

Estimates of the World's Remaining Hydrocarbon Resources: Data Sources and Recent Trends

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Workshop on Oil & Gas Resources

Swiss Federal Office of Energy

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Remaining World Hydrocarbon Resources

Principal Reference Sources for Oil & Gas Reserves & Resources

- BP Statistical Review of World Energy
- Cedigaz
- Energy Information Administration (EIA)
- IHS Energy (formerly Petroconsultants)
- International Energy Agency (IEA)
- Oil & Gas Journal (OGJ)
- Organization of Petroleum Exporting Countries (OPEC)
- United Nations Development Programme (UNDP)
- US Geological Survey (USGS)
- World Energy Council (WEC)
- World Oil

Remaining World Hydrocarbon Resources

Data Sources



United Nations Development Programme

World Energy Assessment: Energy and the challenge of Sustainability

TABLE 5.1. ESTIMATED OIL RESERVES

| Region | Identified reserves (Masters and others, 1994) | Identified reserves plus 95% ^a (Masters and others, 1994) | Identified reserves plus model ^b (Masters and others, 1994) | Identified reserves plus 5% ^c (Masters and others, 1994) | Proven recoverable reserves (WEC, 1998) | Proven reserves (BP, 1999) |
|--------|---|---|---|--|--|-------------------------------|
|--------|---|---|---|--|--|-------------------------------|

Masters et al. (1994) - "The Petroconsultants' data system has provided essential basic data for our program studies and this paper."

TABLE 5.3. ESTIMATED NATURAL GAS RESERVES

| Region | Proven recoverable reserves (WEC, 1998) | Total recoverable reserves (WEC, 1998) | Proven and additional reserves (IGU, 2000) | Proven reserves (BP, 1999) |
|--------|--|---|---|-------------------------------|
|--------|--|---|---|-------------------------------|

Remaining World Hydrocarbon Resources

Data Sources



19th Survey of Energy Resources (2001)

Crude oil and natural gas liquids: proved recoverable reserves

- “Sources: WEC Member Committees, 2000/2001; *Oil & Gas Journal* - December 18 2000; *Annual Statistical Report 2000* - OAPEC; *Annual Statistical Bulletin 1999* - OPEC; various national sources.”

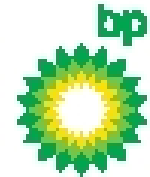
Natural gas: proved recoverable reserves

- “Sources: WEC Member Committees, 2000/2001; *Oil & Gas Journal* - December 18, 2000; *Natural Gas in the World 2000* - Cédigaz; *Annual Statistical Report 2000* - OAPEC; various national sources.”

Remaining World Hydrocarbon Resources

Data Sources

BP Statistical Review of World Energy
June 2003



Oil Reserves

“Source of data – With the exception of Azerbaijan, Kazakhstan and Egypt for 2001, the estimates contained in this table are those published by the *Oil & Gas Journal*, plus an estimate of natural gas liquids for USA and Canada. Reserves of shale oil and oil sands are not included.”

Gas Reserves

As *Oil & Gas Journal* excepts Azerbaijan and Egypt.

Remaining World Hydrocarbon Resources

Data Sources



Energy Information Administration

Official Energy Statistics from the U.S. Government

International Energy Outlook --- 2003

- "Table 11 shows estimates of the conventional oil resource base by region out to the year 2025. Proved reserves are from the annual assessment of worldwide reserves published by *Oil & Gas Journal*."
- "As of January 1 2003, proved world natural gas reserves, as reported by *Oil & Gas Journal*, were estimated at 5,501 trillion cubic feet."

Remaining World Hydrocarbon Resources

Data Sources



Organization of the Petroleum Exporting Countries

OPEC Annual Statistical Bulletin - 2001

OPEC Proven Crude Oil Reserves

“Sources: *Direct communications to the Secretariat; OGJ; World Petroleum Trends; national sources; World Oil; AOG.*”

OPEC Proven Natural Gas Reserves

“Sources: *Direct communications to the Secretariat; Cedigaz; OGJ; national sources; World Oil; MEES; PIW; EIU.*”

Remaining World Hydrocarbon Resources

Data Sources

OPEC Annual Statistical Bulletin - Oil & Gas Journal

A Comparison of OPEC Country Proven Oil Reserve Estimates

| | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
|------------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Algeria (OPEC) | 9,236 | 9,200 | 9,200 | 9,200 | 9,200 | 9,979 | 9,979 | 10,800 | 11,200 | 11,314 | 11,314 | 11,314 | 11,314 | 11,314 |
| Algeria (O&GJ) | 9,200 | 9,200 | 9,200 | 9,200 | 9,200 | 9,200 | 9,200 | 9,200 | 9,200 | 9,200 | 9,200 | 9,200 | 9,200 | 11,314 |
| Indonesia (OPEC) | 5,114 | 5,415 | 5,909 | 5,598 | 5,167 | 4,980 | 4,980 | 4,980 | 4,867 | 5,100 | 5,201 | 5,123 | 5,095 | 4,722 |
| Indonesia (O&GJ) | 8,200 | 11,050 | 6,581 | 5,779 | 5,779 | 5,779 | 5,167 | 4,980 | 4,980 | 4,980 | 4,980 | 5,000 | 5,000 | 4,700 |
| Iran (OPEC) | 92,860 | 92,850 | 92,860 | 92,860 | 92,860 | 94,300 | 93,700 | 92,600 | 92,600 | 93,700 | 93,100 | 99,530 | 99,080 | 99,080 |
| Iran (O&GJ) | 92,860 | 92,850 | 92,860 | 92,860 | 92,860 | 89,250 | 88,200 | 93,000 | 93,000 | 89,700 | 89,700 | 89,700 | 89,700 | 125,800 |
| Iraq (OPEC) | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 | 112,000 | 112,500 | 112,500 | 112,500 | 112,500 | 112,500 | 115,000 |
| Iraq (O&GJ) | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 | 112,000 | 112,500 | 112,500 | 112,500 | 112,500 | 112,500 | 115,000 |
| Kuwait (OPEC) | 97,125 | 97,025 | 96,500 | 96,500 | 96,500 | 96,500 | 96,500 | 96,500 | 96,500 | 96,500 | 96,500 | 96,500 | 96,500 | 96,500 |
| Kuwait (+1/2 NZ) (O&GJ) | 97,125 | 97,025 | 96,500 | 96,500 | 96,500 | 96,500 | 96,500 | 96,500 | 96,500 | 96,500 | 96,500 | 96,500 | 96,500 | 99,000 |
| Libya (OPEC) | 22,800 | 22,800 | 22,800 | 22,800 | 22,800 | 22,800 | 29,500 | 29,500 | 29,500 | 29,500 | 29,500 | 36,000 | 36,000 | 36,000 |
| Libya (O&GJ) | 22,800 | 22,800 | 22,800 | 22,800 | 22,800 | 22,800 | 29,500 | 29,500 | 29,500 | 29,500 | 29,500 | 29,500 | 29,500 | 36,000 |
| Nigeria (OPEC) | 16,000 | 17,100 | 20,000 | 20,991 | 20,991 | 20,991 | 20,828 | 20,828 | 20,828 | 22,500 | 29,000 | 29,000 | 31,506 | 31,506 |
| Nigeria (O&GJ) | 16,000 | 17,100 | 17,900 | 17,900 | 17,900 | 17,900 | 20,828 | 15,521 | 16,786 | 22,500 | 22,500 | 24,000 | 24,000 | 25,000 |
| Qatar (OPEC) | 4,500 | 2,993 | 2,993 | 3,121 | 3,121 | 3,500 | 3,700 | 3,700 | 3,700 | 3,700 | 3,700 | 13,157 | 15,207 | 15,207 |
| Qatar (O&GJ) | 4,500 | 4,500 | 3,729 | 3,729 | 3,729 | 3,700 | 3,700 | 3,700 | 3,700 | 3,700 | 13,157 | 15,207 | 15,207 | 15,207 |
| Saudi Arabia (OPEC) | 260,050 | 260,342 | 260,936 | 261,203 | 261,355 | 261,374 | 261,450 | 261,444 | 261,541 | 261,542 | 262,784 | 262,766 | 262,697 | 262,790 |
| Saudi Arabia (+1/2 NZ) (O&GJ) | 257,559 | 260,004 | 260,342 | 260,342 | 261,203 | 261,203 | 261,203 | 261,500 | 261,500 | 261,500 | 261,700 | 261,750 | 261,800 | 261,900 |
| United Arab Emirates (OPEC) | 98,105 | 98,100 | 98,100 | 98,100 | 98,100 | 98,100 | 98,100 | 97,800 | 97,800 | 97,800 | 97,800 | 97,800 | 97,800 | 97,800 |
| United Arab Emirates (O&GJ) | 98,105 | 98,100 | 98,100 | 98,100 | 98,100 | 98,100 | 98,100 | 97,800 | 97,800 | 97,800 | 97,800 | 97,800 | 97,800 | 97,800 |
| Venezuela (OPEC) | 59,040 | 60,054 | 62,649 | 63,330 | 64,448 | 64,877 | 66,329 | 72,667 | 74,931 | 76,108 | 76,848 | 76,848 | 77,685 | 77,800 |
| Venezuela (O&GJ) | 58,504 | 59,040 | 59,100 | 62,650 | 63,330 | 64,477 | 64,477 | 64,878 | 71,669 | 72,600 | 76,862 | 77,685 | 77,800 | 77,800 |

Remaining World Hydrocarbon Resources

Data Sources

OIL&GAS JOURNAL

Dec 22nd 2003

“Proven” oil reserves estimates for 97 countries;
66 estimates unchanged from 2002;
38 estimates unchanged from 1998;
13 estimates unchanged since 1993.

Remaining World Hydrocarbon Resources

Data Sources

Oil & Gas Journal

Dec 22nd 2003

- Out of 20 countries in Eastern Europe and the Former Soviet Union, only one change in oil reserves (Croatia) between 2002 and 2003;
- World's fifth-largest proven oil reserve holder (Abu Dhabi) unchanged at 92.2 billion barrels from 1988 to 2003 (produced 10.5 billion barrels during this period);
- Fourth-largest reserve holder (Kuwait) unchanged at 94.0 billion barrels from 1991 to 2002 (produced 7.85 billion barrels during this period).

Remaining World Hydrocarbon Resources

Data Sources

Oil & Gas Journal

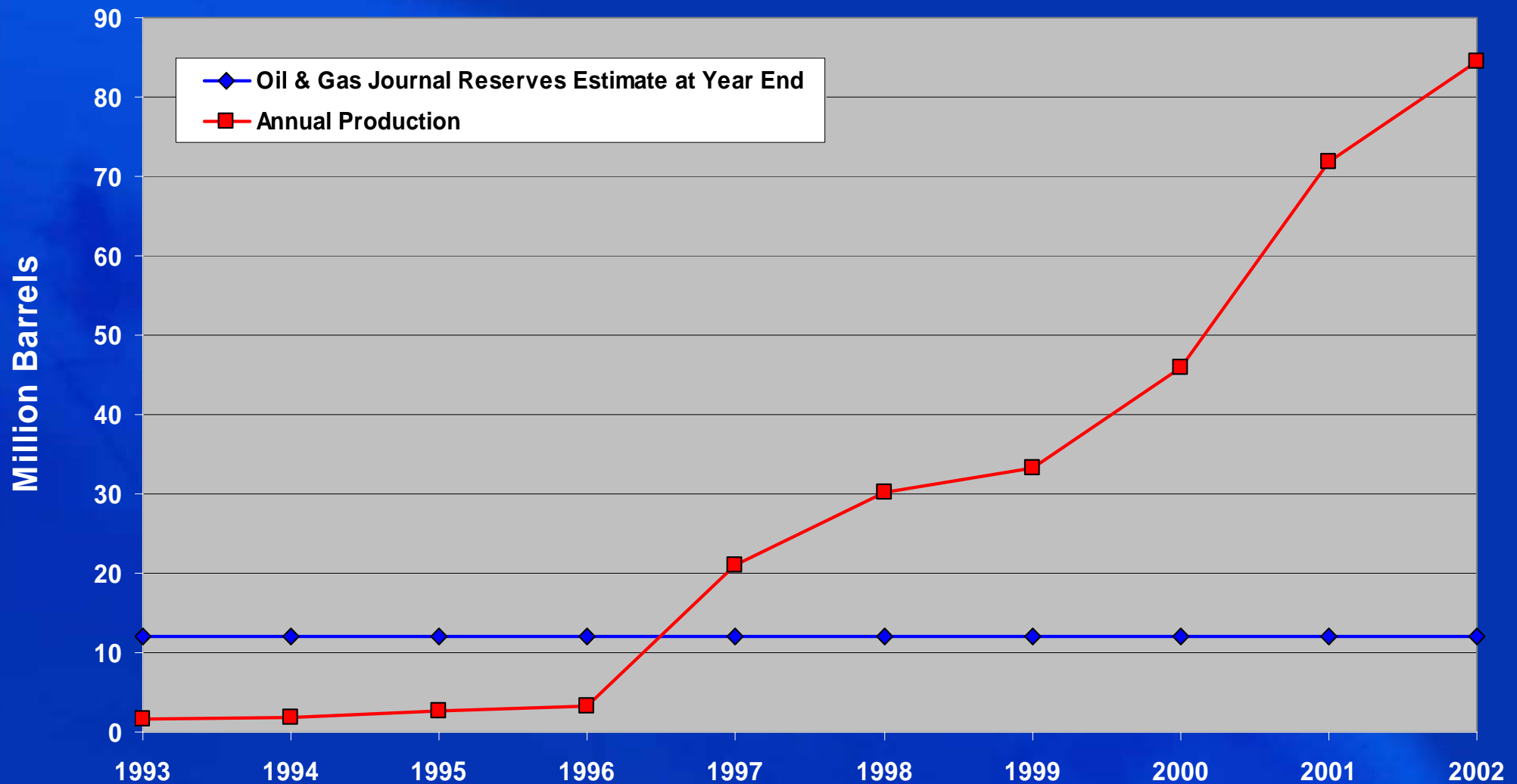
Dec 22nd 2003

- Angola proven oil reserves unchanged at 5,412 million barrels from 1994 to 2003 despite 38 giant discoveries being made during this period;
- Equatorial Guinea proven oil reserves unchanged at 12 million barrels from 1994 to 2003 despite 4 giant discoveries being made during this period and annual production in 2002 of 84 million barrels.

Remaining World Hydrocarbon Resources

Equatorial Guinea

Annual Production versus Oil & Gas Journal Reserves



Remaining World Hydrocarbon Resources

Data Sources

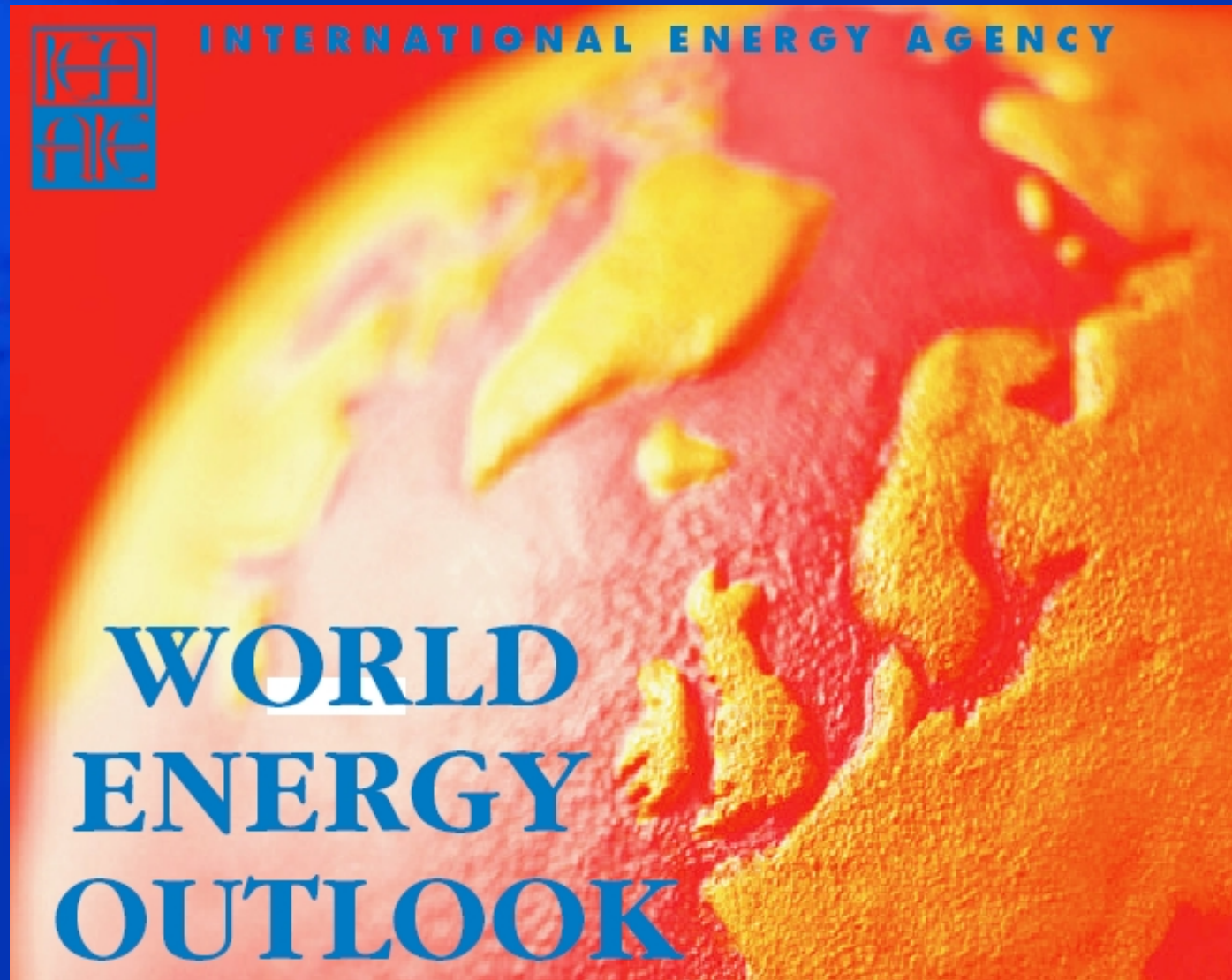
OIL&GAS JOURNAL

Dec 22nd 2003

“Proven” gas reserves estimates for 102 countries;
76 estimates unchanged from 2002;
45 estimates unchanged from 1998;
7 estimates unchanged since 1993.

Remaining World Hydrocarbon Resources

Data Sources



Remaining World Hydrocarbon Resources

Data Sources

International Energy Agency

Table 2.5: USGS Estimates of Global Oil and NGL Resources
(billion barrels)

| | Oil | NGL* | Total |
|---------------------------------------|--------------|------------|--------------|
| Undiscovered recoverable resources | 732 | 207 | 939 |
| Mean reserve growth | 688 | 42 | 730 |
| Mean remaining reserves | 891 | 68 | 959 |
| Cumulative production | 710 | 7 | 717 |
| Ultimate recoverable resources | 3,021 | 324 | 3,345 |

*NGL volumes for the US are included in the oil figures.

Note: World reserve and cumulative production data reflect only those parts of the world actually assessed.

Source: USGS (2000).

Remaining World Hydrocarbon Resources

Data Sources

International Energy Agency

- Liquids Reserves:

US Geological Survey - *World Petroleum Assessment 2000*

- Gas Reserves:

US Geological Survey - *World Petroleum Assessment 2000* /

Cedigaz

Remaining World Hydrocarbon Resources

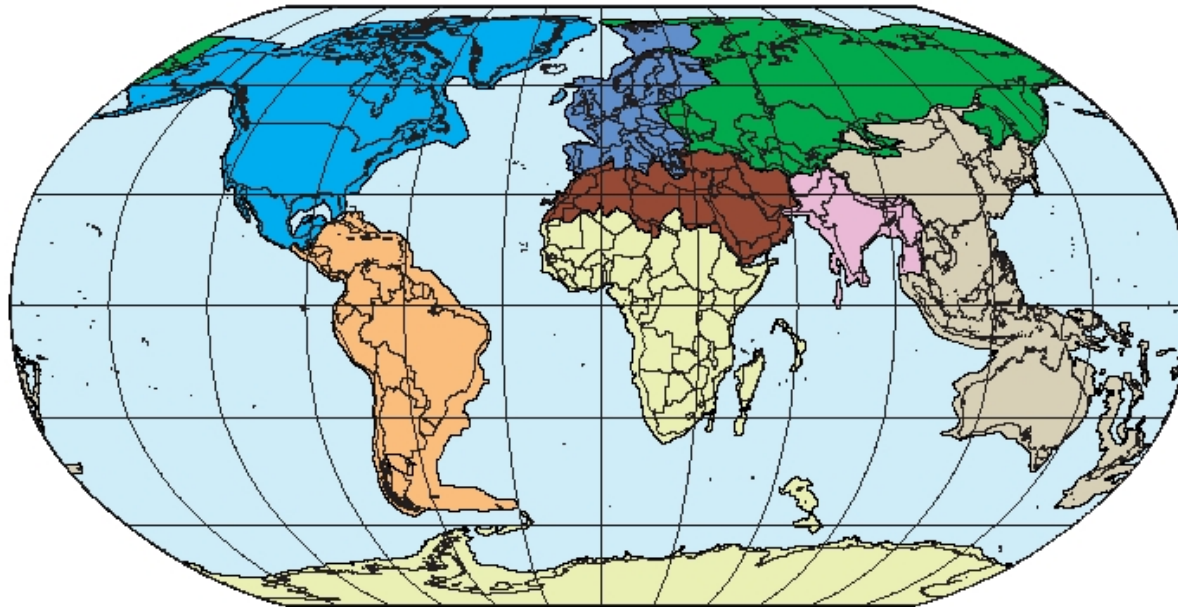
Data Sources

United States Geological Survey



**U.S. GEOLOGICAL SURVEY WORLD PETROLEUM ASSESSMENT 2000—
DESCRIPTION AND RESULTS**
BY USGS WORLD ENERGY ASSESSMENT TEAM

Click anywhere to continue



Remaining World Hydrocarbon Resources

Data Sources

United States Geological Survey

| Oil | | | | Gas | | | | | NGL | | | |
|-----------------|-----|----|------|---------------------|-----|----|------|------|-----------------|-----|----|------|
| Billion Barrels | | | | Trillion Cubic Feet | | | | BBOE | Billion Barrels | | | |
| F95 | F50 | F5 | Mean | F95 | F50 | F5 | Mean | Mean | F95 | F50 | F5 | Mean |

World (excluding United States)

| | | | | | | | | | | | | | |
|-------------------------------|-----|-----|-------|--------------|-------|-------|-------|---------------|--------------|----|-----|-----|------------|
| Undiscovered conventional | 334 | 607 | 1,107 | 649 | 2,299 | 4,333 | 8,174 | 4,669 | 778 | 95 | 189 | 378 | 207 |
| Reserve growth (conventional) | 192 | 612 | 1,031 | 612 | 1,049 | 3,305 | 5,543 | 3,305 | 551 | 13 | 42 | 71 | 42 |
| Remaining reserves* | | | | 859 | | | | 4,621 | 770 | | | | 68 |
| Cumulative production* | | | | 539 | | | | 898 | 150 | | | | 7 |
| Total | | | | 2,659 | | | | 13,493 | 2,249 | | | | 324 |

United States

| | | | | | | | | | | | | | |
|---------------------------------|----|--|-----|------------|-----|--|-----|--------------|------------|--|--|--|--|
| Undiscovered conventional** | 66 | | 104 | 83 | 393 | | 698 | 527 | 88 | Combined with oil Combined with oil Combined with oil Combined with oil | | | |
| Reserve growth (conventional)** | | | | 76 | | | | 355 | 59 | | | | |
| Remaining reserves | | | | 32 | | | | 172 | 29 | | | | |
| Cumulative production | | | | 171 | | | | 854 | 142 | | | | |
| Total | | | | 362 | | | | 1,908 | 318 | | | | |

World Total

(including United States)

3,021

15,401

2,567

*World reserve and cumulative production data reflect only those parts of the world actually assessed and are from Petroconsultants (1996) and NRG Associates (1995).

**U.S. data from Gautier and others (1996) and Minerals Management Service (1996).

Remaining World Hydrocarbon Resources

Data Sources

Company Reserve Estimates in Financial Reports

- Essentially irrelevant in estimating the world's remaining resources
- Restraints of financial reporting mean that only *Proved Reserves* with confidence level in excess of 90% are normally reported

e.g. **ExxonMobil**

Proved Reserves @ end-2003: **22 billion boe**;

Discovered Resource Base @ end-2003: **>72 billion boe**

- **3.4 times** as great as reported proved reserves

- Can be useful in providing an absolute baseline in certain countries (e.g. Russia)

Remaining World Hydrocarbon Resources

IHS Energy Methodology

A Three-stage Process

(1) Production

- Record the all-time historic annual production of liquids and gas by country (onshore and offshore) from the best available source(s)
- Generate cumulative production by country from annual totals
- Canadian bitumen and synthetic crude oil and Venezuela extra-heavy Orinoco belt production included

Remaining World Hydrocarbon Resources

IHS Energy Methodology

(2) Ultimate Recoverable Resources

- Uses a “bottom-up” approach that reflects evolution of resource estimates for individual fields
- Sum the ultimate “proven+probable” technically-recoverable liquid and gas resources of each field and undeveloped discovery, by year
- All resources attributed to the year of initial discovery
- Aggregate the annual discovered resource values
- Canada and USA must be treated differently

Remaining World Hydrocarbon Resources

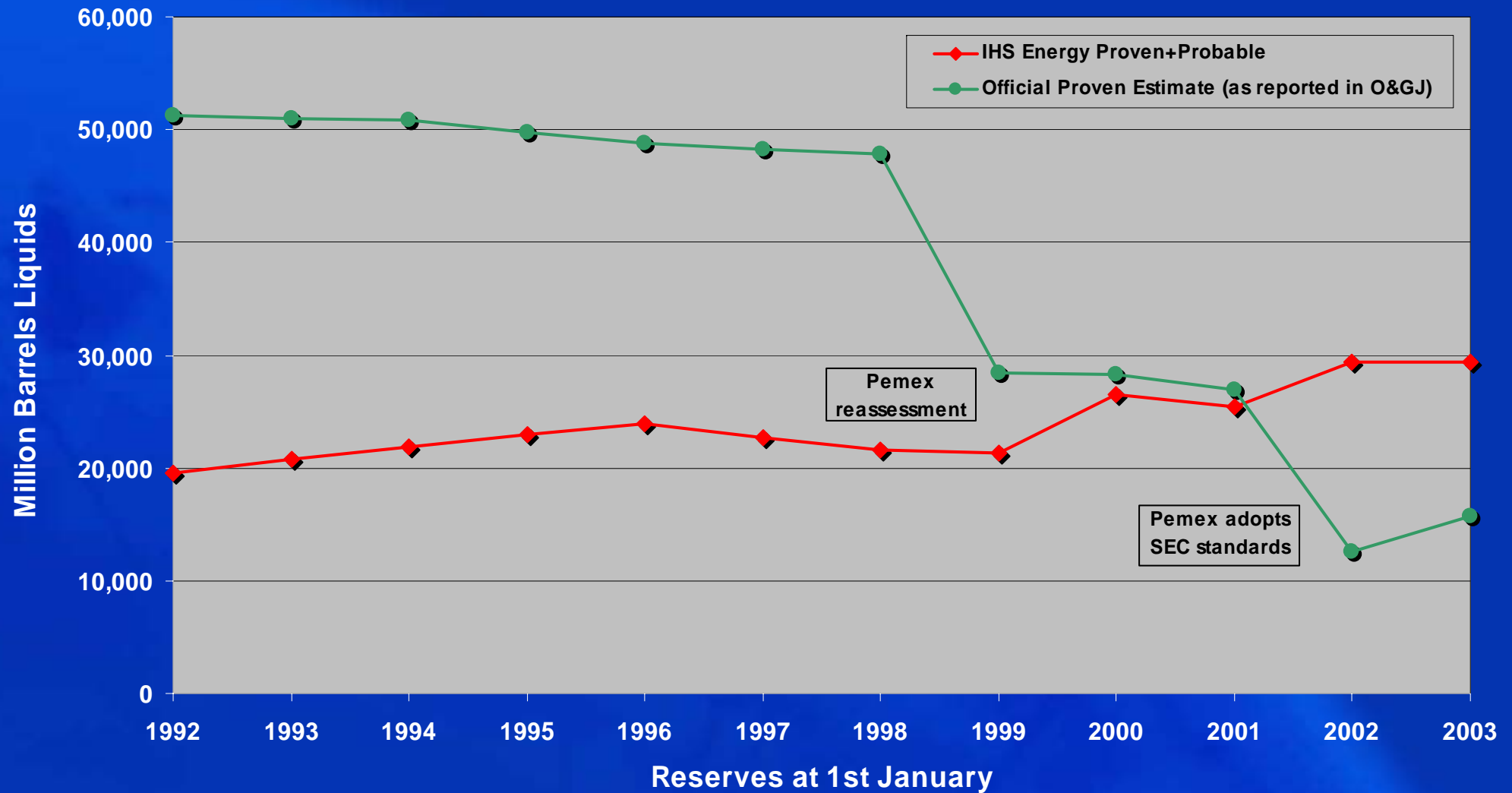
IHS Energy Methodology

(3) Remaining Recoverable Resources

- Subtract country cumulative production (1) from country ultimate recoverable resources (2) to derive remaining resources by country (3)

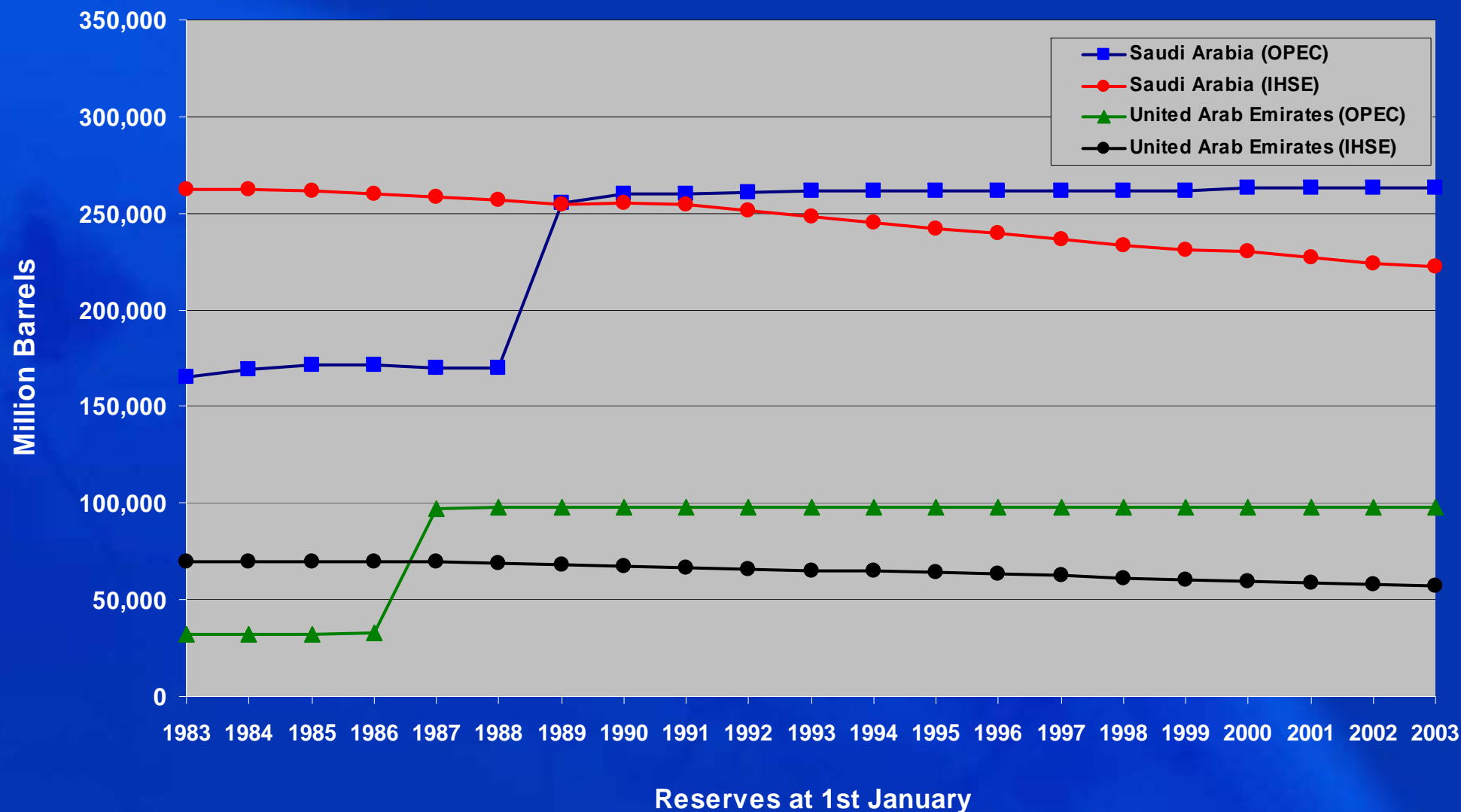
Remaining World Hydrocarbon Resources

Year-on-Year Comparison of IHSE and Official Remaining Liquid Resource Estimates for Mexico



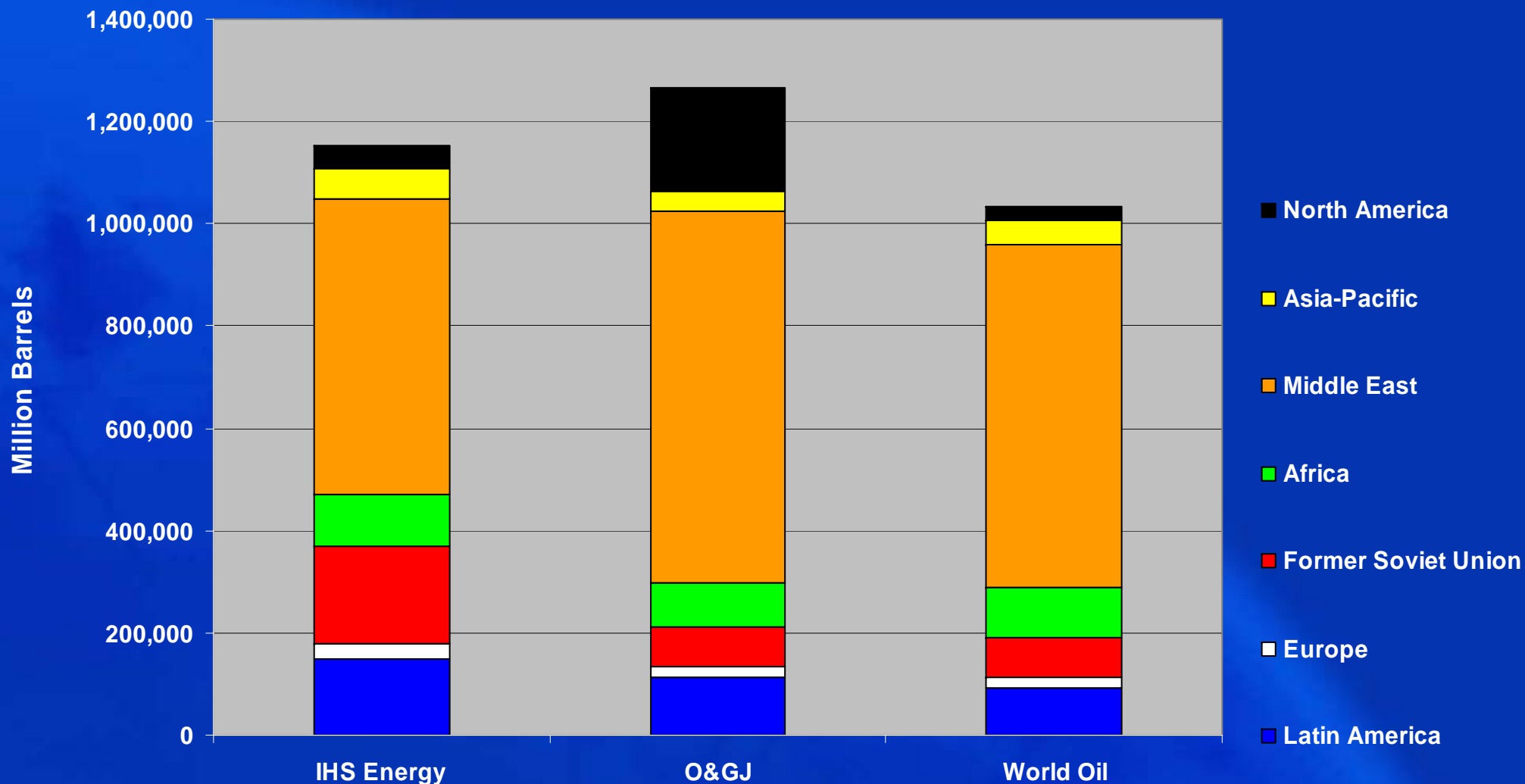
Remaining World Hydrocarbon Resources

Comparison of OPEC and IHS Energy Remaining Liquid Resource Estimates



Remaining World Hydrocarbon Resources

Comparison of World Liquids Reserves / Resources by Region,
from Different Data Sources



Remaining World Hydrocarbon Resources

Resource Plays

Resource Plays belong to a category of hydrocarbon accumulations known as **Continuous-Type Deposits** -

Accumulations that are pervasive throughout a large area and that are not significantly affected by hydrodynamic influences.

Continuous-type deposits lack well-defined downdip water contacts.

Remaining World Hydrocarbon Resources

Resource Play Characteristics

- **Exploration**
 - Low risk
 - large known in-place resource
 - great areal extent
 - Long life reserves
 - booked reserves are small proportion of potential
- **Production**
 - Material volumes
 - Stable, predictable production rates
 - Assembly-line development
 - Very long project life provides
 - opportunity to improve recovery factor
 - opportunity to improve efficiency and reduce costs
 - security of supply
 - Well decline rates decrease with time

Remaining World Hydrocarbon Resources

Resource Play Types

Oil

- Bitumen in oil-sands, Alberta, Canada
- Extra-heavy oil, Orinoco Belt, Venezuela

Gas

- Coalbed Gas (also known as "CBM" or "NGC")
- Tight Lithologies (shale; chalk)
- Anomalously-Pressured Basin-Centre Gas (also known as "deep gas" or "tight sand gas")

and in the future

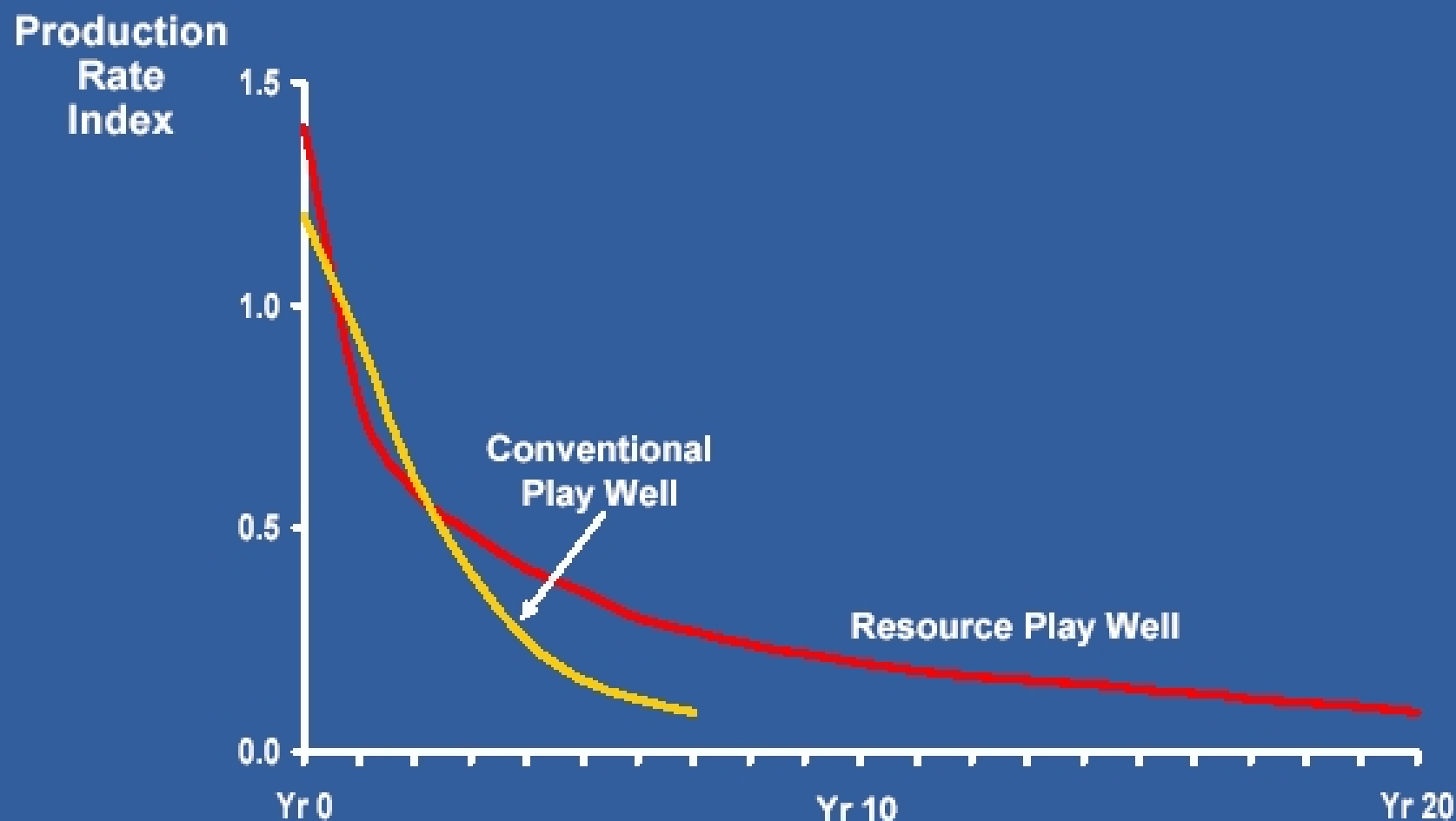
- Gas Hydrates

Production Decline Comparison

Conventional vs Resource

ENCANA CORPORATION

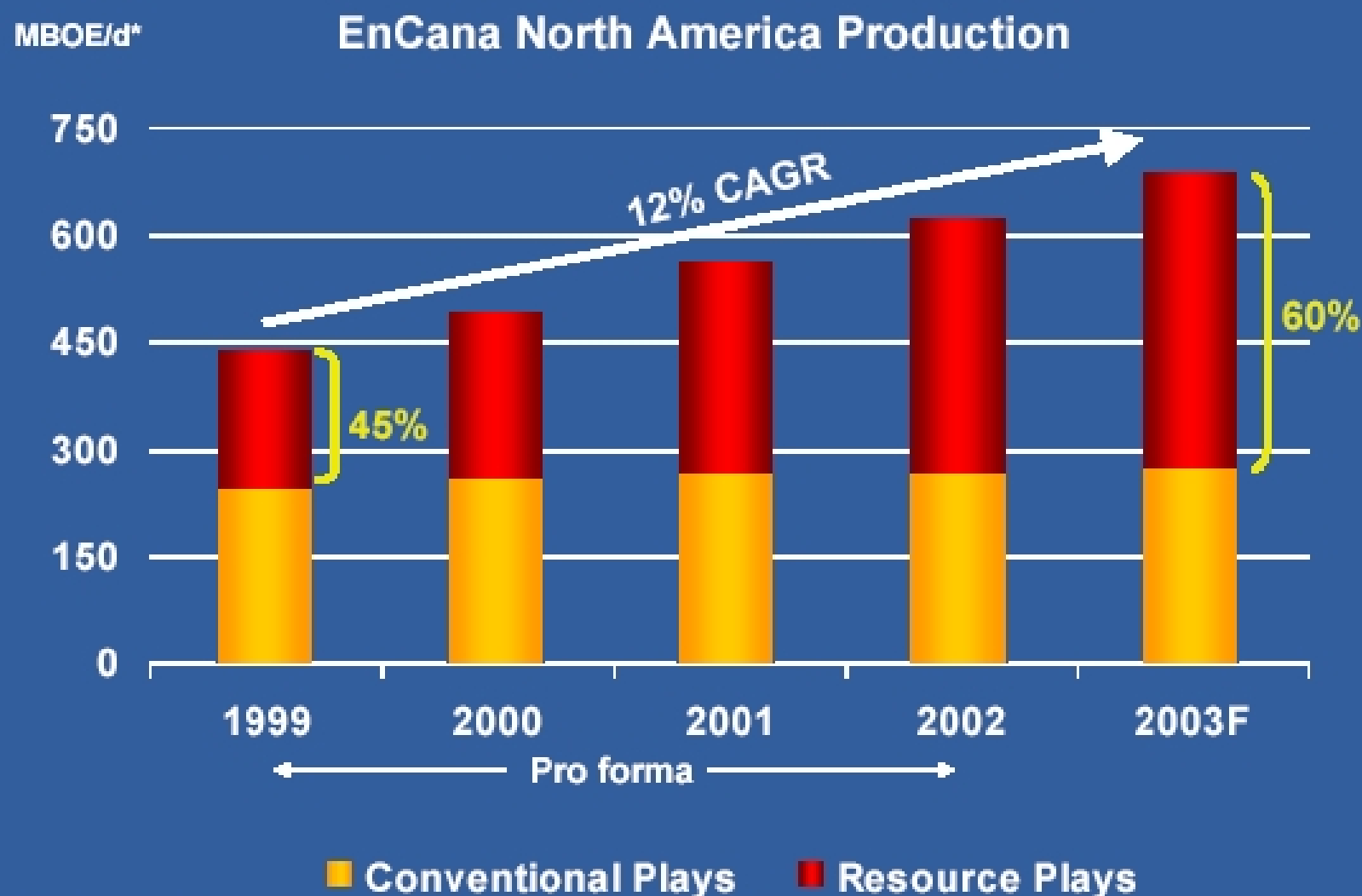
EnCana²



North America Resource Plays *Historical Growth Track Record*

ENCANA CORPORATION

EnCana²



*Before royalties, excludes Syncrude

Remaining World Hydrocarbon Resources

Venezuela - Orinoco Extra-heavy Oil Projects

Five producing projects:

- One Orimulsion®; four joint venture upgrading projects (Cerro Negro; Hamaca; Petrozuata; Sincor)

One project under construction:

- Sinovensa Orimulsion®

One project on hold:

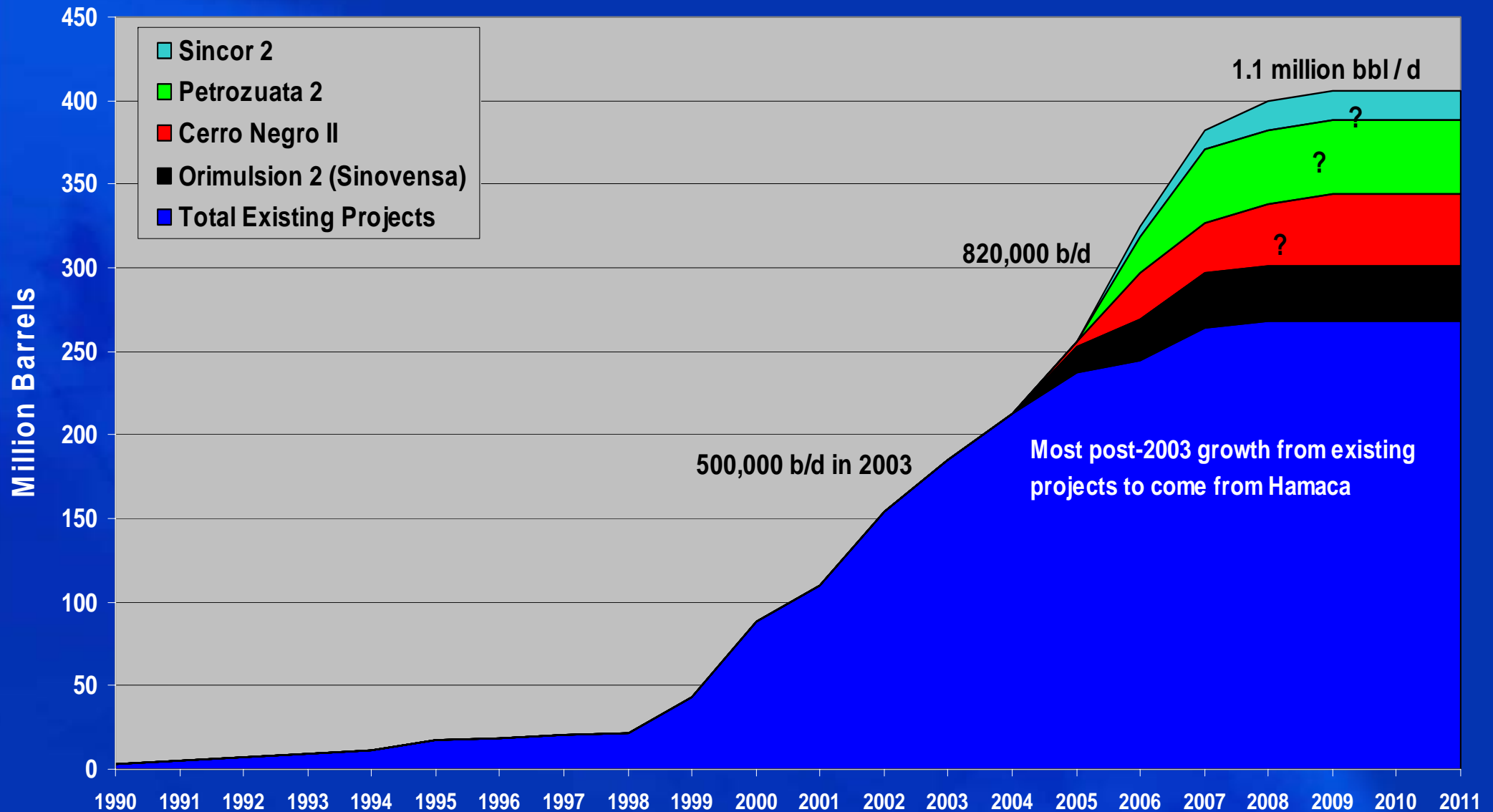
- ENEL Orimulsion®

Three extensions to upgrading projects under consideration:

- Cerro Negro; Petrozuata; Sincor

Remaining World Hydrocarbon Resources

Past and Projected Extra-Heavy Crude Oil Production, Orinoco Belt



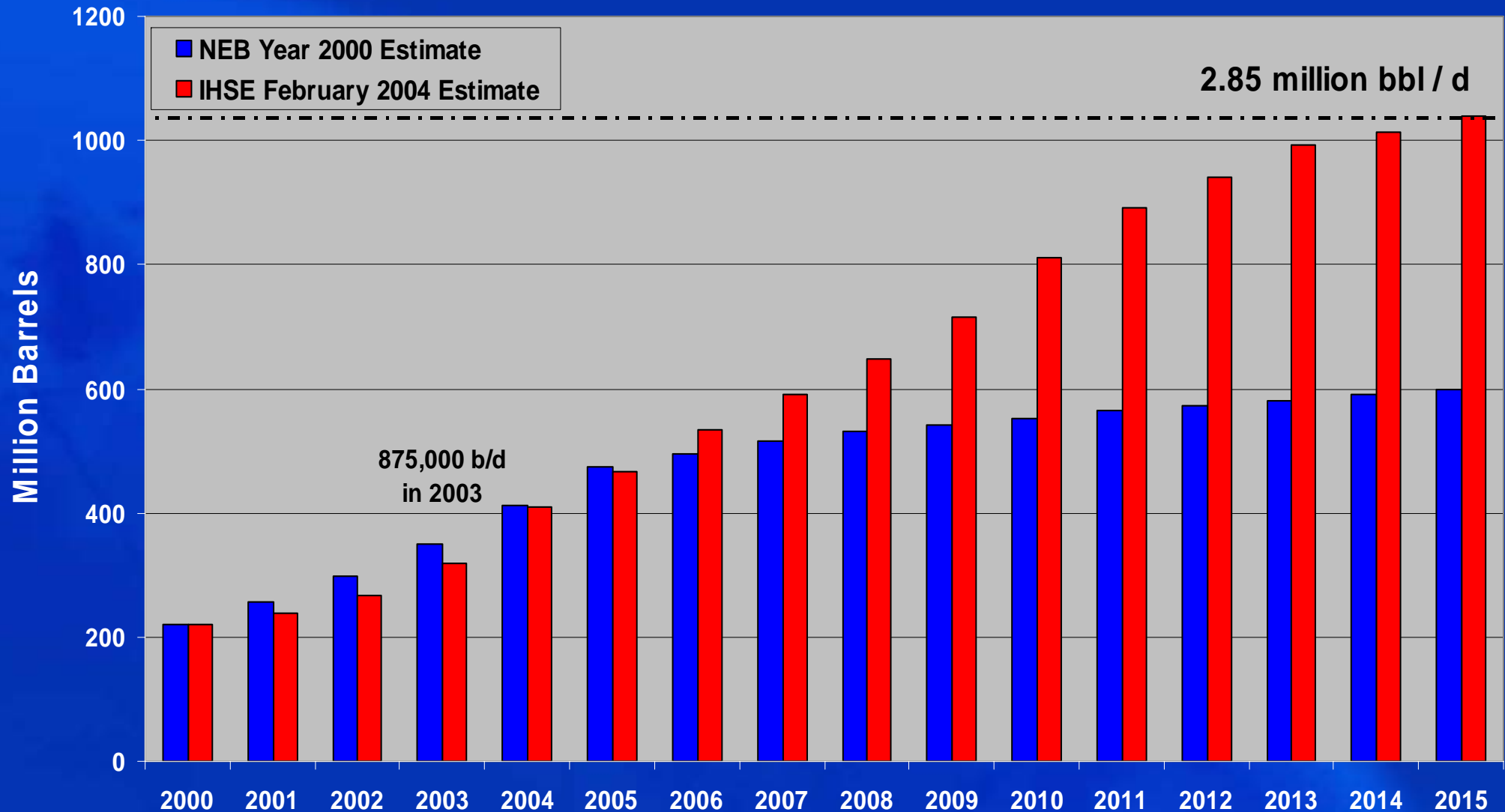
Remaining World Hydrocarbon Resources

Canada – Alberta Oil Sands Projects

- **Mining** - 3 producing; 3 planned; 2 feasibility
 - large projects: average ~ 200,000 b/d SCO
 - low risk plus high recovery factor (90%+ of processed ore)
 - limited by overburden - maximum 75m
- **CSS** - 1 large producer: 180,000 b/d projected by 2008
 - 13% recovery in 1978; 25% recovery in 2000
 - 2 small projects combined with SAGD
- **SAGD** - new technology - 2 producers combined with CSS;
 - 8 in production; 6 in pilot production; 8 planned
 - high recovery factors - 40-50% routine; 80% potential
- **Primary** - many small projects
 - low recovery factors (5-10%)

Remaining World Hydrocarbon Resources

Canadian Bitumen Production Forecasts to 2015



Remaining World Hydrocarbon Resources

Conventional, with Extra-Heavy Oil and Oil Sands

| | Total Discovered | Cumulative Production | Remaining Recoverable | Percent Remaining | Year 2002 Production | Year 2002 R/P |
|--|------------------|-----------------------|-----------------------|-------------------|----------------------|---------------|
| Conventional Liquids Resources Discovered to End-2002 (includes developed Alberta oil sands and Orinoco extra-heavy oil) | 2,139,249 | 985,057 | 1,154,192 | 54.0% | 26,721 | 43 |
| Alberta Bitumen Undeveloped (million barrels) | 168,000 | 0 | 168,000 | 100.0% | 0 | n/a |
| Orinoco Undeveloped (million barrels) | 236,000 | 0 | 236,000 | 100.0% | 0 | n/a |
| Total Liquids (million barrels) | 2,543,249 | 985,057 | 1,558,192 | 61.3% | 26,721 | 58 |
| Natural Gas (billion std cubic feet) | 9,631,532 | 2,873,246 | 6,758,286 | 70.2% | 97,590 | 69 |

Remaining World Hydrocarbon Resources

Depletion

The extent to which a non-renewable resource has already been used as a result of production and consumption.

In this instance -

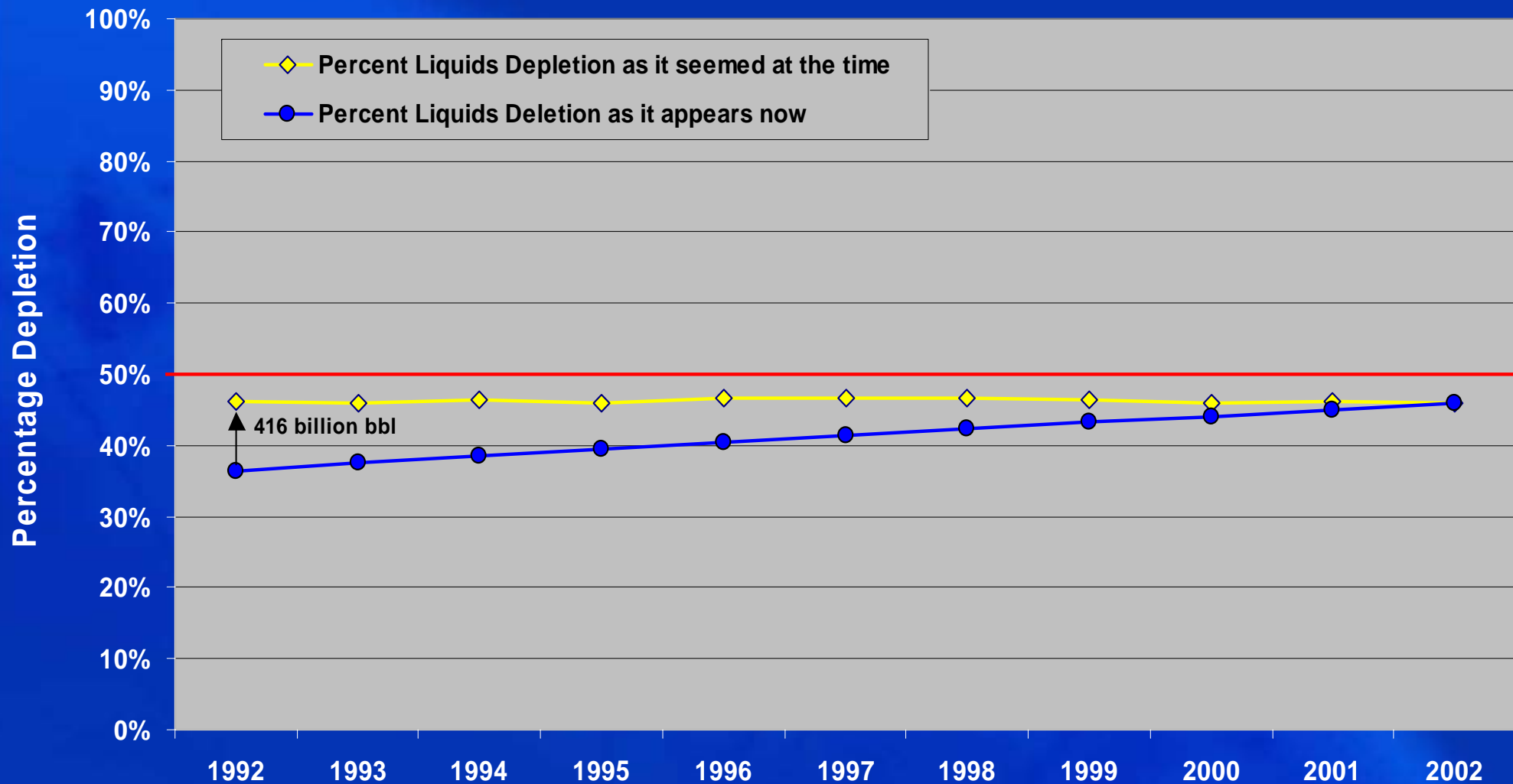
Cumulative Production (liquids or gas)

_____ %

Resources Discovered To Date (liquids or gas)

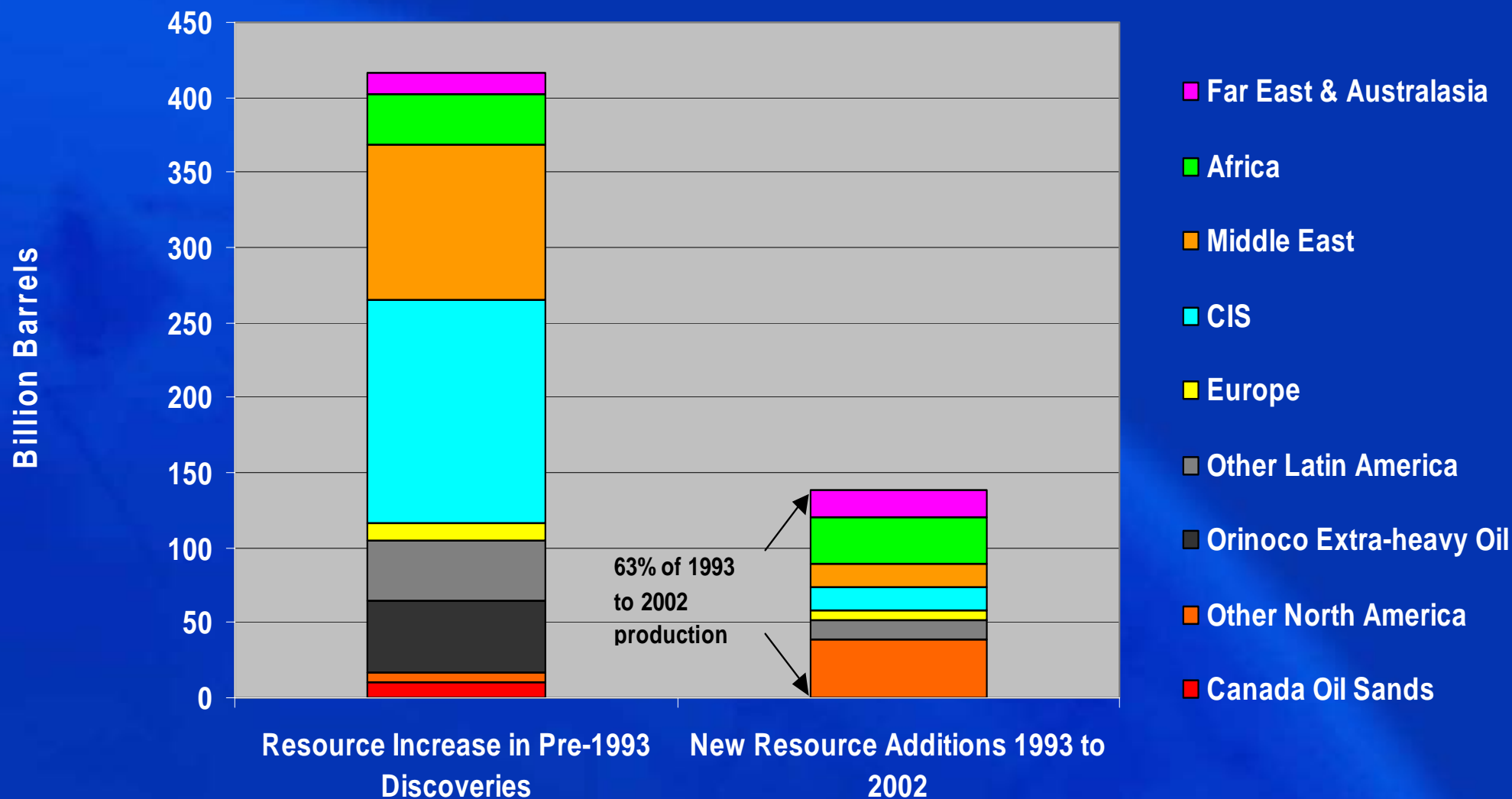
Remaining World Hydrocarbon Resources

Liquids Depletion as it Appeared at Each Year-End versus
Liquids Depletion as it Appeared at End-2002



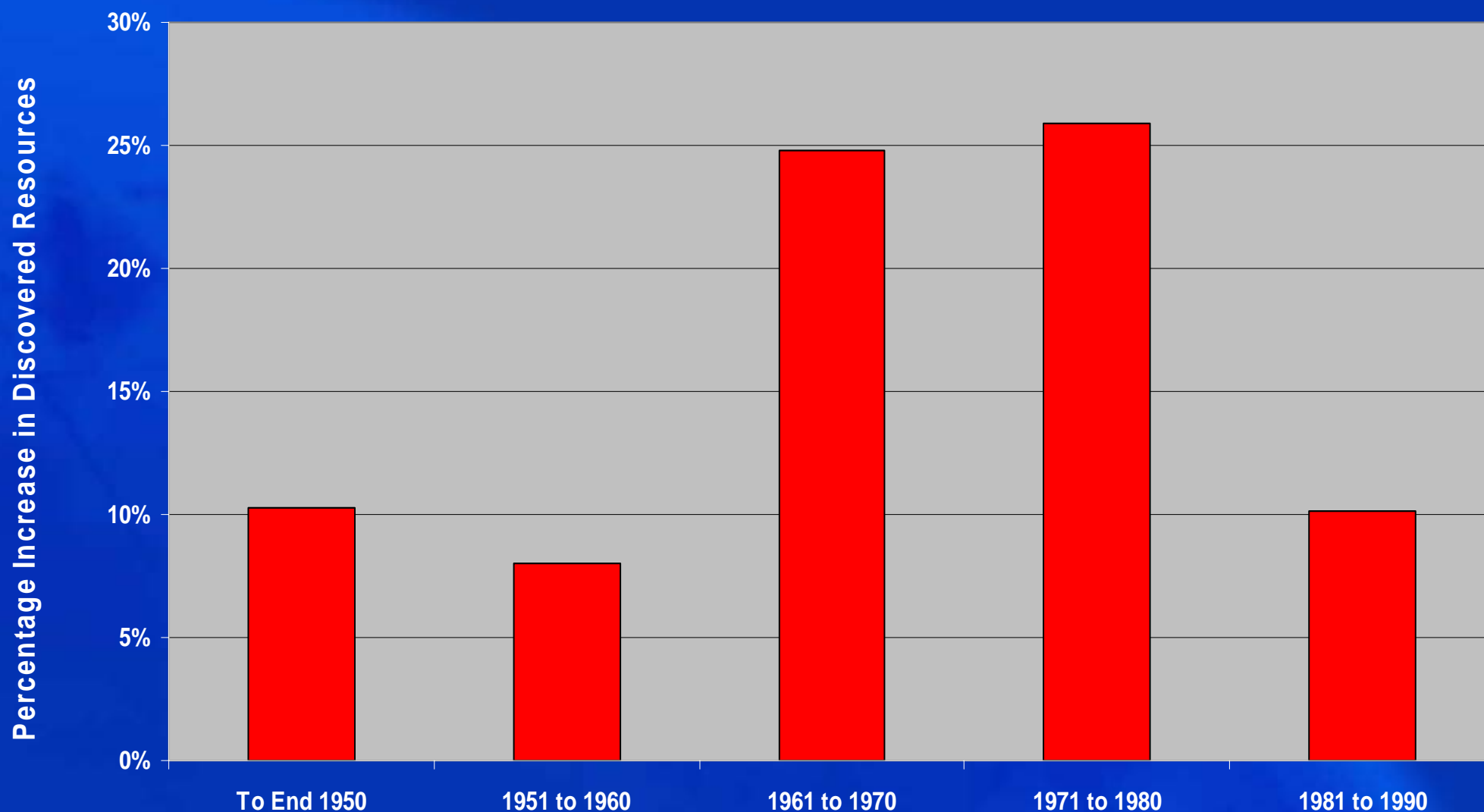
Remaining World Hydrocarbon Resources

Source of Increase in Resources of pre-1993 Discoveries
Compared with New Resource Additions Between 1993 and 2002



Remaining World Hydrocarbon Resources

Percentage Growth in Discovered Resources between 1992 and 2002 by Period of Discovery (World excluding North America, CIS and Orinoco)



Remaining World Hydrocarbon Resources

Reserves Growth

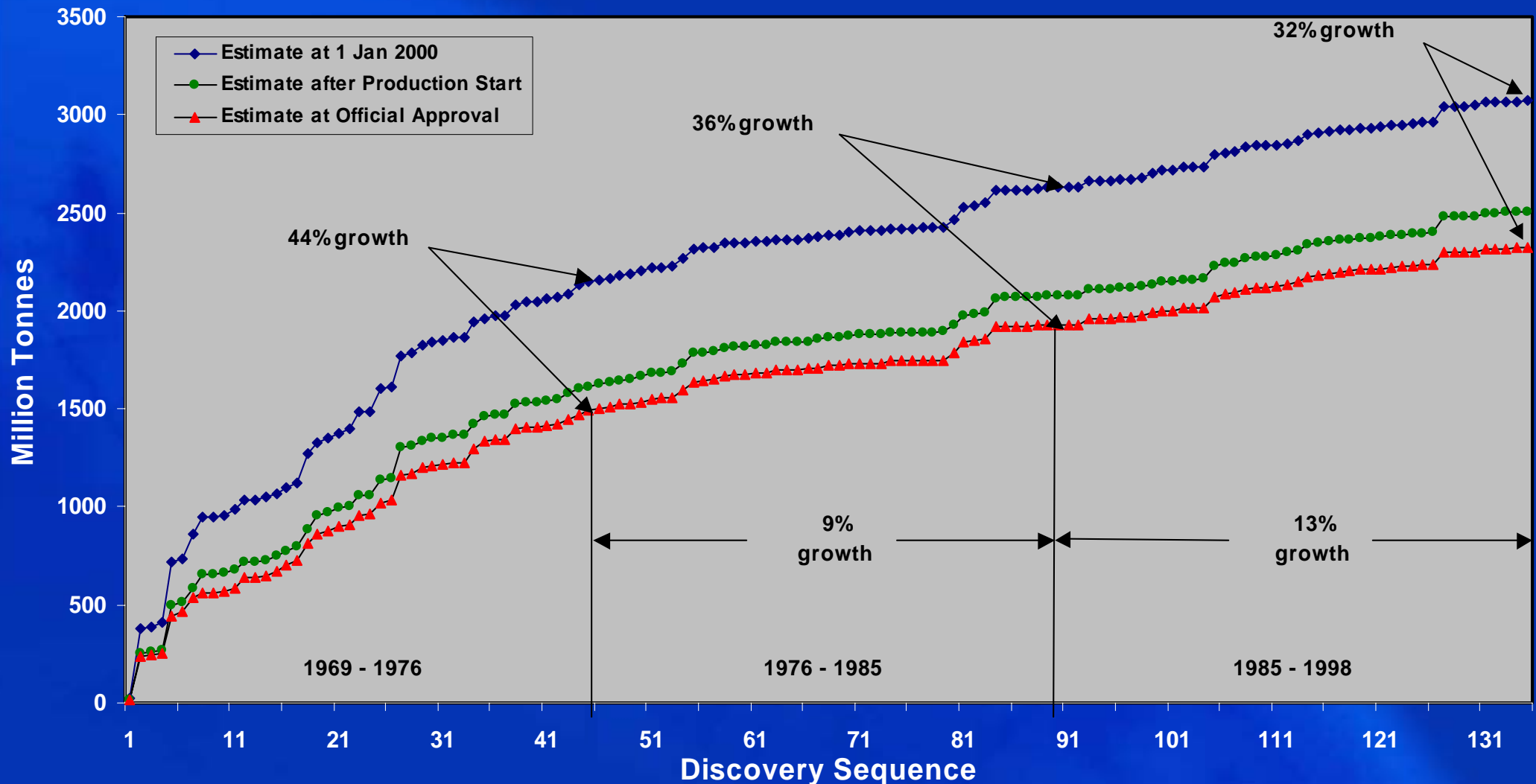
- Also known as “field growth”, this term describes the increase in in-place and, especially, recoverable resources that commonly occurs over time, as oil and gas fields are developed and produced.

Mechanisms

- Improved technology
- New-pool discoveries
- Field micro-management
- Commodity price

Remaining World Hydrocarbon Resources

Cumulative Liquid Reserves versus Discovery Sequence: Producing / Developing Fields of UK Continental Shelf



Remaining World Hydrocarbon Resources

Reserves-to-Production Ratios

with Extra-Heavy Oil and Oil Sands, and Resource Growth

| Year 2002 Reserves to Production Ratios | Remaining Recoverable | Remaining Recoverable with Resource Growth |
|--|----------------------------------|---|
| Conventional Liquids Resources (includes developed Alberta oil sands and Orinoco extra-heavy oil) | 43 | 55 |
| Alberta Bitumen Undeveloped | n/a | n/a |
| Orinoco Undeveloped | n/a | n/a |
| Total Liquids | 58 | 76 |
| Natural Gas | 69 | 78 |

Remaining World Hydrocarbon Resources

Conventional, with Extra-Heavy Oil and Oil Sands,
And Resource Growth

| | Cumulative Production | Remaining Recoverable with Resource Growth | Percent Remaining | Year 2002 Production | Year 2002 R/P |
|---|--------------------------|--|----------------------|-------------------------|------------------|
| Conventional Liquids Resources (includes developed Alberta oil sands and Orinoco extra-heavy oil) | 985,057 | 1,456,750 | 59.7% | 26,721 | 55 |
| Alberta Bitumen Undeveloped (million barrels) | 0 | 304,250 | 100.0% | 0 | n/a |
| Orinoco Undeveloped (million barrels) | 0 | 271,500 | 100.0% | 0 | n/a |
| Total Liquids (million barrels) | 985,057 | 2,032,500 | 67.4% | 26,721 | 76 |
| Natural Gas (billion std cubic feet) | 2,873,246 | 7,565,500 | 72.5% | 97,590 | 78 |

Remaining World Hydrocarbon Resources

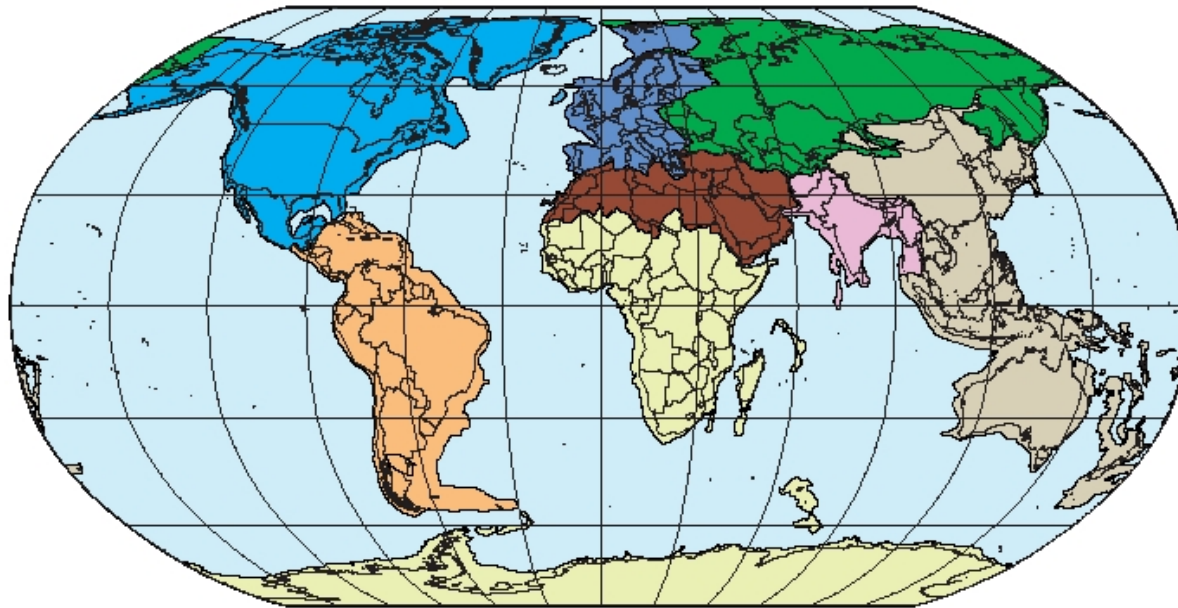
Undiscovered Hydrocarbons ("Yet-to-Find")

Data Source: United States Geological Survey



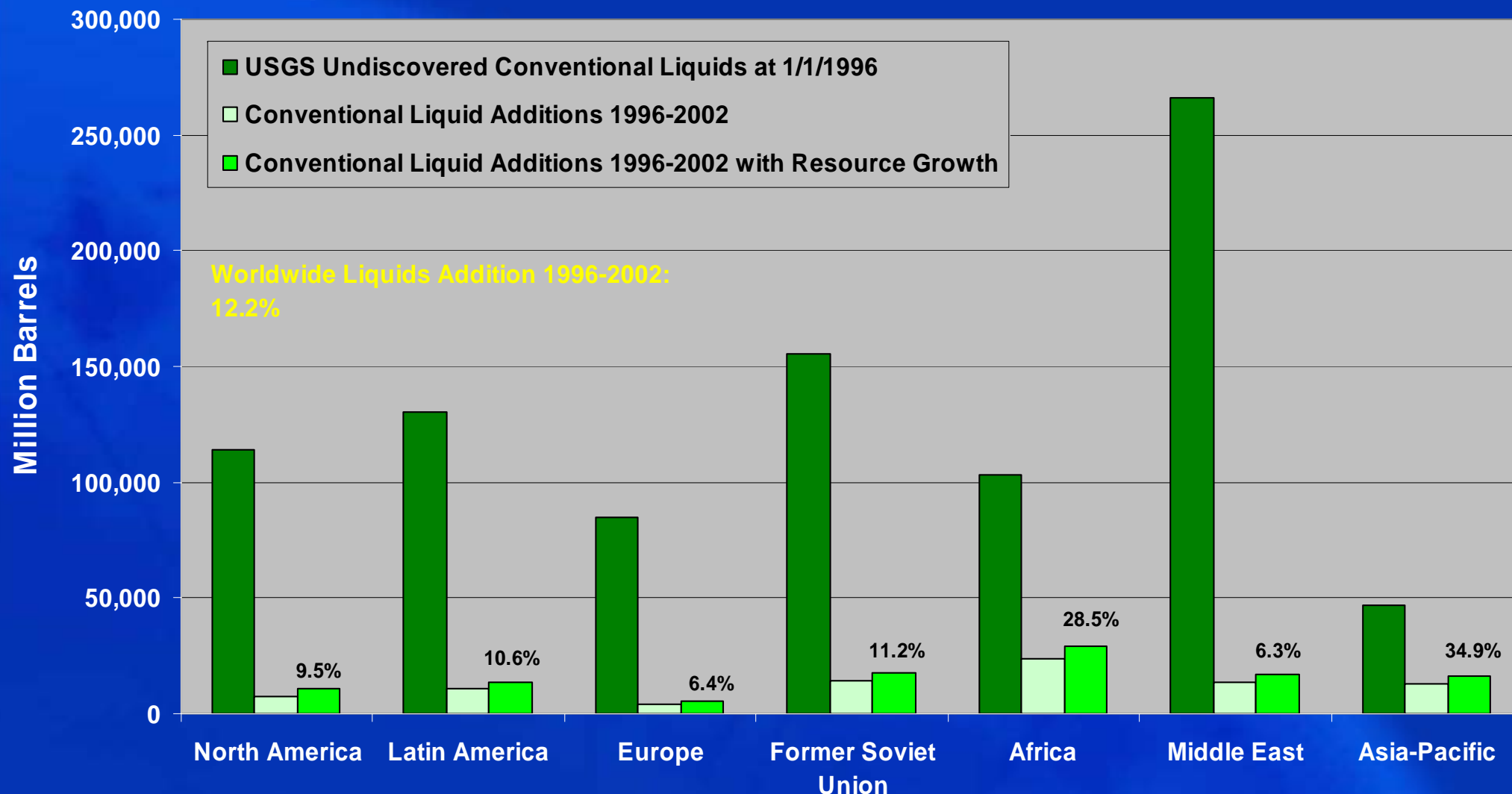
**U.S. GEOLOGICAL SURVEY WORLD PETROLEUM ASSESSMENT 2000—
DESCRIPTION AND RESULTS**
BY USGS WORLD ENERGY ASSESSMENT TEAM

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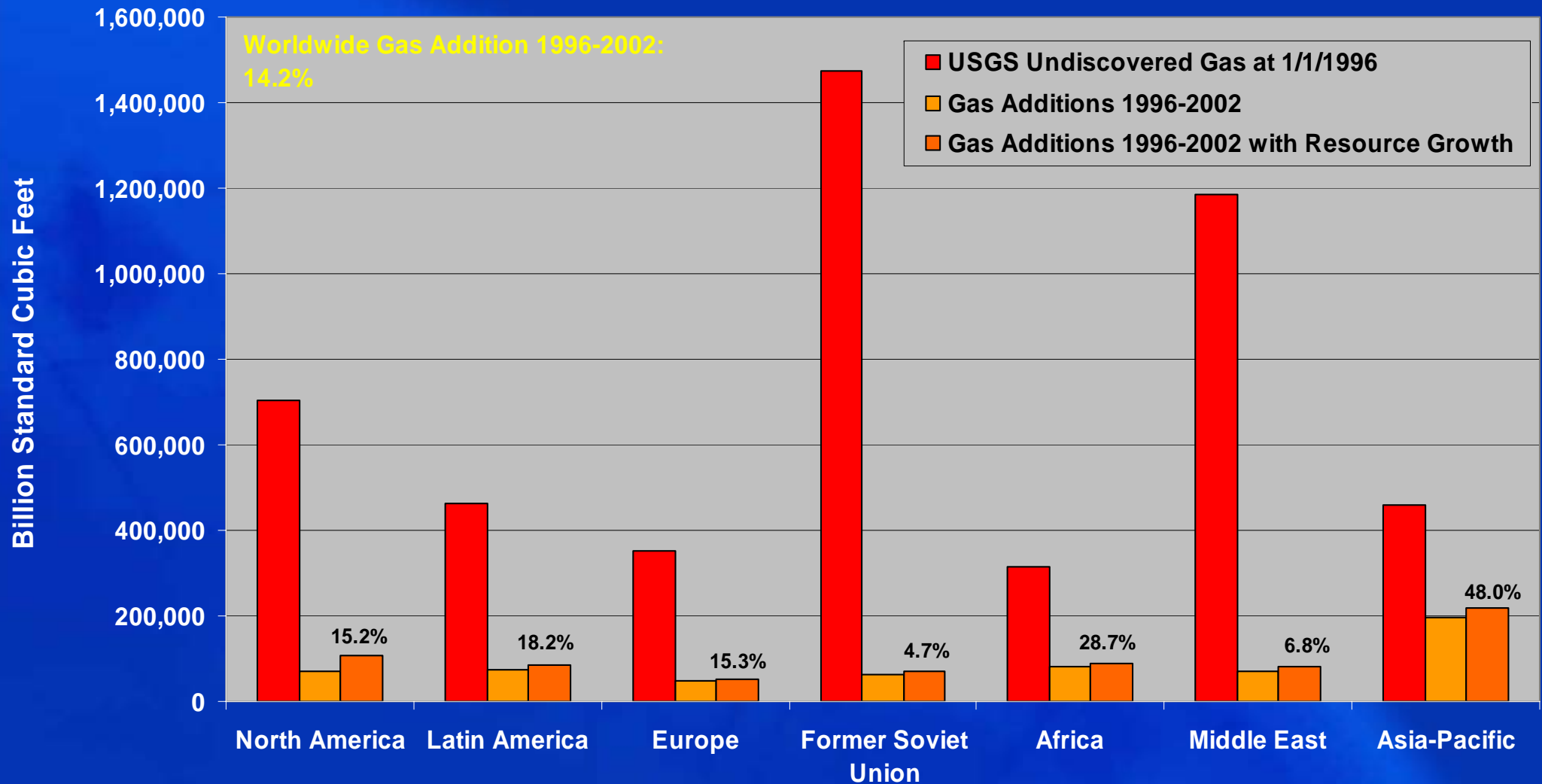
Remaining World Hydrocarbon Resources

USGS Estimate of Undiscovered Liquids at 1 Jan 1996 versus
Liquids Discovered between 1st Jan 1996 and 31st Dec 2002



Remaining World Hydrocarbon Resources

USGS Estimate of Undiscovered Gas at 1 Jan 1996 versus
Gas Discovered between 1st Jan 1996 and 31st Dec 2002



Remaining World Hydrocarbon Resources

Reserves-to-Production Ratios
with Extra-Heavy Oil and Oil Sands, Resource Growth
and Yet-to-Find

| Year 2002 Reserves to Production Ratios | Remaining Recoverable | Remaining Recoverable with Resource Growth | Remaining Recoverable with Resource Growth and Yet-to-Find |
|---|-----------------------|--|--|
| Conventional Liquids Resources (includes developed Alberta oil sands and Orinoco extra-heavy oil) | 43 | 55 | 84 |
| Alberta Bitumen Undeveloped | n/a | n/a | n/a |
| Orinoco Undeveloped | n/a | n/a | n/a |
| Total Liquids | 58 | 76 | 106 |
| Natural Gas | 69 | 78 | 121 |

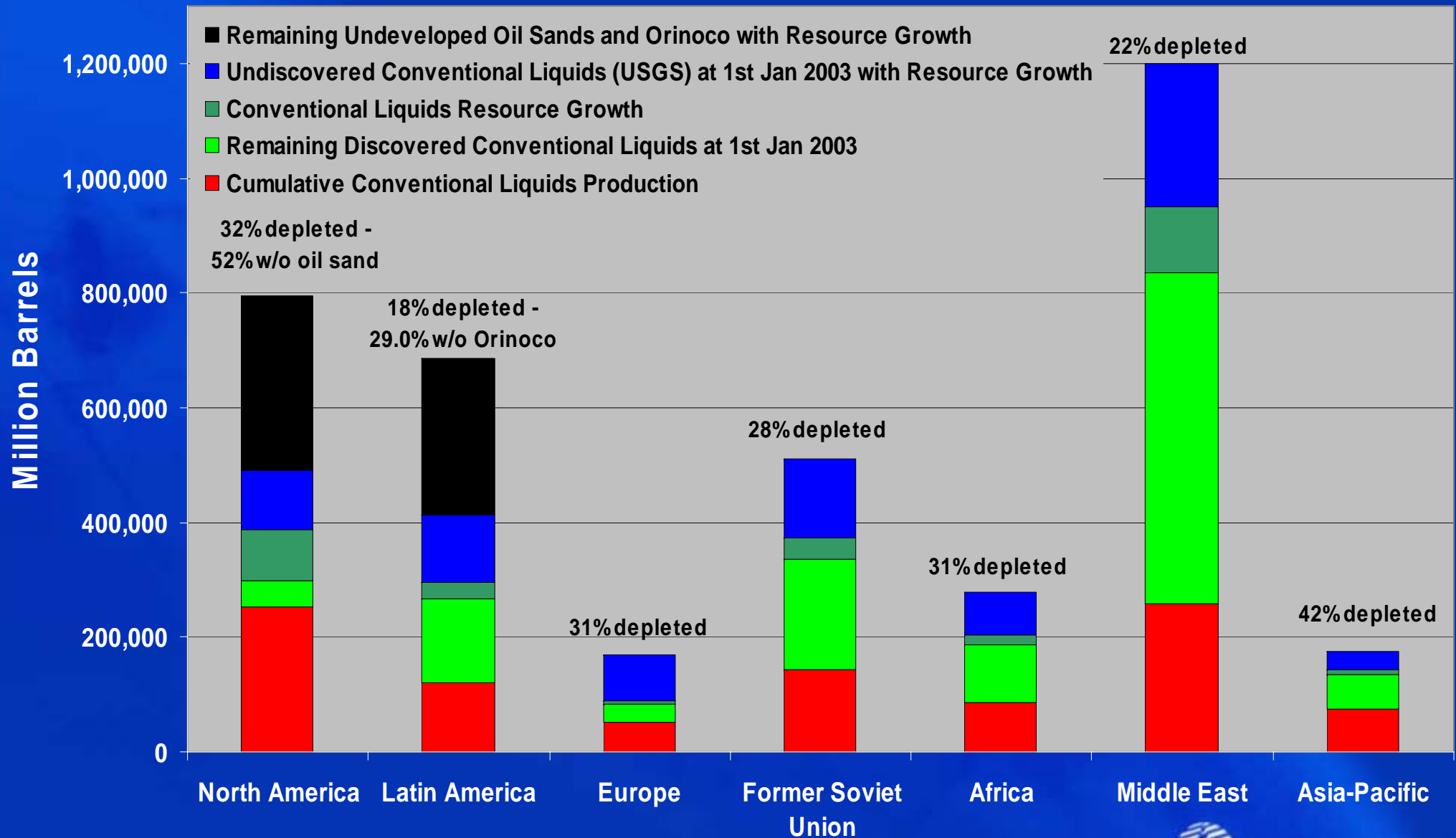
Remaining World Hydrocarbon Resources

Conventional, with Extra-Heavy Oil and Oil Sands,
Resource Growth and Yet-to-Find

| NB: data are rounded | Cumulative Production | Remaining Recoverable with Resource Growth and Yet-to-Find | Percent Remaining | Year 2002 Production | Year 2002 R/P |
|---|--------------------------|---|----------------------|-------------------------|------------------|
| Conventional Liquids Resources (includes developed Alberta oil sands and Orinoco extra-heavy oil) | 985,057 | 2,250,000 | 69.6% | 26,721 | 84 |
| Alberta Bitumen Undeveloped (million barrels) | 0 | 304,250 | 100.0% | 0 | n/a |
| Orinoco Undeveloped (million barrels) | 0 | 271,500 | 100.0% | 0 | n/a |
| Total Liquids (million barrels) | 985,057 | 2,825,000 | 74.1% | 26,721 | 106 |
| Natural Gas (billion std cubic feet) | 2,873,246 | 11,800,000 | 80.4% | 97,590 | 121 |

Remaining World Hydrocarbon Resources

Produced and Remaining Liquids Resources
(Including Reserves Growth, Oil Sands / Extra-heavy Oil and Yet-to-Find)



Remaining World Hydrocarbon Resources

| Liquids Resources (million barrels) | Total Discovered | Cumulative Production | Remaining Recoverable | Percent Depletion | Year 2002 Production | Year 2002 R/P |
|---|---------------------|--------------------------|--------------------------|----------------------|-------------------------|------------------|
| Conventional Liquids Resources Discovered to End-2002 (includes developed Alberta oil sands and Orinoco extra-heavy oil) | 2,139,249 | 985,057 | 1,154,192 | 46.0% | 26,721 | 43 |
| Alberta Bitumen Undeveloped | 168,000 | 0 | 168,000 | 0.0% | 0 | n/a |
| Orinoco Undeveloped | 236,000 | 0 | 236,000 | 0.0% | 0 | n/a |
| Total Discovered Liquids | 2,543,249 | 985,057 | 1,558,192 | 38.7% | 26,721 | 58 |
| Total Discovered Liquids with "Resource Growth" | | | 2,032,500 | 32.6% | | 76 |
| Total Discovered Liquids with "Resource Growth" and Remaining USGS "Yet-to-Find" | | | 2,825,000 | 25.9% | | 106 |
| Natural Gas Resources (billion standard cubic feet) | | | | | | |
| Natural Gas Resources Discovered to End-2002 | 9,631,532 | 2,873,246 | 6,758,286 | 29.8% | 97,590 | 69 |
| Total Discovered Gas with "Resource Growth" | | | 7,565,000 | 27.5% | | 78 |
| Total Discovered Gas with "Resource Growth" and Remaining USGS "Yet-to-Find" | | | 11,800,000 | 19.6% | | 121 |