

Assumptions to the Annual Energy Outlook 2006

Table 50. Crude Oil Technically Recoverable Resources
 (Billion barrels)

Crude Oil Resource Category	As of January 1, 2004
Undiscovered	47.29
Onshore	18.49
Northeast	1.10
Gulf Coast	5.24
Midcontinent	1.13
Southwest	2.97
Rocky Moutain	5.72
West Coast	2.32
Offshore	28.80
Deep (>200 meters Water Depth)	26.99
Shallow (0-200 meters Water Depth)	1.82
Inferred Reserves	45.90
Onshore	35.72
Northeast	0.61
Gulf Coast	0.36
Midcontinent	3.43
Southwest	14.17
Rocky Mountain	9.52
West Coast	7.63
Offshore	10.18
Deep (>200 meters Water Depth)	5.44
Shallow (0-200 meters Water Depth)	4.75
Total Lower 48 States Unproved	93.19
Alaska	30.92
Total U.S. Unproved	124.11
Proved Reserves	23.11
Total Crude Oil	147.22

Note: Resources in areas where drilling is officially prohibited are not included in this table. The Alaska value is not explicitly utilized in the OGSM, but is included here to complete the table. The Alaska value does not include resources from the Arctic Offshore Outer Continental shelf.

Source: Conventional Onshore, State Offshore, and Alaska - U.S. Geological Survey (USGS); Federal (Outer Continental Shelf) Offshore - Minerals Management Service (MMS); Proved Reserves - EIA, Office of Oil and Gas. Table values reflect removal of intervening reserve additions between the date of the latest available assessment and January 1, 2004.

Table 51. Natural Gas Technically Recoverable Resources
(trillion cubic feet)

Natural Gas Resource Category	As of January 1, 2004
<i>Nonassociated Gas</i>	
<i>Undiscovered</i>	268.19
<i>Onshore</i>	122.44
Northeast	4.83
Gulf Coast	68.69
Midcontinent	14.51
Southwest	11.65
Rocky Mountain	16.41
West Coast	6.35
<i>Offshore</i>	145.75
Deep (>200 meters water depth)	88.95
Shallow (0-200 meters water depth)	56.80
<i>Inferred Reserves</i>	224.41
<i>Onshore</i>	177.44
Northeast	1.48
Gulf Coast	85.88
Midcontinent	61.63
Southwest	17.76
Rocky Mountain	9.89
West Coast	0.81
<i>Offshore</i>	46.97
Deep (>200 meters water depth)	3.69
Shallow (0-200 (meters water depth)	43.28
<i>Unconventional Gas Recovery</i>	469.92
• Tight Gas	300.33
Northeast	55.82
Gulf Coast	59.00
Midcontinent	11.90
Southwest	8.81
Rocky Mountain	164.32
West Coast	0.48
• Shale	83.32
Northeast	28.78
Gulf Coast	0.00
Midcontinent	0.00
Southwest	40.39
Rocky Mountain	14.15
West Coast	0.00
• Coalbed	75.18
Northeast	8.31
Gulf Coast	1.82
Midcontinent	5.77
Southwest	0.00
Rocky Mountain	59.28
West Coast	0.00
<i>Associated-Dissolved Gas</i>	132.14
<i>Total Lower 48 Unproved</i>	1083.56
<i>Alaska</i>	31.43
<i>Total U.S. Unproved</i>	1115.00
<i>Proved Reserves</i>	189.04
<i>Total Natural Gas</i>	1304.04

Sources and Notes for this table are listed in the 'Notes and Sources' section at the end of chapter.

Table 52. Assumed Size and Initial Production Year of Major Announced Deepwater Discoveries

Field/Project Name	Block	Water Depth (feet)	Year of Discovery	Field Size Class	Field Size (MMBOE)	Start Year of Production
Gomez	MC755	3098	1986	11	45	2006
Rigel	MC252	5225	2003	11	45	2006
Thunder Horse	MC778	6050	1999	16	1419	2006
Ticonderoga	GC768	5250	2004	11	45	2006
Triton/Poseiden (MC)	MC726	5373	2002	12	89	2006
Wrigley	MC506	3700	2005	12	89	2006
Atlantis	GC699	6130	1998	15	691	2007
Constitution	GC680	5071	2003	14	372	2007
Entrada	GB782	4690	2000	14	372	2007
Jubilee	AT349	8825	2003	13	182	2007
Lorien	GC199	2315	2003	12	89	2007
San Jacinto	DC618	7850	2004	11	45	2007
Spiderman/Amazon	DC621	8087	2002	14	372	2007
Vortex	AT261	8344	2002	13	182	2007
Atlas	LL050	8934	2003	12	89	2008
Blind Faith	MC696	6989	2001	13	182	2008
Cascade	WR206	8143	2002	13	182	2008
Merganser	AT037	7900	2002	11	45	2008
Neptune	AT575	6220	1995	14	372	2008
Shenzi	GC653	4238	2002	14	372	2008
Slammer	MC849	3598	2002	13	182	2008
South Dachshund/Mondo	LL002	8340	2004	11	45	2008
Tahiti	GC640	4017	2002	15	691	2008
Basil Peak	GB244	2120	2001	11	45	2009
Chinook	WR469	8831	2003	14	372	2009
Hawkes	MC509	4174	2001	11	45	2009
Hornet	GC379	2076	2001	13	182	2009
Seventeen Hands	MC299	5448	2001	12	89	2009
Sturgis	AT183	3710	2003	12	89	2009
Telemark	AT063	4457	2000	12	89	2009
Trident	AC903	9743	2001	14	372	2009
Tubular Bells	MC725	4334	2003	12	89	2009
Anduin	MC755	2904	2005	11	45	2010
Great White	AC857	8009	2002	15	691	2010
Puma	GC823	4129	2004	12	89	2010
St. Malo	WR678	7036	2003	14	372	2010
Thunder Hawk	MC734	5724	2004	12	89	2010

Source: Energy Information Administration, Office of Integrating Analysis and Forecasting. The discovery year, initial production year and field sizes are based on industry announcements and MMS estimates.

Table 53. Assumed Annual Rates of Technological Progress for Conventional Crude Oil and Natural Gas Sources
(percent/year)

Category	Slow	Reference	Rapid
Lower 48 Onshore			
Costs			
Drilling	0.45	0.89	1.34
Lease Equipment	0.38	0.76	1.14
Operating	0.26	0.52	0.78
Finding Rates			
New Field Discoveries	0.00	0.00	0.00
Known Fields	0.50	1.00	2.00
Success Rates			
Exploratory	0.25	0.50	0.75
Developmental	0.25	0.50	0.75
Lower 48 Offshore			
Exploration success rates	0.50	1.00	1.50
Delay to commence first exploration and between exploration (years)	0.25	0.50	1.00
Exploration and Development drilling costs	0.50	1.00	1.50
Operating costs	0.60	1.20	1.80
Time to construct production facility (years)	0.30	0.60	0.90
Production facility construction costs	0.60	1.20	1.80
Initial constant production rate	0.30	0.60	0.90
Production Decline rate	0.00	0.00	0.00
Alaska			
Costs			
Drilling	0.50	1.00	1.50
Lease Equipment	0.50	1.00	1.50
Operating	0.50	1.00	1.50
Finding Rates	1.50	3.00	4.50

Source: The values shown in this table are developed by the Energy Information Administration, Office of Integrated Analysis and Forecasting from econometric analysis for onshore costs and discussions with various industry and Government sources for offshore and Alaska costs. Onshore drilling cost data are based on the American Petroleum Institute's *Joint Association Survey on Drilling Costs*. Onshore lease equipment and operating costs are based on the Energy Information Administration's *Costs and Indices for Domestic Oil & Gas Field Equipment and Production Operations*.

Table 54. Technology Types and Impacts

Technology Group	Technology Type	Impact
1	Basin assessments	Increase the available resource base by a) accelerating the time that hypothetical plays in currently unassessed areas become available for development and b) increasing the play probability for hypothetical plays – that portion of a given area that is likely to be productive.
2	Play specific, extended reservoir characterizations	Increase the pace of new development by accelerating the pace of development of emerging plays, where projects are assumed to require extra years for full development compared to plays currently under development.
3	Advanced well performance diagnostics and remediation	Expand the resource base by increasing reserve growth for already existing reserves.
4	Advanced exploration and natural fracture detection R&D	Increases the success of development by a) improving exploration/development drilling success rates for all plays and b) improving the ability to find the best prospects and areas.
5	Geology technology modeling and matching	Matches the “best available technology” to a given play with the result that the expected ultimate recovery (EUR) per well is increased.
6	More effective, lower damage well completion and stimulation technology	Improves fracture length and conductivity, resulting in increased EUR’s per well.
7	Targeted drilling and hydraulic fracturing R&D	Results in more efficient drilling and stimulation which lowers well drilling and stimulation costs.
8	New practices and technology for gas and water treatment	Result in more efficient gas separation and water disposal which lowers water and gas treatment operation and maintenance costs.
9	Advanced well completion technologies, such as cavitation, horizontal drilling, and multi-lateral wells:	Defines applicable plays, thereby accelerating the date such technologies are available and introduces and improved version of the particular technology, which increases EUR per well.
10	Other unconventional gas technologies, such as enhanced coalbed methane and enhanced gas shales recovery	Introduce dramatically new recovery methods that a) increase EUR per well and b) become available at dates accelerated by increase R&D, with c) increased operation and maintenance costs (in the case of coalbed methane) for the incremental gas produced.
11	Mitigation of environmental constraints	Removes development constraints in environmentally sensitive basins, resulting in an increase in basin areas available for development.

Source: Advanced Resources International.

Table 55. Assumed Rates of Technological Progress for Unconventional Gas Recovery

Technology Group	Item	Type of Deposit	Technology Case		
			Slow	Reference	Rapid
1	Year Hypothetical Plays Become Available	All Types-Non DOE	NA	NA	NA
		All Types-DOE	NA	2021	2021
2	Decrease in Extended Portion of Development Schedule for Emerging Plays (per year)	All Types - Non DOE	0.83%	1.67%	2.50%
		All Types - DOE	1.25%	2.50%	3.75%
3	Expansion of Existing Reserves (per year -declining 0.1% per year; eg., 3.0, 2.0...)	Tight Sands	1.0%	2.0%	3.0%
		Coalbed Methane & Gas Shales	2.0%	4.0%	6.0%
4	Increase in Percentage of Wells Drilled Successfully (per year) Year that Best 30 Percent of Basin is Fully Identified	All Types	0.1%	0.2%	0.3%
		All Types	2100	2044	2031
5	Increase in EUR per Well (per year)	All Types	0.13%	0.25%	0.38%
6	Increase in EUR per Well (per year)	All types	0.13%	0.25%	0.38%
7	Decrease in Drilling and Stimulation Costs per Well (per year)	All types	NA	NA	NA
8	Decrease in Water and Gas Treatment O&M Costs per Well (per year)	All Types	NA	NA	NA
9	Year Advanced Well Completion Technologies Become Available	Coalbed Methane	NA	NA	NA
		Tight Sands & Gas Shales	NA	2016	2009
10	Increase in EUR per well (total increase) Year Advanced Recovery Technologies Become Available	Coalbed Methane	NA	NA	NA
		Tight Sands	NA	10%	15%
		Gas Shales	NA	20%	30%
		Coalbed Methane & Tight Sands	NA	NA	2019
		Gas Shales	NA	NA	NA
	Increase in Costs (\$1998/Mcf) for Incremental CBM production	Coalbed Methane	NA	NA	45%
		Tight Sands	NA	NA	15%
		Gas Shales	NA	NA	NA
		Coalbed Methane	NA	NA	0.75
		Tight Sands	NA	NA	0.00
		GasShales	NA	NA	NA

EUR = Estimated Ultimate Recovery.

O&M = Operation & Maintenance.

CBM = Coalbed Methane.

NA = Not applicable.

DOE = Those plays in the Rocky Mountain basins assessed as part of Department of Energy sponsored basin studies.

Source: Reference Technology Case, Advanced Resources, International; Slow and Rapid Technology Cases, Energy Information Administration, Office of Integrated Analysis and Forecasting.