 - 1,499	25	162
1,500 - 4,999	95	2,703
5,000 - 7,499	24	1,312
>= 7,500	16	506
Totals:	1,292	6,342

Figure 8 shows the largest 20 fields ranked in order by Reserves. Eighteen of the 20 fields lie in water depths of greater than or equal to 1,500 ft and account for 52 percent of the Reserves in the GOM. Of the 209 fields in water depths greater than 500 ft, 148 are producing, 56 are depleted or expired, and 5 have yet to produce.

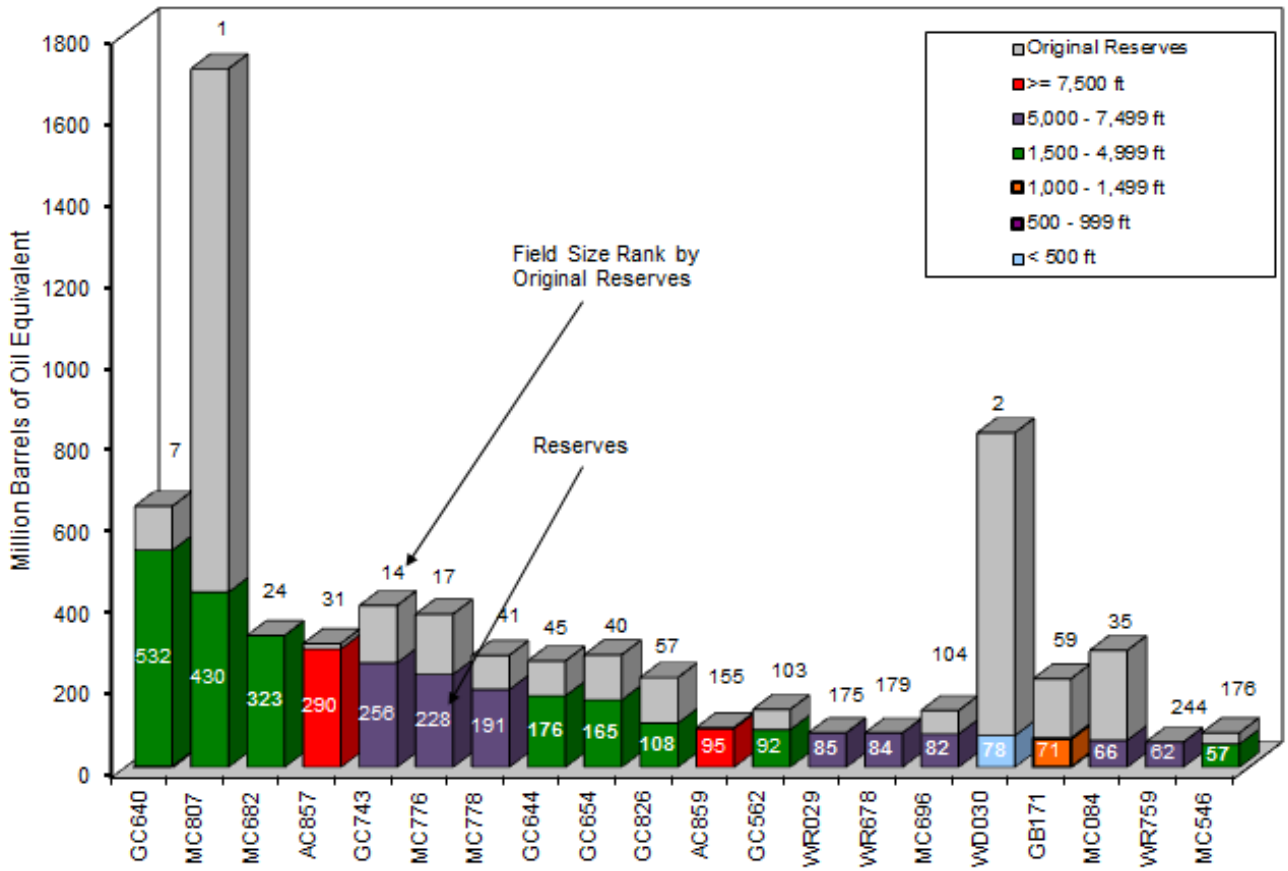

Figure 8. Largest 20 fields, with associated water depths, ranked by Reserves and compared to Original Reserves.

Table 4 ranks the 50 largest fields based on Original Reserves expressed in BOE. Rank, field name, field nickname, discovery year, water depth, field classification, field type, field GOR, Original Reserves, cumulative production through 2011, and Reserves are presented. A complete listing of all 1,292 proved fields is available on the BOEM Web site at: http://www.data.boem.gov/homepg/data_center/field/estimated2011.asp.

Table 4. Fields by rank order, based on Original BOE reserves, top 50 fields.

(Field class: PDP - Proved Developed Producing; PDN - Proved Developed Non-Producing; PU - Proved Undeveloped, RJD- Reserves Justified for Development)

(Field type: O - Oil; G - Gas)

Rank	Field name	Field Nickname	Disc year	Water depth (feet)	Field class	Field type	Original Reserves				Cumulative Production through 2011			Reserves		
							Field GOR (SCF/STB)	Oil (MMbbl)	Gas (Bcf)	BOE (MMbbl)	Oil (MMbbl)	Gas (Bcf)	BOE (MMbbl)	Oil (MMbbl)	Gas (Bcf)	BOE (MMbbl)
1	MC807	MARS-URSA	1989	3,334	PDP	O	1,407	1,370.8	1,928.5	1,713.9	1,044.5	1,347.9	1,284.3	326.3	580.6	429.6
2	WD030		1949	48	PDP	O	1,490	648.3	969.5	820.7	575.2	942.9	742.9	73.1	26.6	77.8
3	EI330		1971	248	PDP	O	4,256	440.6	1,872.2	773.7	431.6	1,856.0	761.8	9.0	16.2	11.9
4	GI043		1956	140	PDP	O	4,391	396.7	1,731.3	704.8	371.4	1,621.2	659.9	25.3	110.1	44.9
5	TS000		1958	13	PDP	G	80,870	45.3	3,660.8	696.6	40.9	3,395.5	645.0	4.4	265.3	51.6
6	BM002		1949	50	PDP	O	1,063	538.3	572.2	640.2	532.7	562.7	632.9	5.6	9.5	7.3
7	GC640	TAHITI/CAESAR/TONGA	2002	4,320	PDP	O	543	583.3	317.0	639.8	98.4	53.4	108.0	484.9	263.6	531.8
8	VR014		1956	26	PDP	G	65,332	48.0	3,137.8	606.3	47.9	3,125.3	604.0	0.1	12.5	2.3
9	MP041		1956	43	PDP	O	5,788	274.5	1,584.3	556.3	261.3	1,500.3	528.2	13.2	84.0	28.1
10	VR039		1948	38	PDP	G	81,323	32.3	2,624.2	499.2	31.7	2,602.2	494.7	0.6	22.0	4.5
11	SS208		1960	102	PDP	O	6,313	224.0	1,418.9	476.4	219.3	1,378.3	464.5	4.7	40.6	11.9
12	GB426	AUGER	1987	2,847	PDP	O	3,592	247.4	888.7	405.6	227.7	827.4	375.0	19.7	61.3	30.6
13	WD073		1962	177	PDP	O	2,503	276.9	697.7	401.0	265.7	666.5	384.2	11.2	31.2	16.8
14	GC743	ATLANTIS	1998	6,285	PDP	O	638	352.1	252.0	396.9	126.4	79.8	140.6	225.7	172.2	256.3
15	EI238		1964	147	PDP	G	16,020	100.4	1,568.1	379.4	90.9	1,500.0	357.8	9.5	68.1	21.6
16	GI016		1948	54	PDP	O	1,297	307.1	397.9	377.9	302.4	388.7	371.6	4.7	9.2	6.3
17	MC776	N.THUNDER HORSE	2000	5,668	PDP	O	945	322.1	304.3	376.2	126.9	119.0	148.0	195.2	185.3	228.2
18	SP061		1967	220	PDP	O	1,941	274.7	532.5	369.4	267.1	524.0	360.3	7.6	8.5	9.1
19	ST172		1962	98	PDP	G	141,076	13.7	1,921.7	355.5	12.0	1,894.5	349.0	1.7	27.2	6.5
20	SP089		1969	421	PDP	O	4,434	197.3	874.5	352.9	192.5	863.4	346.1	4.8	11.1	6.8
21	WC180		1961	48	PDP	G	138,927	13.5	1,868.7	345.9	13.2	1,840.2	340.6	0.3	28.5	5.3
22	ST021		1957	46	PDP	O	1,653	263.7	435.8	341.3	255.4	421.9	330.5	8.3	13.9	10.8
23	SS169		1960	63	PDP	O	5,363	167.5	898.3	327.4	162.1	874.5	317.8	5.4	23.8	9.6
24	MC682	TUBULAR BELLS	2003	4,522	RJD	O	2,479	224.4	556.2	323.4	0	0	0	224.4	556.2	323.4
25	ST176		1963	127	PDP	G	14,105	91.9	1,296.9	322.7	84.6	1,241.3	305.5	7.3	55.6	17.2
26	SM048		1961	101	PDP	G	52,720	30.8	1,623.9	319.8	27.9	1,551.1	303.9	2.9	72.8	15.9
27	MC194	COGNAC	1975	1,022	PDP	O	4,166	182.1	758.4	317.0	179.6	755.8	314.1	2.5	2.6	2.9
28	EC064		1957	50	PDP	G	59,088	27.3	1,617.2	315.1	27.0	1,594.8	310.8	0.3	22.4	4.3
29	EI292		1964	213	PDP	G	80,265	20.5	1,649.3	314.0	19.3	1,644.5	311.9	1.2	4.8	2.1
30	EC271		1971	171	PDP	G	19,075	70.7	1,347.6	310.4	68.9	1,340.9	307.4	1.8	6.7	3.0
31	AC857	GREAT WHITE	2002	7,920	PDP	O	1,614	247.8	313.3	303.6	10.1	17.7	13.3	237.7	295.6	290.3
32	SS176		1956	101	PDP	G	19,862	66.4	1,320.4	301.4	65.4	1,308.3	298.2	1.0	12.1	3.2
33	SP027	EAST BAY	1954	64	PDP	O	5,301	152.8	810.9	297.0	151.3	782.6	290.5	1.5	28.3	6.5
34	WC587		1971	211	PDP	G	118,332	13.4	1,580.7	294.6	13.4	1,578.6	294.2	0	2.1	0.4
35	MC084	KING/HORN MT.	1993	5,300	PDP	O	1,135	234.0	296.3	286.8	184.1	204.1	220.5	49.9	92.2	66.3
36	ST135		1956	129	PDP	O	3,665	171.3	627.7	282.9	167.3	611.8	276.1	4.0	15.9	6.8
37	EI296		1971	214	PDP	G	71,442	20.5	1,470.0	282.1	20.5	1,460.4	280.4	0	9.6	1.7
38	WD079		1966	123	PDP	O	3,841	167.7	641.2	281.8	162.5	626.6	274.0	5.2	14.6	7.8
39	WC192		1954	57	PDP	G	60,807	23.7	1,441.1	280.1	23.1	1,410.0	273.9	0.6	31.1	6.2
40	GC654	SHENZI	2002	4,305	PDP	O	470	254.6	119.8	276.0	103.6	39.5	110.7	151.0	80.3	165.3
41	MC778	THUNDER HORSE	1999	6,078	PDP	O	685	244.9	167.8	274.9	73.5	59.3	84.1	171.4	108.5	190.8
42	MI623		1980	83	PDP	G	101,832	14.3	1,454.1	273.0	13.6	1,392.8	261.4	0.7	61.3	11.6
43	HI573A		1973	341	PDP	O	7,510	116.5	875.7	272.4	111.8	871.6	266.9	4.7	4.1	5.5
44	VK956	RAM-POWELL	1985	3,238	PDP	O	8,838	102.3	904.6	263.3	90.8	862.4	244.3	11.5	42.2	19.0
45	GC644	HOLSTEIN	1999	4,341	PDP	O	1,181	215.9	255.1	261.3	72.8	73.0	85.8	143.1	182.1	175.5
46	GC244	TROIKA	1994	2,795	PDP	O	1,900	192.8	378.7	260.2	174.5	337.2	234.5	18.3	41.5	25.7
47	GI047		1955	88	PDP	O	3,816	154.6	592.3	260.0	149.4	569.4	250.7	5.2	22.9	9.3
48	SP078		1972	202	PDP	G	11,159	82.3	921.7	246.2	78.3	912.2	240.6	4.0	9.5	5.6
49	SM023		1960	82	PDP	G	39,386	30.0	1,182.0	240.3	29.7	1,173.9	238.6	0.3	8.1	1.7
50	PL020		1951	33	PDP	O	5,742	118.3	679.0	239.1	112.7	648.9	228.1	5.6	30.1	11.0

RESERVOIR-SIZE DISTRIBUTION

The size distributions of the reservoirs are shown in **Figures 9, 10, and 11**. The size ranges are based on Original Reserves and are presented on a geometrically progressing horizontal scale. These sizes correspond with the USGS deposit-size ranges shown in **Table 2** with a modification to subdivide small reservoirs into finer distributions. For **Figures 9** and **10**, the Original Reserves are presented in million barrels (MMbbl) and billion cubic feet (Bcf), respectively. The number of reservoirs in each size grouping, shown as percentages of the total, is presented on a linear vertical scale. For the combination reservoirs (saturated oil rims with associated gas caps), shown in **Figure 10**, gas is converted to BOE and added to the liquid reserves.

Figure 9 shows the reservoir-size distribution, on the basis of Original BOE, for 2,334 proved combination reservoirs. The median is 0.9 MMBOE and the mean is 3.0 MMBOE. The GOR, based on Original Reserves, for the oil portion of the reservoirs is 1,197 SCF/STB, and the yield, based on Original Reserves, for the gas cap is 22.2 Bbl of condensate per MMcf of gas.

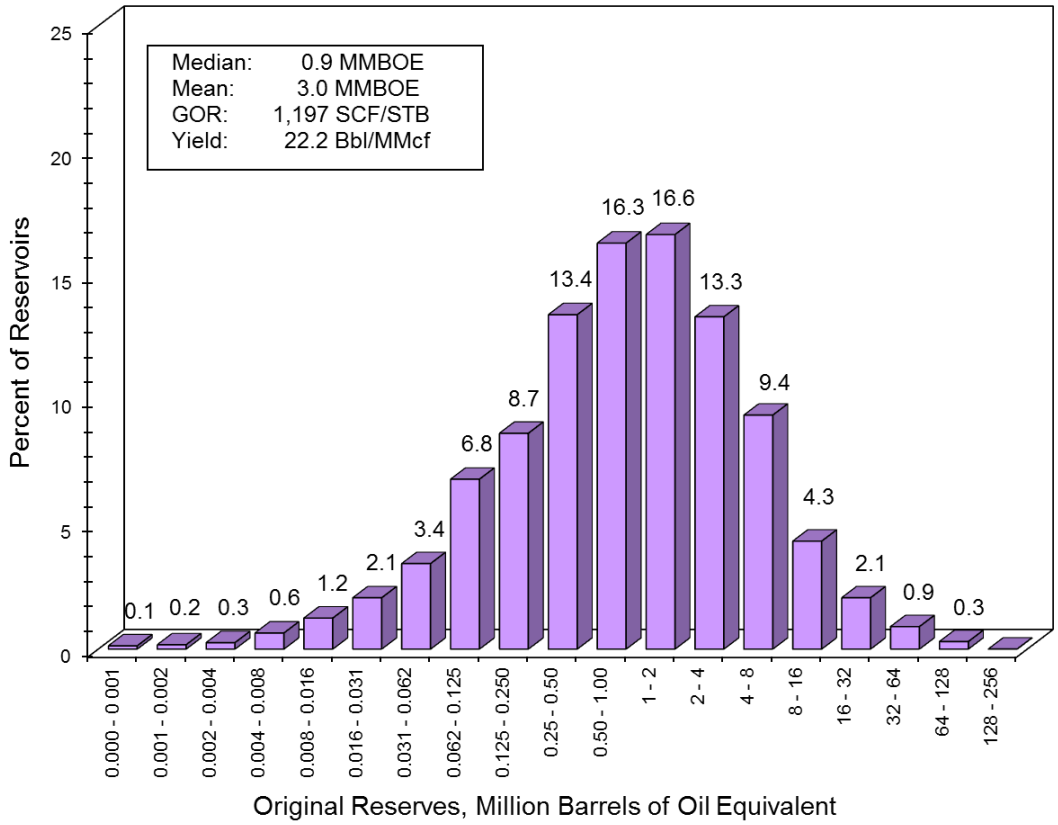

Figure 9. Reservoir-size distribution, 2,334 combination reservoirs.

Figure 10 shows the reservoir-size distribution, on the basis of Original Oil reserves, for 8,737 undersaturated oil reservoirs. The median is 0.3 MMbbl, the mean is 1.8 MMbbl, and the GOR, based on Original reserves, is 1,237 SCF/STB. **Figure 11** shows the reservoir-size distribution, on the basis of Original Gas reserves, for 18,735 gas reservoirs. The median is 2.0 Bcf of gas, the mean is 8.3 Bcf, and the yield, based on Original Reserves, is 12.0 Bbl of condensate per MMcf of gas.

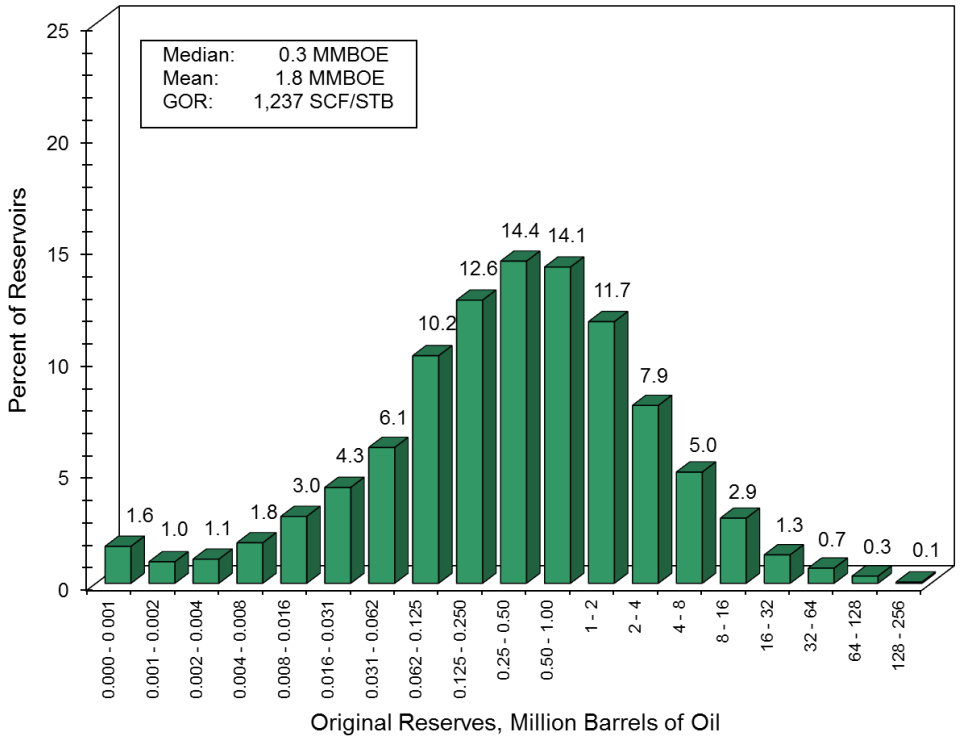

Figure 10. Reservoir-size distribution, 8,737 oil reservoirs.

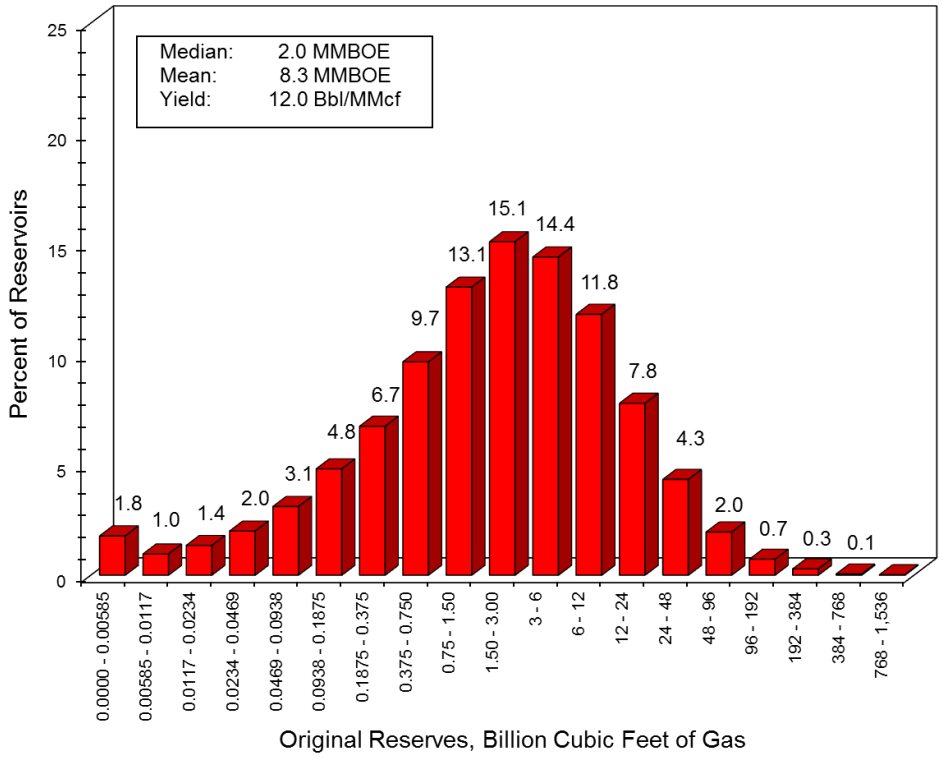

Figure 11. Reservoir-size distribution, 18,735 gas reservoirs.

DRILLING AND PRODUCTION TRENDS

Figure 12 presents the number of exploratory wells drilled each year by water depth category. The total footage drilled in 2011 was 1.29 million feet compared to 1.48 million feet in 2010.

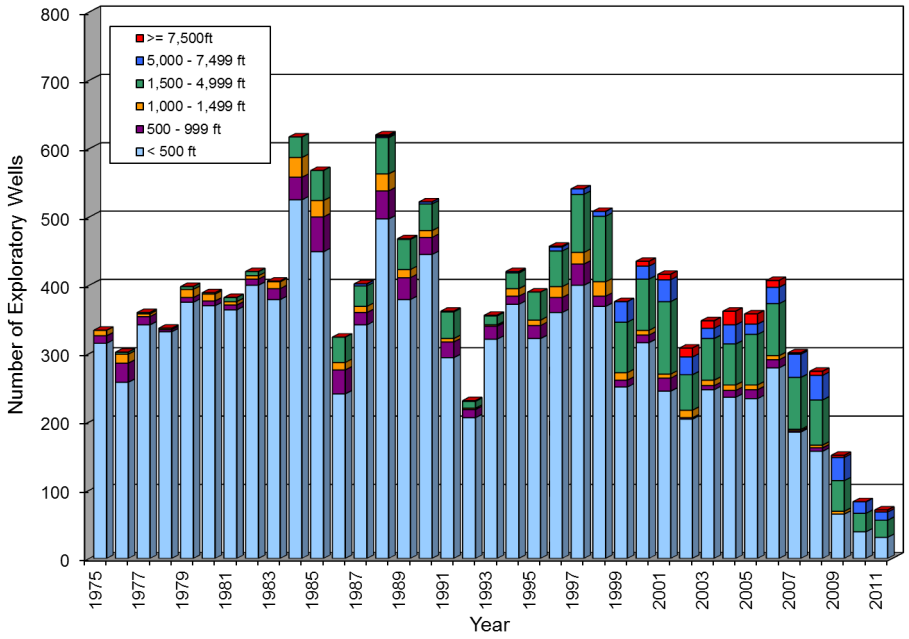

Figure 12. Number of exploratory wells drilled by water depth.

Figure 13 presents the number of development wells drilled each year by water depth category. The total footage drilled in 2011 was 2.11 million feet compared to 1.95 million feet in 2010.

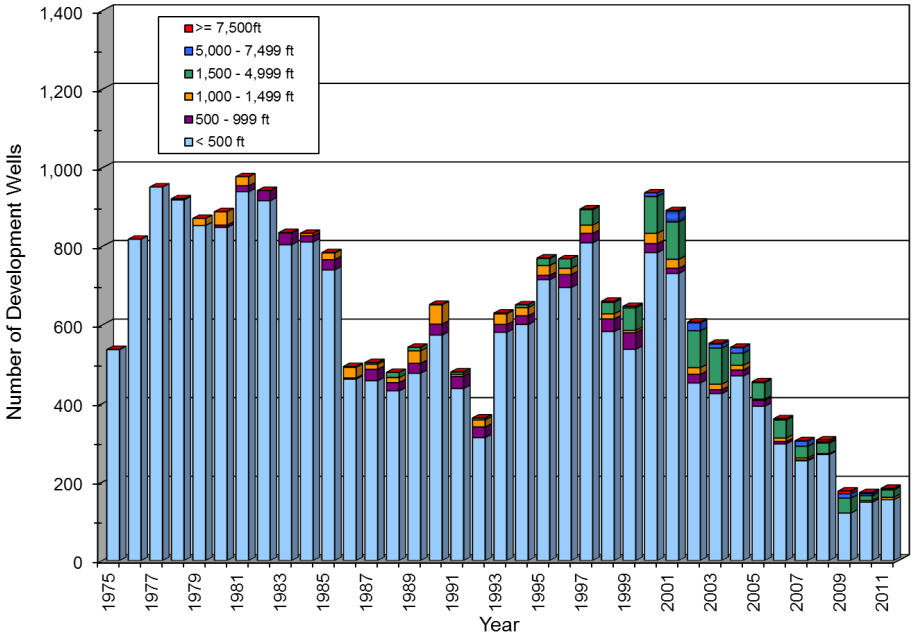

Figure 13. Number of development wells drilled by water depth.

Original Reserves in BBOE for water depth categories by reservoir discovery year are presented in **Figure 14**..

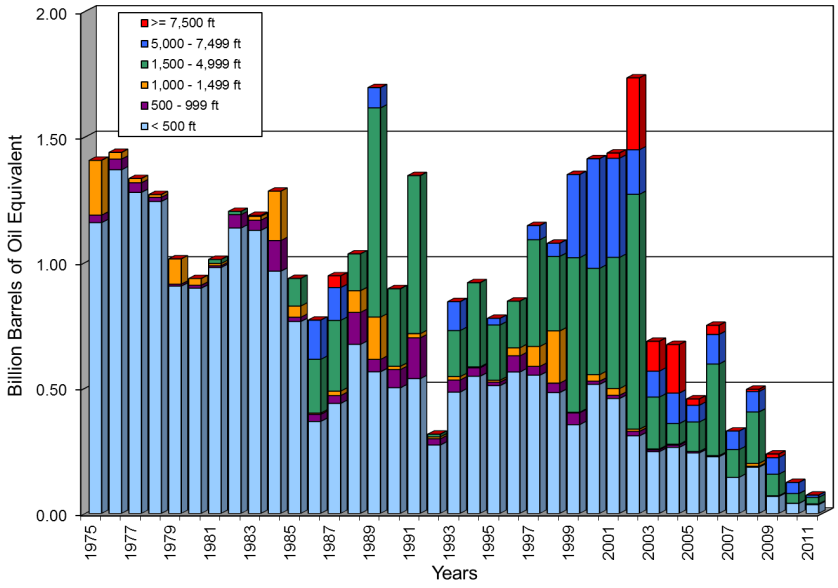

Figure 14. Original Reserves categorized by water depth and reservoir discovery year.

Annual production in the GOM is shown in **Figure 15**. The oil plot includes condensate and the gas plot includes casinghead gas. Annual production for oil and gas is presented as a total, in shallow water (less than 1,000 ft), and in deepwater (greater than 1,000 ft). From 2010 to 2011, annual oil production decreased 14.4 percent to 482 MMbbl and annual gas production decreased 18.8 percent to 1.8 Tcf. The mean daily production in the GOM during 2011 was 1.17 MMbbl of crude oil, 0.14 MMbbl of gas condensate, 1.29 Bcf of casinghead gas, and 3.71 Bcf of gas-well gas. The mean GOR of oil wells was 1,098 SCF/STB, and the mean yield from gas wells was 38.8 Bbl of condensate per MMcf of gas.

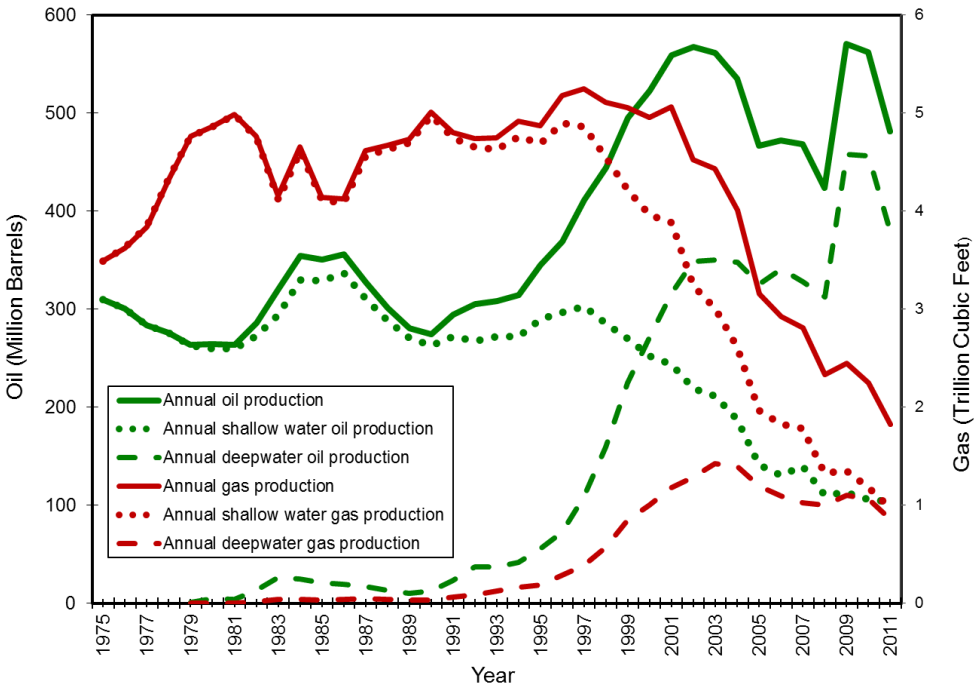

Figure 15. Annual oil and gas production.

SUMMARY AND CONCLUSIONS

A summary of the Reserve estimates for 2011 and a comparison with estimates from the previous year's report (December 31, 2010) are shown in **Table 5**. There were 10 fields added during 2011 (6 oil fields and 4 gas fields), which are tabulated and summarized as increases to Original Reserves. All ten of the fields added were discovered prior to 2011.

Comparison of Reserves

A net change in the reserve estimates is a result of combining the discoveries and the revisions. Reserve estimates may increase or decrease with additional information (e.g. additional wells are drilled, leases are added or expire, or reservoirs are depleted). Re-evaluations of existing field studies are conducted using field development and/or production history to capture the changes in reserve estimates. Revisions of Original Reserves are presented as changes in **Table 5**. Based on periodic reviews and revisions of field studies conducted since the 2010 report, the reserves revisions have resulted in a slight increase in Original Reserves.

The table also demonstrates that the 2011 oil and gas discoveries and field revisions did not exceed production, resulting in a net decrease in Reserves. The Reserves decreased 1.6 percent for oil and decreased 4.2 percent for gas, since the 2010 report.

Table 5. Summary and comparison of GOM oil and gas reserves as of December 31, 2010 and December 31, 2011.

	Oil (Bbbl)	Gas (Tcf)	BOE (Bbbl)
Original Reserves:			
Previous estimates, as of 12/31/2010*	**21.50**	**191.1**	**55.50**
Discoveries	0.46	0.8	0.59
Revisions	-0.05	0.5	0.06
Estimate, as of 12/31/2011 (this report)	**21.91**	**192.4**	**56.15**
Cumulative production:			
Previous estimates, as of 12/31/2010*	**17.11**	**179.3**	**49.01**
Revisions	0.00	0.0	-0.01
Production during 2011	0.48	1.8	0.81
Estimate, as of 12/31/2011 (this report)	**17.59**	**181.1**	**49.81**
Reserves:			
Previous estimates, as of 12/31/2010*	**4.39**	**11.8**	**6.49**
Discoveries	0.46	0.8	0.59
Revisions	-0.05	0.5	0.07
Production during 2011	-0.48	-1.8	-0.81
Estimate, as of 12/31/2011 (this report)	**4.32**	**11.3**	**6.34**

*Kazanis et.al., 2013

Table 6 presents all previous reserve estimates by year. Because of adjustments and corrections to production data submitted by Gulf of Mexico OCS operators, the difference between historical cumulative production for successive years does not always equal the annual production for the latter year.

Table 6. Oil and gas reserves and cumulative production at end of year, 1975-2011.

"Oil" includes crude oil and condensate; "gas" includes associated and nonassociated gas. Reserves estimated as of December 31 each year.

Year	Number of fields included	Original Reserves			Historical Cumulative Production			Reserves		
		Oil (Bbbl)	Gas (Tcf)	BOE (Bbbl)	Oil (Bbbl)	Gas (Tcf)	BOE (Bbbl)	Oil (Bbbl)	Gas (Tcf)	BOE (Bbbl)
1975	255	6.61	59.9	17.27	3.82	27.2	8.66	2.79	32.7	8.61
1976	306	6.86	65.5	18.51	4.12	30.8	9.60	2.74	34.7	8.91
1977	334	7.18	69.2	19.49	4.47	35.0	10.70	2.71	34.2	8.80
1978	385	7.52	76.2	21.08	4.76	39.0	11.70	2.76	37.2	9.38
1979 (1)	417	7.71	82.2	22.34	4.83	44.2	12.69	2.88	38.0	9.64
1980	435	8.04	88.9	23.86	4.99	48.7	13.66	3.05	40.2	10.20
1981	461	8.17	93.4	24.79	5.27	53.6	14.81	2.90	39.8	9.98
1982	484	8.56	98.1	26.02	5.58	58.3	15.95	2.98	39.8	10.06
1983	521	9.31	106.2	28.21	5.90	62.5	17.02	3.41	43.7	11.19
1984	551	9.91	111.6	29.77	6.24	67.1	18.18	3.67	44.5	11.59
1985	575	10.63	116.7	31.40	6.58	71.1	19.23	4.05	45.6	12.16
1986	645	10.81	121.0	32.34	6.93	75.2	20.31	3.88	45.8	12.03
1987	704	10.76	122.1	32.49	7.26	79.7	21.44	3.50	42.4	11.04
1988 (2)	678	10.95	126.7	33.49	7.56	84.3	22.56	3.39	42.4	10.93
1989	739	10.87	129.1	33.84	7.84	88.9	23.66	3.03	40.2	10.18
1990	782	10.64	129.9	33.75	8.11	93.8	24.80	2.53	36.1	8.95
1991	819	10.74	130.5	33.96	8.41	98.5	25.94	2.33	32.0	8.02
1992	835	11.08	132.7	34.69	8.71	103.2	27.07	2.37	29.5	7.62
1993	849	11.15	136.8	35.49	9.01	107.7	28.17	2.14	29.1	7.32
1994	876	11.86	141.9	37.11	9.34	112.6	29.38	2.52	29.3	7.73
1995	899	12.01	144.9	37.79	9.68	117.4	30.57	2.33	27.5	7.22
1996	920	12.79	151.9	39.82	10.05	122.5	31.85	2.74	29.4	7.97
1997	957	13.67	158.4	41.86	10.46	127.6	33.17	3.21	30.8	8.69
1998	984	14.27	162.7	43.22	10.91	132.7	34.52	3.36	30.0	8.70
1999	1,003	14.38	161.3	43.08	11.40	137.7	35.90	2.98	23.6	7.18
2000	1,050	14.93	167.3	44.70	11.93	142.7	37.32	3.00	24.6	7.38
2001	1,086	16.51	172.0	47.11	12.48	147.7	38.77	4.03	24.3	8.35
2002	1,112	18.75	176.8	50.21	13.05	152.3	40.15	5.71	24.6	10.09
2003	1,141	18.48	178.2	50.19	13.61	156.7	41.49	4.87	21.5	8.70
2004	1,172	18.96	178.4	50.70	14.14	160.7	42.73	4.82	17.7	7.97
2005	1,196	19.80	181.8	52.15	14.61	163.9	43.77	5.19	17.9	8.38
2006	1,229	20.30	183.6	52.97	15.08	166.7	44.74	5.22	16.9	8.23
2007	1,251	20.43	184.6	53.28	15.55	169.5	45.71	4.88	15.1	7.57
2008	1,270	21.24	188.4	54.76	15.96	171.8	46.53	5.28	16.6	8.23
2009 (3)	1,278	21.20	190.2	55.03	16.53	176.8	47.99	4.67	13.3	7.04
2010	1,282	21.50	191.1	55.50	17.11	179.3	49.01	4.39	11.8	6.49
2011 (4)	1,292	21.91	192.4	56.15	17.59	181.1	49.81	4.32	11.3	6.34

(1) Gas plant liquids dropped from system
(2) Basis of reserves changed from demonstrated to SPE proved.
(3) Conversion of historical gas production to 14.73 pressure base.
(4) Includes Reserves Justified for Development

Conclusions

As of December 31, 2011, the 1,292 oil and gas fields in the federally regulated part of the Gulf of Mexico Outer Continental Shelf (GOM OCS) contained Original Reserves estimated to be 21.91 billion barrels of oil (BBO) and 192.4 trillion cubic feet (Tcf) of gas. Cumulative Production from the fields accounts for 17.59 BBO and 181.1 Tcf of gas. Reserves are estimated to be 4.32 BBO and 11.3 Tcf of gas for the 782 active fields. Oil reserves have decreased 1.6 percent and the gas reserves have decreased 4.2 percent from the 2010 report.

Additionally, the Contingent Resources are an estimated 4.69 BBO and 12.1 Tcf of gas. These resources can be found in oil and gas fields where the lessee has not made a formal commitment to develop the project; in leases that have not yet qualified and have not been placed in a field; and in fields that expired, relinquished, or terminated without production. As additional drilling and development occur, additional hydrocarbon volumes may become reportable.

CONTRIBUTING PERSONNEL

This report includes contributions from the following Gulf of Mexico Region, Office of Resource Evaluation, personnel.

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APPENDIX A: Definitions of Field, Resource and Reserves Terms

The following definitions as used in this report have been modified from SPE-PRMS and other sources where necessary to conform to requirements of the BOEM Reserves Inventory Program.

Field

A *Field* is an area consisting of a single reservoir or multiple reservoirs all grouped on, or related to, the same general geologic structural feature and/or stratigraphic trapping condition. There may be two or more reservoirs in a field that are separated vertically by impervious strata, laterally by local geologic barriers, or by both. The area may include one OCS lease, a portion of an OCS lease, or a group of OCS leases with one or more wells that have been approved as producible by BOEM pursuant to the requirements of Title 30 Code of Federal Regulations (CFR) 550.115/116, Determination of Well Producibility (*Federal Register, 2012*). A field is usually named after the area and block on which the discovery well is located. Field names and/or field boundaries may be changed when additional geologic and/or production data initiate such a change. Using geological criteria, BOEM designates a new producible lease as a new field or assigns it to an existing field. http://www.boem.gov/BOEM-Newsroom/Offshore-Stats-and-Facts/Gulf-of-Mexico-Region/Field-Naming-Handbook---March-1996.aspx.

Project

A *Project* represents the link between the petroleum accumulation and the decision-making process, including budget allocation. A project, for BOEM's classification of Resources and Reserves, is the Field (see also Field).

Resources

Resources encompass all quantities of petroleum (recoverable and unrecoverable) naturally occurring on or within the Earth's crust, discovered and undiscovered, plus those quantities already produced. Further, it includes all types of petroleum whether currently considered conventional or unconventional.

Undiscovered Resources

Resources postulated, on the basis of geologic knowledge and theory, to exist outside of known fields or accumulations. Included also are resources from undiscovered pools within known fields to the extent that they occur within separate plays. BOEM assesses two types of undiscovered resources, *Undiscovered Technically Recoverable Resources (UTRR)* and *Undiscovered Economically Recoverable Resources (UERR).*

Discovered Resources

Hydrocarbons whose location and quantity are known or estimated from specific geologic evidence are *Discovered Resources*. Included are *Contingent Resources* and *Reserves* depending upon economic, technical, contractual, or regulatory criteria.

Contingent Resources

Those quantities of petroleum estimated, as of a given date, to be potentially recoverable from known accumulations by application of development projects but which are not currently considered to be commercially recoverable due to one or more contingencies.

Unrecoverable

The portion of discovered or undiscovered petroleum-initially-in-place quantities which are estimated, as of a given date, not to be recoverable. A portion of these quantities may become recoverable in the future as commercial circumstances change, technological developments occur, or additional data are acquired.

Reserves

Reserves are those quantities of petroleum anticipated to be commercially recoverable by application of development projects to known accumulations from a given date forward under defined conditions. *Reserves* must further satisfy four criteria: They must be discovered, recoverable, commercial, and remaining (as of a given date) based on the

development project(s) applied. *Reserves* are further sub-classified based on economic certainty.

Original Reserves	*Original Reserves* are the total of the *Cumulative Production* and *Reserves*, as of a specified date.
Reserves Justified for Development	The lowest level of reserves certainty. Implementation of the development project is justified on the basis of reasonable forecast commercial conditions at the time of reporting and that there are reasonable expectations that all necessary approvals/contracts will be obtained.
Probable Reserves	*Probable Reserves* are those additional reserves which analysis of geoscience and engineering data indicate are less likely to be recovered than Proved Reserves but more certain to be recovered than Possible Reserves.
Proved Undeveloped Reserves	*Proved Undeveloped Reserves* are those *Proved Reserves* that are expected to be recovered from future wells and facilities, including future improved recovery projects which are anticipated with a high degree of certainty in reservoirs which have previously shown favorable response to improved recovery projects.
Proved plus Probable Reserves	The sum of the estimated proved reserves and any additional probable reserves (2P). See the separate definitions for Proved Reserves and Probable Reserves.
Proved *Reserves*	*Proved Reserves* are those quantities of petroleum which, by analysis of geoscience and engineering data, can be estimated with reasonable certainty to be commercially recoverable, from a given date forward, from known reservoirs and under defined economic conditions, operating methods, and government regulations. *Proved Reserves* are classified as *Proved Undeveloped Reserves* or *Proved Developed Reserves*.
Proved Developed Reserves	*Proved Developed Reserves* can be expected to be recovered through existing wells and facilities and by existing operating methods. Improved recovery reserves can be considered as *Proved Developed Reserves* only after an improved recovery project has been installed and favorable response has occurred or is expected with a reasonable degree of certainty. Developed reserves are expected to be recovered from existing wells, including reserves behind pipe. Improved recovery reserves are considered developed only after the necessary equipment has been installed, or when the costs to do so are relatively minor. *Proved Developed Reserves* may be sub-categorized as *Producing* or *Non-producing*.
Proved Developed Non-producing Reserves	*Proved Developed Non-producing Reserves* are precluded from producing due to being *shut-in* or *behind-pipe*. *Shut-in* includes (1) completion intervals which are open at the time of the estimate, but which have not started producing, (2) wells which were shut-in for market conditions or pipeline connections, or (3) wells not capable of production for mechanical reasons. *Behind-pipe* refers to zones in existing wells which will require additional completion work or future re-completion prior to the start of production. In both cases, production can be initiated or restored with relatively low expenditure compared to the cost of drilling a new well.

Proved Developed Producing Reserves

Proved Developed Producing Reserves are expected to be recovered from completion intervals that are open and producing at the time of the estimate. Improved recovery reserves are considered producing only after the improved recovery project is in operation.

Cumulative Production

Cumulative Production is the sum of all produced volumes of oil and gas prior to a specified date.

Notice

This report, *Estimated Oil and Gas Reserves, Gulf of Mexico OCS Region, December 31, 2011,* has undergone numerous changes over the last few years. We are continually striving to provide meaningful information to the users of this document. Suggested changes, additions, or deletions to our data or statistical presentations are encouraged so we can publish the most useful report possible. Please contact the Reserves Section Chief, Donald M. Maclay, at (504) 736-2891 at the Bureau of Ocean Energy Management, 1201 Elmwood Park Boulevard, MS GM773E, New Orleans, Louisiana 70123-2394, to communicate your ideas for consideration in our next report. An overview of the Reserves Inventory Program is available on BOEM's Website.

For free publication and digital data, visit the Gulf of Mexico Web site. The report can be accessed as an Acrobat .pdf (portable document format) file, which allows you to view, print, navigate, and search the document with the free downloadable Acrobat Reader 9.0. Digital data used to create the tables and figures presented in the document are also accessible as Excel 97 spreadsheet files (.xls; using Microsoft's Excel spreadsheet viewer, a free file viewer for users without access to Excel). These files are made available in a zipped format, which can be unzipped with the downloadable WinZip program.

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The Department of the Interior Mission

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

The Bureau of Ocean Energy Management

The Bureau of Ocean Energy Management (BOEM) works to manage the exploration and development of the nation's offshore resources in a way that appropriately balances economic development, energy independence, and environmental protection through oil and gas leases, renewable energy development and environmental reviews and studies.