United States Department of the Interior

OFFICE OF THE SECRETARY
Washington, DC 20240

MAR 2 0 2018

The Honorable Paul Ryan
Speaker of the House of Representatives
Washington, D.C. 20515

Dear Mr. Speaker:

I am submitting herewith the "Fifth Biennial Report to Congress: Estimates of Natural Gas and Oil Reserves, Reserves Growth, and Undiscovered Resources in Federal and State Waters off the Coasts of Texas, Louisiana, Mississippi and Alabama -- 2017 Update." This report was prepared by the Department of the Interior pursuant to Section 965c of the Energy Policy Act of 2005.

A similar letter is being sent to the President of the Senate.

Sincerely,

Joseph R. Balash
Assistant Secretary
Land and Minerals Management

Enclosure

Copy to: The Honorable Rob Bishop, Chairman
Committee on Natural Resources

The Honorable Raul Grijalva, Ranking Member
Committee on Natural Resources

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MAR 20 2018

The Honorable Michael Pence
President of the Senate
Washington, D.C. 20510

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Copy to: The Honorable Lisa Murkowski, Chairman
Committee on Energy and Natural Resources

The Honorable Maria Cantwell, Ranking Member
Committee on Energy and Natural Resources

Fifth Biennial Report to Congress: Estimates of Natural Gas and Oil Reserves, Reserves Growth, and Undiscovered Resources in Federal and State Waters off the Coasts of Texas, Louisiana, Mississippi, and Alabama

Energy Policy Act of 2005 – Section 965(c)

Prepared by

Bureau of Ocean Energy Management
Office of Strategic Resources

For the United States Congress
Year 2017

U.S. Department of the Interior
Bureau of Ocean Energy Management

Preface

This report on estimated oil and gas reserves and resources off the coasts of Texas, Louisiana, Mississippi, and Alabama is required by Section 965 of the Energy Policy Act of 2005, Oil and Gas Research Programs. Subsection (c), Natural Gas and Oil Deposits Report, directs the Secretary of the Interior, in consultation with other appropriate Federal agencies, to submit to Congress a report on the latest estimates of natural gas and oil reserves, reserves growth, and undiscovered resources in Federal and state waters off the coasts of Texas, Louisiana, Mississippi, and Alabama.

The Department of the Interior's (DOI) Bureau of Ocean Energy Management (BOEM), as directed, coordinated with appropriate Federal agencies in preparing this report. The Department of Energy's Energy Information Administration (EIA) supplied BOEM with the oil and gas reserves estimates and recent production information for fields within the state waters of Texas, Louisiana, Mississippi, and Alabama. The United States Geological Survey (USGS) provided BOEM with estimates of undiscovered conventionally recoverable oil and gas resources for the same areas. Estimates of oil and gas resources within federal waters offshore Texas, Louisiana, Mississippi, and Alabama are based on the BOEM Assessment of Undiscovered Technically Recoverable Oil and Gas Resources of the Nation's Outer Continental Shelf, 2016.

Based on existing offshore administrative boundaries (see Figure 1), the cumulative production, reserves and contingent resources that exist within the geographic area identified by BOEM as the Western Gulf of Mexico Planning Area (WGOM PA) were allocated to the State of Texas. Cumulative production, reserves and contingent resources that exist on Outer Continental Shelf (OCS) blocks in the Central Gulf of Mexico Planning Area (CGOM PA), were also allocated based on existing offshore administrative boundaries to Louisiana, Mississippi, and Alabama as appropriate.

Executive Summary

This report summarizes the results of BOEM's compilation of the technically recoverable resources for state waters off the coasts of Texas, Louisiana, Mississippi, Alabama, and the adjacent Gulf of Mexico (GOM) OCS. Technically recoverable resources are hydrocarbons potentially amenable to conventional production regardless of the size, accessibility, and economics of the accumulations assessed. The OCS comprises the portion of the submerged seabed whose mineral estate is subject to Federal jurisdiction (see Figure 1). No new government-sponsored geological or geophysical data acquisition was undertaken for this inventory.

The petroleum commodities assessed are crude oil, natural gas liquids (condensates), and natural gas that exist in conventional reservoirs producible with typical traditional recovery techniques. The terms "natural gas" and "gas" are used interchangeably in this report. The volumetric estimates of oil resources reported represent combined volumes of crude oil and condensate. In developing these estimates, it was necessary to make fundamental assumptions regarding future technology and economic conditions. The necessity to predict the future magnitude and directional impact of these factors introduces additional uncertainty to the resource assessment. Although not considered in this report, the continued expansion of the technological frontiers can be reasonably assumed to partially mitigate the impacts of a lower quality remaining resource base (smaller pool sizes, less concentrated accumulations, and more remote locations) and less favorable economic conditions.

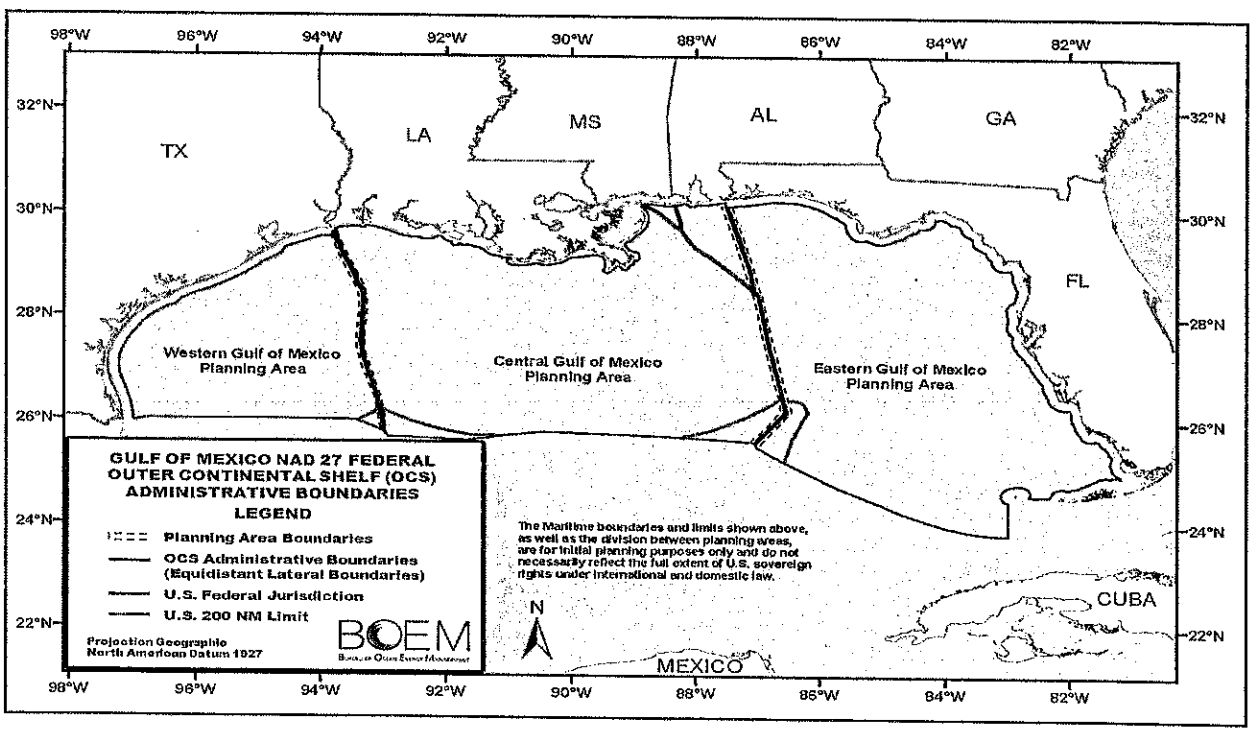

Figure 1: Map Showing the Gulf of Mexico OCS Administrative Boundaries

Resource estimates are just that—*estimates*. All methods of assessing potential quantities of technically recoverable resources are efforts in quantifying a value that will not be reliably known until the resource is nearly depleted. Thus, there is considerable uncertainty intrinsic to any estimate. The estimates incorporate uncertainty, but they cannot account for the unforeseen. As such, resource estimates should be used as general indicators and not predictors of absolute volumes. All resource estimates are subject to continuing revision as undiscovered resources are converted to reserves and reserves to production, and as improvements in data and assessment methods occur. The assessment results do not imply a rate of discovery or a likelihood of discovery and production within a specific time frame. However, uncertainty surrounding the estimates decreases as the asset progresses through this cycle. Resource estimates should be viewed from the perspective of the point in time the assessment was performed—based on the data, information, and methodology available at that time.

Resource estimates are highly dependent on the current knowledge base. In general, risk and uncertainty in estimates of undiscovered oil and natural gas are greatest for frontier areas that have had little or no past exploratory effort. For other areas that have been extensively explored and are in a mature development stage, many of the risks have been reduced or eliminated and the degree of uncertainty in possible outcomes narrowed considerably. As a result, resource potential can be evaluated with much more confidence in non-frontier areas. However, even in some mature producing areas, such as the GOM shelf, considerable uncertainty remains regarding the petroleum potential at greater drilling depths. In spite of this inherent uncertainty, resource assessments are valuable input to developing energy policy and for corporate planning.

Oil and gas resources produced from state waters and the OCS off the coasts of Texas, Louisiana, Mississippi, and Alabama are important to the future domestic energy supply of the United States. These areas are currently available for leasing in the Department's OCS Oil and Gas Leasing Program for 2017-2022, and through the leasing programs of the individual states.

The results of this assessment are presented in Tables 1(a) and 1(b), and in section IV of this report. The total endowment of technically recoverable oil and gas in the state waters and on the OCS is comprised of known resources—i.e., cumulative production and estimates of remaining proved reserves, contingent resources and reserves appreciation—plus estimates of undiscovered technically recoverable resources. The estimate of the total hydrocarbon endowment in state waters off the coasts of Texas, Louisiana, Mississippi, and Alabama is 3.55 billion barrels of oil (Bbo), 63.57 trillion cubic feet of gas (Tcfg), for a total of 14.86 billion barrels of oil equivalent (BBOE)), and the total endowment in federal waters offshore in these same states is 79.18 Bbo, 367.97 Tcfg, and 144.66 BBOE total for the OCS.

Table 1(a): Total Endowment of Technically Recoverable Oil and Gas Resources in State Waters off the Coasts of Texas, Louisiana, Mississippi, and Alabama, 2017

State	Resources in Known Fields		Undiscovered Technically Recoverable Resources (mean estimate)	Total Endowment (mean estimate)
	Cumulative Production (through 2015)	Reserves		
OIL (Billion Barrels)				
Texas	0.07	0.00	0.67	0.74
Louisiana	1.86	0.05	0.86	2.77
Mississippi	0.00	0.00	0.03	0.03
Alabama	0.00	0.00	0.01	0.01
Total in State Waters off the Coasts of TX, LA, MS, and AL	1.93	0.05	1.56	3.55
NATURAL GAS (Trillion Cubic Feet)				
Texas	4.94	0.04	16.97	21.95
Louisiana	14.52	0.20	21.20	35.92
Mississippi	0.00	0.00	0.64	0.64
Alabama	3.72	0.89	0.45	5.06
Total in State Waters off the Coasts of TX, LA, MS, and AL	23.18	1.13	39.26	63.57
BOE (Billion Barrels)				
Texas	.95	0.01	3.69	4.65
Louisiana	4.44	0.09	4.63	9.16
Mississippi	0.00	0.00	0.14	0.14
Alabama	0.66	0.16	0.09	0.91
Total in State Waters off the Coasts of TX, LA, MS, and AL	6.05	0.25	8.55	14.86

Table 1(b): Total Endowment of Technically Recoverable Oil and Gas Resources in the OCS off the Coasts of Texas, Louisiana, Mississippi, and Alabama, 2017

Total Endowment of Technically Recoverable Oil and Gas in the OCS off the Coasts of Texas, Louisiana, Mississippi, and Alabama, 2017

State	Resources in Known Fields				Undiscovered Technically Recoverable Resources (mean estimate)	Total Endowment (mean estimate)	Total Endowment from previous report (from 2013)
	Cumulative Production (through 2015)	Reserves	Contingent Resources	Reserves Appreciation			
OIL (Billion Barrels)							
Texas	1.06	0.22	0.07	0.70	11.57	13.61	16.00
Louisiana	18.36	3.25	2.03	8.39	32.78	64.81	56.04
Mississippi	<0.01	<0.01	<0.01	<.01	0.07	0.07	0.10
Alabama	0.17	0.01	0.02	0.09	0.40	0.69	0.88
Total in the OCS off the Coasts of TX, LA, MS, and AL	19.58	3.48	2.12	9.18	44.82	79.18	73.02
NATURAL GAS (Trillion Cubic Feet)							
Texas	34.72	0.51	1.09	8.36	38.99	83.67	123.07
Louisiana	148.26	6.59	6.67	26.00	85.80	273.31	304.82
Mississippi	0.59	0.04	0.01	0.29	1.08	2.02	1.89
Alabama	2.98	0.15	0.15	1.30	4.39	8.96	10.38
Total in the OCS off the Coasts of TX, LA, MS, and AL	186.55	7.29	7.92	35.95	130.26	367.97	440.16
BOE (Billion Barrels)							
Texas	7.23	0.31	0.26	2.19	18.50	28.50	37.89
Louisiana	44.75	4.42	3.22	13.02	48.04	113.45	110.29
Mississippi	0.11	0.01	<0.01	0.05	0.26	0.43	0.44
Alabama	0.69	0.04	0.04	0.32	1.19	2.28	2.72
Total in the OCS off the Coasts of TX, LA, MS, and AL	52.78	4.78	3.52	15.58	67.99	144.66	151.34

Of the total endowment in state waters off the coasts of Texas, Louisiana, Mississippi, and Alabama, about 1.98 Bbo and 24.31 Tcfg (6.31 BBOE), approximately 42 percent on a barrels of oil equivalent (BOE) basis is represented by resources in known fields—the total of cumulative production and remaining reserves.

- Cumulative production in state waters through 2015 was 1.93 Bbo and 23.18 Tcfg (6.05 BBOE); historical production represents 41 percent of the estimated mean total endowment.
- Estimates of the discovered resources remaining to be produced (reserves and reserves appreciation) total 0.05 Bbo and 1.13 Tcfg (0.25 BBOE).
    - The estimated reserves (as of year end 2015) in fields within state waters are comprised of approximately 80 percent natural gas and 20 percent oil and condensate.
    - The prolific Norphlet deep gas trend discovered in 1979 in state waters of Alabama have been producing for nearly 30 years, while producing fields in state waters of Texas and Louisiana have been producing for more than 50 years. BOEM did not attribute additional growth or appreciation to reserves in known discoveries for the state waters.

The mean estimate for undiscovered technically recoverable resources (UTRR) in state waters totals 1.56 Bbo and 39.26 Tcfg (8.55 BBOE). Of this total BOE estimate, 18 percent is comprised of oil and condensate and 82 percent is natural gas.

Of the total endowment in the OCS off the coasts of Texas, Louisiana, Mississippi, and Alabama, about 34.36 Bbo and 237.71 Tcfg (76.67 BBOE), approximately 53 percent on a BOE basis is represented by resources in known fields—the total of cumulative production, remaining proved and contingent resources, and reserves appreciation.

- Cumulative production in OCS off the coasts of Texas, Louisiana, Mississippi, and Alabama through 2015 was 19.58 Bbo and 186.55 Tcfg (52.78 BBOE); historical production represents 36 percent of the estimated mean total endowment.
- Estimates of the discovered resources remaining to be produced (reserves, contingent resources, and reserves appreciation) total 14.78 Bbo and 51.16 Tcfg (23.88 BBOE). Of this total BOE, approximately 62 percent is oil and condensate and 38 percent is natural gas.
    - BOEM estimates that reserves remaining within the 1,312 fields discovered through 2015 total 3.48 Bbo and 7.29 Tcfg (4.78 BBOE).
    - The estimated contingent resources total 2.12 Bbo and 7.92 Tcgf (3.52 BBOE).
    - An additional volume of reserves growth or appreciation—the projected increase in current estimates of reserves within existing fields based on historical trends—totaling 9.18 Bbo and 35.95 Tcfg (15.58 BBOE) is also forecast to be ultimately recoverable from this same set of existing offshore fields. This growth occurs primarily from the discovery of new reservoirs and an increase in the estimate of the recoverable portion of in-place hydrocarbons within known reservoirs, due to future advances in technology, an increased understanding of reservoir performance, and improvements in economics.

The mean estimate for UTRR in OCS off the coasts of Texas, Louisiana, Mississippi, and Alabama is 44.82 Bbo and 130.26 Tcfg (67.99 BBOE). Of this total BOE, approximately 66 percent is oil and condensate and 34 percent is natural gas.

The results of this assessment indicate that the GOM OCS remains a significant potential domestic source of new oil and natural gas resources from fields yet to be discovered.

It is important to note that this assessment reflects a snapshot in time that should not be viewed as either understated or overstated, when compared to later assessments which will reflect changed circumstances and knowledge. The actual volume of oil and natural gas resources that can be recovered from the GOM OCS is never definitively known. As discussed earlier, evolving technological capabilities, more recent seismic evaluations and exploratory drilling, can lead to higher or lower estimates when the assessments are updated in later years. True knowledge of the actual volume of oil and natural gas resources can only come through the drilling of wells.

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I. Introduction

The OCS and state waters off the coasts of Texas, Louisiana, Mississippi, and Alabama contain significant quantities of oil and natural gas resources, but are subject to a number of technological challenges affecting industry's ability to explore for and develop these resources. These constraints include the need for improvements in technology to handle high pressures and temperatures found in deep wells greater than 30,000 feet below the surface, and mobile drilling rigs and floating production facilities for exploration and development in water depths greater than 9,500 feet. Industry also needs to comply with legal and regulatory requirements and policies designed to ensure safety, environmental protection, and fair return for use of the OCS. Section 965(c) of the Energy Policy Act of 2005 directed the Secretary of the Interior, in consultation with other appropriate Federal agencies, to submit to Congress a report on the latest estimates of natural gas and oil reserves, reserves growth, and undiscovered resources in Federal and state waters off the coasts of Texas, Louisiana, Mississippi, and Alabama within 2 years of the date of enactment of the Act and every 2 years thereafter. This report is the fifth biennial Report to Congress.

The following sections of this report provide background information, address the statutory requirement, and summarize the status of knowledge concerning the resource potential of the areas:

Section II provides background discussion on oil and gas resource assessments, schema, and terminology.

Section III presents the methodology and data sources used to generate estimates of resources.

Section IV discusses results from the resource inventory.

Section V presents conclusions that can be drawn from the results of the resource inventory.

Appendix A presents the glossary that defines relevant terms used in this report.

Appendix B presents a list of relevant abbreviations, acronyms, and symbols used throughout this report.

Appendix C lists the references consulted for this report.

II. Background

Energy is critical to the world's economy. Oil and natural gas resources are the major contributors to the world's energy supply, and this reliance on petroleum is likely to continue for decades.

Geologists, statisticians, and economists have been performing resource assessments for decades in an attempt to provide insights regarding the future petroleum supply. The demands of and uses for these assessments have led to the evolution of increasingly complex quantitative techniques and procedures to meet the challenge. Generally, the evolution has been from deterministic to stochastic methods, incorporating uncertainty and risk analyses. Scientific disciplines involved in the assessment process have evolved in parallel with the methodology, from primarily geology in the early assessments to a complex multi-disciplinary array of geology, geophysics, petroleum engineering, economics, and statistics.

1. Purposes of Resource Assessments: Resource assessments are performed by BOEM at various scales and for many purposes. Regional assessments may be prepared simply to develop an inventory of potential oil and natural gas resources as part of an evaluation of future supply options. Alternatively, assessments may be undertaken to analyze the relative merits of oil and gas development proposals and alternatives versus other competing uses. Resource estimates provide critical input to decision makers regarding the virtues of various policy alternatives. Detailed site-specific assessments provide data essential for valuing Federal lands prior to leasing or analyzing industry exploration or development proposals.

Large corporations and financial institutions use resource estimates for long-term planning, the analysis of investment options, and as a guide in analyzing the future health of the oil and gas industry. Exploration companies use resource assessments to design exploration strategies and target expenditures. Increasingly, resource estimates are used by the Federal government, Congress, and the public to provide objective statements of how much oil and natural gas could be available for future domestic consumption. This report presents the results of regional, play-based resource assessments of the OCS and state waters off the coasts of Texas, Louisiana, Mississippi, and Alabama. The assessments consist of a thorough investigation of the petroleum geology, and an identification of appropriate domestic and international analogs, coupled with a probabilistic methodology to estimate the remaining hydrocarbon potential.

2. Terminology and Classification Schema: A set of precise, universally-accepted definitions regarding resource assessment terminology does not exist, so it is important that the terminology associated with this resource assessment is understood so that the results can be correctly interpreted.

The following are important terms related to this resource assessment. The definitions presented here should be viewed as general explanations, rather than strict technical definitions of the terms.

Resources: Concentrations in the earth's crust of naturally occurring liquid or gaseous hydrocarbons that can conceivably be discovered and recovered. Normal use encompasses both discovered and undiscovered resources.

Undiscovered resources: Resources postulated, on the basis of geologic knowledge and theory, to exist outside of known fields or accumulations. Also included are resources from undiscovered pools within known fields to the extent that they occur within separate plays.

Undiscovered technically recoverable resources (UTRR): Hydrocarbons that may be produced as a consequence of natural pressure, artificial lift, pressure maintenance (gas or water injection), or other secondary recovery methods, but without any consideration of economic viability. The UTRR do not include quantities of hydrocarbon resources that could be recovered by enhanced recovery techniques, gas in geopressured brines, natural gas hydrates, or oil and gas that may be present in insufficient quantities or quality (low permeability "tight" reservoirs) to be produced via conventional recovery techniques. Also, the UTRR are primarily located outside of known fields. UTRR estimates are often presented as a range of estimates. For the purposes of this report, only the mean UTRR estimates are reported.

Reserves: The quantities of hydrocarbon resources anticipated to be recovered from known accumulations from a given date forward. All reserve estimates involve some degree of uncertainty.

Proved reserves: The quantities of hydrocarbons estimated, with reasonable certainty, to be commercially recoverable from known accumulations under current economic conditions, operating methods, and government regulations. Current economic conditions include prices and costs prevailing at the time of the estimate. Estimates of proved reserves do not include reserves appreciation.

Contingent Resources: The 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.

Reserves appreciation: The observed incremental increase through time in the estimates of reserves (proved and unproved) of an oil and/or natural gas field. It is that part of the known resources over and above proved and unproved reserves that will be added to existing fields through extension, revision, improved recovery, and the addition of new reservoirs. Also, this is commonly referred to as reserves growth or field growth.

Cumulative production: The sum of all produced volumes of hydrocarbons prior to a specified point in time.

Estimated Ultimate Recovery (EUR): All hydrocarbon resources within known fields that can be profitably produced using current technology under existing economic conditions. The EUR is the sum of cumulative production plus proved reserves plus unproved reserves plus reserves appreciation.

Total endowment: All technically recoverable hydrocarbon resources of an area. Estimates of total endowment equal undiscovered technically recoverable resources plus EUR.

The BOEM scheme of classifying technically (or conventionally) recoverable hydrocarbons (see Figure 2) is modified from the well-known McKelvey diagram (United States Bureau of Mines and USGS, 1980). The scheme is dynamic, with hydrocarbon resources migrating from one category to another over time. Resource availability is expressed in terms of the degree of certainty about the existence of the resource and the feasibility of its economic recovery. With increasing geologic assurance, hydrocarbon accumulations advance from undiscovered resources to discovered resources to reserves.

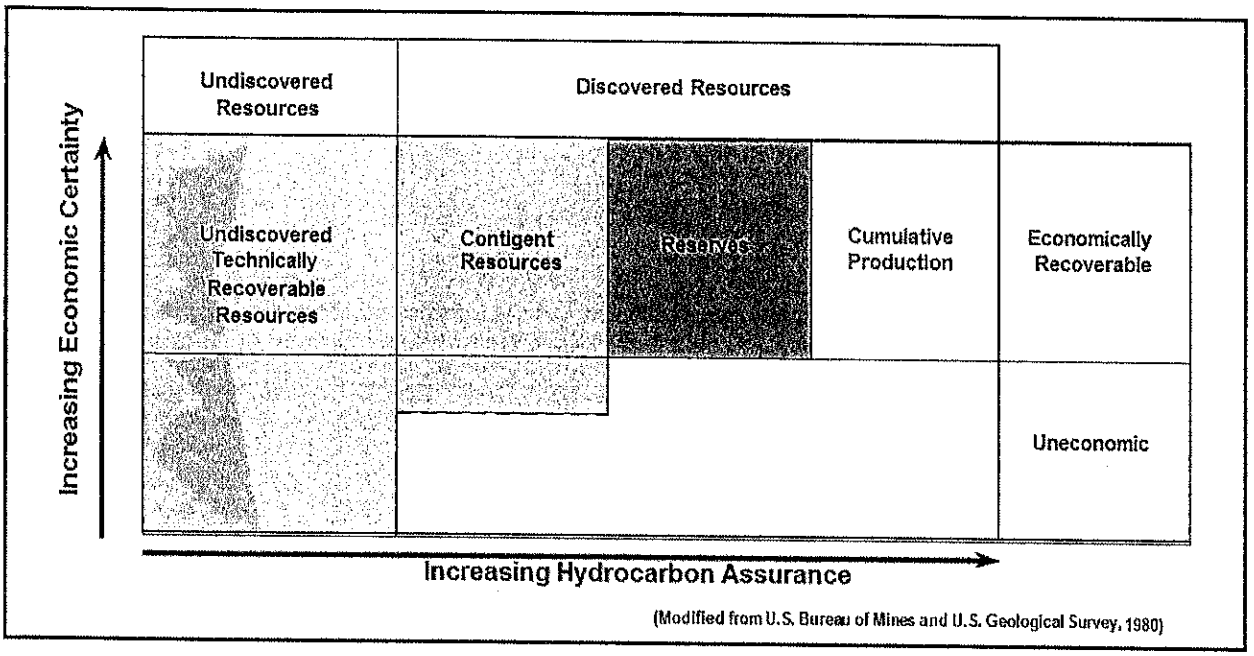

Figure 2: BOEM Resource Classification Schema

Reserves can be classified as proved when sufficient economic and geologic knowledge exists to confirm the likely commercial production of a specific volume of hydrocarbons. Proved reserves must, at the time of the estimate, either have facilities that are operational to process and transport those reserves to market, or a commitment or reasonable expectation to install such facilities in the future (Society of Petroleum Engineers and World Petroleum Congress, 1997). The resource classifications used in this report have been modified from the Society of Petroleum Engineers (SPE), World Petroleum Congress (WPC), American Association of Petroleum Geologists (AAPG) and Society of Petroleum Evaluation Engineers (SPEE), 2007, *Petroleum Resource Management System* where necessary to conform to the requirements of BOEM's Reserves Inventory Program.

The overall movement of petroleum resources within the schema is upward as development and production ensue. The degree of uncertainty as to the existence of resources decreases to the right in the diagram. The degree of economic viability decreases downward and also implies a decreasing certainty of technologic recoverability.

Another key concept to grasp is that of "technically recoverable resources." Resource assessments that are intended to be of more than scientific interest are generally limited to accumulations that are believed to be amenable to discovery and production employing conventional techniques under reasonably foreseeable technological and economic conditions.

*3. **Commodities Assessed***: The petroleum commodities assessed in this inventory are crude oil, natural gas liquids (condensate), and natural gas that exist in conventional reservoirs and are producible through conventional recovery techniques. Crude oil exists in a liquid state in the subsurface and at the surface; it may be described on the basis of its American Petroleum Industry (API) gravity as "light" (i.e., approximately 20° to 50° API) or "heavy" (i.e., generally less than 20° API). Condensate is a very high-gravity (i.e., generally greater than 50° API) liquid; it may exist in a dissolved gaseous state in the subsurface but liquefy at the surface. Crude oil with a gravity greater than 10° API and condensate can be removed from the subsurface with conventional extraction techniques and have been assessed for this effort.

Natural gas is a gaseous hydrocarbon resource, which may consist of associated and/or nonassociated gas; the terms natural gas and gas are used interchangeably in this report. Associated gas exists in spatial contact with crude oil; it may exist in the subsurface as undissolved gas within a gas cap or as gas that is dissolved in crude oil (solution gas). Nonassociated gas exists spatially independent of crude oil. Gas resources that can be removed from the subsurface with conventional extraction techniques have been assessed for this inventory.

Crude oil and condensate are reported jointly as oil; associated and nonassociated gas are reported as gas. Oil volumes are reported as stock tank barrels and gas as standard cubic feet. Oil-equivalent gas is a volume of gas (associated and/or nonassociated) expressed in terms of its energy equivalence to oil (i.e., 5,620 cubic feet of gas per barrel of oil) and is reported in barrels. The combined volume of oil and oil-equivalent gas resources is referred to as BOE and is reported in barrels.

This report encompasses only a portion of all the oil and natural gas resources believed to exist on the GOM continental margin. This assessment does not include potentially large quantities of hydrocarbon resources that could be recovered from known and future accumulations by enhanced recovery techniques, gas in geopressured brines, natural gas hydrates, or oil and natural gas that may be present in insufficient quantities or qualities (low permeability "tight" reservoirs) to be produced by conventional recovery techniques. These unconventional resources have yet to be produced from the OCS or state waters, but with improved extraction technologies and different economic conditions, they may become future sources of domestic oil and gas production.

Estimates of the quantities of historical production, reserves, and future reserves appreciation are presented to provide a frame of reference for analyzing the estimates of the UTRR. Furthermore, reserves appreciation and the UTRR comprise the resource base from which the midterm future oil and gas supplies will emerge.

*4. **Limitations of Resource Assessments***: It is important to recognize that estimates of undiscovered oil and natural gas resources are just that—*estimates*. Resource assessments are an attempt to quantify something that cannot be accurately known until the resource has been essentially depleted. In spite of this inherent uncertainty, resource assessments are a valuable input

to developing energy policy and for corporate planning—e.g., for ranking exploration opportunities, as a basis for economic analyses, and assessments of technology and capital needs. The assessment results do not imply a rate of discovery or a likelihood of discovery and production within a specific timeframe. In other words, resource assessments cannot be used directly to draw conclusions concerning the rate of conversion of these undiscovered resources to reserves and ultimately production.

Imperfect knowledge is associated with almost every facet of the assessment process. Dreyfus and Ashby (1989) noted that resource assessments are performed at widely varying levels of detail and precision. At one end of the spectrum lie estimates of proved reserves. These assessments rely primarily upon detailed investigations incorporating relatively abundant subsurface geological and geophysical data, as well as actual reservoir performance information associated with the particular reservoir. At the other end of the spectrum is the appraisal of undiscovered resources that might exist in areas of regional, national, or even global scope. While dealing with the same type of data as reserve estimates, the scope is extended to a generalized inference of the probable quantities of undiscovered hydrocarbon resources that may exist in broad areas. All resource estimates are subject to continuing revision as undiscovered resources are converted to reserves and reserves to production and as improvements in data and assessment methods occur. Uncertainty surrounding the estimates also decreases as the asset progresses through this cycle.

The various estimates presented in this report should be considered general indicators and not predictors of the absolute volumes of petroleum potential of the areas. It is also important to realize that the UTRR volumes estimated may not be found or, in fact, produced. It is, however, implied that these resources have some chance of existing, being discovered, and possibly produced. Finally, serendipitous plays, those found as complete surprises, are not considered in this assessment. These unknown plays do not have a geologic model that can be logically assessed at this time. In sum, resource estimates should be viewed from the perspective of the point in time the assessment was performed—based on the data, information, and methodology available at that time.

*5. **Role of Risk and Uncertainty in Resource Assessments***: Exploration for hydrocarbons is a high risk proposition. Risk and uncertainty are integral parts of every resource assessment, with nearly every component of the assessment process incorporating a consideration of risk and uncertainty. The accumulation of petroleum in significant quantities requires the juxtaposition of many complex geologic events: the accumulation of organic matter in a source rock; the maturation of this organic matter into petroleum; the presence of a reservoir rock with sufficient thickness, porosity, and permeability; the migration of the petroleum into a trap with adequate size and seals; and the preservation of the petroleum in the trap. Prior to drilling, the actual existence of these geologic conditions is unknown. Not only must all of these conditions coexist, they must also converge at a particular location, an unlikely event that results in a high probability of failure often described as dry hole or geologic risk. Even if all of these conditions coexist at a particular location, there remains considerable uncertainty regarding the effectiveness of a seal, the size of a trap, the quality and thickness of the reservoir, and the volume and type of hydrocarbons that not only migrated into the trap, but were preserved and still remain to be recovered.

In general, risk and uncertainty in estimates of undiscovered oil and natural gas are greatest for frontier areas that have had little or no past exploratory effort. For areas that have been

extensively explored and are in a mature development stage, many of the risks have been reduced or eliminated and the degree of uncertainty in possible outcomes narrowed considerably. As a result, resource potential can be evaluated with much more confidence. However, even in some mature producing areas, such as the GOM shelf, considerable uncertainty remains about the petroleum potential at greater drilling depths. Uncertainty also pervades projections of whether potential reservoirs have been unrecognized or bypassed in past drilling.

Scientists can estimate the quantity of the UTRR based on the present state of geological and engineering knowledge, modified by a consideration of future technological advancement. However, the percentage of that quantity that may actually be discovered and produced is ultimately an economic question. Uncertainties about future crude oil and natural gas prices and the costs of exploration and development (including the impacts of technology advances on costs) adversely affect all economic resource estimates. In terms of the commercial viability of an accumulation, there is substantial uncertainty concerning total costs and future market prices, resulting in additional economic risk and uncertainty for a project.

Finally, there are no foolproof, completely mechanical methods for estimating potential quantities of undiscovered hydrocarbon resources. Because all methods contain elements of subjective judgment or expert opinion, the risk analysis and degree of uncertainty reflected in an estimate is affected by the knowledge, experience, and assessment expertise of the personnel performing the assessment. This expertise is continually refined as new information tests the validity of previous assumptions.

*6. **Role of Technology and Economics in Resource Assessment***: This inventory assesses only technically recoverable hydrocarbon resources, both discovered and undiscovered. In developing these estimates it is necessary to make fundamental assumptions regarding future technology and economics. The inability to accurately predict the magnitude and effect of these factors introduces additional uncertainty to the resource assessment.

Scientists can estimate the quantity of technically recoverable resources (both discovered and undiscovered) on the basis of the present state of geologic and engineering knowledge, modified by a subjective consideration of future technologic advancement. However, the quantity of resources that may ever actually be produced is dependent in large part upon economics. Actual cost/price relationships are critical determinants. New capital intensive exploration and development technologies require higher product prices for implementation. Typically, as these high-cost technologies are more widely employed, costs decrease, resulting in even more widespread use of these techniques. On the other hand, new modest-cost exploitation technologies that increase recoveries or decrease finding, development, or operating costs can markedly increase estimates of technically recoverable resources without requiring an increase in product prices. A decrease in price, as experienced in the late 1980's, can be moderated or offset by the implementation of a technology that reduces unit costs or vice versa. Rogner (1997) concluded that "over the last century technology has probably had a more profound and lasting impact on prices than prices have had on technology."

Generally, the effects of price and technology can be considered interchangeable within the context of a resource assessment. There is a technologic and economic limit to the amount of in-place oil and natural gas resources that can be physically recovered from a reservoir. Within

conventional reservoirs, approximately 30 to 40 percent of the in-place oil and 65 to 80 percent of the in-place natural gas resources are typically recovered through primary and secondary recovery mechanisms. Three principal factors affect the amount of oil or gas that can be recovered from a known reservoir—rock properties, technology, and economics. While industry cannot change the properties of the rock, it can develop new techniques to recover more oil from the rock, thus adding to the resource base. For example, recent technology advances, such as horizontal wells and multi-lateral completions, enable the recovery of a higher percentage of the in-place resources from a field.

Additional technologic and economic constraints are applicable to the circumstances under which exploration and development activities can occur (e.g., ultra-deep water or ultra-deep drilling). Advanced technology now provides for the exploitation of resources in these operating environments that were not previously economically viable. New technologies also reduce the cost of exploring for and developing resources that are otherwise still technically recoverable, e.g., long-distance subsea tie-backs to host production facilities, extended reach drilling, SPAR platforms, or the introduction of FPSO (Floating Production Storage and Offloading Vessels) (for a definition of the term SPAR and FPSO see Appendix A). A reduction in exploration or development costs lowers the minimum threshold volume that must be discovered for commercial development, thus increasing the number of opportunities for production. In each of these ways, the introduction of new technologies serves to expand the resource base that is identifiable and "technically or economically recoverable."

Another important aspect of the role of technology in a resource assessment is the ability through the deployment of new technology to rethink fundamental approaches to developing exploration play concepts. Scientific advances aided by new technologies have affected the ability to identify previously unknown potential exploration plays. An example of this was the introduction of new seismic data acquisition techniques, which when combined with high end computing technology and new data processing algorithms resulted in the ability for geoscientists to "see," for the first time, below massive salt bodies underlying a large portion of the GOM OCS, opening up the "subsalt play."

Understanding the natural evolution in technological progress is critical to fully comprehending resource assessments. It is a reasonable assumption that continued expansion of the technological frontiers can partially mitigate the impacts of a lower quality resource base and less favorable economic conditions. Because it has a significant impact on the cost/price relationship, many forecasters choose to model the impacts of technological advancements primarily as a reduction in the future cost of finding and producing domestic oil and natural gas resources. Recently, BOEM resource assessments captured this effect in the price (cost) supply curves, which present estimates of the volumes of economically recoverable resources at various product prices.

III. Methodology and Data Sources

1. OCS:

A. Data Sources: This assessment of the hydrocarbon potential of the OCS off the coasts of Texas, Louisiana, Mississippi, and Alabama required the compilation and analysis of published information and vast amounts of proprietary geologic, geophysical, and engineering data obtained

by industry from operations performed under permits or mineral leases and furnished to the BOEM.

B. Reserves: Proved and unproved reserves for the OCS off the coasts of Texas, Louisiana, Mississippi, and Alabama are those reported in BOEM's Assessment of Undiscovered Technically Recoverable Oil and Gas Resources of the Nation's Outer Continental Shelf, 2016, hydrocarbon endowment table (BOEM Fact Sheet RED-2016-01). Based on existing offshore administrative boundaries (see Figure 1), the cumulative production and proved and unproved reserves that exist within the geographic area identified by BOEM as the Western Gulf of Mexico Planning Area (WGOM PA) were allocated to the State of Texas. Cumulative production, proved reserves and contingent resources that exist on OCS blocks in the Central Gulf of Mexico Planning Area (CGOM PA), were also allocated based on existing offshore administrative boundaries to Louisiana, Mississippi, and Alabama as appropriate.

C. Reserves Appreciation: As part of the BOEM National Resource Assessment process identified in *Report to Congress: Comprehensive Inventory of U.S. OCS Oil and Natural Gas Resources, February 2006* (Minerals Management Service, 2006), the initial reserves estimate for each active and expired field in the GOM is grown at the geologic play level 50 years from the field's geologic play discovery date using a reserves growth function. This growth function is determined by summing reserve estimates for all fields/plays having the same elapsed time between discovery year and the reserve estimate year and then comparing that sum to the sum of the reserve estimates for those same fields/plays one year later. The estimates of reserves appreciation presented in this report have increased due to recent discoveries of significant deepwater fields in the GOM OCS. The initial reserve estimates associated with these recent discoveries are expected to receive the full complement of nearly 50 years of reserves appreciation resulting in higher grown volumes. Reserves appreciation volumes were allocated to the States of Texas, Louisiana, Mississippi, and Alabama using the methods described above.

D. Assessment of Undiscovered Technically Recoverable Resources (UTRR): Estimates of UTRR reported are based on BOEM's Assessment of Undiscovered Technically Recoverable Oil and Gas Resources of the Nation's Outer Continental Shelf, 2016, (BOEM Fact Sheet RED-2016-01). Mean estimates of UTRR were allocated to the States of Texas, Louisiana, Mississippi, and Alabama using the methods described above.

2. State Waters:

A. Data Sources: In assessing the potential volume of undiscovered conventionally recoverable oil and gas resources within state waters off the coasts of Texas, Louisiana, Mississippi, and Alabama, the USGS estimated resources using its standard resource assessment methodology, found at:
https://energy.usgs.gov/OilGas/AssessmentsData/NationalOilGasAssessment/Methodology.aspx.

The USGS used a variety of data and information to conduct geologically based assessments of more than 80 assessment units and plays, more than 40 of which extended offshore into state waters. In the process, the USGS consulted with the state geological surveys and companies active in these areas. The EIA provided estimates of reserves and annual production submitted by the operators of fields located within state waters.

B. Reserves: EIA maintains a historical database of annual field level reserve estimates and production for oil and gas fields located in state waters. This database consists of operator reported reserves estimates submitted to EIA on Form 23L. EIA provided annual production for natural gas and oil, and reserve estimates for fields located in state waters for the period from 1985-2015. Estimates for the volume of cumulative production prior to 1985 were taken from *Federal Offshore Statistics: 1995* (MMS, 1997). Since the BOEM data for reserves are available only through 2015, the same cutoff date was used for the EIA data.

C. Reserves Appreciation: The BOEM review of the EIA data indicates that there is a general across-the-board trend of decline in the estimates of ultimately recoverable reserves with no indication of reserve appreciation. This is primarily a result of the ages of the state water fields and their high level of depletion. Many of the fields in state waters off the coasts of Texas and Louisiana have been producing for more than 50 years and have already appreciated in their estimates of recoverable reserves through extensional and deeper drilling within the fields. Also, some of the significant new deep discoveries are classified as new fields and are offset to the old fields at depth to avoid the problem of drilling through multiple depleted zones within the old fields. Therefore, only minimal, if any, future reserves appreciation is anticipated in the mature fields common throughout state waters.

D. Assessment of Undiscovered Technically Recoverable Resources: USGS prepares estimates of undiscovered conventionally recoverable oil and gas resources of the onshore United States and within state waters adjacent to each state. Undiscovered conventionally recoverable resources are equivalent to BOEM's UTRR. The USGS allocated the resource estimates to the individual state waters offshore Texas, Louisiana, Mississippi, and Alabama from the larger resource estimates conducted as part of the Gulf Coast petroleum assessment.

IV. Results

This assessment of the GOM continental margin incorporated a comprehensive play-based approach toward the analysis of hydrocarbon potential. A major strength of this method is that it has a strong relationship between information derived from oil and gas exploration activities and the geologic model developed by the assessment team. An extensive effort was involved in developing play models, delineating the geographic limits of each play, and compiling data on critical geologic and reservoir engineering parameters. These parameters were a crucial input in the determination of the total quantities of recoverable resources in each play.

1. ***Cumulative Production***: Cumulative production is a measured quantity that can be accurately determined. The uncertainty associated with these estimates is less than with comparable estimates of volumes of reserves and considerably less than estimates of undiscovered resources.

   Cumulative production through 2015 off the coasts of Texas, Louisiana, Mississippi, and Alabama was 1.93 Bbo and 23.18 Tcfg (6.05 BBOE) from state waters (see Figure 3(a) and Table 2(a)), and 19.58 Bbo and 186.55 Tcfg (52.78 BBOE) from the OCS (see Figure 3(b) and Table 2(b)).

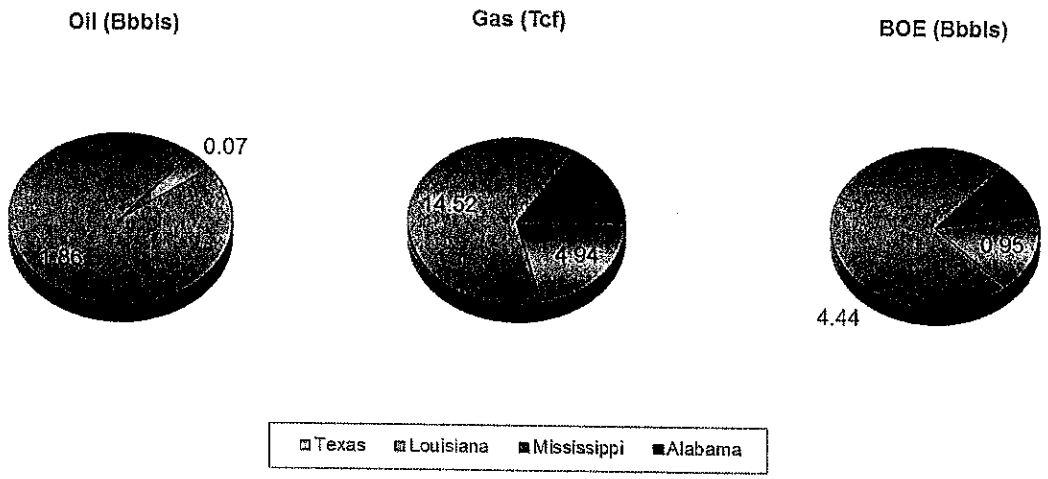

Figure 3(a): Distribution of Cumulative Production in State Waters off the Coasts of Texas, Louisiana, Mississippi, and Alabama by Type and State

Table 2(a): Total Endowment of Technically Recoverable Oil and Gas Resources in State Waters off the Coasts of Texas, Louisiana, Mississippi, and Alabama, 2017

State	Cumulative Production (through 2015)			Reserves			Reserves Appreciation			Undiscovered Technically Recoverable Resources (Mean)			Total Endowment (Mean)		
	Oil (Bbbl)	Gas (Tcf)	BOE (Bbbl)	Oil (Bbbl)	Gas (Tcf)	BOE (Bbbl)	Oil (Bbbl)	Gas (Tcf)	BOE (Bbbl)	Oil (Bbbl)	Gas (Tcf)	BOE (Bbbl)	Oil (Bbbl)	Gas (Tcf)	BOE (Bbbl)
Texas	0.07	4.94	0.95	0.00	0.04	0.01	0.00	0.00	0.00	0.67	16.97	3.69	0.74	21.95	4.65
Louisiana	1.86	14.52	4.44	0.05	0.20	0.09	0.00	0.00	0.00	0.86	21.20	4.63	2.77	35.92	9.16
Mississippi	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.64	0.14	0.03	0.64	0.14
Alabama	0.00	3.72	0.66	0.00	0.89	0.16	0.00	0.00	0.00	0.01	0.45	0.09	0.01	5.06	0.91
Total in State Waters off the Coasts of TX, LA, MS, and AL	**1.93**	**23.18**	**6.05**	**0.05**	**1.13**	**0.25**	**0.00**	**0.00**	**0.00**	**1.56**	**39.26**	**8.55**	**3.55**	**63.57**	**14.86**

Table 2(b): Total Endowment of Technically Recoverable Oil and Gas Resources in the Federal OCS off the Coasts of Texas, Louisiana, Mississippi, and Alabama, 2017

State	Cumulative Production (through 2015)			Reserves			Reserves Appreciation			Undiscovered Technically Recoverable Resources (Mean)			Total Endowment (Mean)		
	Oil (Bbbl)	Gas (Tcf)	BOE (Bbbl)	Oil (Bbbl)	Gas (Tcf)	BOE (Bbbl)	Oil (Bbbl)	Gas (Tcf)	BOE (Bbbl)	Oil (Bbbl)	Gas (Tcf)	BOE (Bbbl)	Oil (Bbbl)	Gas (Tcf)	BOE (Bbbl)
Texas	1.06	34.72	7.23	0.22	0.51	0.31	0.70	8.36	2.19	11.57	38.99	18.50	13.61	83.67	28.50
Louisiana	18.36	148.26	44.75	3.25	6.59	4.42	8.39	26.00	13.02	32.78	85.80	48.04	64.81	273.31	113.45
Mississippi	0.00	0.59	0.11	0.00	0.04	0.01	0.00	0.29	0.05	0.07	1.08	0.26	0.07	2.02	0.43
Alabama	0.17	2.98	0.69	0.01	0.15	0.04	0.09	1.30	0.32	0.40	4.39	1.19	0.69	8.96	2.28
Total in the Federal OCS off the Coasts of TX, LA, MS, and AL	**19.58**	**186.55**	**52.78**	**3.48**	**7.29**	**4.78**	**9.18**	**35.95**	**15.58**	**44.82**	**130.26**	**67.99**	**79.18**	**367.97**	**144.66**

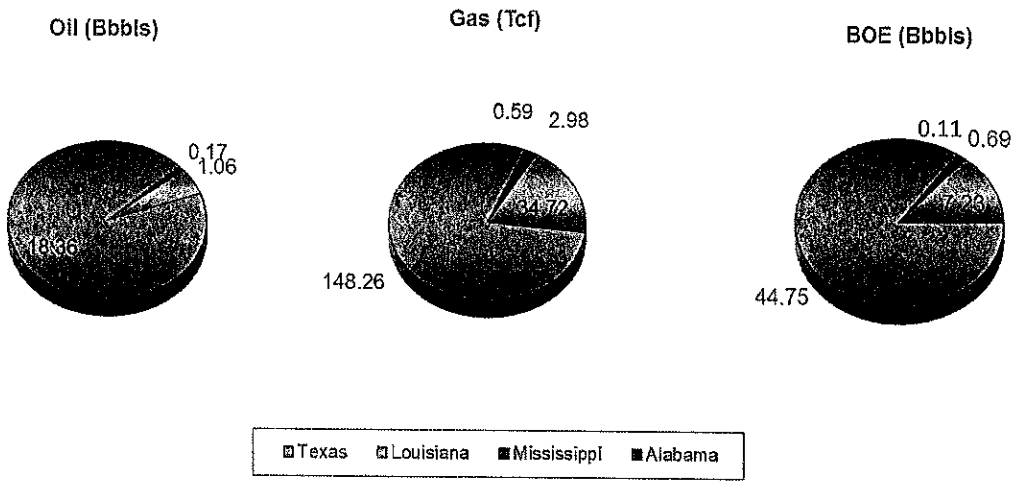

Figure 3(b): Distribution of Cumulative Production in the OCS off the Coasts of Texas, Louisiana, Mississippi, and Alabama by Type and State

2. ***Reserves***: Reserves are frequently estimated at different stages during the exploration and development cycle of a hydrocarbon accumulation, i.e., after exploration and delineation drilling, during development drilling, after some production and, finally, after production has been well established. Different methods of estimating the volume of reserves are appropriate at each stage. Reserve estimating procedures generally progress from volumetric to performance-based techniques as the field matures. The relative uncertainty associated with these estimates decreases as more subsurface information and production history become available. Estimates of reserves are uncertain; however, traditional industry practice has been to calculate reserves through a deterministic process and present the results as single point estimates. Table 2(a) and Figure 4(a) show that the total reserves remaining in the fields in state waters off the coasts of Texas, Louisiana, Mississippi, and Alabama are estimated to be 0.05 Bbo and 1.13 Tcfg (0.25 BBOE). Table 2(b) and Figure 4(b) show that the total proved and unproved reserves remaining in the 1,312 fields in the OCS off the coasts of Texas, Louisiana, Mississippi, and Alabama are estimated to be 3.48 Bbo and 7.29 Tcfg (4.78 BBOE).

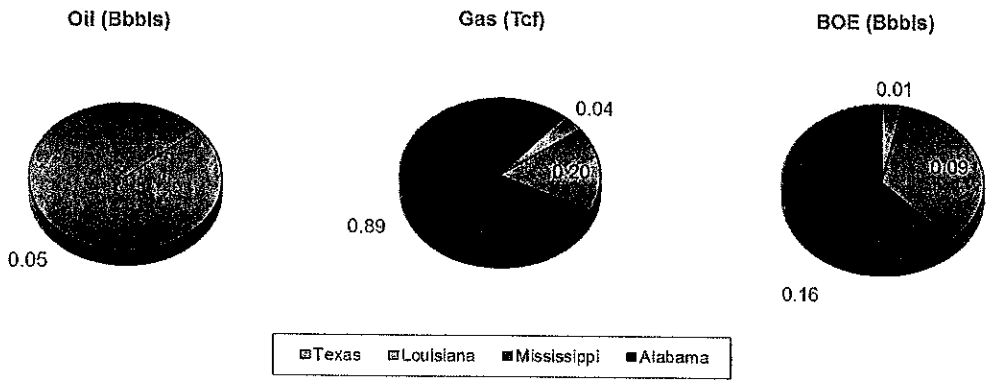

Figure 4(a): Distribution of Reserves in State Waters off the Coasts of Texas, Louisiana, Mississippi, and Alabama by Type and State

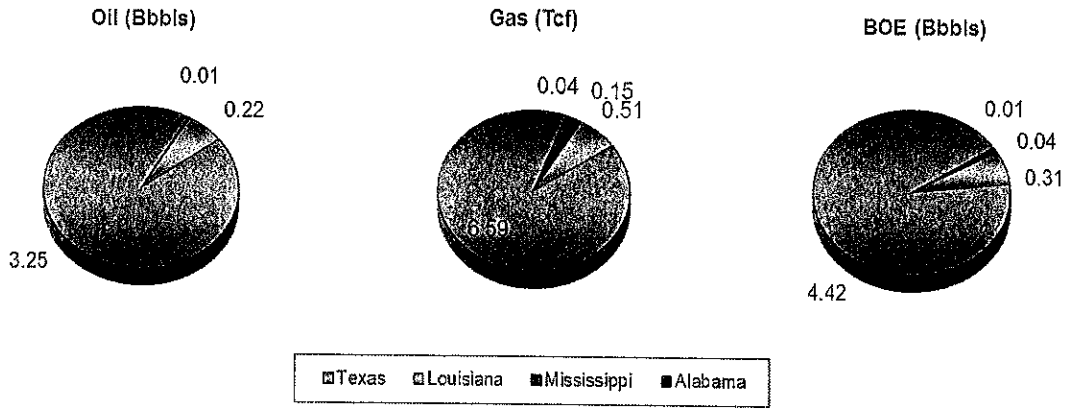

Figure 4(b): Distribution of Reserves in the OCS off the Coasts of Texas, Louisiana, Mississippi, and Alabama by Type and State

3. ***Contingent Resources:*** Table 2(b) and Figure 5 show contingent resources remaining in the 1,312 fields in the OCS off the coasts of Texas, Louisiana, Mississippi, and Alabama are estimated to be 2.12 Bbo and 7.92 Tcfg (3.52 BBOE).

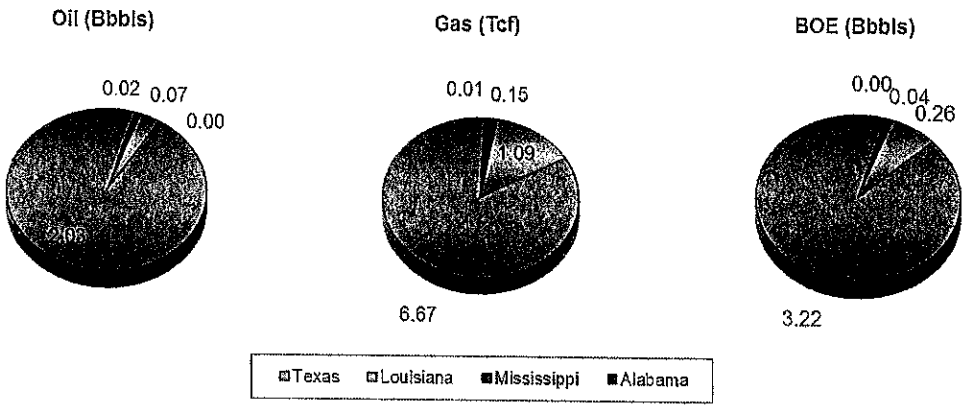

Figure 5: Distribution of Contingent Resources in the OCS off the Coasts of Texas, Louisiana, Mississippi, and Alabama by Type and State

4. ***Reserves Appreciation***: Cumulative production plus total estimated future production (from reserves) equals the estimate of the ultimate recovery (EUR) from a field. Predicting a field's true EUR requires an estimate of its future reserves growth or appreciation. The reserves appreciation phenomenon has been observed in onshore and offshore basins for years. During the initial years after discovery, reserve estimates typically increase rapidly. The rate of growth then tends to level off at a much smaller annual rate of increase. Appreciation is the result of numerous factors which occur as a field is developed and produced, most importantly:

    - consistently conservative standard industry practices for reporting proved reserves;
    - an increased understanding of the petroleum reservoir;
    - physical expansion of the field through the discovery of new reservoirs or the extension of existing reservoirs; and
    - improved recoveries due to experience with actual field performance, the implementation of new technology, and/or changes in the cost-price relationships.

    Growth functions are modeled from empirical historical trends derived from the set of existing OCS fields having proved reserves at the end of 2015, and were used to develop an estimate of an existing field's size at a future date. Growth factors represent the ratio of the size of a field several years after discovery to the initial estimate of its size in the year of discovery. The assumptions central to this analysis are:

    - the amount of growth in any year is proportional to the size of the field;
    - this proportionality varies inversely with the age of the field;
    - the age of the field is a reasonable proxy for the degree to which the factors causing appreciation have operated; and
    - the factors causing future appreciation will result in patterns and magnitudes of growth similar to that observed in the past.

    The appreciation model used in this assessment projects no growth for fields more than 55 years of age. This appears to be a reasonable conclusion since it fits well with the observed data and does not entail extending projections considerably beyond the timeframe of the observations. On balance, however, the model used in this assessment of reserves appreciation is apt to be conservative. The oldest fields are generally the largest, contribute the bulk of the original proved reserves, and also are most likely to experience growth beyond 55 years of age. Although the total volume of hydrocarbons presumed to be available through future reserves growth is substantial, the resources associated with this phenomenon are attainable only in relatively small increments.

    Discoveries in the state waters of Alabama have been producing for nearly 30 years while the fields in the state waters of Texas and Louisiana have been producing for more than 50 years. BOEM did not attribute additional growth and appreciation to reserves in known discoveries for the coastal state waters.

Reserves appreciation in the OCS routinely exceeds new field discoveries and contributes the bulk of annual additions to proved reserves. It is an important consideration in any analysis of future oil and natural gas supplies. Future reserves appreciation within the existing active fields in the OCS off the coasts of Texas, Louisiana, Mississippi, and Alabama is estimated at 9.18 Bbo and 35.95 Tcfg (15.58 BBOE), (see Figure 6 and Table 2(b)). This anticipated volume of growth approaches the year end 2015 estimate of proved and unproved reserves in the GOM OCS.

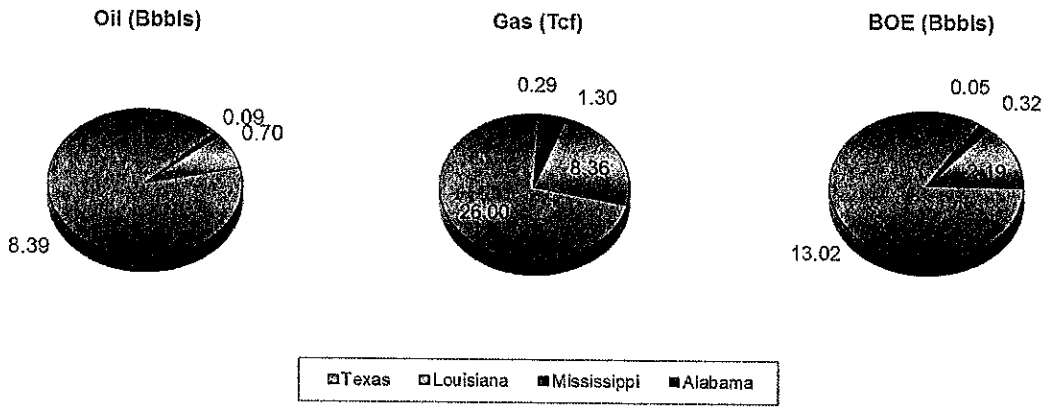

Figure 6: Distribution of Reserves Appreciation in the OCS off the Coasts of Texas, Louisiana, Mississippi, and Alabama by Type and State

5. ***Undiscovered Technically Recoverable Resources (UTRR)***: Estimates of the UTRR for statewaters off the coasts of Texas, Louisiana, Mississippi, and Alabama have a mean of 1.56 Bbo and 39.26 Tcfg (8.55 BBOE) (see Figure 7(a) and Table 2(a)). Similarly, estimates for the OCS have a mean of 44.82 Bbo and 130.26 Tcfg (67.99 BBOE) (see Figure 7(b) and Table 2(b)).

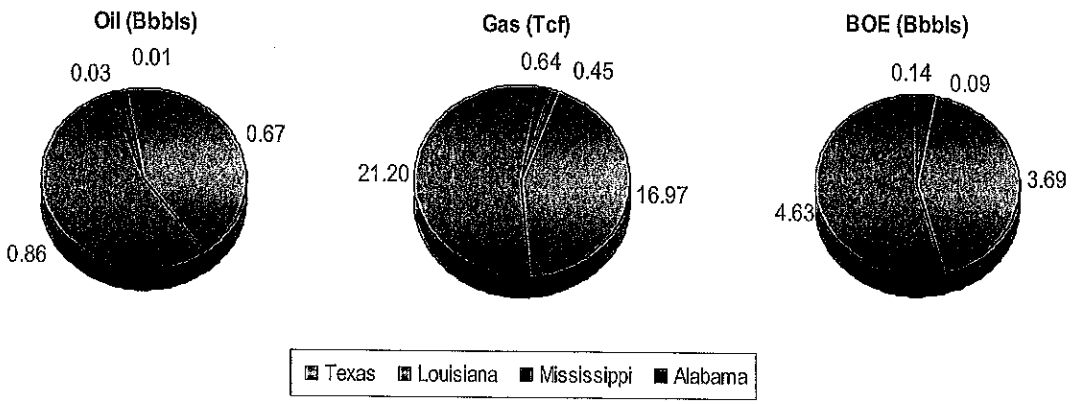

Figure 7(a): Distribution of UTRR in the State waters off the Coasts of Texas, Louisiana, Mississippi, and Alabama by Type and State

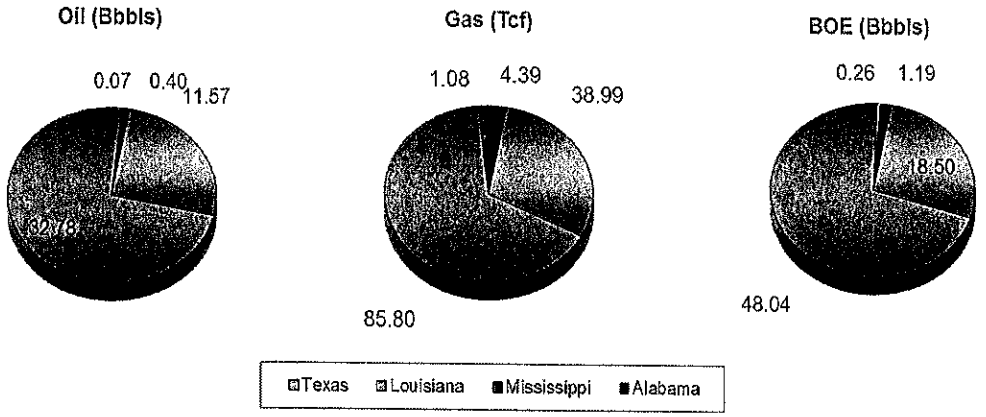

Figure 7(b): Distribution of UTRR in the OCS off the Coasts of Texas, Louisiana, Mississippi, and Alabama by Type and State

6. ***Total Endowment***: Mean estimates of the total hydrocarbon endowment for state waters off the coasts of Texas, Louisiana, Mississippi, and Alabama are 3.55 Bbo and 63.57 Tcfg (14.86 BBOE) (see Figure 8(a) and Table 2(a)). More than 40 percent of the total endowment in terms of the mean estimate of the BOE has already been produced.

   Mean estimates of the total hydrocarbon endowment for the OCS off the coasts of Texas, Louisiana, Mississippi, and Alabama are 79.18 Bbo and 367.97 Tcfg (144.66 BBOE) (see Figure 8(b) and Table 2(b)). More than 36 percent of the total endowment in terms of the mean estimate of the BOE has already been produced. An additional 17 percent is contained within the various reserves categories, the source of near and midterm production.

During the 50 year history of the state waters and OCS production off the coasts of Texas, Louisiana, Mississippi, and Alabama, approximately 21.52 Bbo and 209.73 Tcfg have been produced, providing employment opportunities and revenue to the Treasury while contributing to U.S. energy security. The vast majority of the remaining reserves are located within deepwater fields in the Central and Western GOM. Also important as a source of future domestic production is the 11.3 Bbo and 43.87 Tcfg projected as future volumes of contingent resources and reserves appreciation within the existing fields.

After more than 50 years of exploration and development in the OCS off the coasts of Texas, Louisiana, Mississippi, and Alabama, 47 percent of the mean BOE total endowment is represented by undiscovered resources.

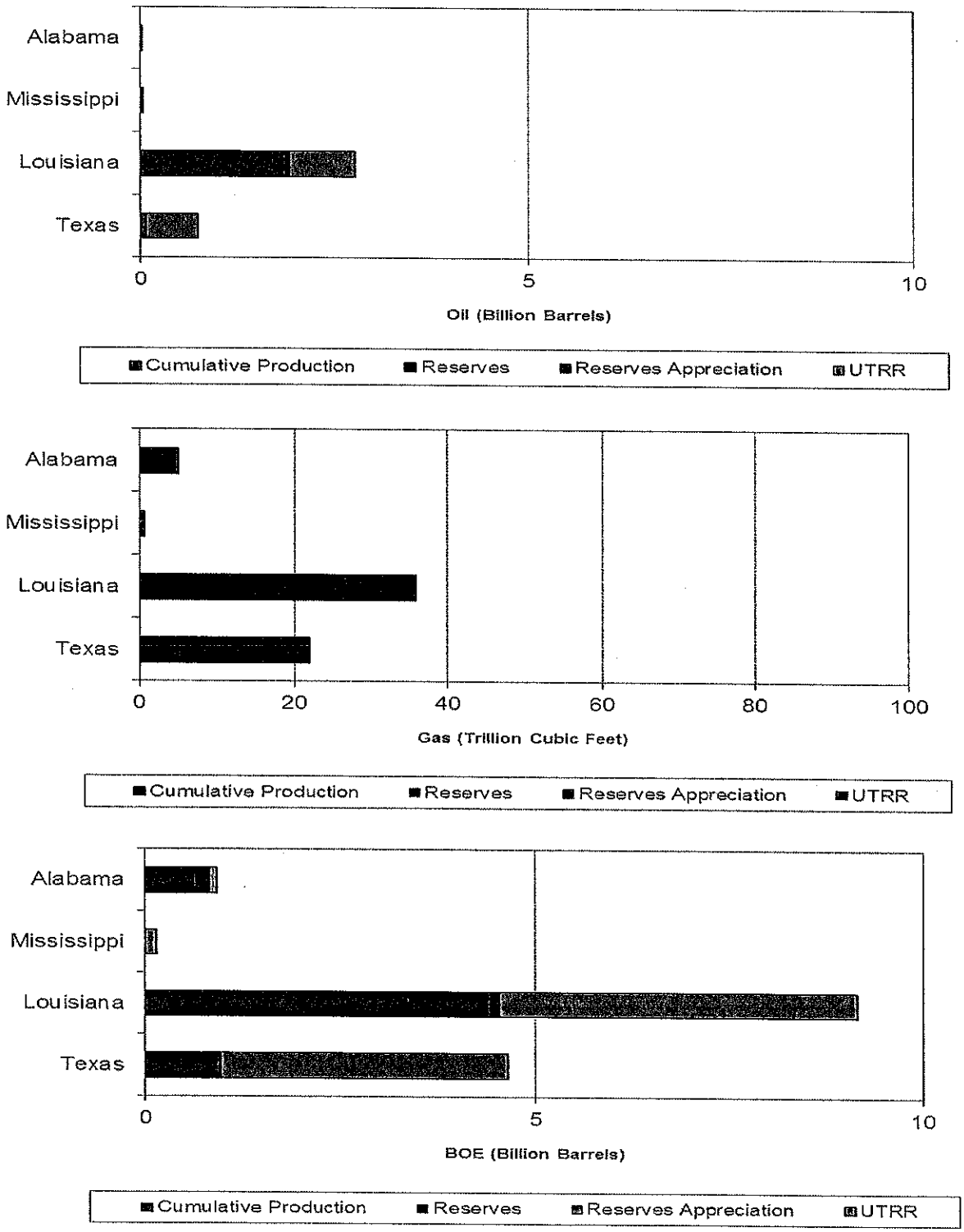

Figure 8(a): Distribution of Total Hydrocarbon Endowment in State Waters off the Coasts of Texas, Louisiana, Mississippi, and Alabama by Type, State, and Resource Category

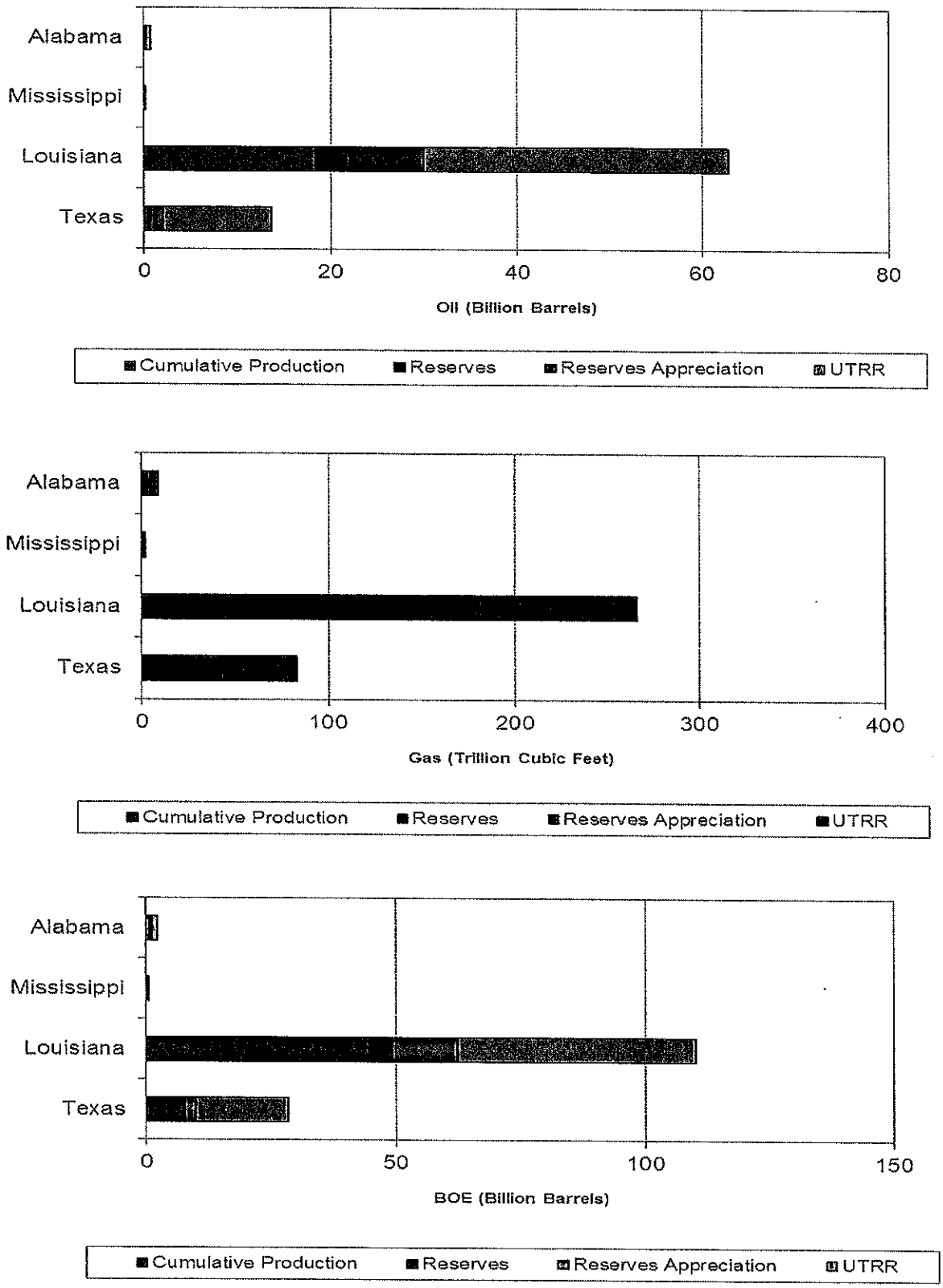

Figure 8(b): Distribution of Total Hydrocarbon Endowment in the OCS off the Coasts of Texas, Louisiana, Mississippi, and Alabama by Type, State, and Resource Category

V. Conclusions

Oil and gas resources located off the coasts of Texas, Louisiana, Mississippi, and Alabama are important to the future domestic energy supply of the United States. These areas are available for leasing through various state and Federal leasing programs.

The estimate of the total hydrocarbon endowment, which includes cumulative production, off the coasts of Texas, Louisiana, Mississippi, and Alabama, is 3.55 Bbo and 63.57 Tcfg (14.86 BBOE) for state waters and 79.18 Bbo and 367.97 Tcfg (144.66 BBOE) for the OCS.

Of the total endowment in state waters off the coasts of Texas, Louisiana, Mississippi, and Alabama, about 1.98 Bbo and 24.31 Tcfg (approximately 42 percent on a BOE basis) is represented by resources in known fields—the total of cumulative production, remaining proved and unproved reserves, and reserves appreciation.

Of the total endowment in the OCS off the coasts of Texas, Louisiana, Mississippi, and Alabama, about 34.36 Bbo and 237.71 Tcfg (76.67 BBOE), approximately 53 percent on a BOE basis is represented by resources in known fields—the total of cumulative production, remaining proved and contingent resources, and reserves appreciation.

The oil and gas reserves, growth to reserves in known discoveries, and undiscovered technically recoverable resources in the OCS off the coasts of Texas, Louisiana, Mississippi, and Alabama are located predominantly in water depths greater than 1,000 feet and beneath thick layers of salt (subsalt) embedded within sand and clay deposits. These new deepwater and subsalt discoveries and prospects are difficult to image with seismic data and are expensive to explore and develop due to expected increases in the costs for deepwater drilling rigs and exploration and development support vessels throughout the world.

Appendices

Appendix A: Glossary
Appendix B: Abbreviations, Acronyms, and Symbols
Appendix C: References

Appendix A: Glossary

The glossary defines relevant terms in a general rather than in a strictly technical way.

American Petroleum Industry (API) gravity: An arbitrary scale expressing the gravity or density of liquid petroleum products. The measuring scale is calibrated in terms of degrees API. The higher the API gravity, the lighter the fluid.

Appreciation: Analogous to reserves appreciation. See "reserves."

Assessment: The estimation of potential amounts of technically recoverable hydrocarbon resources.

Associated gas: See "gas, natural."

Barrel: A volumetric unit of measure for crude oil equivalent to 42 U.S. gallons.

Barrel of oil-equivalent (BOE): The sum of gas resources, expressed in terms of their energy equivalence to oil, plus the oil volume. The conversion factor of 5,620 standard cubic feet of gas equals 1 BOE is based on the average heating values of domestic hydrocarbons.

Chance: See "probability" or "risk."

Condensate: Hydrocarbons associated with saturated gas that are present in the gaseous state at reservoir conditions, but are produced as liquid hydrocarbons at the surface.

Continental margin: The composite continental rise, continental slope, and continental shelf as a single entity. The term, as used in this report, applies only to the portion of the margin whose mineral estate is under Federal jurisdiction; geographically synonymous with Outer Continental Shelf (OCS).

Continental shelf: The shallow, gradually sloping zone extending from the shoreline to a depth at which there is a marked steep descent to the ocean bottom.

Continental slope: The portion of the continental margin extending seaward from the continental shelf to the continental rise or ocean floor.

Contingent Resources: See "reserves."

Conventionally recoverable: Producible by natural pressure, pumping, or secondary recovery methods, such as gas or water injection.

Cumulative production: The sum of all produced volumes of hydrocarbons prior to a specified point in time.

Deterministic: A process in which future states can be forecast exactly from knowledge of the present state and rules governing the process. It contains no random or uncertain components.

Development: Activities following exploration, including the installation of production facilities and the drilling and completion of wells for production.

Dissolved gas: See "gas, natural."

Economic analysis: An assessment performed in order to estimate the portion of the undiscovered conventionally recoverable resources in an area that is expected to be commercially viable in the long term under a specific set of economic conditions.

Economic risk: See "risk."

Estimated ultimate recovery (EUR): See "reserves."

Exploration: The process of searching for minerals prior to development. Exploration activities include geophysical surveys, drilling to locate hydrocarbon reservoirs, and drilling of delineation wells to determine the extent and quality of an existing discovery prior to a development decision.

FPSO: A floating production, storage and offloading (FPSO) unit is a floating vessel used by the offshore oil and gas industry for the processing of hydrocarbons and for storage of oil.

Field: A producible accumulation of hydrocarbons consisting of a single pool or multiple pools related to the same geologic structure and/or stratigraphic condition. In general, usage of this term refers to a commercial accumulation.

Gas, natural: A mixture of gaseous hydrocarbons (typically methane with lesser amounts of ethane, propane, butane, pentane, and possibly some nonhydrocarbon gases).

Associated gas: Natural gas that occurs in crude oil reservoirs as free gas (gas cap).

Dissolved gas: Natural gas that occurs as gas in solution within crude oil reservoirs.

Nonassociated gas: Natural gas that occurs in reservoirs not in contact with significant quantities of crude oil.

Geologic risk: See "risk."

Growth factor: A function used to calculate an estimate of a field's size at a future date. Growth factors reflect technology, market, and economic conditions existing over the period spanned by the estimates.

Annual growth factor: The function representing the ratio of the size of a field of a specific age as estimated in a given year to the size estimated for that same field in a subsequent year.

Cumulative growth factor: The function representing the ratio of the size of a field for a specific number of years after discovery to the initial estimate of its size in the year of discovery.

Hydrocarbon maturation: The process by which organic material trapped in source rocks is transformed naturally by heat and pressure through time and depth of burial into oil and/or gas.

Hydrocarbons: Any of a large class of organic compounds containing primarily carbon and hydrogen. Hydrocarbons include crude oil and natural gas. As used in this report, the term is synonymous with petroleum.

Mean: A statistical measure of central tendency; the arithmetic average or expected value, calculated by summing all values and dividing by the number of values.

Model: A geologic hypothesis expressed in mathematical form.

Nonassociated gas: See "gas, natural."

Oil, crude: A mixture of hydrocarbons that exists naturally in the liquid phase in subsurface reservoirs.

Outer Continental Shelf (OCS): The continental margin, including the shelf, slope, and rise, beyond the line that marks the boundary of state ownership; that part of the seabed under Federal jurisdiction.

Petroleum: A collective term for oil, gas, and condensate.

Planning area: A subdivision of an offshore area used as the initial basis for considering blocks to be offered for lease in the Department of the Interior's OCS oil and gas leasing program.

Play: A group of known and/or postulated pools that share common geologic, geographic, and temporal properties, such as history of hydrocarbon generation, migration, reservoir development, and entrapment.

Probability: A means of expressing an outcome on a numerical scale that ranges from impossibility to absolute certainty; the chance that a specified event will occur.

Proved reserves: See "reserves."

Recoverable resources: See "resources."

Region: A very large expanse of acreage usually characterized or set apart by some aspect such as a political division or area of similar geography. In this report, the regions are groupings of planning areas.

Reserves: The quantities of hydrocarbon resources anticipated to be recovered from known accumulations from a given date forward. All reserve estimates involve some degree of uncertainty.

Proved reserves: The quantities of hydrocarbons estimated with reasonable certainty to be commercially recoverable from known accumulations and under current economic conditions, operating methods, and government regulations. Current economic conditions include prices and costs prevailing at the time of the estimate. Estimates of proved reserves do not include reserves appreciation.

Reserves appreciation: The observed incremental increase through time in the estimates of reserves of an oil and/or gas field. It is that part of the known resources over and above proved and unproved reserves that will be added to existing fields through extension, revision, improved recovery, and the addition of new reservoirs. Also referred to as reserves growth or field growth.

Contingent Resources: The 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.

Estimated ultimate recovery (EUR): All hydrocarbon resources within known fields that can be profitably produced using current technology under existing economic conditions. Estimates of ultimate recovery equal the sum of cumulative production, proved reserves, unproved reserves, and reserves appreciation.

Reservoir: A subsurface, porous, permeable rock body in which an isolated accumulation of oil and/or gas is stored.

Resource assessment: The estimation of potential amounts of recoverable resources. The focus is normally on conventionally or technically recoverable hydrocarbons.

Resources: Concentrations in the earth's crust of naturally occurring liquid or gaseous hydrocarbons that can conceivably be discovered and recovered. Normal use encompasses both discovered and undiscovered resources.

Recoverable resources: The volume of hydrocarbons that is potentially recoverable, regardless of the size, accessibility, recovery technique, or economics of the postulated accumulations.

Technically recoverable resources: The volume of hydrocarbons that may be produced from a wellbore as a consequence of natural pressure, artificial lift, pressure maintenance (gas or water injection), or other secondary recovery methods. They do not include quantities of hydrocarbon resources that could be recovered by enhanced recovery techniques, gas in geopressured brines, natural gas hydrates, or oil and gas that may be present in insufficient quantities or quality (low permeability "tight" reservoirs) to be produced via conventional recovery techniques.

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.

Undiscovered technically recoverable resources (UTRR): Resources in undiscovered accumulations analogous to those in existing fields producible with current recovery technology and efficiency, but without any consideration of economic viability. These accumulations are of sufficient size and quality to be amenable to conventional primary and secondary recovery techniques. Undiscovered conventionally recoverable resources are primarily located outside of known fields.

Risk: The chance or probability that a particular event will not occur.

Economic risk: The chance that no commercial accumulation of hydrocarbons will exist in the area under consideration (e.g., prospect, play, or area). The chance that an area may not contain hydrocarbons, or the volume present may be noncommercial is incorporated in the economic risk.

Geologic risk: The chance that technically recoverable volumes of hydrocarbons will not exist in the area under consideration (e.g., prospect, play, basin or area). The commercial viability of an accumulation is not a consideration.

SPAR: An offshore facility consisting of a large diameter vertical cylinder supporting a deck. It has a typical fixed platform topside (surface deck with drilling and production equipment), three types of risers (drilling, production, and export), and a hull which is moored using a taut catenary system of 6 to 20 lines anchored into the seafloor. SPAR's are presently used in water depths up to 3,000 feet, although existing technology can extend this to about 10,000 feet.

Subsea system: An offshore facility ranging from single subsea wells producing to a nearby platform, floating production system, or tension leg platform to multiple wells producing

through a manifold and pipeline system to a distant production facility. These systems are now used in water depths up to 7,000 feet, although existing technology can extend this to about 10,000 feet.

Stochastic: A process in which each observation possesses a random variable.

Subjective judgment: A technique utilized to assign probabilities of occurrence to possible events when all of the possible outcomes of an event are not known and when the frequency of recognized outcomes cannot be estimated with certainty; often referred to as expert opinion.

Total endowment: All conventionally recoverable hydrocarbon resources of an area. Estimates of total endowment equal the sum of undiscovered technically recoverable resources, cumulative production, proved reserves, unproved reserves, and reserves appreciation.

Uncertainty: Imprecision in estimating the value (or range of values) for a variable.

Undiscovered resources: See "resources."

Undiscovered technically recoverable resources (UTRR): See "resources."

Unproved reserves: See "reserves."

Appendix B: Abbreviations and Acronyms

API	American Petroleum Institute
Bbbl	billion barrels
Bbo	billion barrels of oil
BBOE	billion barrels of oil equivalent
BOE	barrels of oil equivalent
BOEM	Bureau of Ocean Energy Management
CGOM	Central Gulf of Mexico
DOE	Department of Energy
DOI	Department of the Interior
EIA	Energy Information Administration
EUR	estimated ultimate recovery
GOM	Gulf of Mexico
MMS	Minerals Management Service
OCS	Outer Continental Shelf
PA	planning area
Tcf	trillion cubic feet
Tcfg	trillion cubic feet of gas
UTRR	undiscovered technically recoverable resources
U.S.	United States
USGS	U.S. Geological Survey
WGOM	Western Gulf of Mexico

Appendix C: References

Bureau of Ocean Energy Management. 2016. Assessment of Undiscovered Technically Recoverable Oil and Gas Resources of the Nation's OCS, 2016: BOEM Fact Sheet RED-2016-01, January 2016, 8 p.

Bureau of Ocean Energy Management. Estimated Oil and Gas Reserves, Gulf of Mexico OCS Region, December 31, 2009 BOEM 2013-01160, 2-3, 18, 22 p.

Bureau of Energy Management. 2013. Fourth Biennial Report to Congress: Estimates of Natural Gas and Oil Reserves in Federal and State Waters off the Coasts of Texas, Louisiana, Mississippi, and Alabama, Energy Policy Act of 2005 – Section 965(c), 35 p.

Dreyfus, D.A. and A.B. Ashby. 1989. Global natural gas resources: Energy, v.14, no. 12, p. 734-784.

Minerals Management Service. 2009. Second Biennial Report to Congress: Estimates of Natural Gas and Oil Reserves in Federal and State Waters off the Coasts of Texas, Louisiana, Mississippi, and Alabama, Energy Policy Act of 2005 – Section 965(c), 35 p.

Minerals Management Service. 1997. Federal Offshore Statistics:1995: MMS OCS Report MMS 97-007, 122 p.

Minerals Management Service. 2006. Report to Congress: Comprehensive inventory of U.S. oil and natural gas resources, Energy Policy Act of 2005 – Section 357, 144 p.

National Research Council. 1991. Undiscovered oil and gas resources: an evaluation of the Department of the Interior's 1989 assessment procedures: National Academy Press, Washington, D.C., 179 p

Rogner, H.H. 1997. An assessment of world hydrocarbon resources: annual review of energy and the environment, v. 22, p. 217-262.

Society of Petroleum Engineers (SPE), American Association of Petroleum Geologists (AAPG), World Petroleum Council (WPC), and Society of Petroleum Evaluation Engineers (SPEE), 2007, *Petroleum Resource Management System*, 49 p.

U.S. Bureau of Mines and U.S. Geological Survey. 1980. Principles of a resource/reserve classification for minerals: U.S. Geological Survey Circular 831, 5 p.

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LM-Acting COS Jill Moran	3 - Surname	01/29/2018		01/30/2018

DEPARTMENTAL CONTACTS

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Assistant Secretary – Indian Affairs	513-0827 MIB 4141	Stephaine Cloud		
Bureau of Indian Affairs	208-5116 MIB 4606	Anna Owens-Brown		
Bureau of Safety and Environmental Enforcement	208-5460 MIB 5426	Anita Childs John Gregory		
Congressional & Legislative Affairs	208-7693 MIB 6248	Ayesha Giles		
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Policy Management & Budget	208-3697 MIB 5023	Kashieka Minor		
Policy Program Management	208-3219 MIB 5120	Kiren Anderson Appointments		
Senior Advisor Alaska Affairs Rep. Steve Wackowski	907/271-5485 MIB	Lesia Monson via email		
SIO-Counselor - Vincent DeVito	MIB 6136 208-4105	Gisella Ojeda - Dodds	3/9/18	
Solicitor Office	208-5429 MIB 6429	Rhonda Worthy		
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The Honorable Paul Ryan
Speaker of the House of Representatives
Washington, D.C. 20515

Dear Mr. Speaker:

I am submitting herewith the "Fifth Biennial Report to Congress: Estimates of Natural Gas and Oil Reserves, Reserves Growth, and Undiscovered Resources in Federal and State Waters off the Coasts of Texas, Louisiana, Mississippi and Alabama -- 2017 Update." This report was prepared by the Department of the Interior pursuant to Section 965c of the Energy Policy Act of 2005

A similar letter is being sent to the President of the Senate.

Sincerely,

Walter D. Cruickshank
Acting Director

Should be sign by R2, DB, or JB

Enclosure

Copy to: The Honorable Rob Bishop, Chairman
Committee on Natural Resources

The Honorable Raul Grijalva, Ranking Member
Committee on Natural Resources

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