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1995 National Oil and Gas Assessment and Onshore Federal Lands

compiled by

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TABLE OF CONVERSIONS TO SI UNITS

[For this assessment, 6,000 cubic feet of gas equals 1 barrel of oil equivalent (BOE)]

multiply unit	by	to obtain metric unit
barrel	0.159	cubic meter
cubic foot	0.02832	cubic meter
foot	0.3048	meter

Unit Abbreviations

BBO Billions of barrels of oil	BCFG Billions cubic feet gas
BBL Billions of barrels	TCFG Trillions cubic feet gas
MMBO..... Millions of barrels of oil	mcf..... Thousands of cubic feet
MMBOE .. Millions of barrels of oil equivalent	bbl..... Barrels

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SUMMARY

This report summarizes estimated volumes of oil and gas in undiscovered conventional and continuous-type accumulations that occur on onshore Federal Lands. The basis of these estimates is the U.S. Geological Survey's 1995 National Assessment of oil and gas resources (Gautier and others, 1996). Onshore Federal Lands account for about 29 percent of US land area but only 5.1 percent of 1995 US oil production and 8.8 percent of 1995 US gas production. Estimates are as of January 1994. The Minerals Management Service has released a parallel study for Federal offshore areas (1996).

Quantities of technically recoverable oil and gas in conventional undiscovered oil and gas fields; in continuous-type oil and gas accumulations in sandstones, chinks, and shales, and in continuous-type accumulations of coalbed gas that occur on onshore Federal Lands were assessed (Table 1). Estimates of oil in undiscovered conventional fields range from 4.4 to 12.8 billion barrels (BBO) with a mean value of 7.5 BBO. Similarly, estimates of technically recoverable gas in undiscovered conventional fields range from 34.0 to 96.8 trillion cubic feet (TCF), with a mean value of 57.9 TCF. Almost 85 percent of the assessed gas in undiscovered conventional accumulations was non-associated gas, that is, gas in gas fields rather than gas in oil fields. Estimates of technically recoverable resources in continuous-type accumulations for oil are from 0.2 to 0.6 BBO, with a mean value of 0.3 BBO, and for gas, from 72.4 to 202.4 TCF with a mean value of 127.1 TCF. Estimates of technically recoverable coalbed gas range from 13.0 TCF to 19.6 TCF with a mean value of 16.1 TCF. The range of estimates correspond to the 95 percent probability (19 in 20 chance) and 5 percent probability (1 in 20 chance), respectively, of at least those amounts occurring.

Table 1. Total estimated volumes in onshore Federal Lands of technically recoverable and economically recoverable oil, gas, and natural gas liquids (NGL) in undiscovered conventional, continuous-type, and coalbed gas accumulations as of January 1994. [Volumes, BBO; billions of barrels of oil, TCF; trillions of feet gas, BBL; billions of barrels of NGL, Costs; bbl, barrel; mcf, thousand cubic feet]

	Technically recoverable			Economically*** recoverable at	
	F95	Mean	F05	\$18/bbl \$2/mcf	\$30/bbl \$3.34/mcf
Conventional undiscovered					
Oil (BBO)	4.4	7.5	12.8	1.6	3.3
Gas (TCF)	34.0	57.9	96.8	9.7	13.6
NGL (BBL)	1.1	1.8	2.7	0.7	0.9
Continuous-type accumulations*					
Oil (BBO)	0.2	0.3	0.6	0.1	0.2
Gas (TCF)	72.4	127.1	202.4	6.1	11.4
NGL (BBL)	0.1	1.5	2.6	0.0	0.1
Coalbed gas**					
Gas (TCF)	13.0	16.1	19.6	7.0	11.8

* Technically recoverable based on Crovelli and Schmoker, 1997.

** Technically recoverable based on Crovelli and Nuccio, 1997.

*** Includes costs of finding, developing and producing the resource. Based on mean values of technically recoverable estimate.

The economic evaluation used the mean values of the technically recoverable resources assessed by the geologists. Figures 1A and 1B summarize the aggregate incremental costs of finding, developing, and producing oil and gas from undiscovered conventional fields and from continuous-type and coalbed gas accumulations located in onshore Federal Lands. In the figures, the economic resources in continuous-type accumulations and coalbed gas are depicted as the difference between the undiscovered conventional curve and the curve designated as total. At \$30 per barrel or \$3.34 per thousand cubic feet (mcf), 3.3 BBO oil and 13.6 TCF gas in undiscovered conventional fields can be found, developed, and produced. In addition, at that cost level, 0.2 BBO oil and 11.4 TCF gas in continuous-type accumulations and 11.8 TCF of coalbed gas can be developed. For economic oil, Alaska and the Rocky Mountains and Northern Great Plains regions are dominant and for economic gas, the Colorado Plateau and Basin and Range and the Rocky Mountains and Northern Great Plains regions dominate.

INTRODUCTION

The 1995 National Assessment of oil and gas resources by the U.S. Geological Survey (USGS) posits a set of scientifically based estimates of recoverable quantities of oil and gas that could be added to the measured (proved) reserves of the United States. The geologic component of the 1995 National Assessment of oil and gas (Gautier and others, 1996¹) developed estimates of hydrocarbons that are producible using current technology but without reference to economic profitability, while the economic component (Attanasi, 1996) presents costs of finding, developing, and producing the assessed resources. Estimates presented in this report are derived with the basic analytical framework and assessment data used in the geologic and economic components of the 1995 National Assessment. Detailed descriptions of results, geologic framework, and methodologies may be found in Gautier and others (1996). Supporting data are in Beeman and others, 1996, and Charpentier and others, 1996 and in the USGS Open file Reports series 95-75-A through M. The geologists and supporting professional staff responsible for the geologic assessment and allocation of play assessments to Federal Lands are listed at the end of this text. The assessment of the Federal Outer Continental Shelf by the Minerals Management Service is published in "An Assessment of the Undiscovered Hydrocarbon Potential of the Nation's Outer Continental Shelf" (1996).

RESOURCES ASSESSED

For the 1995 National Assessment, geologists assessed the numbers and size distribution of technically recoverable *undiscovered conventional* oil and gas accumulations at the geologic play level. They also assessed technically recoverable *unconventional resources in continuous-type* oil and gas accumulations and *technically recoverable gas in selected coalbeds*. For this report, geologists allocated a portion of the *assessed technically recoverable undiscovered conventional accumulations* and the *assessed unconventional (that is, continuous-type and coalbed gas) accumulations at the*

¹ Note that some corrections were made in the estimated amounts of natural gas liquids (NGL) and gas from those presented in USGS Circular 1118 and Gautier and others, 1995. Estimates in Gautier and others 1996 (version 2) are referred to in this text.

play level to Federal Lands. Although the 1995 National Assessment included projections of future additions to proved reserves from discovered conventional fields, called *inferred reserves or reserve growth*, data were insufficient to allocate projections of field growth of identified fields to Federal Lands, therefore, estimates of inferred reserves were not made.

Commodities assessed were crude oil, natural gas (associated and non-associated), and natural gas liquids from gas. All gas quantities are expressed as *dry gas*, that is, gas that has been stripped of natural gas liquids. Gas dissolved in geopressured brines and oil in tar deposits, and in oil shales are excluded. Gas from low-permeability “tight” sandstone reservoirs, oil and gas from shale reservoirs, and coalbed gas were specifically assessed. Only resources extractable through a well-bore were assessed.

Undiscovered technically recoverable resources are defined as estimated quantities of resources hypothesized to exist on the basis of geologic knowledge, data on past discoveries, or theory, and that are contained in undiscovered accumulations outside of known fields. Estimated resource quantities are producible using current recovery technology but without reference to economic viability. Posited *undiscovered accumulation sizes* include all components of field growth that might occur during field development and production. *Conventional accumulations* are oil and gas accumulations that have well-defined hydrocarbon-water contacts and seals that hold the hydrocarbons. Hydrocarbons can typically be extracted using traditional development and production practices. *Accumulations assessed by geologists as occurring outside of existing fields were considered for the purposes of the economic analysis as separate and discrete new fields*. Onshore and State offshore areas of the United States were divided into eight regions and further subdivided into a total of 71 provinces (figure 2). For the 71 provinces, about 460 conventional plays were assessed. The economic analysis was based on the characteristics of the *mean* of undiscovered conventional resources assessed at the province level.

Continuous-type accumulations are hydrocarbon accumulations that are pervasive throughout a large area or region and that do not owe their existence to the buoyancy of hydrocarbons in water as conventional accumulations do. Coalbed gas was assessed separately although it is also a form of continuous-type accumulation. In contrast to conventional accumulations, continuous-type accumulations have no downdip hydrocarbon-water contact. A dominant characteristic of the reservoir rock of a continuous-type accumulation is that it is everywhere oil-or-gas charged. Other geologic characteristics include positioning of the accumulation downdip from water-saturated rocks, low reservoir permeability, abnormal (high or low) pressures, and close association of the reservoir with the source rocks from which hydrocarbons were generated. These accumulations are contained in sandstone, siltstone, shale, chalk, or coal. Large portions remain undrilled and their areal extent and production properties remain uncertain. Play assessment methods that rely on the historical discovery size distributions are not applicable. New geologic and economic assessment methods were devised for assessing technically and commercially recoverable oil and gas from continuous-type plays. Economic evaluations were prepared at the play level and were also based on the *characteristics associated with the mean* values of the assessed resources.

In recognition of the uncertainties associated with the estimation of undiscovered accumulations of oil and natural gas, the estimates of technically recoverable resources are

presented as a range of possibilities: a low case having a 95 percent probability of that amount or more occurring, a high case having a 5 percent probability of that amount or more occurring, and a mean case representing an arithmetic average of all possible outcomes. Finally, the estimates are reported as fully "risked" estimates, a category which includes the possibility that some areas may be devoid of oil or natural gas accumulations in the sizes assessed.

METHODS OF ASSESSMENT

Geologic assessment methods

Assessments on which this study is based were part of the 1995 National assessment of oil and gas resources by the USGS (1995), the reader is referred to Gautier and others (1996) for detailed treatment of the analysis and methodology. Beeman and others (1996) and Charpentier and others (1996) present additional supporting data.

Assessments of resources for Federal lands were derived separately from play estimates and were based on the percentage of each play's undiscovered oil and gas resources estimated to be under Federal Land or mineral ownership (see Appendix B, Table B-2, Table B-3, and Table B-4.). The estimates considered the distribution of these lands relative to the geology of the play and to the distribution and intensity of exploration activity in the play. Where Federal ownership of oil or gas in plays was estimated to be less than 0.5 percent, it was considered to be negligible and shown as zero. This was done for two reasons. First the adequacy of the land and mineral ownership data would not support more definitive estimates, and second, the reliability of estimates on scattered small tracts requires a level of geologic data not generally available.

Separate methods were used for assessing undiscovered resources in small and larger fields for each province (Gautier and others, 1996). Small fields were defined in the 1995 study as those fields that have recoverable resources that are less than 1 million barrels of oil or 6 billion cubic feet of gas. The Federal share of these small field resources in each province was assumed to be equal to the weighted average percentage of the play resources in the province allocated to Federal lands. To arrive at the estimated quantity of assessed resources for larger areas, such as provinces, regions, or the Nation, distributions for the basic assessment units (plays and small field assessment) for Federal lands were progressively aggregated, incorporating assumptions about dependencies at each level. For the aggregation of conventional undiscovered resources at the play level to the province level, dependencies among plays were the same as those used in the 1995 National Assessment. Aggregation of technically recoverable resources to the regional and National levels assumed independence among provinces and among regions. Estimates and aggregation assumptions of the continuous-type and coalbed gas plays are reported in Crovelli and Schmoker (1997) and Crovelli and Nuccio (1997).

Economic assessment methods

The economic analysis presents estimates of the costs required to transform assessed technically recoverable resources in undiscovered conventional and unconventional oil and gas accumulations into producible proved reserves. *Incremental cost functions* specify these unit costs as functions of the cumulative quantity of resources transformed. Costs include finding, development, production, and also a return on

investment. The computation of the incremental cost functions requires that the “full cost” of the marginal unit of resources plus producible reserves equals well head price.²

Incremental cost functions show the quantity of resources that the industry *is capable of adding* to proved reserves or cumulative production rather than predicting what the industry *will actually supply*. Actual additions and market supply are the outcome of optimizations of numerous supplier decisions over geographically diverse regions and hydrocarbon sources that assure market supply at lowest costs. Economic analysis provides a baseline to compare costs when examining alternative sources for oil and gas, and alternative technologies. Coalbed gas and conventional gas, for example, have different production technologies that characterize discovery, development, and production costs. These differences are accounted for as resources are put on a common basis by the incremental cost functions.

The methods applied in the economic analysis are explained in detail in Attanasi and Rice (1995), Attanasi and others (1995), Attanasi and others (1996), and Attanasi and Bird (1996). Results of the economic component of the National Assessment are summarized in Attanasi (1996). The economic analysis uses the *mean value* of the assessed hydrocarbons. Industry is assumed to exhibit rational behavior, so that investment will not be undertaken unless the full operating costs, investment costs, and the cost of capital can be recovered. A 12 percent required after-tax rate of return was assumed for this analysis. Cost levels were the same as those that prevailed during 1993. The economic analysis focused on prices between \$18 per barrel (\$2 per mcf) and \$30 per barrel (\$3.34 per mcf). The price of dry gas (gas without natural gas liquids) was assumed to be two-thirds the price of oil when expressed on an equivalent energy basis. For example, if oil prices are \$18 per barrel the implied price of gas would be \$2 per mcf. The relationship between oil and gas prices corresponds roughly to the historical average. Also, the well head price of natural gas liquids is assumed to be three-fourths the per barrel price of crude oil. Lower 48 West Coast prices were assumed for Northern Alaska, so the well head price used in the evaluation required subtraction of all transportation costs from the West Coast price. Appendix C reproduces the general and specific assumptions of the economic component of the National Assessment.

DATA:

Data sources for assessment of onshore Federal Lands

Land ownership and mineral ownership maps, mostly produced by the Bureau of Land Management (BLM), were used to determine the distribution of the Federal land and mineral ownership for plays in the large western public land states. These maps were generally at scales of 1:500,000 and 1:100,000. In a few instances, USGS 1:100,000 scale quadrangle base maps, and land status maps published by states and other sources were also accessed. Principal map sources are shown separately in the references.

In general, where mineral ownership maps were lacking, any lands owned by the Government were included in the assessment under the assumption that if the Government

² These functions are often incorrectly referred as marginal cost or price-supply functions. However, they differ from the economist's marginal cost or supply functions in that resource quantities are not expressed in terms of rate of resource supply, that is, the number of barrels per year but rather in terms of cumulative barrels added to reserves or production.

owned the land, it generally owned the mineral rights. Study of available land ownership and mineral ownership maps shows that for the majority of the lands owned by the Government, the Government also holds the mineral rights. In some areas the Government owns mineral rights where it does not own surface rights to the land. In these instances, the Government often holds rights to specific minerals (e.g. the large coal mineral rights held by the Government in the Powder River and Williston basins of the Rocky Mountains). Areas including Federal oil and gas mineral rights were included in the assessment. Areas where the Government has mineral ownership other than oil and gas were excluded from the assessment under the assumption that the Government is not a participant in oil and gas development.

In some regions, maps of Federal land and mineral ownership are either incomplete or nonexistent, particularly outside of the western states. This is especially true for mineral ownership. Though Federal land and mineral rights data are incomplete, available data were judged adequate for the purpose of allocating play resources to such lands. Whereas it would be desirable to have better data concerning these lands, it is unlikely that such data would significantly alter the overall results. Much of the missing data are probably for small tracts and, in comparison to the known Federal land and mineral ownership, is probably only a small part of the total. Another feature of Federal land maps is that many maps show proclamation boundaries. This is the case for many National Forests, particularly those in the midwest and eastern U.S. Often, the Government owns only a fraction of the lands and minerals inside these boundaries. Generally, intermediate-scale land maps (e.g. 1:100,000 land status maps) are available for these areas which show the amount of Government ownership. Where available, these intermediate-scale maps were used to estimate Government ownership in the assessment process. Land and minerals inside of the proclamation boundaries may be acquired or transferred to private ownership by the Federal Government on a continuing basis, so that land maps for these areas can become out of date. Maps used in the assessment are of recent vintage, and such minor changes should not significantly affect overall results.

Distribution of Federal Lands

The total area of the 50 States of the United States is 2.3 billion acres. At the time of the assessment, Federal civil and defense agencies administered over 657 million acres or 29 percent of the total land area of the United States (BLM, 1996), as is shown in Table 2. Indian and Native lands, even where administered in trust by the United States, are not Federal lands and are not treated in this report. Detailed maps of Federal surface and mineral ownership are available from State offices of the Bureau of Land Management, generally at scales of 1:500,000 or 1:100,000, and were the primary source of land data used in the assessment.

As of fiscal year 1994, the Bureau of Land Management (BLM), an agency of the Department of Interior, had responsibility for 267 million acres, or 40 percent of the Federally owned lands, about one third of which is in Alaska. Most of the remainder is in the 11 westernmost conterminous States. These BLM lands are primarily public domain lands which have never left Federal ownership. Additional landholding agencies of the Department of the Interior include the Fish and Wildlife Service, National Park Service, and Bureau of Reclamation. Two other large landholding agencies of the Federal

Government are the Department of Agriculture, with over 190 million acres in the National Forest system, and the Department of Defense, with approximately 30 million acres.

Geographic distribution of Federal lands is very uneven, as is readily shown on the by Table 2. Federal ownership in Nevada is approximately 83 percent of the land area of the state, followed more distantly by Alaska, with about 66 percent, and by Utah, Idaho, Oregon and Wyoming.

FEDERAL ONSHORE OIL AND GAS RESOURCES

Technically recoverable oil and gas resources

Table 3 shows the *regional estimates* of technically recoverable oil and gas for onshore Federal Lands by resource category. Companion tables at the *province* level are provided in Appendix A. Table A-2 shows corrected estimates of technically recoverable undiscovered conventional oil and gas for the US onshore and State offshore areas by province (Gautier and others, 1996). Table A-3 shows estimates of undiscovered conventional oil and gas for onshore Federal Lands by province. Figure 3 and Figure 4 show the relative magnitudes of the technically recoverable resources of oil and gas by region and resource category. Similarly, Tables A-4 and A-5 show estimates of technically recoverable resources of continuous-type accumulations and coalbed gas located on onshore Federal Lands. About 85 percent of the technically recoverable gas in undiscovered conventional fields is non-associated gas, that is gas in gas fields. Overall, about 29 percent of US onshore land area is Federally owned and, at the mean level, about 25 and 22 percent of the undiscovered conventional oil and gas assessed in the 1995 National Assessment were assigned to Federal Lands. The Northern Alaska province accounts for almost half of the oil and more than half of the undiscovered conventional gas assessed on onshore Federal Lands. The Powder River basin (33) and the Wyoming Thrust Belt (36) provinces of the Rocky Mountains and Northern Great Plains Region have the next largest concentrations of undiscovered conventional oil and gas, respectively, assessed on Federal Lands.

Assessed continuous-type resources and coalbed gas were confined to the lower 48 States. Amounts of oil in continuous-type accumulations on Federal Lands are small. Federal Lands did, however, account for 41 percent of the total gas in continuous-type accumulations and 32 percent of the total coalbed gas assessed in the 1995 National Assessment. The Rocky Mountains and Northern Great Plains Region, principally Southwest Wyoming province (37), has the largest assessed quantity of technically recoverable gas in continuous-type accumulations on Federal Lands (Table A-4). The Colorado Plateau and Basin and Range Region (Uinta-Piceance Basin, province 20, and San Juan Basin, province 22) had by far the largest assessed quantity of coalbed gas on Federal Lands (Table A-5). For all onshore Federal Lands, gas assessed in continuous-type accumulations represents more than twice the gas in undiscovered conventional fields (Tables A-3, A-4).

Economically recoverable oil and gas resources

Table 4 shows regional mean values of technically recoverable quantities of oil, gas, and natural gas liquids in conventional undiscovered accumulations, continuous-type

accumulations, and coalbed gas accumulations along with economic quantities having incremental costs of \$18 per barrel or \$2 per mcf and \$30 per barrel or \$3.34 per mcf. Figures 3 and 4 depict the regional estimates of oil and total gas by sources. Because of an absence of markets, for the 1995 Assessment it was assumed that gas in Northern Alaska would not be economic. At \$18 per barrel and \$2 per mcf only about 20 percent of the technically recoverable undiscovered conventional oil and 17 percent of the technically recoverable undiscovered gas is economic to find, develop, and produce on Federal Lands³. This compares to 30 percent for onshore oil and 24 percent for onshore gas on all lands (Attanasi, 1996). This results because regions having lowest cost conventional oil and gas resources, that is, West Texas and Eastern New Mexico (Region 5) and the Gulf Coast (Region 6) (see Attanasi, 1996) have little Federal Land. Approximately two-thirds of the economic gas is non-associated gas. Table A-3 shows economic undiscovered conventional oil on Federal Lands distributed more or less evenly among several provinces but undiscovered conventional gas concentrated principally in the Wyoming Thrust Belt province (36) and in the Uinta-Piceance province (20).

At \$2 and \$3.34 per mcf, only 6 and 11 TCF (5 and 9 percent) of the more than 127 TCF assessed mean technically recoverable gas in continuous-type accumulations is economic. Nearly all of the economic gas at \$2 per mcf is from the San Juan Basin province (22) and Uinta-Piceance Basin province (20) of the Colorado Plateau and Basin and Range region and the North-Central Montana Province (28) of the Rocky Mountains and Northern Great Plains region. As incremental costs are allowed to increase to \$3.34 per mcf, additional gas becomes economic in the Uinta-Piceance and San Juan basins and a tiny part of the large quantity of assessed technically recoverable gas in the Southwestern Wyoming province (37) is added.

The economic component of the 1995 National Assessment showed that the lowest cost coalbed gas resources are in the Uinta-Piceance and San Juan Basins. Three-fourths of the assessed technically recoverable coalbed gas resources of the Uinta-Piceance Basin and half of the coalbed gas resources of the San Juan Basin were assigned to Federal Lands. At \$2 per mcf, 43 percent of the assessed coalbed gas is economic and, at \$3.34 per mcf, 73 percent of the assessed Federal Land coalbed gas is economic.

CONCLUSIONS

At their mean values the technically recoverable undiscovered conventional oil and gas resources on Federal Lands amounted to about 7.5 BBO and 57.9 TCF. Technically recoverable gas in continuous-type (unconventional) accumulations amounted to about 127 TCF or more than twice the amount assessed in undiscovered conventional accumulations. Although the undiscovered conventional oil and gas on Federal Lands could not be characterized as the lowest cost resources assessed in the 1995 National

³ If finding costs are completely omitted so all undiscovered conventional fields are assumed to be identified, then at \$18 per barrel (\$2 per mcf) 54 percent of the technically recoverable oil and 35 percent of the technically recoverable gas is commercially developable and at \$30 per barrel (\$3.34 per mcf) 75 percent of the oil and 66 percent of the gas is commercially developable. Similarly, if just the lower 48 States are considered, then at \$18 per barrel (\$2 per mcf) 74 percent of the technically recoverable oil and 79 percent of the technically recoverable gas is commercially developable and at \$30 per barrel (\$3.34) about 85 percent of the technically recoverable oil and gas is commercially developable.

Assessment, the quantities allocated to Federal Lands are significant. Some of the gas assessed in continuous-type accumulations on Federal Lands, particularly in the Uinta-Piceance and San Juan Basins were characterized by very low costs. Most of the 92 TCF assessed in continuous-type gas accumulations on Federal Lands in the Southwest Wyoming province (37) was characterized as having relatively high costs. However, this large gas resource provides an attractive incentive for development of cost reducing technologies to convert it to an economic resource.

The 1989 US Geological Survey's national oil and gas assessment (Mast and others, 1989) evaluated only conventional resources. Furthermore, the economic analysis did not include finding costs. The 1995 assessment revised downward by more than 40 percent the assessed technically recoverable conventional oil in the Northern Alaska province. This revision resulted from new drilling information and an alternative interpretation of the thermal history of the province (Gautier and others, 1996) that reduced the perceived maximum depths where oil was thought to occur. For undiscovered conventional fields in the lower 48 States, the 1989 Assessment assigned 3.6 BBO oil and 26.9 TCF gas to onshore Federal Lands (Dolton and others, 1990) whereas the 1995 Assessment assigned 3.8 BBO crude oil and 24.0 TCF gas to onshore Federal Lands. Where comparable, the assessment valuations are quite similar.

The inferred reserves component of the 1995 Assessment is not included in this assessment of Federal Lands. The 1995 National Assessment projected during the next 80 years that 60 BBO of oil and 322 TCF of gas could be added to reserves in conventional oil and gas fields discovered before 1992. This is significantly greater than the approximately 30 BBO of oil and 259 TCF gas assessed for undiscovered conventional resources in all onshore and State offshore areas in the 1995 National Assessment. In 1995, oil production of onshore Federal Lands represented 6.6 percent of total US *onshore* oil production and gas production from Federal Lands was 12.3 percent of total US *onshore* gas production. More detailed information about production units on Federal Lands, that is, conventional versus unconventional continuous-type accumulations, and discovery dates of fields, are needed to allocate the 1995 National Assessment inferred reserve estimates to onshore Federal Lands.

The economic analysis could also have been prepared using distributions associated with the 5th and 95th fractiles of the assessment rather than the mean values reported in the geologic assessment. It is appropriate to use this point estimate in the computations and for ease of communicating results; however, such a point estimate may convey a misguided sense of precision in the results. Indeed, uncertainty exists in the costs and technical relationships used in the economic analysis as well.

For a National perspective, the resources estimated by the Minerals Management Service (1996) in undiscovered conventional oil and gas for the Federal Outer Continental Shelf (OCS) should be added to the estimates presented here. At \$18 per barrel (\$2 per mcf dry gas) the Minerals Management Service assessed a total of 14.4 BBO and 72.5 TCFG for the total US OCS. At \$30 per barrel (\$3.34 per mcf dry gas), economic resources were estimated at about 21 BBO and 100 TCFG. For the lower 48 OCS alone, at \$18 per barrel economic undiscovered conventional oil was estimated to be 10.6 BBO and at \$30 per barrel economic undiscovered conventional oil was estimated to be 11.4 BBO (MMS, 1996). Amounts of economic gas assigned to Alaska were very small.

Regional and Province Geologists and other professional staff responsible for geologic assessment

Regional Geological Coordinators

Alaska Region	K. J. Bird
Pacific Coast Region	C. M. Isaacs, M. E. Tennyson
Colorado Plateau and Basin and Range Region	J. A. Grow, J. A. Peterson
Rocky Mountains and Northern Great Plains Region	C. M. Molenaar, C. W. Spencer
Midcontinent Region	R. R. Charpentier, J. W. Schmoker
West Texas and Eastern New Mexico Region	M. M. Ball
Gulf Coast Region	C. J. Schenk
Eastern Region	R. T. Ryder
Coordinator, Continuous-type deposits	J. W. Schmoker
Geological Specialist, Continuous-type deposits	T. D. Fouch, B. E. Law
Statistics, Continuous-type deposits	R. A. Crovelli
Computation, Continuous-type deposits	R. H. Balay
Petroleum Engineering	L. E. Boone, J. C. Quinn
Coordinator, Coal-Bed gas	D. D. Rice
Geological Specialist, Coalbed gas	R. C. Johnson, W. B. Cashion
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Province Geologists	
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Central Alaska (002)	R. G. Stanley, D. G. Howell
Southern Alaska (003)	L. B. Magoon III, T. R. Bruns, M. A. Fisher, C. M. Molenaar
Western Oregon-Washington (004)	S. Y. Johnson, M. E. Tennyson
Eastern Oregon-Washington (005)	M. E. Tennyson
Klamath-Sierra Nevada (006)	M. E. Tennyson
Northern Coastal (007)	R. G. Stanley
Sonoma-Livermore Basin (008)	L. B. Magoon III
Sacramento Basin (009)	L. B. Magoon III
San Joaquin Basin (010)	L. A. Beyer
Central Coastal (011)	R. G. Stanley
Santa Maria Basin (012)	M. E. Tennyson
Ventura Basin (013)	M. A. Keller
Los Angeles Basin (014)	L. A. Beyer
Salton Trough (016)	C. E. Barker
Idaho-Snake River Downwarp (017)	J. A. Peterson
Western Great Basin (018)	C. E. Barker
Eastern Great Basin (019)	J. A. Peterson, J. A. Grow
Uinta-Piceance Basin (020)	C. W. Spencer, T. D. Fouch
Paradox Basin (021)	A. C. Huffman, Jr.
San Juan Basin (022)	A. C. Huffman, Jr.
Albuquerque-Santa Fe Rift (023)	C. M. Molenaar
Northern Arizona (024)	W. C. Butler, J. G. Palacas
Southern Arizona-Southwestern New Mexico (025)	W. C. Butler
South-Central New Mexico (026)	W. C. Butler
Montana Thrust Belt (027)	W. J. Perry, Jr.
North-Central Montana (028)	T. S. Dyman
Southwest Montana (029)	W. J. Perry, Jr.

Province Geologists

Williston Basin (031)	J. A. Peterson
Sioux Arch (032)	J. A. Peterson
Powder River Basin (033)	G. L. Dolton, J. E. Fox
Big Horn Basin (034)	J. E. Fox, G. L. Dolton
Wind River Basin (035)	J. E. Fox, G. L. Dolton
Wyoming Thrust Belt (036)	R. B. Powers
Southwestern Wyoming (037)	B. E. Law
Park Basins (038)	C. J. Wandrey
Denver Basin (039)	D. K. Higley
Las Animas Arch (040)	C. W. Keighin
Raton Basin-Sierra Grande Uplift (041)	C. W. Keighin
Pedernal Uplift (042)	M. M. Ball, M. E. Henry
Palo Duro (043)	M. M. Ball, M. E. Henry
Permian Basin (044)	M. M. Ball
Bend Arch-Fort Worth Basin (045)	M. M. Ball, W. J. Perry, Jr.
Marathon Thrust Belt (046)	W. J. Perry, Jr.
Western Gulf (047)	C. J. Schenk
East Texas Basin (048)	C. J. Schenk
Louisiana-Mississippi Salt Basins (049)	C. J. Schenk
Florida Peninsula (050)	R. M. Pollastro
Superior (051)	J. G. Palacas
Iowa Shelf (052)	J. G. Palacas
Cambridge Arch-Central Kansas Uplift (053)	D. K. Higley
Salina Basin (054)	S. E. Prenskey
Nemaha Uplift (055)	R. R. Charpentier
Forest City Basin (056)	R. R. Charpentier
Ozark Uplift (057)	J. R. Hatch
Anadarko Basin (058)	M. E. Henry, T. C. Hester
Sedgwick Basin (059)	S. E. Prenskey
Cherokee Platform (060)	R. R. Charpentier
Southern Oklahoma (061)	M. E. Henry, T. C. Hester
Arkoma Basin (062)	W. J. Perry, Jr.
Michigan Basin (063)	G. L. Dolton
Illinois Basin (064)	D. L. Macke
Black Warrior Basin (065)	R. T. Ryder
Cincinnati Arch (066)	R. T. Ryder
Appalachian Basin (067)	R. T. Ryder
Blue Ridge Thrust Belt (068)	R. C. Milici
Piedmont (069)	R. C. Milici
Atlantic Coastal Plain (070)	R. C. Milici
Adirondack (071)	R. C. Milici
New England (072)	R. C. Milici

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Appendix A. Tables of province names and regions, estimates of technically recoverable and economic oil and gas resources in undiscovered conventional fields, continuous-type accumulations, and coalbed gas accumulations. Tables included are:

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Table A-1. List of petroleum provinces by Region of onshore and State offshore areas in the United States. From Gautier and others, 1996

Region	Province code	Province name
Region 1. Alaska		
	001	Northern Alaska
	002	Central Alaska
	003	Southern Alaska
Region 2. Pacific Coast		
	004	Western Oregon-Washington
	005	Eastern Oregon-Washington
	006*	Klamath-Sierra Nevada
	007	Northern Coastal
	008	Sonoma-Livermore Basin
	009	Sacramento Basin
	010	San Joaquin Basin
	011	Central Coastal
	012	Santa Maria Basin
	013	Ventura Basin
	014	Los Angeles Basin
	015*	San Diego-Oceanside
	016*	Salton Trough
Region 3. Colorado Plateau and Basin and Range		
	017	Idaho-Snake River Downwarp
	018	Western Great Basin
	019	Eastern Great Basin
	020	Uinta-Piceance Basin
	021	Paradox Basin
	022	San Juan Basin
	023	Albuquerque-Santa Fe Rift
	024	Northern Arizona
	025	Southern Arizona-Southwestern New Mexico
	026*	South-Central New Mexico
Region 4. Rocky Mountains and Northern Great Plains		
	027	Montana Thrust Belt
	028	North-Central Montana
	029	Southwest Montana
	031	Williston Basin
	032*	Sioux Arch
	033	Powder River Basin
	034	Big Horn Basin
	035	Wind River Basin
	036	Wyoming Thrust Belt
	037	Southwestern Wyoming
	038	Park Basins
	039	Denver Basin
	040	Las Animas Arch
	041	Raton Basin-Sierra Grande Uplift

Table A-1 continued

Region	Province code	Province name
Region 5. West Texas and Eastern New Mexico		
	042*	Pedernal Uplift
	043	Palo Duro Basin
	044	Permian Basin
	045	Bend Arch-Fort Worth Basin
	046	Marathon Thrust Belt
Region 6. Gulf Coast		
	047	Western Gulf
	048*	East Texas Basin
	049	Louisiana - Mississippi Salt Basins
	050	Florida Peninsula
Region 7. Midcontinent		
	051	Superior
	052*	Iowa Shelf
	053	Cambridge Arch-Central Kansas Uplift
	054*	Salina Basin
	055	Nemaha Uplift
	056	Forest City Basin
	057*	Ozark Uplift
	058	Anadarko Basin
	059	Sedgwick Basin
	060	Cherokee Basin
	061	Southern Oklahoma
	062	Arkoma Basin
Region 8. Eastern		
	063	Michigan Basin
	064	Illinois Basin
	065	Black Warrior Basin
	066	Cincinnati Arch
	067	Appalachian Basin
	068	Blue Ridge Thrust Belt
	069	Piedmont
	071	Adirondack Uplift*
	072	New England*

* For the Klamath-Sierra Nevada (006) and Salton Trough (016) no technically recoverable resources were assigned. For South-Central New Mexico (026), Sioux Arch (032), Pedernal Uplift (042), Iowa Shelf (052), Ozark Uplift (057), Adirondack Uplift (071), and New England(072) only negligible resources were assessed. The San Diego-Oceanside (015) was assessed by Minerals Management Service. The assessment of the East Texas Basin (048) is included in the values shown for the Louisiana-Mississippi Salt Basins (049) and the assessment for the Salina Basin (054) is included in the values shown for the Sedgwick Basin (059).

Table A-2 Estimated volumes by province of technically recoverable undiscovered conventional oil, gas and natural gas liquids (NGL) on all onshore and State waters areas of the United States as of January 1994. [From Gautier and others, 1996].

PROVINCE NUMBER NAME	CRUDE OIL			GAS			NGL		
	BILLIONS OF F95	BARRELS F05	MEAN	TRILLIONS OF F95	CUBIC FEET F05	MEAN	BILLIONS OF F95	BARRELS F05	MEAN
Region 1. Alaska									
1. Northern Alaska	2.33	15.42	7.40	23.29	124.44	63.55	0.45	2.15	1.15
2. Central Alaska	0.00	0.32	0.06	0.51	7.31	2.76	0.00	0.00	0.00
3. Southern Alaska	0.19	2.20	0.96	0.69	4.38	2.16	0.00	0.00	0.00
Total Region 1.	3.19	16.74	8.43	27.92	129.34	68.48	0.45	2.14	1.15
Region 2. Pacific Coast									
4. W. Oregon-Wash.	0.00	0.12	0.02	0.10	1.95	0.80	0.00	0.01	<0.01
5. E. Oregon-Wash.	0.00	0.00	0.00	0.00	1.62	0.39	0.00	<0.01	<0.01
7. Northern Coastal	< 0.01	0.09	0.03	0.34	2.32	1.08	0.00	<0.01	<0.01
8. Sonoma-Liver. Bs.	0.00	0.06	0.01	0.00	0.42	0.06	0.00	0.00	0.00
9. Sacramento Basin	0.00	<0.01	0.00	0.62	7.84	3.33	<0.01	0.03	0.01
10. San Joaquin Basin	0.51	2.16	1.21	1.08	4.60	2.56	0.04	0.20	0.11
11. Central Coastal	0.10	1.17	0.49	0.03	0.37	0.15	0.00	0.01	0.01
12. Santa Maria Basin	0.02	0.60	0.21	0.01	0.35	0.12	<0.01	0.03	0.01
13. Ventura Basin	0.28	2.27	1.06	0.66	3.66	1.90	0.02	0.13	0.07
14. Los Angeles Basin	0.41	1.78	0.98	0.61	3.08	1.61	0.02	0.11	0.06
Total Region 2.	2.55	5.93	4.02	7.67	17.68	12.00	0.16	0.39	0.26
Region 3. Colorado Plateau and Basin and Range									
17. Idaho-Snake R. Dw.	0.00	0.01	<0.01	0.00	0.09	0.01	0.00	0.00	0.00
18. W. Great Basin	0.00	<0.01	<0.01	0.00	0.03	<0.01	0.00	0.00	0.00
19. E. Great Basin	0.06	1.35	0.49	0.01	1.14	0.34	0.00	0.03	0.01
20. Uinta-Piceance Bs.	0.04	0.60	0.21	1.94	9.54	4.53	0.01	0.22	0.08
21. Paradox Basin	0.11	0.60	0.31	0.92	3.41	1.98	0.03	0.17	0.09
22. San Juan Basin	0.07	0.28	0.16	0.51	1.49	0.95	0.01	0.05	0.03
23. Alb.-Santa Fe Rft.	0.00	0.15	0.04	0.00	1.26	0.35	0.00	0.07	0.02
24. N. Arizona	0.00	0.32	0.06	0.00	0.97	0.17	0.00	0.09	0.02
25. S. Az.-SW. N. Mex.	0.00	0.06	0.02	<0.01	0.53	0.21	<0.01	0.05	0.02
Total Region 3.	0.64	2.33	1.30	5.27	13.98	8.56	0.13	0.44	0.26
Region 4. Rocky Mountain and Northern Great Plains									
27. Montana Thrust Belt	0.00	0.02	<0.01	0.00	8.51	1.92	0.00	0.03	0.01
28. North-Cen. Mt.	0.13	0.42	0.27	0.40	1.37	0.85	<0.01	<0.01	<0.01
29. SW. Montana	0.00	0.13	0.03	0.12	0.78	0.41	<0.01	0.01	<0.01
31. Williston Basin	0.25	1.18	0.66	0.90	2.66	1.72	0.08	0.30	0.18
33. Powder River Basin	0.70	3.87	1.94	0.67	2.93	1.62	0.04	0.18	0.10
34. Big Horn Basin	0.08	0.87	0.39	0.24	1.20	0.62	<0.01	0.03	0.01
35. Wind River Basin	0.05	0.32	0.16	0.57	2.21	1.24	0.01	0.02	0.01
36. Wyoming Thrust Belt	0.21	1.16	0.62	5.55	16.59	10.68	0.53	1.91	1.17
37. SW. Wyoming	0.04	0.40	0.17	0.70	2.86	1.57	0.01	0.05	0.03
38. Park Basins	<0.01	0.11	0.03	<0.01	0.07	0.02	0.00	<0.01	0.00
39. Denver Basin	0.09	0.42	0.23	0.34	1.40	0.76	0.01	0.04	0.03
40. Las Animas Basin	0.04	0.28	0.14	0.20	1.06	0.53	0.01	0.03	0.01
41. Raton B.-S.G. Up.	0.00	0.00	0.00	0.00	0.12	0.04	0.00	<0.01	<0.01
Total Region 4.	3.07	6.84	4.63	15.30	31.18	21.98	0.90	2.31	1.55
Region 5. West Texas and Eastern New Mexico									
43. Palo Duro Basin	0.01	0.07	0.03	<0.01	0.02	0.01	0.00	0.00	0.00
44. Permian Basin	1.59	4.50	2.88	10.53	23.21	16.40	0.41	0.92	0.64
45. Bend A.-Ft. W. Bs.	0.29	1.13	0.64	1.19	3.36	2.15	0.08	0.23	0.15
46. Marathon Thr. Belt	<0.01	0.04	0.02	0.06	0.29	0.15	<0.01	0.02	0.01
Total Region 5.	2.22	5.26	3.57	12.89	25.67	18.71	0.55	1.10	0.80

Table A-2 Continued

PROVINCE NUMBER NAME	CRUDE OIL BILLIONS OF BARRELS			GAS TRILLIONS OF CU. FT.			NGL BILLIONS OF BARRELS		
	F95	F05	MEAN	F95	F05	MEAN	F95	F05	MEAN
Region 6. Gulf Coast									
47. Western Gulf	0.73	4.54	2.29	44.27	96.68	68.41	1.17	2.59	1.83
49. La.-Ms. Salt Bs.	0.86	5.24	2.69	18.64	41.83	29.57	0.68	2.61	1.50
50. Florida Peninsula	0.05	1.20	0.42	<0.01	0.11	0.04	0.00	0.00	0.00
Total Region 6.	2.66	8.80	5.39	70.88	130.31	98.02	2.22	4.70	3.32
Region 7. Midcontinent									
51. Superior	0.00	0.44	0.05	0.00	2.95	0.42	0.00	<0.01	<0.01
53. Cam. Ar.-C. Ks. Up.	0.04	0.43	0.20	0.08	1.04	0.41	<0.01	0.04	0.02
55. Nemaha Uplift	0.03	0.29	0.12	0.17	0.97	0.48	0.01	0.06	0.03
56. Forest City Basin	0.00	0.06	0.02	0.00	0.19	0.07	0.00	0.01	<0.01
58. Anadarko Basin	0.20	0.63	0.38	8.72	21.29	14.21	0.14	0.31	0.22
59. Sedgwick Basin	0.02	0.11	0.06	0.13	0.48	0.30	<0.01	0.03	0.01
60. Cherokee Basin	0.02	0.17	0.08	0.07	0.35	0.19	<0.01	0.02	0.01
61. Southern Oklahoma	0.05	0.57	0.24	0.47	1.78	1.01	0.01	0.05	0.03
62. Arkoma Basin	0.00	0.07	0.01	1.18	4.26	2.50	0.04	0.16	0.09
Total Region 7.	0.75	1.82	1.18	13.61	27.51	19.58	0.31	0.54	0.42
Region 8. Eastern									
63. Michigan Basin	0.49	1.96	1.11	3.41	9.61	6.15	0.16	0.42	0.28
64. Illinois Basin	0.05	0.56	0.26	0.01	3.32	0.50	0.00	0.00	0.00
65. Black Warrior Basin	0.01	0.07	0.03	0.97	3.31	2.03	<0.01	0.02	0.01
66. Cincinnati Arch	< 0.01	0.04	0.02	<0.01	0.04	0.02	0.00	<0.01	<0.01
67. Appalachian Basin	0.03	0.24	0.10	1.55	3.43	2.42	<0.01	0.01	<0.01
68. Blue Ridge Th. Belt	0.00	0.00	0.00	0.00	0.15	0.03	0.00	0.00	0.00
69. Piedmont	0.00	0.00	0.00	0.00	1.19	0.39	0.00	0.00	0.00
Total Region 8.	0.84	2.41	1.53	7.98	16.10	11.54	0.18	0.44	0.30
Total US onshore and State waters									
Total	23.37	39.41	30.05	206.26	328.39	258.86	6.46	9.94	8.05

* The assessment of the East Texas Basin (048) is included in the values shown for the Louisiana-Mississippi Salt Basins (049) and the assessment for the Salina Basin (054) is included in the values shown for the Sedgwick Basin (059). Provinces assessed with no resources or not assessed were omitted.

Table A-3. Estimated volumes by province of technically recoverable undiscovered conventional oil, gas, and natural gas liquids (NGL) for onshore Federal Lands as of January 1994.

PROVINCE NUMBER NAME	CRUDE OIL BILLIONS OF BARRELS			GAS TRILLIONS OF CU. FT.			NGL BILLIONS OF BARRELS		
	F95	F05	MEAN	F95	F05	MEAN	F95	F05	MEAN
Region 1. Alaska									
1. Northern Alaska	0.78	8.55	3.48	9.67	68.38	32.20	0.17	1.11	0.54
2. Central Alaska	0.00	0.17	0.03	0.17	4.08	1.38	0.00	0.00	0.00
3. Southern Alaska	0.00	0.87	0.24	0.02	1.21	0.38	0.00	0.00	0.00
Total Region 1.	0.98	8.96	3.75	11.28	69.97	33.97	0.17	1.10	0.54
Region 2. Pacific Coast									
4. W. Oregon-Wash.	0.00	0.02	0.00	0.00	0.23	0.05	0.00	0.00	0.00
5. E. Oregon-Wash.	0.00	0.00	0.00	0.00	0.48	0.10	0.00	0.00	0.00
7. Northern Coastal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8. Sonoma Liver. Bs.	0.00	0.01	0.00	0.00	0.07	0.01	0.00	0.00	0.00
9. Sacramento Basin	0.00	0.00	0.00	0.00	0.26	0.07	0.00	0.00	0.00
10. San Joaquin Basin	0.00	0.10	0.02	0.00	0.20	0.04	0.00	0.01	0.00
11. Central Coastal	0.02	0.45	0.16	0.01	0.16	0.06	0.00	0.01	0.00
12. Santa Maria Basin	0.00	0.04	0.01	0.00	0.03	0.01	0.00	0.00	0.00
13. Ventura Basin	0.01	0.23	0.09	0.02	0.45	0.16	0.00	0.02	0.01
14. Los Angeles Basin	0.00	0.08	0.01	0.00	0.23	0.04	0.00	0.01	0.00
Total Region 2.	0.10	0.66	0.30	0.20	1.36	0.55	0.00	0.03	0.01
Region 3. Colorado Plateau and Basin and Range									
17. Idaho-Snake R. Dw.	0.00	0.01	0.00	0.00	0.06	0.01	0.00	0.00	0.00
18. W. Great Basin	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00
19. E. Great Basin	0.06	1.27	0.43	0.01	0.67	0.20	0.00	0.01	0.00
20. Uinta-Piceance Bs.	0.03	0.51	0.17	1.23	7.41	3.23	0.01	0.19	0.06
21. Paradox Basin	0.03	0.28	0.13	0.47	2.18	1.18	0.01	0.09	0.04
22. San Juan Basin	0.01	0.10	0.04	0.13	0.65	0.35	0.00	0.02	0.01
23. Alb.-Santa Fe Rft.	0.00	0.12	0.03	0.00	0.26	0.07	0.00	0.01	0.00
24. N. Arizona	0.00	0.17	0.03	0.00	0.60	0.09	0.00	0.06	0.01
25. S. Az.-SW. N. Mex.	0.00	0.04	0.01	0.00	0.37	0.11	0.00	0.04	0.01
Total Region 3.	0.31	1.78	0.84	2.88	9.68	5.24	0.05	0.28	0.14
Region 4. Rocky Mountain and Northern Great Plains									
27. Montana Thrust Belt	0.00	0.01	0.00	0.00	7.29	1.60	0.00	0.02	0.00
28. North-Cent. Mt.	0.00	0.07	0.03	0.01	0.22	0.08	0.00	0.00	0.00
29. SW. Montana	0.00	0.03	0.01	0.00	0.14	0.04	0.00	0.00	0.00
31. Williston Basin	0.02	0.25	0.10	0.09	0.51	0.26	0.01	0.06	0.03
33. Powder River Basin	0.35	2.22	1.08	0.33	1.74	0.91	0.02	0.11	0.06
34. Big Horn Basin	0.07	0.83	0.36	0.18	0.98	0.49	0.00	0.02	0.01
35. Wind River Basin	0.03	0.26	0.12	0.38	1.79	0.95	0.00	0.02	0.01
36. Wyoming Thrust Belt	0.09	0.79	0.38	3.81	13.01	7.97	0.35	1.44	0.81
37. SW. Wyoming	0.02	0.31	0.12	0.44	2.30	1.17	0.01	0.04	0.02
38. Park Basins	0.00	0.06	0.01	0.00	0.04	0.01	0.00	0.00	0.00
39. Denver Basin	0.00	0.01	0.00	0.00	0.02	0.01	0.00	0.00	0.00
40. Las Animas Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
41. Raton B.-S. G. Up.	0.00	0.00	0.00	0.00	0.05	0.01	0.00	0.00	0.00
Total Region 4.	1.25	3.54	2.20	8.19	21.64	13.50	0.48	1.58	0.94
Region 5. West Texas and Eastern New Mexico									
43. Palo Duro Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
44. Permian Basin	0.06	0.43	0.21	0.29	1.77	0.84	0.01	0.08	0.04
45. Bend A.-Ft. W. Bs.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
46. Marathon Thr. Belt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Region 5.	0.06	0.43	0.21	0.29	1.73	0.84	0.01	0.08	0.04

Table A-3. Continued

PROVINCE NUMBER NAME	CRUDE OIL BILLIONS OF BARRELS			GAS TRILLIONS OF CU. FT.			NGL BILLIONS OF BARRELS		
	F95	F05	MEAN	F95	F05	MEAN	F95	F05	MEAN
Region 6. Gulf Coast									
47. Western Gulf	0.00	0.21	0.06	0.38	3.44	1.39	0.01	0.10	0.04
49. La.-Ms. Salt Bs.	0.00	0.22	0.07	0.25	1.54	0.70	0.01	0.14	0.05
50. Florida Penninsula	0.00	0.21	0.06	0.00	0.02	0.01	0.00	0.00	0.00
Total Region 6.	0.04	0.46	0.18	0.90	4.45	2.09	0.03	0.20	0.09
Region 7. Midcontinent									
51. Superior	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
53. Cam. Ar.-C. Ks. Up.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
55. Nemaha Uplift	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
56. Forest City Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
58. Anadarko Basin	0.00	0.04	0.01	0.16	1.74	0.70	0.00	0.03	0.01
59. Sedgwick Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
60. Cherokee Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
61. Southern Oklahoma	0.00	0.05	0.01	0.00	0.23	0.06	0.00	0.01	0.00
62. Arkoma Basin	0.00	0.01	0.00	0.07	1.51	0.57	0.00	0.05	0.02
Total Region 7.	0.00	0.08	0.03	0.47	2.77	1.33	0.01	0.07	0.03
Region 8. Eastern									
63. Michigan Basin	0.00	0.07	0.02	0.02	0.47	0.15	0.00	0.02	0.01
64. Illinois Basin	0.00	0.03	0.01	0.00	0.22	0.04	0.00	0.00	0.00
65. Black Warrior Basin	0.00	0.01	0.00	0.00	0.42	0.14	0.00	0.00	0.00
66. Cincinnati Arch	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
67. Appalachian Basin	0.00	0.02	0.00	0.01	0.29	0.09	0.00	0.00	0.00
68. Blue Ridge Th. Belt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
69. Piedmont	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Region 8.	0.00	0.12	0.03	0.14	1.16	0.42	0.00	0.02	0.01
US Federal Onshore									
Total	4.38	12.83	7.54	34.00	96.79	57.94	1.13	2.70	1.80

Table A-4. Technically recoverable resources in continuous-type oil and gas accumulations in sandstones, shales, and chalks for onshore Federal Lands by province as of January 1994. [From Crovelli and Schmoker, 1997].

PROVINCE NUMBER NAME	CRUDE OIL BILLIONS OF BARRELS			GAS TRILLIONS CU. FT.			NGL BILLIONS OF BARRELS		
	F95	Mean	F05	F95	MEAN	F05	F95	MEAN	F05
Region 2- Pacific Coast									
5. E. Oregon-Wash.	0.00	0.00	0.00	1.12	4.88	12.40	0.01	0.05	0.12
Total Region 2.	0.00	0.00	0.00	1.12	4.88	12.40	0.01	0.05	0.12
Region 3. Colorado Plateau & Basin and Range									
20. Uinta-Piceance Bs.	0.02	0.03	0.05	6.49	9.72	13.95	0.03	0.06	0.08
21. Paradox Basin	0.04	0.16	0.39	0.03	0.13	0.31	0.00	0.00	0.00
22. San Juan Basin	0.03	0.08	0.02	4.27	8.46	14.74	0.00	0.00	0.00
Total Region 3.	0.11	0.27	0.51	12.35	18.31	25.82	0.03	0.06	0.08
Region 4. Rocky Mountains and Northern Great Plains									
28.&31. NC. Mt/Wil. oil	0.02	0.04	0.06	0.02	0.03	0.05	0.00	0.00	0.00
28.&31. NC. Mt/Wil. gas	0.00	0.00	0.00	3.42	7.52	13.90	0.00	0.00	0.00
37. SW. Wyoming	0.00	0.00	0.00	43.47	92.46	165.07	0.06	1.34	2.40
39. Denver Basin	0.00	0.00	0.00	0.01	0.04	0.10	0.00	0.00	0.00
Total Region 4.	0.02	0.04	0.06	49.08	100.06	175.58	0.06	1.34	2.40
Region 6. Gulf Coast									
47 Western Gulf	0.01	0.01	0.02	0.02	0.03	0.05	0.00	0.00	0.00
49. La.-Ms. Salt Bs.	0.00	0.00	0.00	0.09	0.15	0.23	0.00	0.00	0.01
Total Region 6.	0.01	0.01	0.02	0.12	0.18	0.27	0.00	0.00	0.01
Region 8. Eastern									
63. Michigan Basin	0.00	0.00	0.00	0.31	1.39	3.62	0.00	0.00	0.00
64. Illinois Basin	0.00	0.00	0.00	0.03	0.09	0.20	0.00	0.00	0.00
66. Cincinnati	0.00	0.00	0.00	0.00	0.04	0.13	0.00	0.00	0.00
67. Appalachian Basin	0.00	0.00	0.00	1.51	2.11	2.86	0.00	0.00	0.00
Total Region 8.	0.00	0.00	0.00	1.94	3.64	6.15	0.00	0.00	0.00
Federal Onshore									
Total	0.15	0.32	0.57	72.38	127.08	202.36	0.71	1.45	2.55

Table A-5. Technically recoverable resources of gas in coalbed gas accumulations for onshore Federal Lands by province as of January 1994.[From Crovelli and Nuccio, 1997].

Province code and name	TRILLIONS CU. FT. GAS		
	F95	MEAN	F05
Region 2. Pacific coast			
4. Western Oregon-Washington	0.03	0.06	0.10
Total Region 2.	0.03	0.06	0.10
Region 3. Colorado Plateau & Basin and Range			
20. Uinta-Piceance	5.54	7.90	10.82
22. San Juan Basin	2.94	3.79	4.81
Total Region 3.	9.60	11.69	14.04
Region 4. Rocky Moutains & Northern Great Plains			
33. Powder River Basin	0.30	1.01	2.59
35. Wind River	0.09	0.17	0.30
37. Southwestern Wyoming	0.21	1.93	4.04
41. Raton Basin	0.08	0.09	0.11
Total Region 4.	1.39	3.20	6.04
Region 7. Midcontinent			
62. Arkoma Basin	0.16	0.23	0.31
Total Region 7.	0.16	0.23	0.31
Region 8. Eastern			
65. Black Warrior Basin	0.01	0.02	0.04
67A. Northern Appalachian	0.50	0.73	1.10
67B. Central Appalachian	0.09	0.15	0.23
Total Region 8.	0.66	0.90	1.20
Federal Onshore			
Total	12.97	16.08	19.63

Table A-6. Oil, gas, and natural gas liquids (NGL) in undiscovered conventional oil and gas fields, continuous-type accumulations, and coalbed gas on Federal Lands with incremental cost of \$18 per barrel oil and \$2 per thousand cubic feet gas as of January 1994. [BBO, billions of barrels of oil; TCF, trillions of cubic feet of gas; BBL, billions of barrels of NGL]

Province Code and Name	Conventional undisc.			Continuous-type			Coalbed
	OIL (BBO)	GAS (TCF)	NGL (BBL)	OIL (BBO)	GAS (TCF)	NGL (BBL)	GAS (TCF)
Region 1. Alaska							
1. Northern Alaska	0.50	0.50	0.01	0.00	0.00	0.00	0.00
2. Central Alaska	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3. Southern Alaska	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Region 1.	0.50	0.50	0.01	0.00	0.00	0.00	0.00
Region 2. Pacific Coast							
4. Western Oregon-Wash.	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5. Eastern Oregon-Wash.	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7. Northern Coastal	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8. Sonoma-Livermore Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9. Sacramento Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10. San Joaquin Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11. Central Coastal	0.02	0.01	0.00	0.00	0.00	0.00	0.00
12. Santa Maria Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13. Ventura Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14. Los Angeles Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Region 2.	0.03	0.01	0.00	0.00	0.00	0.00	0.00
Region 3. Colorado Plateau and Basin and Range							
17. Idaho-Snake R. Downwarp	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18. W. Great Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19. E. Great Basin	0.19	0.04	0.00	0.00	0.00	0.00	0.00
20. Uinta-Piceance Basin	0.12	1.63	0.04	0.00	1.48	0.01	3.38
21. Paradox Basin	0.01	0.04	0.00	0.00	0.00	0.00	0.00
22. San Juan Basin	0.00	0.04	0.00	0.06	3.53	0.00	3.18
23. Alb.-Sante Fe Rift	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24. N. Arizona	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25. S. Ariz.-SW. New Mex.	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Region 3.	0.33	1.75	0.04	0.06	5.01	0.01	6.56
Region 4. Rocky Mountains and Northern Great Plains							
27. Montana Thrust Belt	0.00	0.70	0.00	0.00	0.00	0.00	0.00
28. North-Central Montana	0.00	0.00	0.00	0.00	1.00	0.00	0.00
29. SW. Montana	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31. Williston Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
33. Powder River Basin	0.19	0.12	0.01	0.00	0.00	0.00	0.00
34. Big Horn Basin	0.21	0.09	0.00	0.00	0.00	0.00	0.00
35. Wind River Basin	0.03	0.15	0.00	0.00	0.00	0.00	0.00
36. Wyoming Thrust Belt	0.29	6.23	0.64	0.00	0.00	0.00	0.00
37. SW. Wyoming	0.01	0.06	0.00	0.00	0.00	0.00	0.27
38. Park Basins	0.00	0.00	0.00	0.00	0.00	0.00	0.00
39. Denver Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40. Las Animas Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
41. Raton B.-Sierra Gr. Up.	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Region 4.	0.74	7.35	0.66	0.00	1.00	0.00	0.27
Region 5. West Texas and Eastern New Mexico							
43. Palo Duro Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
44. Permian Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45. Bend Arch-Ft. Worth Bs.	0.00	0.00	0.00	0.00	0.00	0.00	0.00
46. Marathon Thrust Belt	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Region 5.	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table A-6 Continued

Province Code and Name	Conventional undisc.			Continuous-type			Coalbed
	OIL (BB0)	GAS (TCF)	NGL (BBL)	OIL (BB0)	GAS (TCF)	NGL (BBL)	GAS (TCF)
Region 6. Gulf Coast							
47. Western Gulf	0.00	0.00	0.00	0.00	0.00	0.00	0.00
49. La-Ms. Salt Basins	0.00	0.00	0.00	0.00	0.13	0.00	0.00
50. Florida Peninsula	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Total Region 6.	0.01	0.00	0.00	0.00	0.13	0.00	0.00
Region 7. Midcontinent							
51. Superior	0.00	0.00	0.00	0.00	0.00	0.00	0.00
53. Cambridge Ar.-C. Ks. Up.	0.00	0.00	0.00	0.00	0.00	0.00	0.00
55. Nemaha Uplift	0.00	0.00	0.00	0.00	0.00	0.00	0.00
56. Forest City Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
58. Anadarko Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
59. Sedgwick Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
60. Cherokee Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
61. Southern Oklahoma	0.00	0.00	0.00	0.00	0.00	0.00	0.00
62. Arkoma Basin	0.00	0.07	0.00	0.00	0.00	0.00	0.00
Total Region 7.	0.00	0.07	0.00	0.00	0.00	0.00	0.00
Region 8. Eastern							
63. Michigan Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
64. Illinois Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
65. Black Warrior Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
66. Cincinnati Arch	0.00	0.00	0.00	0.00	0.00	0.00	0.00
67. Appalachian Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.13
68. Blue Ridge Thrust Belt	0.00	0.00	0.00	0.00	0.00	0.00	0.00
69. Piedmont	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Region 8.	0.00	0.00	0.00	0.00	0.00	0.00	0.13
Federal Onshore							
TOTAL	1.60	9.67	0.71	0.06	6.14	0.01	6.96

Table A-7. Oil, gas, and natural gas liquids (NGL) in undiscovered conventional oil and gas fields, continuous-type accumulations, and coalbed gas on Federal Lands with incremental costs of \$30 per barrel oil and \$3.34 per thousand cubic feet as of January 1994. [BBO, billions of barrels of oil; TCF, trillions of cubic feet of gas; BBL, billions of barrels of NGL]

Province code and name	Conventional undisc.			Continuous-type		Coalbed	
	OIL (BBO)	GAS (TCF)	NGL (BBL)	OIL (BBO)	GAS (TCF)	NGL (BBL)	GAS (TCF)
Region 1. Alaska							
1. Northern Alaska	1.35	1.20	0.02	0.00	0.00	0.00	0.00
2. Central Alaska	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3. Southern Alaska	0.03	0.04	0.00	0.00	0.00	0.00	0.00
Total Region 1.	1.38	1.23	0.02	0.00	0.00	0.00	0.00
Region 2. Pacific Coast							
4. Western Oregon-Wash.	0.00	0.00	0.00	0.00	0.00	0.00	0.03
5. Eastern Oregon-Wash.	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7. Northern Coastal	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8. Sonoms-Livermore Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9. Sacramento Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10. San Joaquin Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11. Central Coastal	0.06	0.02	0.00	0.00	0.00	0.00	0.00
12. Santa Maria Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13. Venture Basin	0.01	0.02	0.00	0.00	0.00	0.00	0.00
14. Los Angeles Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Region 2.	0.07	0.04	0.00	0.00	0.00	0.00	0.03
Region 3. Colorado Plateau and Basin and Range							
17. Idaho-Snake R. Downwarp	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18. W. Great Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19. E. Great Basin	0.28	0.08	0.00	0.00	0.00	0.00	0.00
20. Uinta-Piceance Basin	0.15	2.41	0.05	0.00	1.71	0.01	6.35
21. Paradox Basin	0.04	0.27	0.01	0.15	0.12	0.00	0.00
22. San Juan Basin	0.02	0.16	0.01	0.06	4.70	0.00	3.68
23. Albuquerque-Sante Fe Rift	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24. N. Arizona	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25. S. Ariz.-SW. New Mexico	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Region 3.	0.48	2.92	0.07	0.21	6.53	0.01	10.03
Region 4. Rocky Mountains and Northern Great Plains							
27. Montana Thrust Belt	0.00	0.99	0.00	0.00	0.00	0.00	0.00
28. North-Central Montana	0.00	0.00	0.00	0.00	1.05	0.00	0.00
29. SW. Montana	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31. Williston Basin	0.01	0.02	0.00	0.00	0.00	0.00	0.00
33. Powder River Basin	0.59	0.36	0.02	0.00	0.00	0.00	0.51
34. Big Horn Basin	0.29	0.25	0.00	0.00	0.00	0.00	0.00
35. Wind River Basin	0.06	0.37	0.01	0.00	0.00	0.00	0.16
36. Wyoming Thrust Belt	0.33	6.92	0.71	0.00	0.00	0.00	0.00
37. SW. Wyoming	0.04	0.30	0.01	0.00	2.62	0.04	0.69
38. Park Basins	0.00	0.00	0.00	0.00	0.00	0.00	0.00
39. Denver Basin	0.00	0.00	0.00	0.00	0.03	0.00	0.00
40. Las Animas Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
41. Raton B.-Sierra Grande Up.	0.00	0.00	0.00	0.00	0.00	0.00	0.09
Total Region 4.	1.31	9.20	0.76	0.00	3.70	0.04	1.44
Region 5. West Texas and Eastern New Mexico							
43. Palo Duro Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
44. Permian Basin	0.01	0.03	0.00	0.00	0.00	0.00	0.00
45. Bend Arch-Ft. Worth Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
46. Marathon Thrust Belt	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Region 5.	0.01	0.03	0.00	0.00	0.00	0.00	0.00

Table A-7 continued

Province code and name	Conventional undisc.			Continuous-type		Coalbed	
	OIL (BB0)	GAS (TCF)	NGL (BBL)	OIL (BB0)	GAS (TCF)	NGL (BBL)	GAS (TCF)
Region 6. Gulf Coast							
47. Western Gulf	0.00	0.00	0.00	0.00	0.00	0.00	0.00
49. Louisiana-Miss. Salt Basins	0.00	0.00	0.00	0.00	0.14	0.00	0.00
50. Florida Peninsula	0.03	0.00	0.00	0.00	0.00	0.00	0.00
Total Region 6.	0.03	0.00	0.00	0.00	0.14	0.00	0.00
Region 7. Midcontinent							
51. Superior	0.00	0.00	0.00	0.00	0.00	0.00	0.00
53. Cambridge Arch-C. Kansas	0.00	0.00	0.00	0.00	0.00	0.00	0.00
55. Nemaha Uplift	0.00	0.00	0.00	0.00	0.00	0.00	0.00
56. Forest City Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
58. Anadarko Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
59. Sedgwick Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
60. Cherokee Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
61. Southern Oklahoma	0.00	0.00	0.00	0.00	0.00	0.00	0.00
62. Arkoma Basin	0.00	0.19	0.01	0.00	0.00	0.00	0.18
Total Region 7.	0.00	0.19	0.01	0.00	0.00	0.00	0.18
Region 8. Eastern							
63. Michigan Basin	0.00	0.00	0.00	0.00	0.97	0.00	0.00
64. Illinois Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
65. Black Warrior Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
66. Cincinnati Arch	0.00	0.00	0.00	0.00	0.00	0.00	0.00
67. Appalachian Basin	0.00	0.00	0.00	0.00	0.09	0.00	0.15
68. Blue Ridge Thrust Belt	0.00	0.00	0.00	0.00	0.00	0.00	0.00
69. Piedmont	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Region 8.	0.00	0.00	0.00	0.00	1.06	0.00	0.15
Federal Onshore							
TOTAL	3.29	13.61	0.85	0.21	11.43	0.06	11.83

Appendix B. Plays codes, play names, and percentage of play resources allocated to Federal Onshore Lands.
Tables included are:

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Table B-1. List of onshore and State offshore petroleum plays of the United States	30
Table B-2. Percent of undiscovered conventional oil and gas resources allocated to Federal onshore areas by each play and for small fields by province	43
Table B-3. Percent of oil and gas resources allocated to Federal onshore areas for each continuous-type oil and gas play	53
Table B-4. Percent of gas allocated to Federal onshore areas for each coalbed gas play	55

Table B-1. List of play names and codes with region and province codes. Play names in italics are unconventional, that is either continuous-type or coalbed gas plays.

REG. NO.	PROV. CODE	PLAY CODE	PLAY NAME
1	1	101	Topset
1	1	102	Turbidite
1	1	103	Barrow Arch Beaufortian
1	1	104	Barrow Arch Ellesmerian
1	1	105	Ellesmerian-Beaufortian Clastics
1	1	106	Lisburne
1	1	107	Lisburne Unconformity
1	1	108	Endicott
1	1	109	Fold Belt
1	1	110	Western Thrust Belt
1	1	111	Eastern Thrust Belt
1	2	201	Central Alaska Cenozoic Gas
1	2	202	Central Alaska Mesozoic Gas
1	2	203	Central Alaska Paleozoic Oil
1	2	204	Kandik Pre-Mid-Cretaceous Strata
1	2	205	Kandik Upper Cretaceous and Tertiary Non-Marine Strata
1	3	301	Alaska Peninsula Mesozoic
1	3	302	Alaska Peninsula Tertiary
1	3	303	Cook Inlet Beluga-Sterling Gas
1	3	304	Cook Inlet Hemlock-Tyonek Oil
1	3	305	Cook Inlet Late Mesozoic Oil
1	3	306	Copper River Upper Cretaceous - Tertiary Biogenic Gas
1	3	307	Copper River Mesozoic Oil
1	3	308	Gulf of Alaska Yakataga Fold Belt
1	3	309	Gulf of Alaska Yakutat Foreland
2	4	401	Bellingham Basin Gas
2	4	402	Southeastern Puget Lowland Gas
2	4	403	Puget Lowland Deep Gas
2	4	404	Tofino - Fuca Basin Gas
2	4	405	Western Washington Melange
2	4	406	Southwest Washington Miocene Sandstone
2	4	407	Cowlitz-Spencer Gas
2	4	408	Astoria
2	4	410	Southwest Oregon Eocene Gas
2	4	412	<i>Willamette - Puget Sound Basin-Centered Gas</i>
2	4	450	<i>Western Washington - Bellingham Basin</i>
2	4	451	<i>Western Washington - Western Cascade Mountains</i>
2	4	452	<i>Western Washington - Southern Puget Lowlands</i>
2	5	501	Northwestern Columbia Plateau Gas
2	7	701	Eel River Gas
2	7	702	Franciscan Oil
2	7	703	Sargent/Hollister Oil and Gas
2	8	801	Sonoma-Livermore
2	9	901	Northern Forbes-Kione

Table B-1. Continued

REG. NO.	PROV. CODE	PLAY CODE	PLAY NAME
2	9	902	Southern Forbes-Kione
2	9	903	Western Winters through Domingene
2	10	1001	Pliocene Non-associated Gas
2	10	1002	Southeast Stable Shelf
2	10	1003	Lower Bakersfield Arch
2	10	1004	West Side Fold Belt Sourced by Post-Lower Miocene Rocks
2	10	1005	West Side Fold Belt Sourced by Pre-Middle Miocene Rocks
2	10	1006	Northeast Shelf of Neogene Basin
2	10	1007	Northern Area Non-associated Gas
2	10	1008	Tejon Platform
2	10	1009	South End Thrust Salient
2	10	1010	East Central Basin and Slope North of Bakersfield Arch
2	10	1111	Deep Overpressured Fractured Rocks of West Side Fold and Overthrust Belt
2	11	1101	Point Arena Oil
2	11	1102	Point Reyes Oil
2	11	1103	Pescadero Oil
2	11	1104	La Honda Oil
2	11	1105	Bitterwater Oil
2	11	1106	Salinas Oil
2	11	1107	Western Cuyama Basin
2	11	1109	Cox Graben
2	11	1201	Anticlinal Trends - Onshore
2	12	1202	Basin Margin
2	12	1204	Diagenetic
2	12	1211	Anticlinal Trends - Offshore State Waters
2	13	1301	Paleogene - Onshore
2	13	1302	Neogene - Onshore
2	13	1303	Pliocene Stratigraphic
2	13	1304	Cretaceous
2	13	1311	Paleogene - Offshore State Waters
2	13	1312	Neogene - Offshore State Waters
2	14	1401	Santa Monica Fault System and Las Cienegas Fault and Block
2	14	1402	Southwestern Shelf and Adjacent Offshore State Lands
2	14	1403	Newport-Inglewood Deformation Zone and Southwestern Flank of Central Syncline
2	14	1404	Whittier Fault Zone and Fullerton Embayment
2	14	1405	Northern Shelf and Northern Flank of Central Syncline
2	14	1406	Anaheim Nose
2	14	1407	Chino Marginal Basin, Puente and San Jose Hills, and San Gabriel Valley Marginal Basin
2	14	1408	<i>Deep, Overpressured Fractured Rocks of the Central Syncline</i>
3	17	1701	Miocene Lacustrine (Lake Bruneau)
3	17	1702	Pliocene Lacustrine (Lake Idaho)
3	17	1703	Pre-Miocene

Table B-1 Continued

REG. NO.	PROV. CODE	PLAY CODE	PLAY NAME
3	17	1704	Older Tertiary
3	18	1801	Hornbrook Basin-Modoc Plateau
3	18	1802	Eastern Oregon Neogene Basins
3	18	1803	Permian-Triassic Source Rocks Northwestern Nevada and East Central and Eastern Oregon
3	18	1804	Cretaceous Source Rocks, Northwestern Nevada
3	18	1805	Neogene Source Rocks, Northwestern Nevada and Eastern California
3	19	1901	Unconformity "A"
3	19	1902	Late Paleozoic
3	19	1903	Early Tertiary - Late Cretaceous Sheep Pass and Equivalents
3	19	1905	Younger Tertiary Basins
3	19	1906	Late Paleozoic - Mesozoic (Central Nevada) Thrust Belt
3	19	1907	Sevier Frontal Zone
3	20	2001	Piceance Tertiary Conventional
3	20	2002	Uinta Tertiary Oil and Gas
3	20	2003	Upper Cretaceous Conventional
3	20	2004	Cretaceous Dakota to Jurassic
3	20	2005	Permian-Pennsylvanian Sandstones and Carbonates
3	20	2007	<i>Tight Gas Piceance Mesaverde Williams Fork</i>
3	20	2009	<i>Cretaceous Self-Sourced Fractured Shales Oil</i>
3	20	2010	<i>Tight Gas Piceance Mesaverde Iles</i>
3	20	2014	Basin Margin Subthrusts
3	20	2015	<i>Tight Gas Uinta Tertiary East</i>
3	20	2016	<i>Tight Gas Uinta Tertiary West</i>
3	20	2018	<i>Basin Flank Uinta Mesaverde</i>
3	20	2020	<i>Deep Synclinal Uinta Mesaverde</i>
3	20	2050	<i>Uinta Basin - Book Cliffs</i>
3	20	2051	<i>Uinta Basin - Sego</i>
3	20	2052	<i>Uinta Basin - Emery</i>
3	20	2053	<i>Piceance Basin - White River Dome</i>
3	20	2054	<i>Piceance Basin - Western Basin Margin</i>
3	20	2055	<i>Piceance Basin - Grand Hogback</i>
3	20	2056	<i>Piceance Basin - Divide Creek Anticline</i>
3	20	2057	<i>Piceance Basin - Igneous Intrusion</i>
3	21	2101	Buried Fault Blocks, Older Paleozoic
3	21	2102	Porous Carbonate Buildup
3	21	2103	<i>Fractured Interbed</i>
3	21	2104	Permian-Pennsylvanian Marginal Clastics
3	21	2105	Salt Anticline Flank
3	21	2106	Permo-Triassic Unconformity
3	21	2107	Cretaceous Sandstone
3	21	2201	Porous Carbonate Buildup
3	21	2203	Permian-Pennsylvanian Marginal Clastics
3	22	2204	Entrada

Table B-1. Continued

REG. NO.	PROV. CODE	PLAY CODE	PLAY NAME
3	22	2205	<i>Dakota Central Basin Gas</i>
3	22	2206	Basin Margin Dakota Oil
3	22	2207	Tocito/Gallup Sandstone Oil
3	22	2208	<i>Mancos Fractured Shale</i>
3	22	2209	<i>Central Basin Mesaverde Gas</i>
3	22	2210	Basin Margin Mesaverde Oil
3	22	2211	<i>Pictured Cliffs Gas</i>
3	22	2212	Fruitland-Kirtland Fluvial Sandstone Gas
3	22	2250	<i>San Juan Basin - Overpressured</i>
3	22	2252	<i>San Juan Basin - Underpressured Discharge</i>
3	22	2253	<i>San Juan Basin - Underpressured</i>
3	23	2301	Albuquerque Basin
3	23	2302	Hagan - Santa Fe Embayment
3	23	2303	Espanola Basin
3	23	2304	San Luis Valley Biogenic Gas
3	23	2305	San Juan Sag
3	24	2401	Hurricane Fault/Uinkaret Plateau
3	24	2402	Oraibi Trough
3	24	2403	Late Proterozoic (Chuar-Sourced) and Lower Paleozoic
3	24	2404	Holbrook Basin Anticline
3	25	2501	Alamo Hueco Basin
3	25	2502	Pedregosa Basin
3	25	2503	Seven Tertiary Continental Basins
3	25	2504	Altar/San Luis Basin
3	26	2602	Orogrande Basin
3	26	2603	Mesilla - Mimbres Basins
4	27	2701	Imbricate Thrust Gas
4	27	2703	<i>Cone Calcareous Member, Marias River Shale</i>
4	27	2704	Helena Salient Gas
4	27	2705	Blacktail Salient Oil
4	27	2706	Tertiary Basins Oil and Gas
4	27	2707	Imbricate Thrust Oil
4	28	2801	Proterozoic
4	28	2802	Cambrian-Ordovician Sandstones
4	28	2803	Red River Carbonates
4	27,28	2804	<i>Bakken Shale Fracture Systems</i>
4	28	2805	Devonian-Mississippian Carbonates
4	28	2806	Tyler Sandstone
4	28	2807	Fractured-Faulted Carbonates in Anticlines
4	28	2808	Jurassic-Cretaceous Sandstones
4	28	2809	Shallow Cretaceous Biogenic Gas
4	28	2810	<i>Northern Great Plains Biogenic Gas, High Potential</i>
4	28	2811	<i>Northern Great Plains Biogenic Gas, Moderate Potential (Suffield Block Analog)</i>
4	28	2812	<i>Northern Great Plains Biogenic Gas, Low Potential</i>

Table B-1. Continued

REG. NO.	PROV. CODE	PLAY CODE	PLAY NAME
4	29	2901	Crazy Mountains and Lake Basins Cretaceous Gas
4	29	2903	Nye-Bowler Wrench Zone Oil and Gas
4	29	2904	Beartooth Frontal Oil and Gas
4	29	2905	Madison Subthrust Oil
4	29	2906	Snowcrest-Greenhorn Frontal
4	29	2907	Tertiary Basins Oil and Gas
4	29	2908	Basement Structure
4	29	2910	Crazy Mountains and Lake Basins Oil
4	31	3101	Madison (Mississippian)
4	31	3102	Red River (Ordovician)
4	31	3103	Middle and Upper Devonian (Pre-Bakken - Post-Prairie Salt)
4	31	3105	Pre-Prairie Middle Devonian and Silurian
4	31	3106	Post-Madison through Triassic Clastics
4	31	3107	Pre-Red River Gas
4	31	3110	<i>Bakken Fairway</i>
4	31	3111	<i>Bakken Intermediate</i>
4	31	3112	<i>Bakken Outlying</i>
4	31	3113	<i>Southern Williston Basin Margin - Niobrara Shallow Biogenic</i>
4	32	3202	Truncated Paleozoic
4	33	3301	Basin Margin Subthrust
4	33	3302	Basin Margin Anticline
4	33	3303	Leo Sandstone
4	33	3304	Upper Minnelusa Sandstone
4	33	3305	Lakota Sandstone
4	33	3306	Fall River Sandstone
4	33	3307	Muddy Sandstone
4	33	3308	<i>Mowry Fractured Shale</i>
4	33	3309	Deep Frontier Sandstone
4	33	3310	Turner Sandstone
4	33	3311	<i>Niobrara Fractured Shale</i>
4	33	3312	Sussex-Shannon Sandstone
4	33	3313	Mesaverde-Lewis
4	33	3315	Biogenic Gas
4	33	3350	<i>Powder River Basin - Shallow Mining-Related</i>
4	33	3351	<i>Powder River Basin - Central Basin</i>
4	34	3401	Basin Margin Subthrust
4	34	3402	Basin Margin Anticline
4	34	3403	Deep Basin Structure
4	34	3404	<i>Basin-Center Gas</i>
4	34	3405	Sub-Absaroka
4	34	3406	Phosphoria Stratigraphic
4	34	3407	Tensleep Paleotopography
4	34	3408	Greybull-Cloverly-Muddy Sandstone Stratigraphic
4	34	3410	Bighorn-Darby Wedge-Edge Pinchout

Table B-1. Continued

REG. NO.	PROV. CODE	PLAY CODE	PLAY NAME
4	34	3411	Flathead-Lander and Equivalent Sandstone Stratigraphic
4	34	3412	Madison Limestone Stratigraphic
4	34	3413	Darwin-Amsden Sandstone Stratigraphic
4	34	3414	Triassic and Jurassic Stratigraphic
4	34	3416	Cody and Frontier Stratigraphic
4	34	3417	Shallow Tertiary - Upper Cretaceous Stratigraphic
4	35	3501	Basin Margin Subthrust
4	35	3502	Basin Margin Anticline
4	35	3503	Deep Basin Structure
4	35	3504	Muddy Sandstone Stratigraphic
4	35	3505	<i>Basin-Center Gas</i>
4	35	3506	Phosphoria Stratigraphic
4	35	3509	Bighorn Wedge-Edge Pinchout
4	35	3510	Flathead-Lander and Equivalent Sandstone Stratigraphic
4	35	3511	Madison Limestone Stratigraphic
4	35	3512	Darwin-Amsden Sandstone Stratigraphic
4	35	3513	Triassic and Jurassic Stratigraphic
4	35	3515	Shallow Tertiary - Upper Cretaceous Stratigraphic
4	35	3518	Cody and Frontier Stratigraphic
4	35	3550	<i>Wind River Basin - Mesaverde</i>
4	36	3601	Moxa Arch Extension
4	36	3602	Crawford-Meade Thrusts
4	36	3603	Northern Thrusts
4	36	3604	Absaroka Thrust
4	36	3606	Hogsback Thrust
4	36	3607	Cretaceous Stratigraphic
4	37	3701	Rock Springs Uplift
4	37	3702	Cherokee Arch
4	37	3703	Axial Uplift
4	37	3704	Moxa Arch-LaBarge
4	37	3705	Basin Margin Anticline
4	37	3706	Subthrust
4	37	3707	Platform
4	37	3708	Jackson Hole
4	37	3709	Deep Basin
4	37	3740	<i>Greater Green River Basin - Cloverly-Frontier</i>
4	37	3741	<i>Greater Green River Basin - Mesaverde</i>
4	37	3742	<i>Greater Green River Basin - Lewis</i>
4	37	3743	<i>Greater Green River Basin - Fox Hills-Lance</i>
4	37	3744	<i>Greater Green River Basin - Fort Union</i>
4	37	3750	<i>Greater Green River Basin - Rock Springs</i>
4	37	3751	<i>Greater Green River Basin - Iles</i>
4	37	3752	<i>Greater Green River Basin - Williams Fork</i>
4	37	3753	<i>Greater Green River Basin - Almond</i>
4	37	3754	<i>Greater Green River Basin - Lance</i>

Table B-1. Continued

REG. NO.	PROV. CODE	PLAY CODE	PLAY NAME
4	37	3755	<i>Greater Green River Basin - Fort Union</i>
4	38	3801	Cretaceous - Upper Jurassic Structural
4	38	3802	Subthrust
4	38	3803	<i>Upper Cretaceous Niobrara Fractured Shale Oil</i>
4	39	3901	Pierre Shale Sandstones
4	39	3903	Niobrara Chalk - Shallow Biogenic Gas
4	39	3904	<i>Greater Wattenberg Codell/Niobrara Oil and Gas</i>
4	39	3905	Dakota Group (Combined J and D Sandstones)
4	39	3906	<i>J Sandstone Deep Gas (Wattenberg)</i>
4	39	3907	Basin-Margin Structural
4	39	3908	Permian-Pennsylvanian
4	39	3910	Subthrust Structural
4	39	3911	<i>Fractured Shale - Pierre</i>
4	39	3920	<i>Fractured Niobrara - Greater Silo/Dale Salt-Edge Oil</i>
4	39	3921	<i>Fractured Niobrara - Greater Northern Denver Basin Oil</i>
4	40	4001	Middle and Upper Pennsylvanian Carbonates Oil
4	40	4004	Lower Pennsylvanian (Morrowan) Sandstone Oil, Gas, and Natural Gas Liquids
4	40	4005	Mississippian Carbonate
4	41	4101	Upper Cretaceous - Lower Tertiary
4	41	4102	Jurassic - Lower Cretaceous
4	41	4150	<i>Northern Raton Basin</i>
4	41	4151	<i>Raton Basin - Purgatoire River</i>
4	41	4152	<i>Southern Raton Basin</i>
5	42	4201	Upper Paleozoic and Younger
5	43	4301	Upper Paleozoic
5	44	4401	Pre-Pennsylvanian, Delaware - Val Verde Basins
5	44	4402	Pre-Pennsylvanian, Central Basin Platform
5	44	4403	Pre-Pennsylvanian, Northwestern and Eastern Shelves
5	44	4404	Lower Pennsylvanian (Bend) Sandstone
5	44	4405	Horseshoe Atoll, Upper Pennsylvanian - Wolfcampian
5	44	4406	Upper Pennsylvanian, Northwestern and Eastern Shelves, Northern Delaware and Midland Basins and N.C. Basin Platform
5	44	4407	Upper Pennsylvanian and Lower Permian Shelf, Slope and Basin Sandstones
5	44	4408	Wolfcampian Carbonate, Eastern and Southern Margins of the Central Basin Platform
5	44	4409	Spraberry-Dean
5	44	4410	San Andres-Clearfork, Central Basin Platform and Ozona Arch
5	44	4411	San Andres-Clearfork, Northwestern and Eastern Shelves
5	44	4412	Delaware Sandstones
5	45	4501	Pre-Mississippian Carbonate
5	45	4502	Mississippian Carbonate
5	45	4503	<i>Mississippian Barnett Shale</i>
5	45	4504	Lower Pennsylvanian (Bend) Sandstone and Conglomerate

Table B-1. Continued

REG. NO.	PROV. CODE	PLAY CODE	PLAY NAME
5	45	4505	Strawn (Desmoinesian)
5	45	4506	Post-Desmoinesian
5	45	4510	Texas Ouachita Fold-Thrust Belt
5	46	4601	Frontal Zone Oil and Gas
6	47	4701	Houston Salt Dome Flank Oil and Gas
6	47	4702	Norphlet South Texas Deep Gas
6	47	4703	Smackover South Texas Gas
6	47	4704	Cotton Valley Western Gulf Gas and Oil
6	47	4705	Lower Cretaceous Carbonate Shelf/Shelf Edge Gas and Oil
6	47	4706	Lower Cretaceous Shelf Carbonate Fault Zone Oil
6	47	4707	Buda Fault Zone Oil
6	47	4708	Buda Downdip Oil
6	47	4709	Tuscaloosa Deep Sandstone Gas
6	47	4710	Woodbine South Angelina Flexure Oil and Gas
6	47	4711	Austin Shelf Edge Gas and Oil
6	47	4713	Austin Updip Oil
6	47	4714	Upper Cretaceous Volcanic Mound Oil and Gas
6	47	4715	Upper Cretaceous Sandstones Fault Zone Oil
6	47	4716	Upper Cretaceous Sandstones Maverick Basin Oil
6	47	4717	Upper Cretaceous Sandstones Downdip Gas
6	47	4718	Lower Wilcox Lobo Gas
6	47	4719	Lower Wilcox Fluvial Oil and Gas
6	47	4720	Lower Wilcox Downdip Overpressured Gas
6	47	4721	Upper Wilcox Updip Fluvial Gas
6	47	4722	Upper Wilcox Shelf-Edge Gas and Oil
6	47	4723	Upper Wilcox Downdip Overpressured Gas
6	47	4724	Middle Eocene Sandstones Downdip Gas
6	47	4725	Middle Eocene Sandstones Updip Fluvial Oil and Gas
6	47	4726	Yegua Updip Fluvial - Deltaic Oil and Gas
6	47	4727	Yegua Downdip Gas
6	47	4728	Jackson Updip Gas and Oil
6	47	4729	Jackson Downdip Gas
6	47	4730	Vicksburg Updip Gas
6	47	4731	Vicksburg Downdip Gas
6	47	4732	Frio South Texas Downdip Gas
6	47	4733	Frio South Texas Mid-Dip Oil and Gas
6	47	4734	Frio Updip Fluvial Gas and Oil
6	47	4735	Frio SE Texas/S. Louisiana Mid-Dip Gas and Oil
6	47	4736	Frio SE Texas/S. Louisiana Downdip Gas
6	47	4737	Hackberry Sandstone Gas and Oil
6	47	4738	Anahuac Sandstone Gas and Oil
6	47	4739	Lower Miocene Fluvial Sandstone Oil and Gas
6	47	4740	Lower Miocene Deltaic Sandstone Gas and Oil
6	47	4741	Lower Miocene Slope and Fan Sandstone Gas

Table B-1. Continued

REG.	PROV.	PLAY	PLAY NAME
NO.	CODE	CODE	
6	47	4742	Middle Miocene Fluvial Sandstone Gas and Oil
6	47	4743	Middle Miocene Deltaic Sandstone Gas and Oil
6	47	4744	Upper Miocene Fluvial Sandstone Gas and Oil
6	47	4745	Upper Miocene Deltaic Sandstone Gas and Oil
6	47	4746	Plio-Pleistocene Fluvial Sandstone Oil
6	47	4747	<i>Austin Chalk-Pearsall</i>
6	47	4748	<i>Austin Chalk-Giddings</i>
6	47	4749	<i>Austin Chalk-Outlying</i>
6	48		See prov. 49 plays that are comb. with prov. 48
6	48, 49	4901	Piercement Salt Dome Flanks Oil and Gas
6	48, 49	4902	Basement Structures Oil and Gas
6	49	4903	Norphlet Mobile Bay Deep Gas
6	49	4904	Norphlet Wiggins - Hancock Arch Gas
6	49	4905	Norphlet Salt Basin Oil and Gas
6	49	4906	Norphlet Alabama Updip Oil
6	49	4907	Norphlet SE Margin Jackson Dome Flank Deep Gas
6	48, 49	4908	Norphlet Southern Arkansas/East Texas Oil
6	49	4909	Smackover Wiggins - Baldwin Flanks Gas
6	49	4910	Smackover Alabama/Florida Peripheral Fault Zone Oil and Gas
6	49	4911	Smackover Alabama/Florida Updip Oil
6	48, 49	4912	Smackover Salt Basins Gas and Oil
6	49	4913	Smackover Jackson Dome Deep Gas
6	48, 49	4914	Smackover Jackson Dome Flank CO2
6	49	4915	Smackover North Louisiana Gray Sandstone Gas
6	48, 49	4916	Smackover East Texas - Southern Arkansas Fault Zone Oil and Gas
6	48, 49	4917	Smackover East Texas - South Arkansas Updip Oil
6	49	4918	Haynesville Salt Basins Gas and Oil
6	49	4919	Haynesville Updip Alabama - Florida Oil
6	48, 49	4920	Gilmer Limestone Gas
6	48, 49	4921	Cotton Valley Updip Oil
6	48, 49	4922	Cotton Valley Salt Basins Gas
6	49	4923	<i>Cotton Valley Blanket Sandstones Gas</i>
6	48, 49	4924	Cotton Valley Sabine Uplift Gas
6	48, 49	4925	Hosston Updip Oil
6	49	4926	Hosston/Travis Peak Salt Basins Gas
6	48, 49	4927	Travis Peak Sabine Uplift Gas
6	48, 49	4928	Sligo/Pettet Updip Oil
6	48, 49	4929	Sligo/Pettet Salt Basins Gas
6	48, 49	4930	Pettet Southern Sabine Uplift Gas and Oil
6	48, 49	4931	James Limestone Gas
6	48, 49	4932	Glen Rose/Rodessa Updip Oil
6	48, 49	4933	Glen Rose/Rodessa Salt Basins Gas
6	48, 49	4934	Paluxy Updip Oil
6	48, 49	4935	Paluxy Downdip Gas
6	48, 49	4936	Tuscaloosa Peripheral Fault Zone Oil

Table B-1. Continued

REG. NO.	PROV. CODE	PLAY CODE	PLAY NAME
6	48, 49	4937	Tuscaloosa/Woodbine Structural Oil and Gas
6	48, 49	4938	Tuscaloosa Stratigraphic Oil and Gas
6	48, 49	4939	Woodbine/Tuscaloosa Sabine Flanks Oil
6	49	4940	Eutaw/Tokio Updip Oil
6	49	4941	Eutaw Southern Salt Basins Gas
6	49	4942	Austin Oil
6	49	4943	Selma Salt Basins Oil
6	49	4944	Nacotoch/Navarro Oil and Gas
6	49	4945	Wilcox Salt Basins Oil
6	49	4946	Wilcox N. Louisiana Salt Basin Gas
6	49	4947	Mobile Bay Miocene Gas
6	50	5001	Upper Sunniland Tidal Shoal Oil
6	50	5002	Lower Sunniland Fractured "Dark Carbonate" Oil
6	50	5003	Dollar-Bay Shoal-Reef Dolomite Oil
6	50	5004	Lower Cretaceous Carbonate Composite Oil
6	50	5005	Extended Upper Sunniland Tidal Shoal Oil
6	50	5006	Wood River Dolomite Deep Gas
7	51	5101	Precambrian Midcontinent Rift System
7	52	5201	Middle Ordovician
7	53	5303	Permian
7	53	5304	Mississippian and Devonian
7	53	5305	Pennsylvanian Cyclical Carbonates and Sandstones
7	53	5308	Ordovician
7	53	5309	Early Ordovician/Cambrian Arbuckle
7	55	5501	Pre-Woodford Paleozoic
7	55	5503	Mississippian
7	55	5504	Pennsylvanian-Permian Structural
7	55	5505	Pennsylvanian Stratigraphic
7	55	5507	Internal Arbuckle/Reagan
7	56	5601	Pre-Woodford Paleozoic
7	56	5602	Mississippian
7	56	5603	Pennsylvanian
7	56	5650	<i>Forest City Basin - Central Basin</i>
7	57	5701	Middle Ordovician (Champlainian)
7	58	5801	Deep Structural Gas
7	58	5802	Uppermost Arbuckle
7	58	5803	Internally Sourced Arbuckle Oil and Gas
7	58	5804	Wichita Mountains Uplift
7	58	5805	Simpson Oil and Gas
7	58	5807	Viola Oil and Gas
7	58	5809	Hunton Stratigraphic-Unconformity Gas and Oil
7	58	5810	Misener Oil
7	58	5811	<i>Woodford/Chattanooga/Arkansas Novaculite of Midcontinent</i>
7	58	5812	Deep Stratigraphic Gas

Table B-1. Continued

REG. NO.	PROV. CODE	PLAY CODE	PLAY NAME
7	58	5813	Lower Mississippian Stratigraphic Oil and Gas
7	58	5814	Upper Mississippian Stratigraphic Gas and Oil
7	58	5815	Springer Stratigraphic Gas and Oil
7	58	5816	Morrow Sandstone Gas and Oil Stratigraphic
7	58	5817	Atokan Sandstone Stratigraphic Gas
7	58	5818	Atokan Limestone Stratigraphic Gas and Oil
7	58	5819	Lower Desmoinesian Stratigraphic Gas and Oil
7	58	5820	Upper Desmoinesian Oil and Gas
7	58	5821	Lower Missourian Stratigraphic Oil and Gas
7	58	5822	Upper Missourian Oil and Gas
7	58	5823	Lower Virgilian Sandstone Gas and Oil
7	58	5824	Upper Virgilian Stratigraphic Oil and Gas
7	58	5825	Permian Carbonate Stratigraphic Gas
7	58	5827	Washes
7	58	5828	Permian Sandstone Oil and Gas
7	59	5901	Lower Paleozoic Combination Traps
7	59	5902	Mississippian Combination Traps
7	59	5903	Pennsylvanian Combination Traps
7	60	6001	Pre-Woodford Paleozoic
7	60	6003	Mississippian
7	60	6004	Pennsylvanian Structural
7	60	6005	Pennsylvanian Stratigraphic
7	60	6007	Internal Arbuckle/Reagan
7	60	6050	<i>Cherokee Platform - Central Basin</i>
7	61	6101	Deep Gas
7	61	6102	Arbuckle Oil
7	61	6103	Simpson Structural Oil
7	61	6104	Viola Oil and Gas
7	61	6105	Hunton Oil
7	61	6107	Misener-Woodford-Sycamore Gas and Oil
7	61	6108	Springer Sandstone Oil and Gas
7	61	6109	Atokan Sandstone Oil
7	61	6110	Desmoinesian Sandstone Oil
7	61	6111	Missourian Sandstone Oil and Gas
7	61	6112	Virgilian Sandstone Oil and Gas
7	61	6113	Permian Sandstone Oil and Gas
7	62	6201	Hinterland Oil
7	62	6202	Atoka-Desmoinesian Fluvial-Deltaic and Shelf Sandstone Gas
7	62	6203	Atoka Deep-Water Sandstone Gas
7	62	6204	Morrowan Shallow Marine Sandstone and Limestone Gas
7	62	6205	Arbuckle through Misener Basement Fault and Shelf Gas
7	62	6206	Cromwell-Spiro-Wapanucka Sub-Choctaw Thrust Gas
7	62	6207	Carboniferous Turbidite Thrust-Belt Gas
7	62	6208	Lower Paleozoic Through Mississippian Eastern Arkoma Gas

Table B-1. Continued

REG. NO.	PROV. CODE	PLAY CODE	PLAY NAME
7	62	6209	Morrowan Clastic Wedge Gas
7	62	6250	<i>Arkoma Basin - Anticline</i>
7	62	6251	<i>Arkoma Basin - Syncline</i>
8	63	6301	Anticline
8	63	6303	Mississippian Sandstone Gas
8	63	6304	Berea Sandstone Stratigraphic
8	63	6306	Devonian Carbonate Stratigraphic
8	63	6307	Northern Niagaran Reef
8	63	6308	Southern Niagaran Reef
8	63	6309	Offshore Niagaran Reef
8	63	6310	Burnt Bluff Stratigraphic
8	63	6311	Trenton-Black River
8	63	6312	Ordovician Sandstone Gas
8	63	6313	Pre-Glenwood Unconformity
8	63	6314	Cambrian
8	63	6315	Precambrian Rift
8	63	6317	Impact Structure
8	63	6318	Clinton
8	63	6319	<i>Antrim Shale Gas, Developed Area</i>
8	63	6320	<i>Antrim Shale Gas, Undeveloped Area</i>
8	64	6401	Illinois Basin - Post-New Albany
8	64	6402	Illinois Basin - Hunton
8	64	6403	Illinois Basin - Silurian Reef
8	64	6404	Illinois Basin - Middle and Upper Ordovician Carbonate
8	64	6405	Illinois Basin - Rough Creek Graben
8	64	6407	<i>Illinois Basin - New Albany Shale Gas</i>
8	64	6409	Illinois Basin - Pre-Middle Ordovician
8	64	6410	Northern Mississippi Embayment - Reelfoot Rift
8	64	6411	Northern Mississippi Embayment - Post Mid-Cambrian
8	64	6412	Northern Mississippi Embayment - Late Paleozoic
8	64	6450	<i>Illinois Basin - Central Basin</i>
8	65	6501	Cambrian and Ordovician Carbonate
8	65	6502	Upper Mississippian Sandstone
8	65	6503	Pennsylvanian Sandstone
8	65	6505	Devonian Chert and Carbonate
8	65	6550	<i>Black Warrior Basin Recharge</i>
8	65	6551	<i>Black Warrior Basin - Southeastern Basin</i>
8	65	6552	<i>Black Warrior Basin - Coastal Plain</i>
8	65	6553	<i>Black Warrior Basin - Central and Western Basin</i>
8	66	6601	Cambrian and Lower Ordovician Carbonate
8	66	6602	Middle and Upper Ordovician Carbonate
8	66	6603	Silurian and Devonian Carbonate
8	66	6604	<i>Devonian Black Shale Gas</i>
8	66	6605	Mississippian Carbonate
8	67	6701	Rome Trough

Table B-1. Continued

REG.	PROV.	PLAY	PLAY NAME
NO.	CODE	CODE	
8	67	6701	Upper Cambrian, Ordovician, and Lower/Middle Silurian Thrust Belt
8	67	6703	Beekmantown/Knox Carbonate Oil/Gas
8	67	6704	Rose Run/Gatesburg/Theresa Sandstone Gas
8	67	6706	Trenton/Black River Carbonate Oil/Gas
8	67	6708	Queenston/Bald Eagle Sandstone Gas
8	67	6714	Keefer/Big Six Sandstone Gas
8	67	6715	"Corniferous Limestone"/Big Six Sandstone Oil/Gas
8	67	6716	Upper Silurian Sandstone Gas
8	67	6717	Silurian Carbonate Gas
8	67	6718	Silurian and Devonian Carbonate Thrust Belt
8	67	6719	Devonian Carbonate Gas
8	67	6720	Oriskany Sandstone Gas/Faulted Anticlines
8	67	6721	Griskany Sandstone Gas
8	67	6725	Mississippian and Pennsylvanian Sandstone/Carbonate
8	67	6727	Tuscarora Sandstone Gas
8	67	6728	<i>Clinton/Medina Sandstone Gas High Potential</i>
8	67	6729	<i>Clinton/Medina Sandstone Gas Medium Potential</i>
8	67	6730	<i>Clinton/Medina Sandstone Gas Medium-Low Potential</i>
8	67	6731	<i>Clinton/Medina Sandstone Gas Low Potential</i>
8	67	6732	Clinton/Medina Sandstone Oil/Gas
8	67	6733	<i>Upper Devonian Sandstone Gas High Potential</i>
8	67	6734	<i>Upper Devonian Sandstone Gas Medium Potential</i>
8	67	6735	<i>Upper Devonian Sandstone Gas Medium-Low Potential</i>
8	67	6736	<i>Upper Devonian Sandstone Gas Low Potential</i>
8	67	6737	Upper Devonian Sandstone Oil/Gas
8	67	6740	<i>Devonian Black Shale - Greater Big Sandy</i>
8	67	6741	<i>Devonian Black Shale - Greater Siltstone Content</i>
8	67	6742	<i>Devonian Black Shale - Lower Thermal Maturity</i>
8	67	6743	<i>Devonian Black Shale-Undeveloped NE Ohio and Western Pennsylvania</i>
8	67	6750	<i>Northern Appalachian Basin - Anticline</i>
8	67	6751	<i>Northern Appalachian Basin - Syncline</i>
8	67	6752	<i>Central Appalachian Basin - Central Basin</i>
8	67	6753	<i>Cahaba Coal Field</i>
8	68	6801	Southern Appalachian Sub-Thrust Sheet
8	68	6802	Champlain Valley/Sub-Taconic Allochthon
8	69	6901	East Coast Mesozoic Basins

Table B-2. Percent of undiscovered conventional oil and gas resources allocated to Federal Onshore Areas* by each play for large fields (at least 1 MMBO or 6 BCFG) and by each province for small fields

Province small fields	Play code	Percent Crude Oil	Percent Non-associated Gas
Prv. 1 Northern Alaska			
	101	60	60
	102	25	25
	103	30	30
	104	25	25
	105	70	70
	106	70	70
	109	35	35
	110	40	40
	111	80	60
Prv. 1. Northern Alaska		47	51.1
Prv. 2. Central Alaska			
	201	50	50
	205	50	50
Prv. 2. Central Alaska		50	50
Prv. 3. Southern Alaska			
	301	20	20
	302	20	20
	303	10	10
	304	10	10
	308	65	65
	309	75	75
Prv. 3. Southern Alaska		24.7	12
Prv. 4. Western Oregon-Washington			
	401	0	0
	402	10	10
	403	11	11
	404	3	3
	405	16	16
	406	0	0
	407	3	3
	410	33	33
Prv. 4. W. Oregon-Wash.		15	6.4
Prv. 5. Eastern Oregon -Washington			
	501	20	20
	502	43	43
Prv. 5. E. Oregon-Wash.		0	25.7
Prv. 7. Northern Coastal			
	701	0	0
	703	0	0
Prv. 7. Northern Coastal		0	0
Prv. 8. Sonoma-Livermore Basin			
	801	20	20
Prv. 8. Sonoma-Livermore Basin		20	20
Prv. 9. Sacramento Basin			
	901	2	2
	902	2	2
	903	2	2
Prv. 9. Sacramento Basin		2	2

Table B-2. Continued

Province small fields	Play code	Percent Crude Oil	Percent Non-associated Gas
Prv. 10. San Joaquin Basin			
	1001	0	0
	1002	0	0
	1003	0	0
	1004	2	2
	1005	3	3
	1006	0	0
	1007	0	0
	1008	0	0
	1009	1	1
	1010	0	0
Prv. 10. San Joaquin Basin		1.7	0
Prv. 11. Central Coastal			
	1101	0	0
	1102	20	20
	1103	0	0
	1104	0	0
	1105	10	10
	1106	40	40
	1107	60	60
	1109	10	10
Prv. 11. Central Coastal		33.4	0
Prv. 12. Santa Maria Basin			
	1201	19	19
	1202	0	0
	1204	14	14
	1211	0	0
Prv. 12. Santa Maria Basin		5	0
Prv. 13. Ventura Basin			
	1301	30	30
	1302	15	15
	1311	0	0
	1312	0	0
Prv. 13. Ventura Basin		8.2	9.1
Prv. 14. Los Angeles Basin			
	1401	0	0
	1402	0	0
	1403	5	5
	1404	0	0
	1405	0	0
	1406	0	0
	1407	0	0
Prv. 14. Los Angeles Basin		1.5	0
Prv. 17. Idaho-Snake River Downwarp			
	1701	70	70
Prv. 17. Idaho-Snake R. Downwarp		70	70
Prv. 18. Western Great Basin			
	1803	85	85
Prv. 18. W. Great Basin		85	85

Table B-2. Continued

Province small fields	Play code	Percent Crude Oil	Percent Non-associated Gas
Prv. 19. Eastern Great Basin			
	1901	90	90
	1902	95	95
	1903	90	90
	1905	90	90
	1906	85	85
	1907	40	40
Prv. 19. E. Great Basin		88.7	52.2
Prv. 20. Uinta-Piceance Basin			
	2001	60	60
	2002	75	75
	2003	75	75
	2004	75	75
	2005	80	80
	2014	65	65
Prv. 20. Uinta-Piceance Basin		78.7	66.2
Prv. 21. Paradox Basin			
	2101	80	80
	2102	20	20
	2104	80	80
	2105	80	80
	2106	80	80
	2107	80	80
Prv. 21. Paradox Basin		40.9	71.3
Prv. 22. San Juan Basin			
	2204	35	35
	2206	15	15
	2207	30	30
	2210	15	15
	2212	50	50
Prv. 22. San Juan Basin		24.9	42.4
Prv. 23. Albuquerque-Santa Fe Rift			
	2301	5	5
	2302	0	0
	2305	90	90
Prv. 23. Albuquerque-Santa Fe Rift		64.6	5
Prv. 24. Northern Arizona			
	2402	0	0
	2403	60	60
	2404	15	15
Prv. 24. N. Arizona		45.4	60
Prv. 25. S. Arizona-Southwestern New Mexico			
	2504	55	55
Prv. 25. S. Ariz.-S. W. N. Mexico		55	55
Prv. 27. Montana Thrust Belt			
	2701	85	85
	2704	15	15
	2705	50	50
	2706	25	25
	2707	75	75
Prv. 27. Montana Thrust Belt		54.5	83

Table B-2. Continued

Province small fields	Play code	Percent Crude Oil	Percent Non-associated Gas
Prv. 28. North-Central Montana			
	2802	10	10
	2803	15	15
	2805	10	10
	2806	10	10
	2807	10	10
	2808	10	10
	2809	10	10
Prv. 28. North-Central Montana		10.1	10
Prv. 29. Southwest Montana			
	2901	5	5
	2903	35	35
	2904	60	60
	2905	60	60
	2907	10	10
	2910	3	3
Prv. 29. SW. Montana		20.4	9.4
Prv. 31. Williston Basin			
	3101	15	15
	3102	15	15
	3103	15	15
	3105	15	15
	3106	15	15
	3107	15	15
Prv. 31. Williston Basin		15	15
Prv. 33. Powder River Basin			
	3301	50	50
	3302	45	45
	3303	55	55
	3304	55	55
	3305	55	55
	3306	55	55
	3307	55	55
	3309	60	60
	3310	50	50
	3312	60	60
	3313	60	60
Prv. 33. Powder River Basin		55.5	55
Prv. 34. Big Horn Basin			
	3401	90	90
	3402	75	75
	3403	80	80
	3405	100	100
	3406	90	90
	3407	75	75
	3408	75	75
Prv. 34. Big Horn Basin		94.3	78.1

Table B-2. Continued

Province small fields	Play code	Percent Crude Oil	Percent Non-associated Gas
Prv. 35 Wind River Basin			
	3501	75	75
	3502	65	65
	3503	75	75
	3504	80	80
	3506	90	90
	3515	75	75
Prv. 35. Wind River Basin		77.2	75.5
Prv. 36. Wyoming Thrust Belt			
	3601	100	100
	3602	40	40
	3603	75	75
	3604	50	35
	3606	45	45
	3607	60	60
Prv. 36. Wyoming Thrust Belt		60	76.3
Prv. 37. Southwest Wyoming			
	3701	60	60
	3702	90	90
	3703	60	60
	3704	75	75
	3705	85	85
	3706	85	85
	3707	60	60
	3708	100	100
Prv. 37. SW. Wyoming		69.6	76.6
Prv. 38. Park Basins			
	3801	30	30
	3802	80	80
Prv. 38. Park Basins		47.8	0
Prv. 39. Denver Basin			
	3901	1	1
	3903	0	0
	3905	3	3
	3907	0	0
	3908	0	0
Prv. 38. Denver Basin		1.6	0.3
Prv. 40. Las Animas Arch			
	4001	0	0
	4004	0	0
	4005	0	0
Prv. 40. Las Animas Arch		0	0
Prv. 41. Raton Basin-Sierra Grande Uplift			
	4101	30	30
Prv. 41. Raton B.-Sierra Grande Up.		0	30
Prv. 43 Palo Duro Basin			
	4301	0	0
Prv. 43. Palo Duro Basin		0	0

Table B-2. Continued

Province small fields	Play code	Percent Crude Oil	Percent Non-associated Gas
Prv. 44. Permian Basin			
	4401	4	4
	4402	0.5	0.5
	4403	3	3
	4404	5	5
	4405	0	0
	4406	12	12
	4407	0	0
	4408	0	0
	4409	0	0
	4410	0.5	0.5
	4411	8	8
	4412	12	12
Prv. 44. Permian Basin		7.1	4.4
Prv. 45. Bend Arch-Fort Worth Basin			
	4501	0	0
	4502	0	0
	4504	0	0
	4505	0	0
	4506	0	0
Prv. 45. Bend Arch Ft. Worth Basin		0	0
Prv. 46. Marathon Thrust Belt			
	4601	0	0
Prv. 46. Marathon Thrust Belt		0	0
Prv. 47. Western Gulf			
	4701	5	5
	4703	0	0
	4704	0.5	0.5
	4705	5	5
	4708	1	1
	4709	5	5
	4710	7	7
	4715	0.5	0.5
	4716	0	0
	4717	0	0
	4718	1	1
	4719	5	5
	4720	2	2
	4721	0.5	0.5
	4722	2	2
	4723	0	0
	4724	1	1
	4725	2	2
	4726	2	2
	4727	1	1
	4728	1	1
	4729	0.5	0.5
	4730	1	1
	4731	1	1
	4732	2	2
	4733	1	1
	4734	2	2
	4735	1	1
	4736	2	2
	4737	4	4

Table B-2. Continued

Province small fields	Play code	Percent Crude Oil	Percent Non-associated Gas
Prv. 47. Western Gulf Continued			
	4738	1	1
	4739	2	2
	4740	2	2
	4741	1	1
	4742	2	2
	4743	0.5	0.5
	4744	2	2
	4745	0.5	0.5
Prv. 47. Western Gulf		2.6	2
Prv. 49. Louisiana-Mississippi Salt Basins			
	4901	2	2
	4902	1	1
	4903	0	0
	4904	5	5
	4905	5	5
	4906	2	2
	4907	0	0
	4909	5	5
	4910	1	1
	4911	2	2
	4912	5	5
	4913	0	0
	4915	0.5	0.5
	4916	0	0
	4917	0	0
	4918	5	5
	4919	5	5
	4920	1	1
	4921	1	1
	4922	5	5
	4924	2	2
	4925	2	2
	4926	4	4
	4927	2	2
	4928	2	2
	4929	5	5
	4930	2	2
	4931	5	5
	4932	2	2
	4933	5	5
	4934	2	2
	4935	5	5
	4936	0.5	0.5
	4937	3	3
	4938	0	0
	4941	5	5
	4942	4	4
	4943	6	6
	4945	5	5
	4946	1	1
	4947	0	0
Prv. 49. La.-Miss. Salt Basins		2.5	2.4

Table B-2. Continued

Province small fields	Play code	Percent Crude Oil	Percent Non-associated Gas
Prv. 50. Florida Peninsula			
	5001	15	15
	5002	25	25
	5003	12.5	12.5
	5004	3	3
	5005	1	1
Prv. 50. Florida Peninsula		13.5	0
Prv. 51. Superior			
	5101	0	0
Prv. 51. Superior		0	0
Prv. 53. Cambridge Arch-Central Kansas Uplift			
	5303	0	0
	5305	0	0
	5309	0	0
Prv. 53. Cambridge Arch-C. Ks. Up.		0	0
Prv. 55. Nemaha Uplift			
	5501	0	0
	5503	0	0
	5504	0	0
	5505	0	0
	5507	0	0
Prv. 55. Nemaha Upflift		0	0
Prv. 56. Forest City Basin			
	5601	0	0
	5603	0	0
Prv. 56. Forest City Basin		0	0
Prv. 58. Anadarko Basin			
	5801	4	4
	5802	0	0
	5803	0	0
	5804	0	0
	5805	0	0
	5807	0	0
	5809	0	0
	5810	4	4
	5812	5	5
	5813	5	5
	5814	4	4
	5815	0	0
	5816	5	5
	5817	0	0
	5818	3	3
	5819	8	8
	5820	2	2
	5821	5	5
	5822	10	10
	5823	10	10
	5824	3	3
	5825	4	4
	5827	3	3
Prv. 58. Anadarko Basin		3.7	5.1

Table B-2. Continued

Province small fields	Play code	Percent Crude Oil	Percent Non-associated Gas
Prv. 59. Sedgwick Basin			
	5901	0	0
	5902	0	0
	5903	0	0
Prv. 59. Sedgwick Basin		0	0
Prv. 60. Cherokee Basin			
	6001	0	0
	6003	0	0
	6004	0	0
	6005	0	0
	6007	0	0
Prv. 60. Cherokee Basin		0	0
Prv. 61. Southern Oklahoma			
	6101	2	2
	6102	3	3
	6103	5	5
	6104	8	8
	6105	10	10
	6107	11	11
	6108	11	11
	6109	8	8
	6110	1	1
	6111	0	0
Prv. 61. Southern Oklahoma		4.4	5.6
Prv. 62. Arkoma Basin			
	6201	15	15
	6202	10	10
	6203	30	30
	6204	10	10
	6205	15	15
	6206	30	30
	6207	20	20
Prv. 62. Arkoma Basin		15	22.8
Prv. 63. Michigan Basin			
	6301	3	3
	6304	5	5
	6306	4	4
	6307	5	5
	6308	2	2
	6309	0	0
	6310	10	10
	6311	2	2
	6312	4	4
	6313	0	0
	6318	10	10
Prv. 63. Michigan Basin		1.7	3
Prv. 64. Illinois Basin			
	6401	3	3
	6402	0	0
	6403	3	3
	6404	5	5
	6405	10	10
Prv. 64. Illinois Basin		2	10

Table B-2. Continued

Province small fields	Play code	Percent Crude Oil	Percent Non-associated Gas
Prv. 65. Black Warrior Basin			
	6501	4	4
	6502	8	8
	6503	8	8
	6505	1	1
Prv. 65. Black Warrior Basin		6	7
Prv. 66. Cincinnati Arch			
	6601	0	0
	6602	0	0
Prv. 66. Cincinnati Arch		0	0
Prv. 67. Appalachian Basin			
	6701	4	4
	6702	10	10
	6703	5	5
	6704	5	5
	6706	5	5
	6708	2	2
	6714	1	1
	6716	1	1
	6717	3	3
	6718	3	3
	6719	3	3
	6720	4	4
	6721	3	3
	6725	1	1
	6727	1	1
	6732	1	1
Prv. 67. Appalachian Basin		4.4	3.8
Prv. 68. Blue Ridge Thrust Belt			
	6802	0	0
Prv. 68. Blue Ridge Thrust Belt		0	0
Prv. 69. Piedmont			
	6901	0	0.5
Prv. 69. Piedmont		0	0.5

* Allocations to Federal Lands for associated gas and associated natural gas liquids in oil fields were the same as those for crude oil and the allocations of non-associated natural liquids were the same as those for non-associated gas. The province level small field allocations to Federal Lands for each province were computed as the weighted average of resources allocated to Federal Lands over all plays in the province. In some cases where geologists allocated play resources to Federal Lands, the play may have had either negligible or no oil or non-associated gas so that the small field weighted average is negligible or zero. See, for example, the plays in Province 5 Eastern Oregon-Washington.

Table B-3. Percent of Oil and Gas Resources Allocated to Federal Onshore Areas for each Continuous-type Oil and Gas Play

Play Code	Percent Crude Oil	Percent Non-associated Gas
Province 5. Eastern Oregon-Washington		
503		40
Province 20. Uinta-Piceance		
2007		55
2009	35	
2010		55
2015		80
2016		75
2018		60
2020		2
Province 21. Paradox Basin		
2103	65	
Province 22. San Juan Basin		
2205		40
2208	40	
2209		40
2211		40
2804	10	
Province 28. North-Central Montana		
2810		20
2811		20
2812		15
Province 31. Williston Basin		
3110	40	
3111	10	
3112	5	
3113		2
Province 37. Southwestern Wyoming		
3740		75
3741		80
3742		75
3743		80
3744		65
Province 39. Denver Basin		
3904	2	
3906		5
3920	0	
3921	5	
Province 47. Western Gulf		
4747	0	
4748	0	
4749	7	
Province 49. Louisiana-Mississippi Salt Basins		
4923		2.5
Province 63. Michigan Basin		
6319		0
6320		10
Province 64. Illinois Basin		
6407		5
Province 66. Cincinnati Arch		
6604		3

Table B-3. Continued

Play Code	Percent	
	Crude Oil	Non-associated Gas
Province 67. Appalachian Basin		
6728		3
6729		3
6730		1
6733		5
6734		5
6735		5
6740		3
6741		3
6742		3

Table B-4. Percent of Resources Allocated to Federal Onshore Areas for Coalbed Gas Plays.

Play Code	Percent Gas
Province 4. Western Oregon-Washington	
450	1
451	10
452	4
Province 20. Uinta-Piceance Basin	
2050	50
2051	60
2052	90
2053	85
2054	80
2055	50
2057	85
2056	80
Province 22. San Juan Basin	
2250	55
2252	50
2253	35
Province 33. Powder River Basin	
3350	95
3351	85
Province 35. Wind River Basin	
3550	40
Province 37. Southwest Wyoming	
3750	65
3751	35
3752	25
3753	70
3754	70
3755	70
Province 41. Raton Basin-Sierra Grande Uplift	
4150	10
4151	0
4152	0
Province 56. Forest City Basin	
5650	0
Province 60. Cherokee Basin	
6050	0
Province 62. Arkoma Basin	
6250	0
6251	10
Province 64. Illinois Basin	
6450	0
Province 65. Black Warrior Basin	
6550	0
6551	0
6552	3
6553	2
Province 67. Appalachian Basin	
6750	0
6751	7
6752	5
6753	0

Appendix C. Economic Assumptions for preparing incremental cost functions

General assumptions:

1. The economic analysis uses the *mean* of the assessed hydrocarbons.
2. Industry exhibits rational behavior, so that investment will not be undertaken unless the full operating costs, investment costs, and the cost of capital can be recovered.
3. Incremental costs include *all the costs of finding, developing, and producing oil and gas* in a particular geographic area. For undiscovered conventional fields, exploration effort, ordering and arrival rate of discoveries, and finding costs are computed with *province level finding rate functions* (see Attanasi and others, 1996). Data were insufficient for *recalibrating undiscovered conventional field finding rate functions* for only Federal Lands within each province (see footnote 3 in text for effect of including finding cost on economically recoverable oil and gas resources). For continuous-type accumulations and coalbed gas accumulations, it was assumed that the industry could not selectively drill, therefore, industry would not initiate exploration of the play at a given depth interval unless the aggregate after-tax net present value of the commercially developable cells was sufficient to cover all costs of exploration associated with that 5,000 foot depth interval.
4. Industry was assumed to use a 12 percent after-tax rate of return as a hurdle rate or required rate of return to undertake new investment. The cash flow analysis was specific to individual projects and ignored minimum income taxes and tax preference items that might be important from a corporate accounting stance.
5. Federal taxes are based on the 1986 Tax Reform Act and the 1993 revision. State tax rates were as of 1993. Costs levels are those that prevailed in 1993.
6. Royalty payment to the resource owner is 12.5 percent of gross revenues for onshore areas and 16.67 percent for State offshore areas.
7. Dry gas (gas without natural gas liquids) prices were assumed to be two-thirds the price of oil when expressed on an equivalent energy basis. For example, if oil prices are \$18 per barrel the implied price of gas would be \$2 per mcf. This relationship between oil and gas prices corresponds roughly to the historical average. The analysis also focused on prices between \$18 per barrel (\$2 per mcf) and \$30 per barrel (\$3.34 per mcf). Also, the well head price of natural gas liquids is assumed to be three-fourths the per barrel price of crude oil.
8. By-product revenues from associated gas and natural gas liquids are credited in the economic evaluation to the primary products of either crude oil or non-associated natural gas in the calculation of the incremental cost functions.

Specific assumptions: Undiscovered conventional

1. Economic evaluation of undiscovered conventional oil and gas fields was generally prepared at the province level and based on the assessed field-size distribution of undiscovered fields within 5,000 foot depth intervals.
2. Exploration continues until the expected net present value of the commercially developable resources discovered by the last increment of wildcat drilling is insufficient to pay for that increment of wildcat drilling.

3. Except in the Northern Alaska province (001), oil and gas prices used in the economic evaluation were well head prices. For the Northern Alaska province, the oil price used in the economic evaluation was the Lower 48 West Coast price, rather than the well head price, so incremental costs include transportation from the field to the Lower 48 West Coast. Oil produced in Northern Alaska is transported through the Trans-Alaska Pipeline System (TAPS).
4. Because of the absence of a market for the gas resources of Northern Alaska, non-associated gas fields were not evaluated and a zero price was attached to the extracted associated gas from oil fields.
5. The oil and gas resources of Central Alaska and Southern Alaska, provinces (002, 003), outside the Cook Inlet were not evaluated by the economic analysis because these areas have very limited potential and expected discovery sizes are insufficient to offset cost barriers imposed by the hostile climate, primitive infrastructure, and remoteness from markets.
6. Technically recoverable resources assigned to Lake Michigan and Lake Erie were not evaluated in the economic analysis. The technically recoverable resources amounted to 0.67 BBO and 3.0 TCFG.

Specific assumptions: Continuous-type and coalbed gas plays

1. Economic evaluations of continuous-type accumulations and coalbed gas were prepared at the play level and based on the expected cell-size frequency distribution of untested cells for each 5,000 foot depth interval over which the play extends.
2. Each untested cell requires a new well; recompletions to the target plays of producing wells were not considered.
3. Within continuous-type or coalbed gas plays, it is assumed there is no trend in the discovery rate or well productivities as drilling progresses. In particular, it is assumed that within a play, operators cannot high-grade areas except by restricting drilling to specific depth intervals. To the extent possible, so-called sweet spots were made separate plays.

Table 2.-- Federal surface ownership, by State.[From Bureau of Land Management, 1996]

State	Total of State	Federally owned	
	(acres)	(acres)	(percent)
Alabama	32,678,400	1,081,372	3.3
Alaska	365,481,600	242,795,761	66.4
Arizona	72,688,000	32,488,418	44.7
Arkansas	33,599,360	2,932,563	8.7
California	100,206,720	46,956,438	46.9
Colorado	66,485,760	24,140,220	36.3
Connecticut	3,135,360	12,359	0.4
Delaware	1,265,920	241,642	19.1
D.C.	39,040	9,152	23.4
Florida	34,721,280	2,719,390	7.8
Georgia	37,295,360	1,676,945	4.5
Hawaii	4,105,600	688,140	16.8
Idaho	52,933,120	32,946,171	62.2
Illinois	35,795,200	1,078,211	3.0
Indiana	23,158,400	470,099	2.0
Iowa	35,860,480	470,634	1.2
Kansas	52,510,720	581,100	0.7
Kentucky	25,312,320	1,073,674	4.2
Louisiana	28,867,840	1,011,233	3.5
Maine	19,847,680	329,479	1.7
Maryland	6,319,360	529,978	8.4
Massachusetts	5,034,880	201,948	4.0
Michigan	36,492,160	4,713,346	12.9
Minnesota	51,205,760	7,303,591	14.3
Mississippi	30,222,720	1,358,178	4.5
Missouri	44,248,320	2,107,880	4.8
Montana	93,271,040	25,959,420	27.8
Nebraska	49,031,680	700,447	1.4
Nevada	70,264,320	58,264,529	82.9
New Hampshire	5,768,960	762,667	13.2
New Jersey	4,813,440	638,192	13.3
New Mexico	77,766,400	26,569,505	34.1
New York	30,680,960	423,121	1.4
North Carolina	31,402,880	2,447,947	7.8
North Dakota	44,452,480	1,848,926	4.2
Ohio	26,222,080	349,725	1.3
Oklahoma	44,087,680	769,791	1.7
Oregon	61,598,720	36,939,182	60.0
Pennsylvania	28,804,480	725,499	2.5
Rhode Island	677,120	17,659	2.6
South Carolina	19,374,080	791,437	4.1
South Dakota	48,881,920	2,697,618	5.5
Tennessee	26,727,680	1,563,946	5.8
Texas	168,217,600	2,356,223	1.4
Utah	52,696,960	33,838,182	64.2
Vermont	5,936,640	432,370	7.3

Table 2.-- Federal surface ownership, by State--continued

State	Total of State	Federally owned	
	(acres)	(acres)	(percent)
Virginia	25,496,320	3,018,083	11.8
Washington	42,693,760	11,456,308	26.8
West Virginia	15,410,560	1,092,265	7.1
Wisconsin	35,011,200	2,929,171	8.4
Wyoming	62,343,040	31,024,074	49.8
Total	2,271,343,360	657,256,773	28.9

Table 3. Estimated volumes by Region of technically recoverable oil, natural gas, and natural gas liquids in undiscovered conventional oil and gas accumulations, continuous-type accumulations, and coalbed gas in onshore Federal Lands by assessment region as of January 1994. Continuous-type estimates from Crovelli and Schmoker, 1997; coalbed gas estimates from Crovelli and Nuccio, 1997. [Oil in billions of barrels, gas in trillions of cubic feet, and natural gas liquids (NGL) in billions of barrels]

Region	Conventional			Continuous-type			Coalbed gas		
	F95	Mean	F5	F95	Mean	F5	F95	Mean	F5
1. Alaska									
Oil	0.98	3.75	8.96						
Gas	11.28	33.97	69.97						
NGL	0.17	0.54	1.10						
2. Pacific Coast									
Oil	0.10	0.30	0.66						
Gas	0.20	0.55	1.36	1.12	4.88	12.40	0.02	0.06	0.10
NGL	0.00	0.01	0.03	0.01	0.05	0.12			
3. Colorado Plateau and Basin and Range									
Oil	0.31	0.84	1.78	0.11	0.27	0.51			
Gas	2.88	5.24	9.68	12.35	18.31	25.82	9.60	11.69	14.04
NGL	0.05	0.14	0.28	0.03	0.06	0.08			
4. Rocky Mountains and Northern Great Plains									
Oil	1.25	2.20	3.54	0.02	0.04	0.06			
Gas	8.19	13.50	21.64	49.08	100.06	175.58	1.39	3.20	6.04
NGL	0.48	0.94	1.58	0.06	1.34	2.40			
5. West Texas and Eastern New Mexico									
Oil	0.06	0.21	0.43						
Gas	0.29	0.84	1.73						
NGL	0.01	0.04	0.08						
6. Gulf Coast									
Oil	0.04	0.18	0.46	0.01	0.01	0.02			
Gas	0.90	2.09	4.45	0.12	0.18	0.27			
NGL	0.03	0.09	0.20	0.00	0.00	0.01			
7. Midcontinent									
Oil	0.00	0.03	0.08						
Gas	0.47	1.33	2.77				0.16	0.23	0.31
NGL	0.01	0.03	0.07						
8. Eastern									
Oil	0.00	0.03	0.12	0.00	0.00	0.00			
Gas	0.14	0.42	1.16	1.94	3.64	6.15	0.66	0.90	1.19
NGL	0.00	0.01	0.02	0.00	0.00	0.00			
Total, onshore Federal Lands									
Oil	4.38	7.54	12.93	0.15	0.32	0.57			
Gas	34.00	57.94	96.79	72.38	127.08	202.36	12.97	16.08	19.63
NGL	1.13	1.80	2.70	0.71	1.45	2.55			

Table 4. Estimated volumes by Region, at two levels of cost, of *economically recoverable* oil, gas, and natural gas liquids (NGL) in undiscovered conventional, continuous-type and coalbed gas accumulations in onshore Federal Lands as of January 1994. [Volumes; BBO, billions of barrels oil; TCF, trillions of cubic feet, BBL, billions of barrels; bbl, barrels; mcf, thousands of cubic feet]

REGION	Conventional undiscovered					
	\$18/bbl, \$2/mcf			\$30/bbl, \$3.34/mcf		
	Oil	Gas	NGL	Oil	Gas	NGL
	(BBO)	(TCF)	(BBL)	(BBO)	(TCF)	(BBL)
1. Alaska	0.50	0.50	0.01	1.38	1.23	0.02
2. Pacific Coast	0.03	0.01	0.00	0.07	0.04	0.00
3. Colorado Plt. & Basin and Range	0.33	1.75	0.04	0.48	2.92	0.07
4. Rock Mtn. & N. Great Plains	0.74	7.35	0.66	1.31	9.20	0.76
5. West Texas & E. New Mexico	0.00	0.00	0.00	0.01	0.03	0.00
6. Gulf Coast	0.01	0.00	0.00	0.03	0.00	0.00
7. Midcontinent	0.00	0.07	0.00	0.00	0.19	0.01
8. Eastern	0.00	0.00	0.00	0.00	0.00	0.00
Total Federal Onshore	1.60	9.67	0.71	3.29	13.61	0.85

REGION	Unconventional accumulations								
	Continuous-type			Coalbed		Continuous-type		Coalbed	
	\$18/bbl, \$2/mcf			\$2/mcf		\$30/bbl, \$3.34/mcf		\$3.34/mcf	
	Oil	Gas	NGL	Gas	Oil	Gas	NGL	Gas	
	(BBO)	(TCF)	(BBL)	(TCF)	(BBO)	(TCF)	(BBL)	(TCF)	
1. Alaska	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2. Pacific Coast	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	
3. Colorado Plt. & Basin and Range	0.06	5.01	0.01	6.56	0.21	6.53	0.01	10.03	
4. Rock Mtns. & N. Great Plains	0.00	1.00	0.00	0.27	0.00	3.70	0.04	1.44	
5. West Texas & E. New Mexico	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
6. Gulf Coast	0.00	0.13	0.00	0.00	0.00	0.14	0.00	0.00	
7. Midcontinent	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	
8. Eastern	0.00	0.00	0.00	0.13	0.00	1.06	0.00	0.15	
Total Federal Onshore	0.06	6.14	0.01	6.96	0.21	11.43	0.06	11.83	

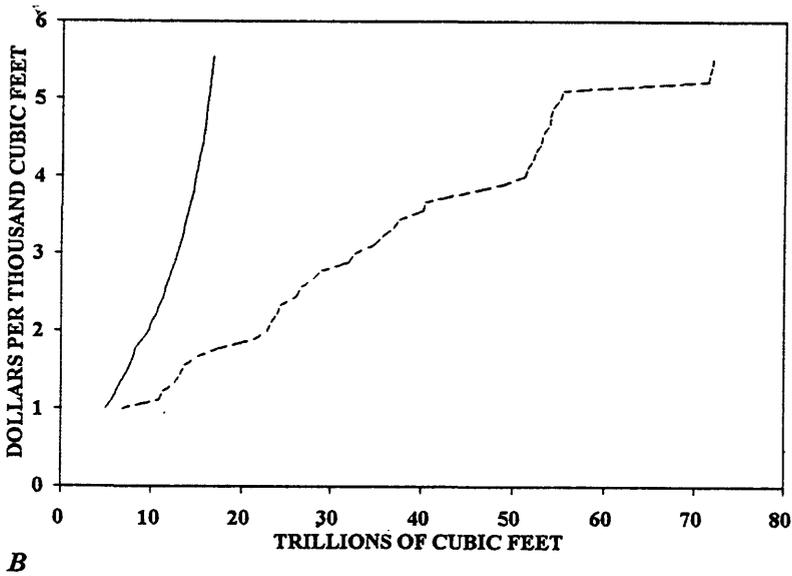
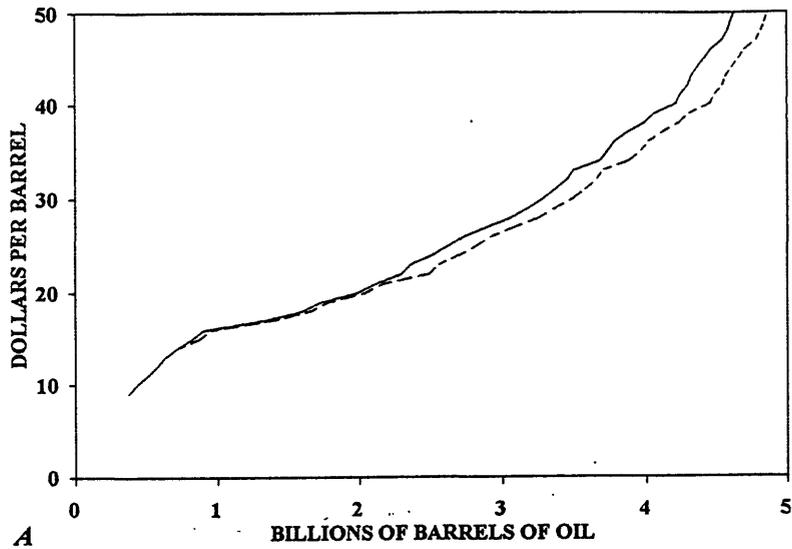
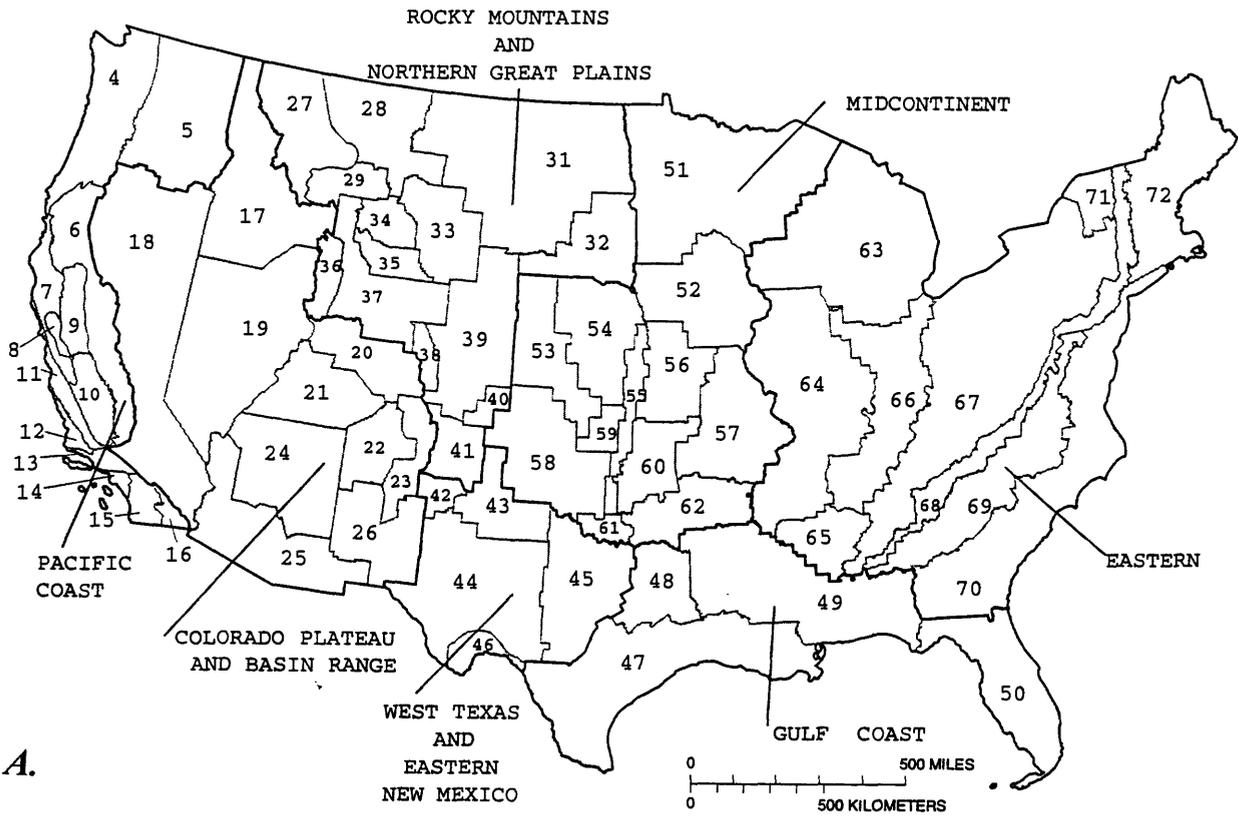
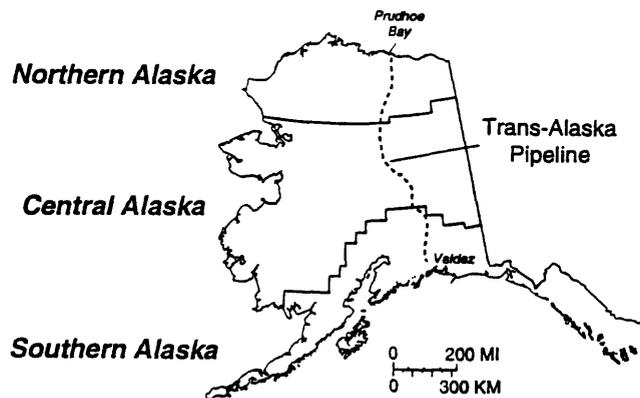


Figure 1. *A*, Incremental costs, in dollars per barrel, of finding, developing, and producing crude oil from undiscovered conventional oil fields and continuous-type oil accumulations in onshore Federal Lands of the United States. Solid line represents undiscovered conventional oil, and dashed line represents total of undiscovered conventional oil and oil in continuous-type accumulations. *B*, Incremental costs, in dollars per thousand cubic feet, of finding, developing, and producing undiscovered conventional gas in oil and gas fields and continuous-type oil and gas accumulations and coalbed gas accumulations in onshore Federal Lands of the United States. Solid line represents undiscovered conventional gas and dashed line represents total of gas in undiscovered conventional fields, continuous-type accumulations, and coalbed gas.



A.



B.

Figure 2. A, Petroleum regions and provinces in onshore and State offshore areas in the conterminous United States. Heavy lines are regional boundaries; lighter lines are province boundaries. B, Petroleum provinces of onshore and State offshore areas of Alaska. Regions and provinces are listed by name and number in table A-1, Appendix A.

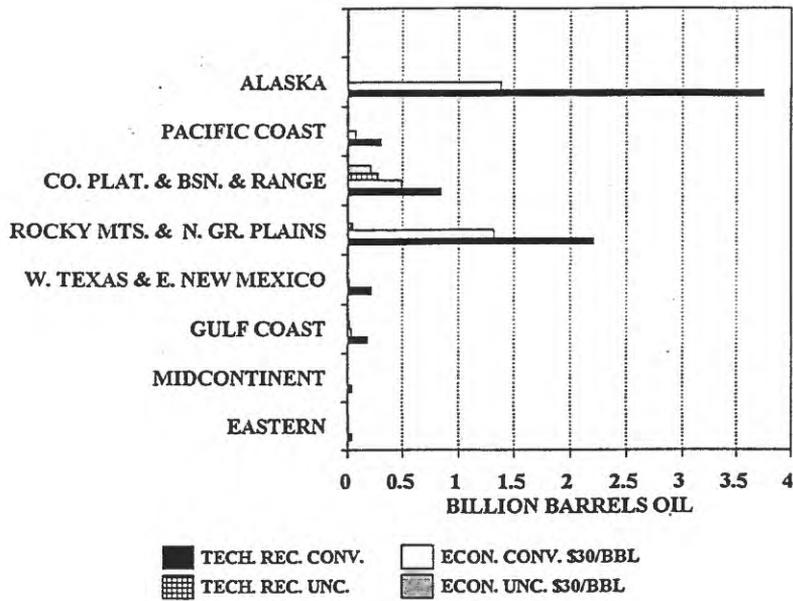


Figure 3. Regional estimates of crude oil from undiscovered conventional oil fields and continuous-type oil accumulations for onshore Federal Lands; estimates of technically recoverable and quantities having incremental costs of \$30 per barrel (bbl) of oil.

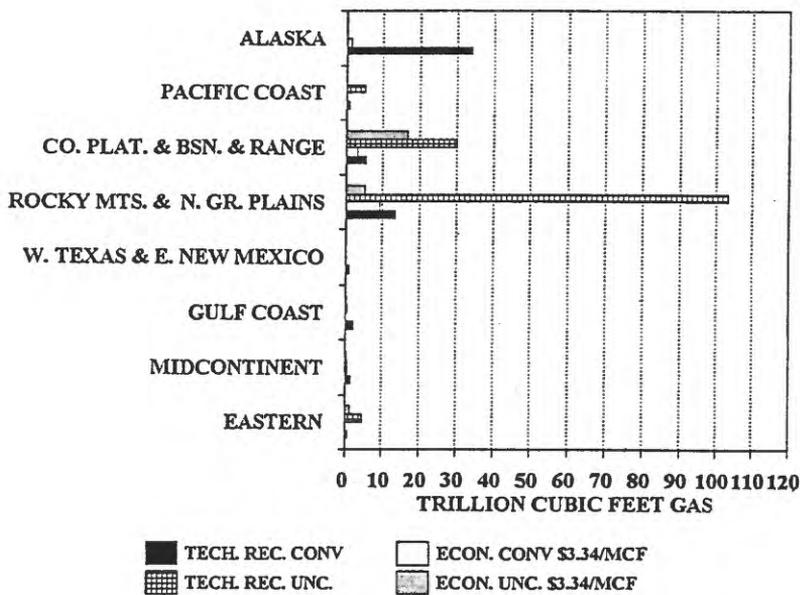


Figure 4. Regional estimates of gas from undiscovered conventional oil and gas fields and unconventional accumulations (that is, continuous-type accumulations and coalbed gas) for onshore Federal Lands; estimates of technically recoverable and quantities having incremental costs of \$3.34 per thousand cubic feet (mcf) gas.