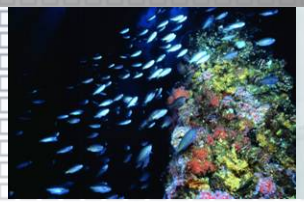
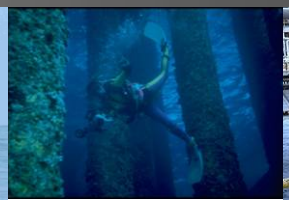
# Minerals Management Service

## Future Natural Gas Supply from the Federal OCS

## June 16, 2008

*safe operations* *environmental protection* *fair value*



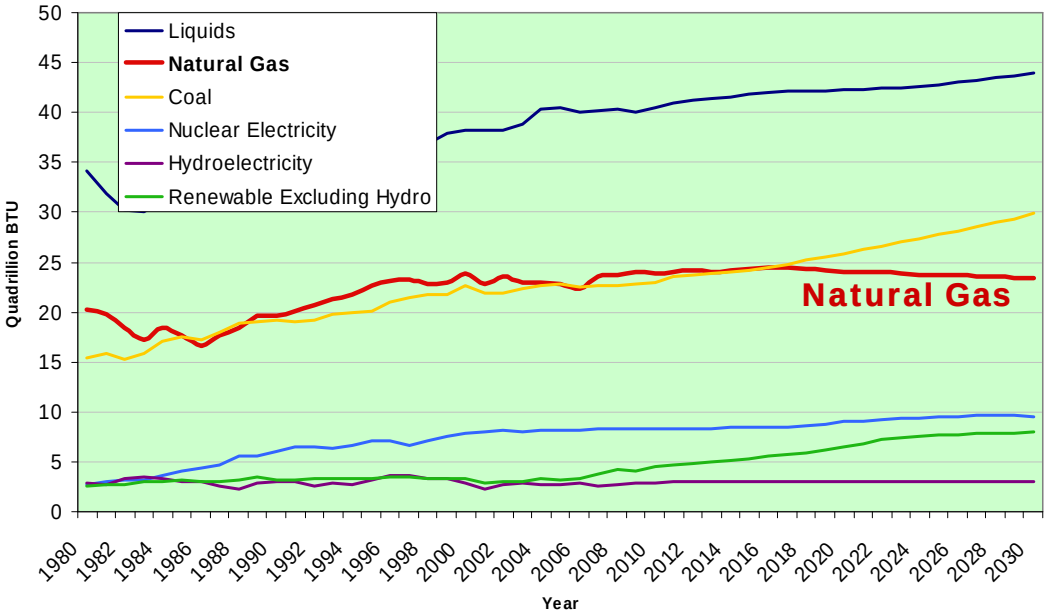




*Securing Ocean Energy and Economic Value for America*

www.mms.gov

# U.S. Natural Gas Consumption

- The DOE-EIA expects annual U.S. natural gas consumption to remain nearly constant through 2030 at the 2008 level of about 23 tcfg per year.




From EIA 2008

***What role can the Federal OCS be expected to play in meeting the continuing demands of the Nation for natural gas?***

# Outline

- MMS Mission and Statistics
- OCS Gas Resources, Reserves, and Production
- OCS Activities
- OCS Areas Off-Limits to Development
- Potential Sources of OCS Gas
- Conclusions

# *MMS* Mission

*To manage the energy and mineral resources on the Outer Continental Shelf (OCS) in an environmentally sound and safe manner and to collect, verify, and distribute mineral revenues from Federal and Indian lands in a timely manner*

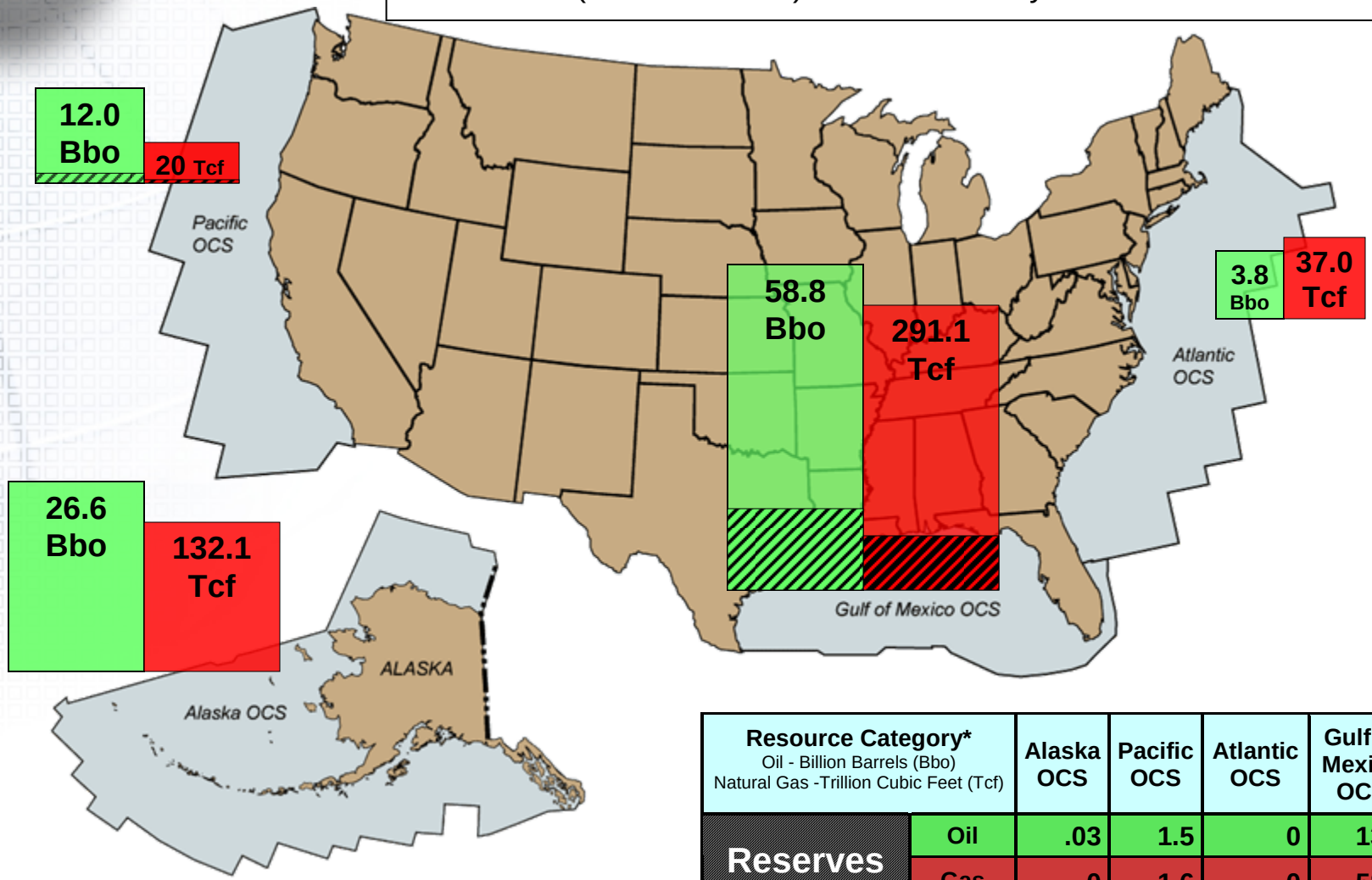
# Offshore Minerals Management

- Responsible for 1.76 billion OCS acres
  - Lease issuance to decommission
- Day-to-Day
  - ~8,000 leases
  - ~43 million acres leased
  - ~27% of oil; ~15% natural gas
  - ~4,000 production platforms
  - ~33,000 miles of pipeline
  - ~42,000 OCS personnel
  - ~125 operating companies
- ~$8 billion annual revenue

(FY08 already has over $9 billion from bonus bids in recent lease sales alone)

# OCS Hydrocarbon Potential

16 Bbo and 170 Tcf of gas produced since 1954. Significant potential remains as reserves (in known fields) or resources in yet-to-be discovered fields



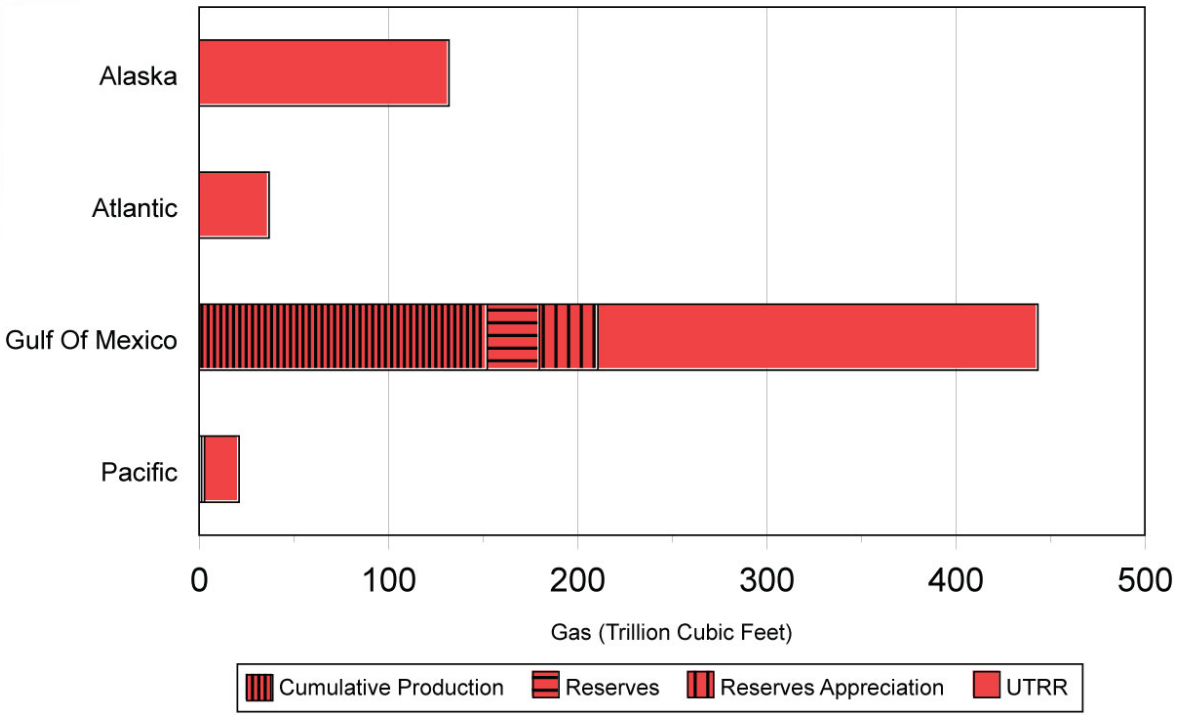

**MMS National Assessment, 2006**

* **Undiscovered Technically Recoverable Resources**
**Reserves and Reserves Appreciation**

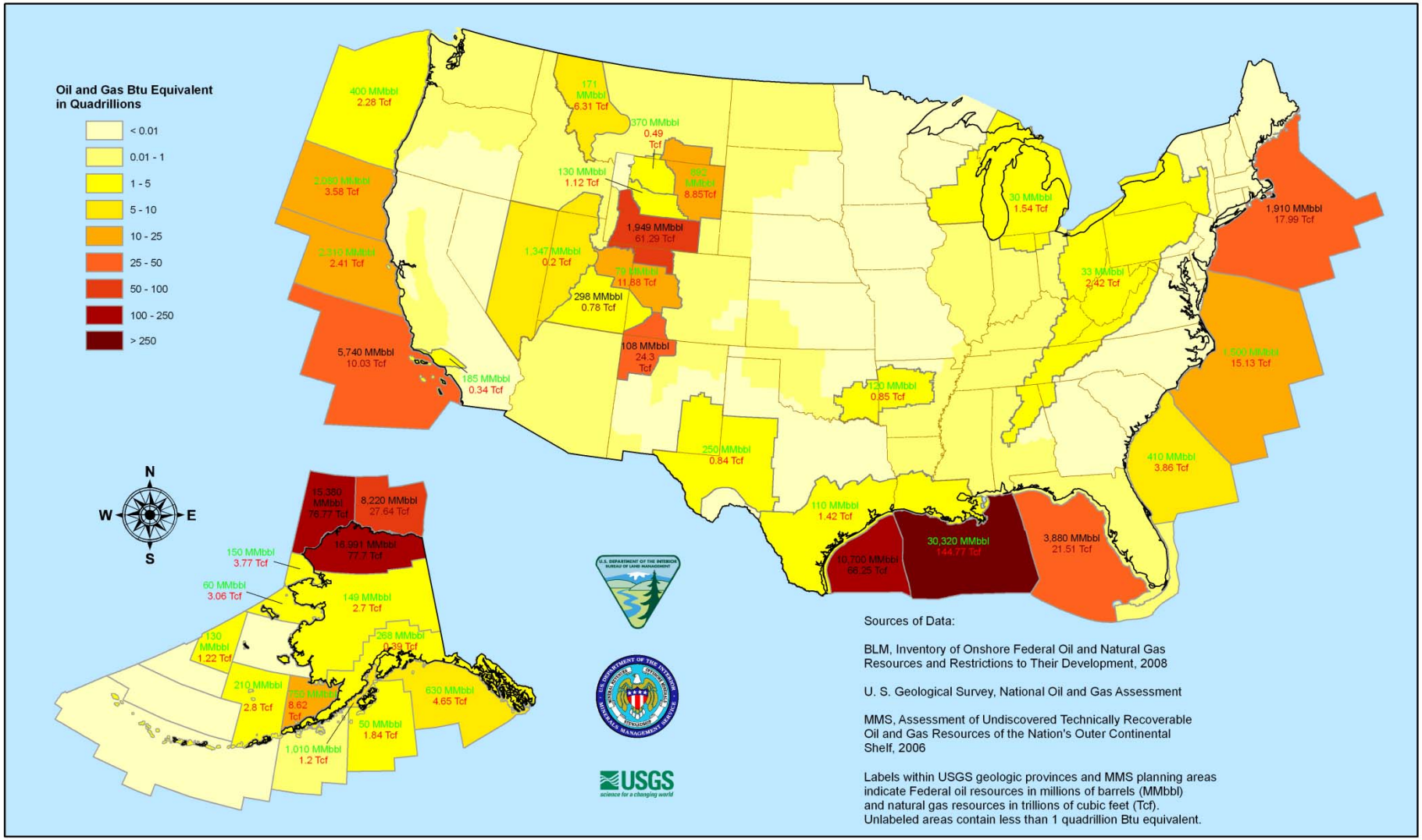
| Resource Category* Oil - Billion Barrels (Bbo) Natural Gas -Trillion Cubic Feet (Tcf) | | Alaska OCS | Pacific OCS | Atlantic OCS | Gulf of Mexico OCS | Total OCS |
|---|---|---|---|---|---|---|
| Reserves | Oil | .03 | 1.5 | 0 | 13.9 | 15.4 |
| | Gas | 0 | 1.6 | 0 | 58.6 | 60.2 |
| Resources | Oil | 26.6 | 10.5 | 3.8 | 44.9 | 85.8 |
| | Gas | 132.1 | 18.3 | 37.0 | 232.5 | 419.9 |

# OCS Gas Resource Base

| | |
|---|---|
| Cumulative Production | 153.6 tcf |
| Reserves (12/2003) | 29.3 tcf |
| Reserves Appreciation | 30.9 tcf |
| UTRR (mean) | 420.0 tcf |
| **Total** | **633.6 tcf** |



# Undiscovered Technically Recoverable Oil and Gas Resources on Federal Lands




Sources of Data:

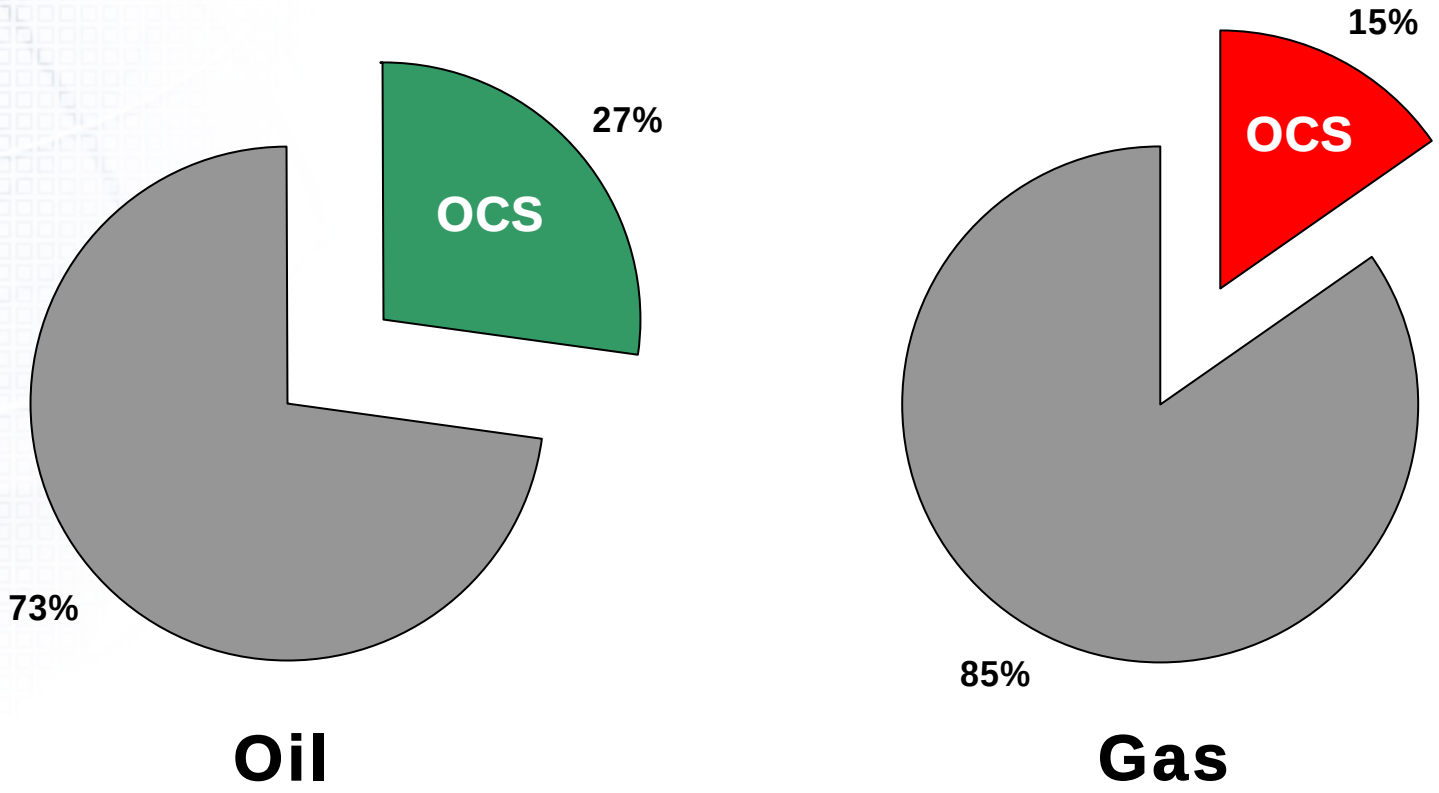
BLM, Inventory of Onshore Federal Oil and Natural Gas Resources and Restrictions to Their Development, 2008

U. S. Geological Survey, National Oil and Gas Assessment

MMS, Assessment of Undiscovered Technically Recoverable Oil and Gas Resources of the Nation's Outer Continental Shelf, 2006

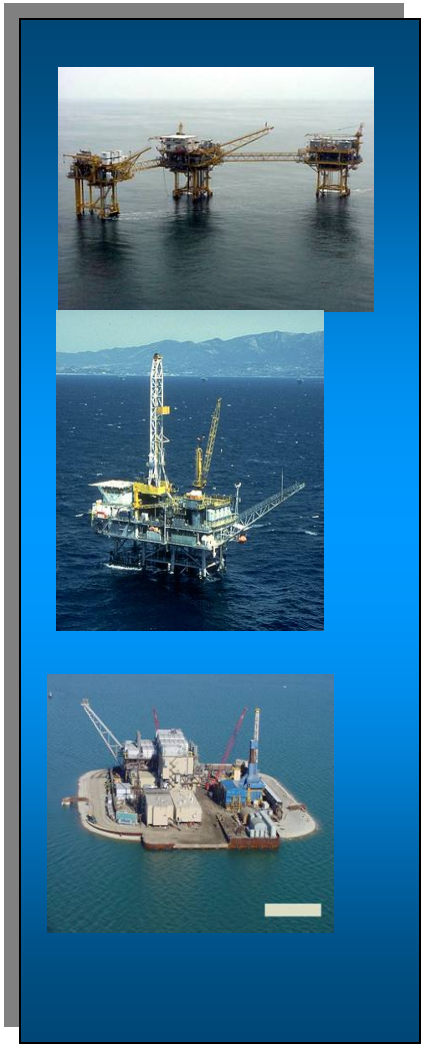
Labels within USGS geologic provinces and MMS planning areas indicate Federal oil resources in millions of barrels (MMbbl) and natural gas resources in trillions of cubic feet (Tcf). Unlabeled areas contain less than 1 quadrillion Btu equivalent.

# OCS Contribution to US Oil and Gas Production

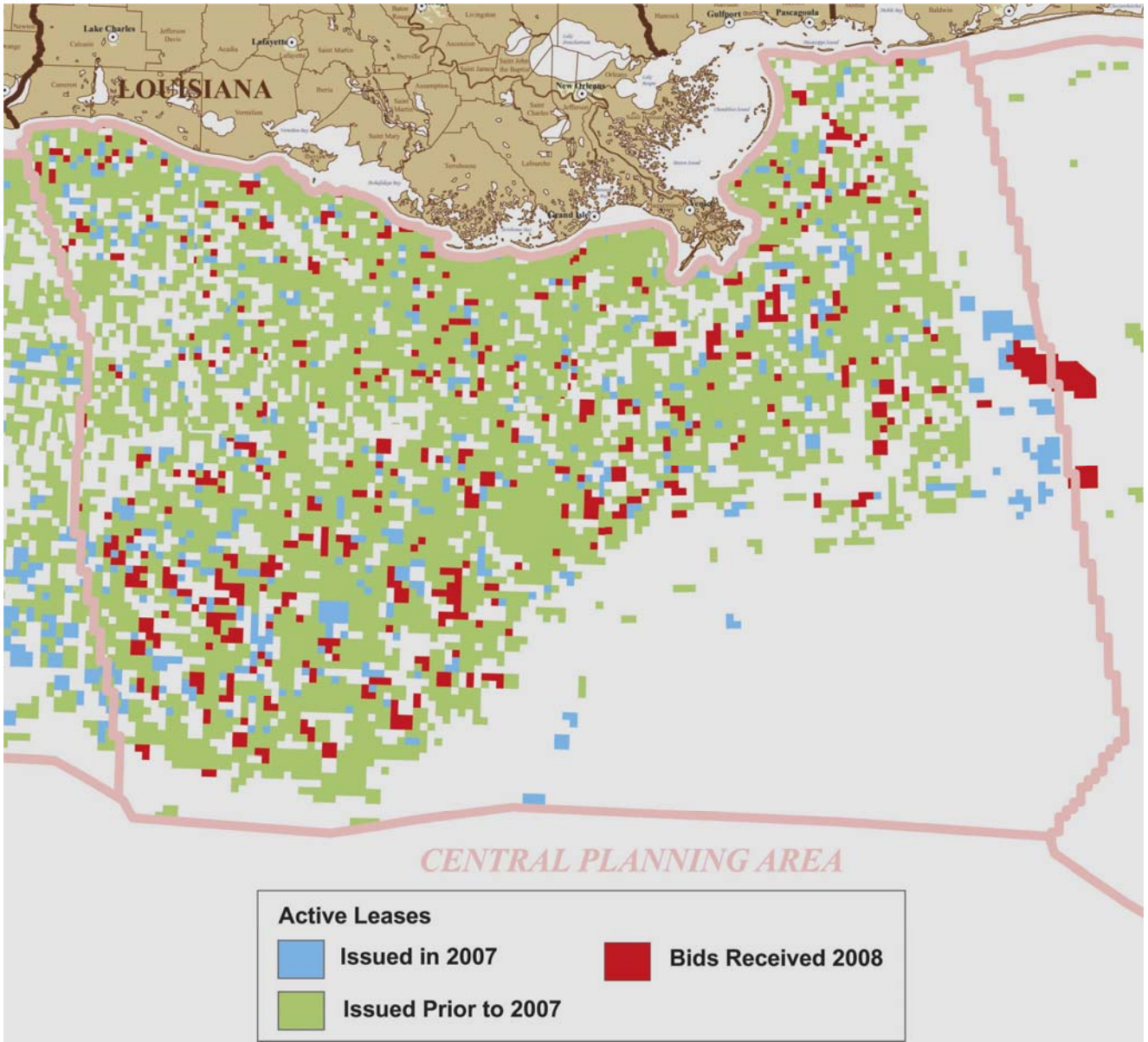


# Offshore Oil & Gas Activity

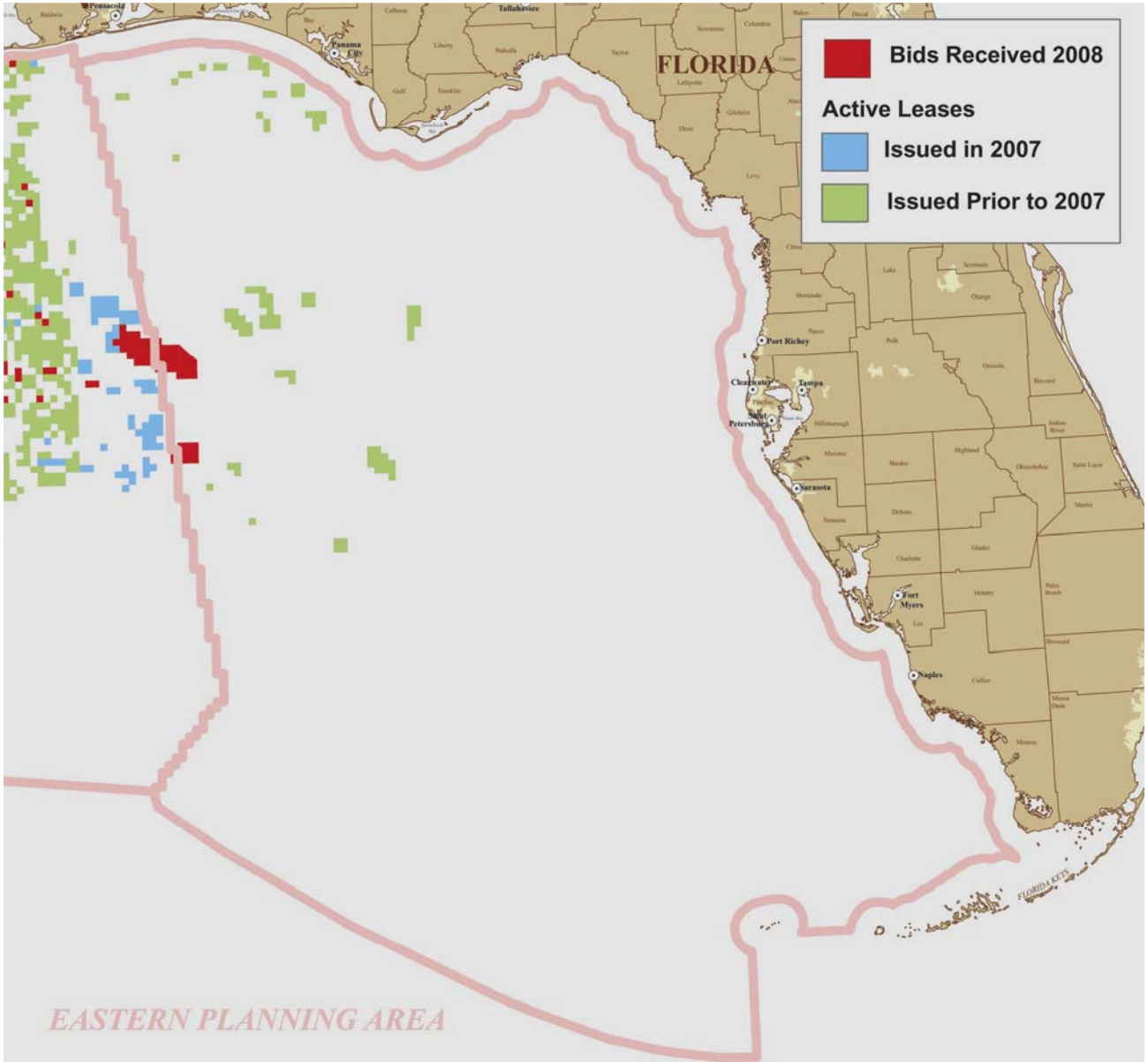
- Gulf of Mexico - **most active**
  - ~ 7,900 leases; ~20% producing
  - Production: ~1.4 million bopd; 7.7 Bcfgpd
- Pacific
  - 79 leases (36 undeveloped); 23 platforms,
  - Production: ~68,000 bopd; 125 MMcfpd
- Alaska
  - 751 leases, 3 producing
  - Northstar ~40,000 bopd (7,100 bopd Federal share)
  - Liberty - development proposal



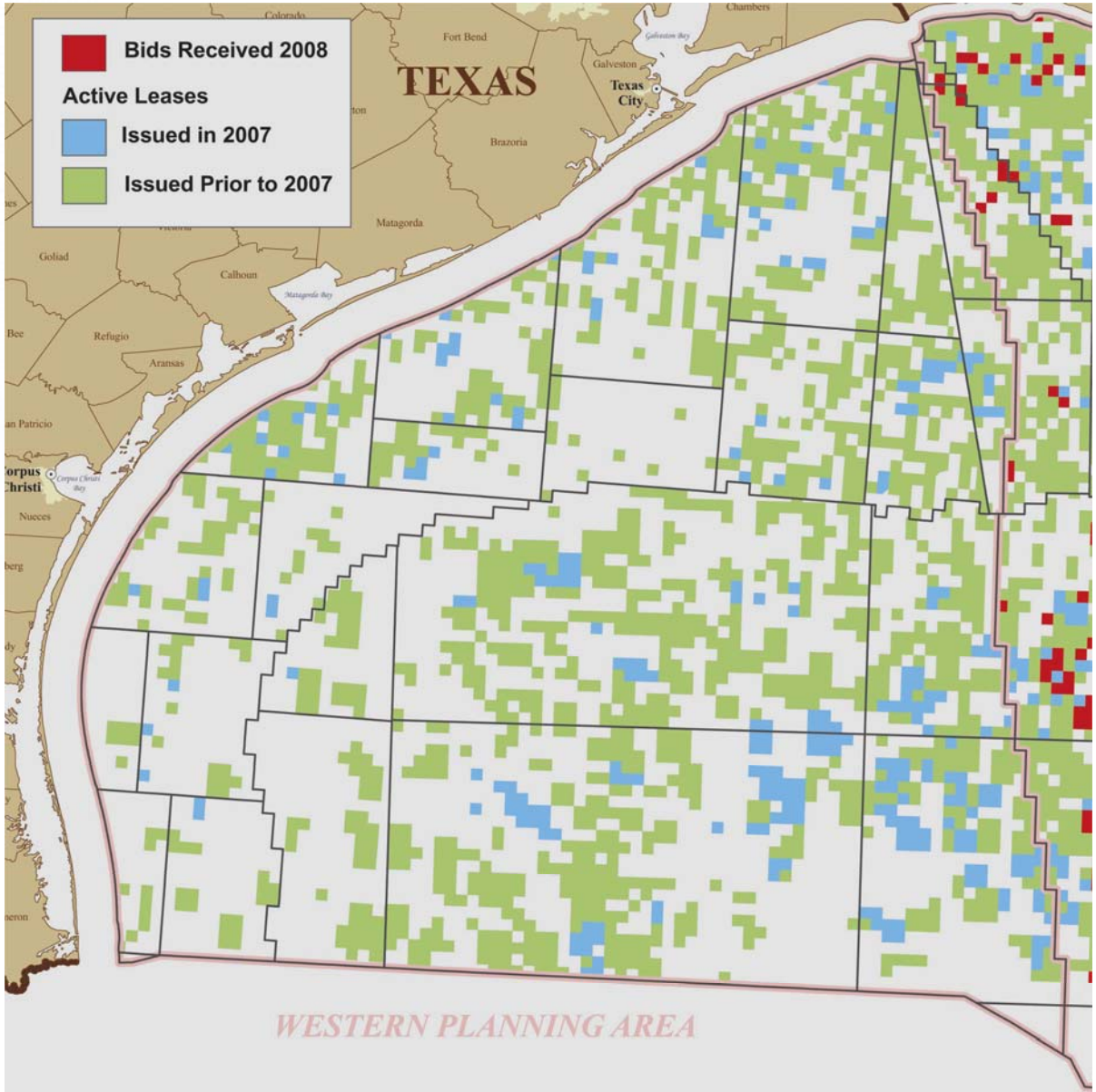
# Central Gulf of Mexico Leases



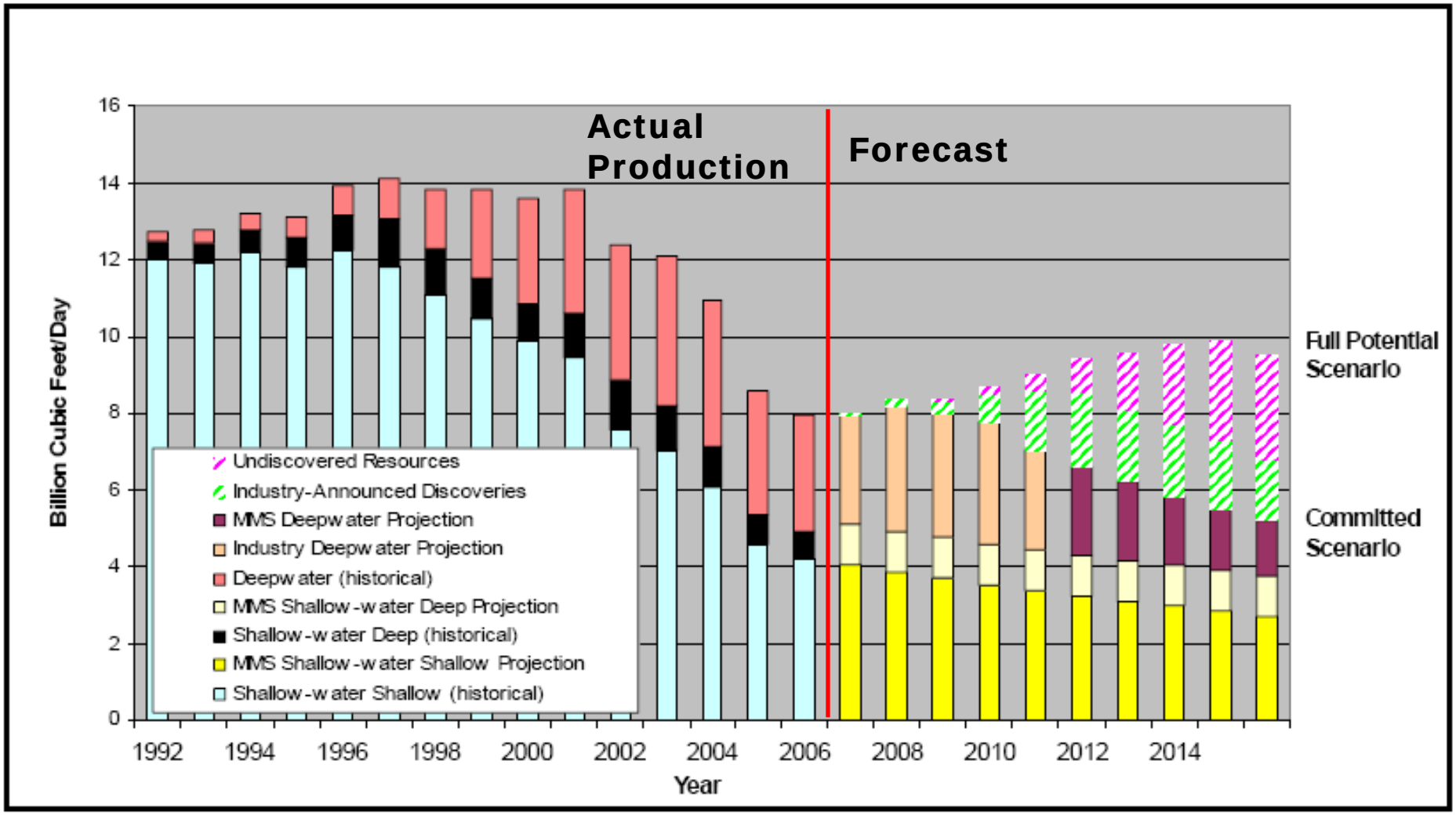
# Eastern Gulf of Mexico Leases



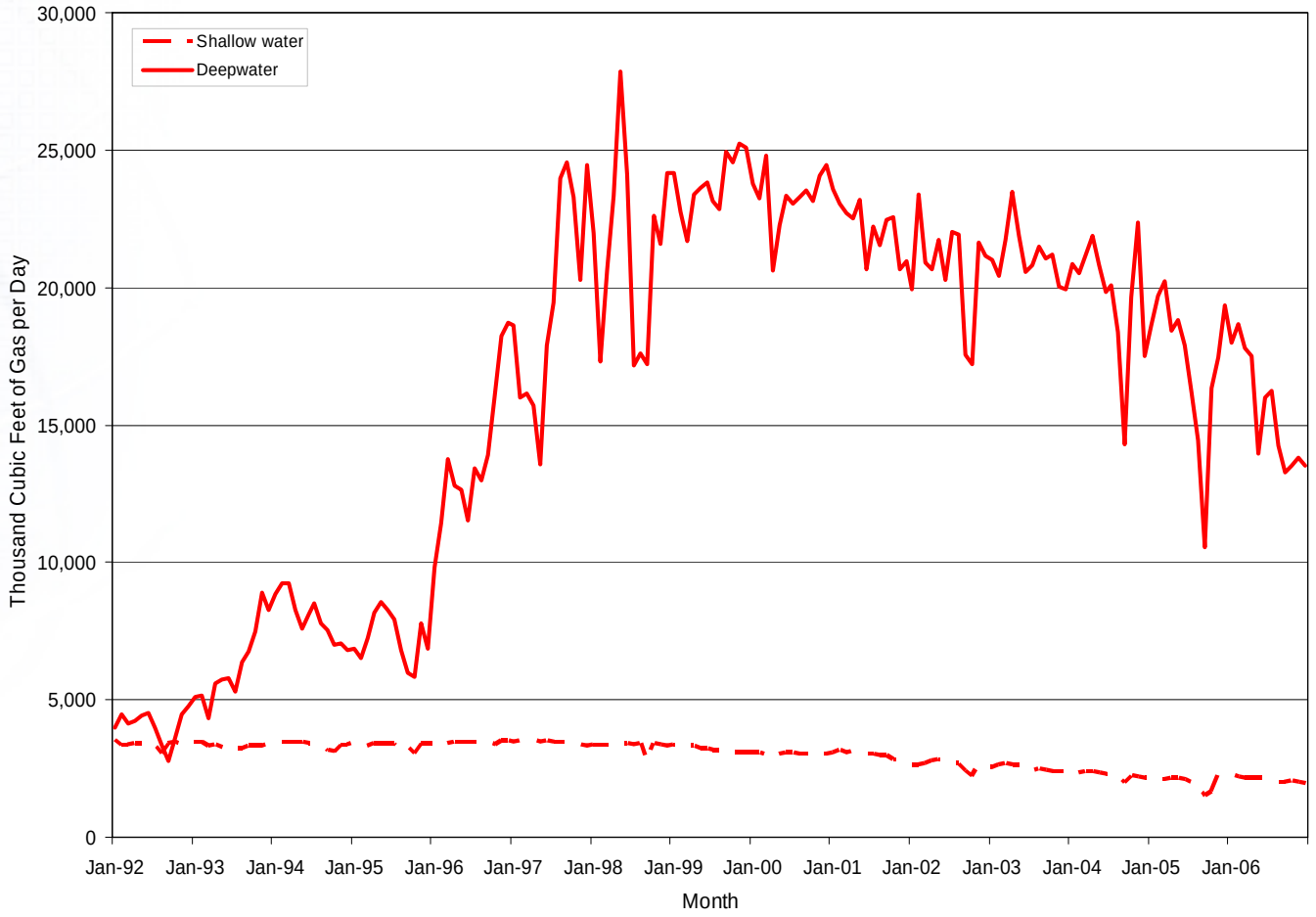
# Western Gulf of Mexico Leases



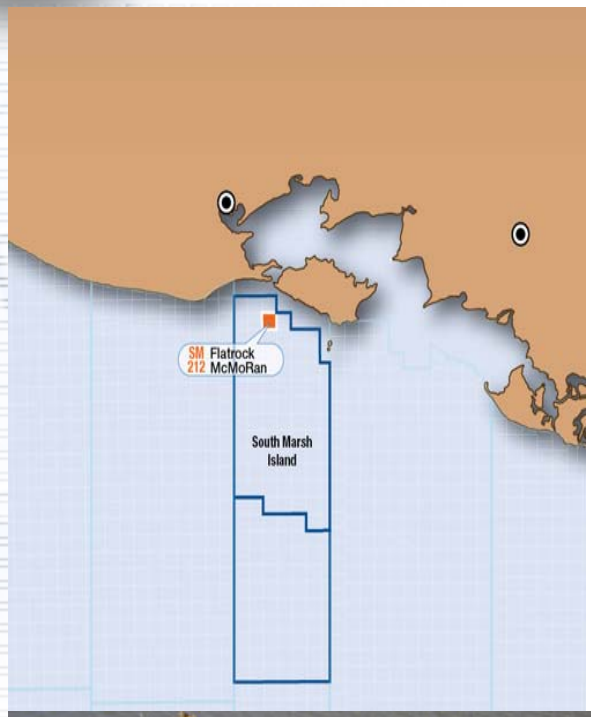
# Gulf of Mexico Gas Production Forecast



# GOM Gas Well Production Rates



# Flatrock Shallow Water Deep Gas Success



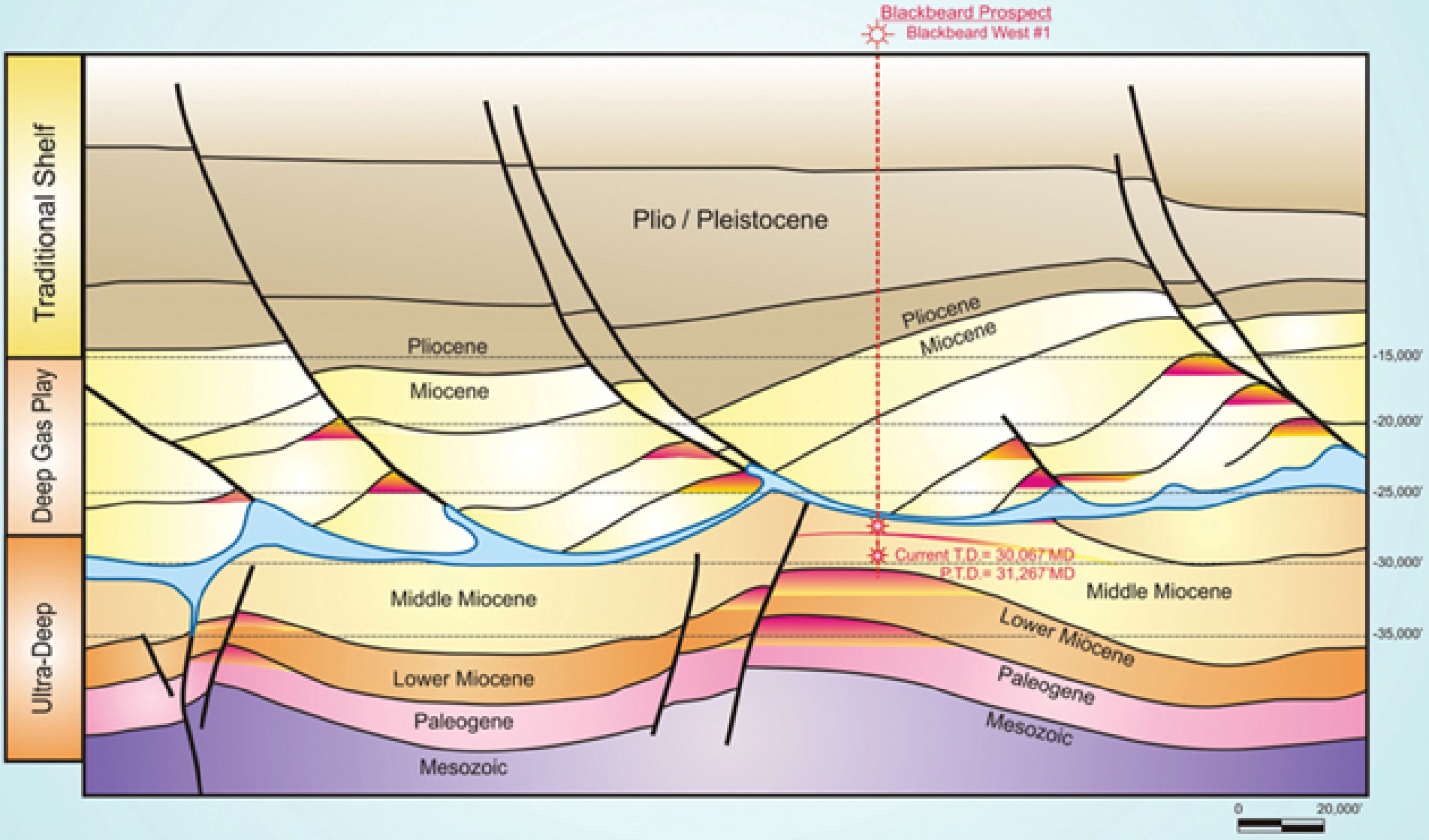

- South Marsh Island Block 212, about 5 miles southwest of Iberia Parish, Louisiana.
- OCS-G Lease 310 (114,601 acres).
- 10 feet of water.
- Well 1: Drilled to 18,400 feet and production began in January 2008 at 50 MMCFED.
- Well 2: Drilled to 17,100 feet (eventually will be 18,100 feet) and production to begin in mid-2008 at a rate of 114 MMCFED.
- Well 3: Sidetracked to 18,175 feet and has encountered 256 feet of net pay.
- Well 4: Drilling is below 13,000 feet with a proposed total depth of 18,500 feet.

# South Timbalier Block 168 Ultra-deep Exploratory Well

- Located in 70 feet of water, about 115 miles southwest of New Orleans.
- Deepest well ever drilled below the mudline in the Gulf of Mexico.
- Formerly known as “Blackbeard West # 1, it was drilled to 30,067 feet by Newfield and abandoned in August 2006 due to higher than expected pressure.

- McMoRan reentered the well on March 18, 2008 and has deepened it to 30,964 feet.
- Well has encountered a potential Miocene hydrocarbon bearing zone, to be further evaluated after deeper drilling.
- Well has been re-permitted to a total depth of 33,000 feet.

# Geologic Model-Deep Shelf 15,000'-30,000'



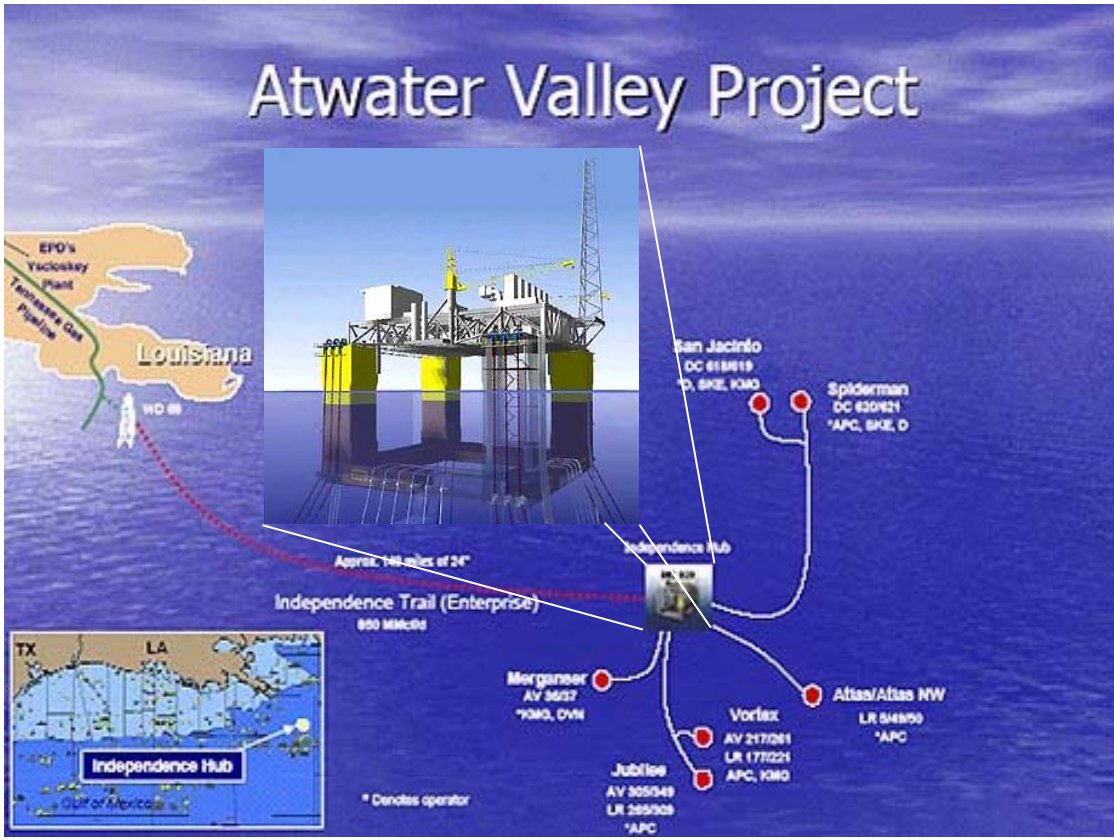
# Independence Hub

- Natural Gas Hub Platform with 1 Bcf/d capacity
- Received first production July 2007
- 134 mile 24” pipeline
- 210 miles of subsea flowlines
- Hub Water depth approximately 8,000 feet

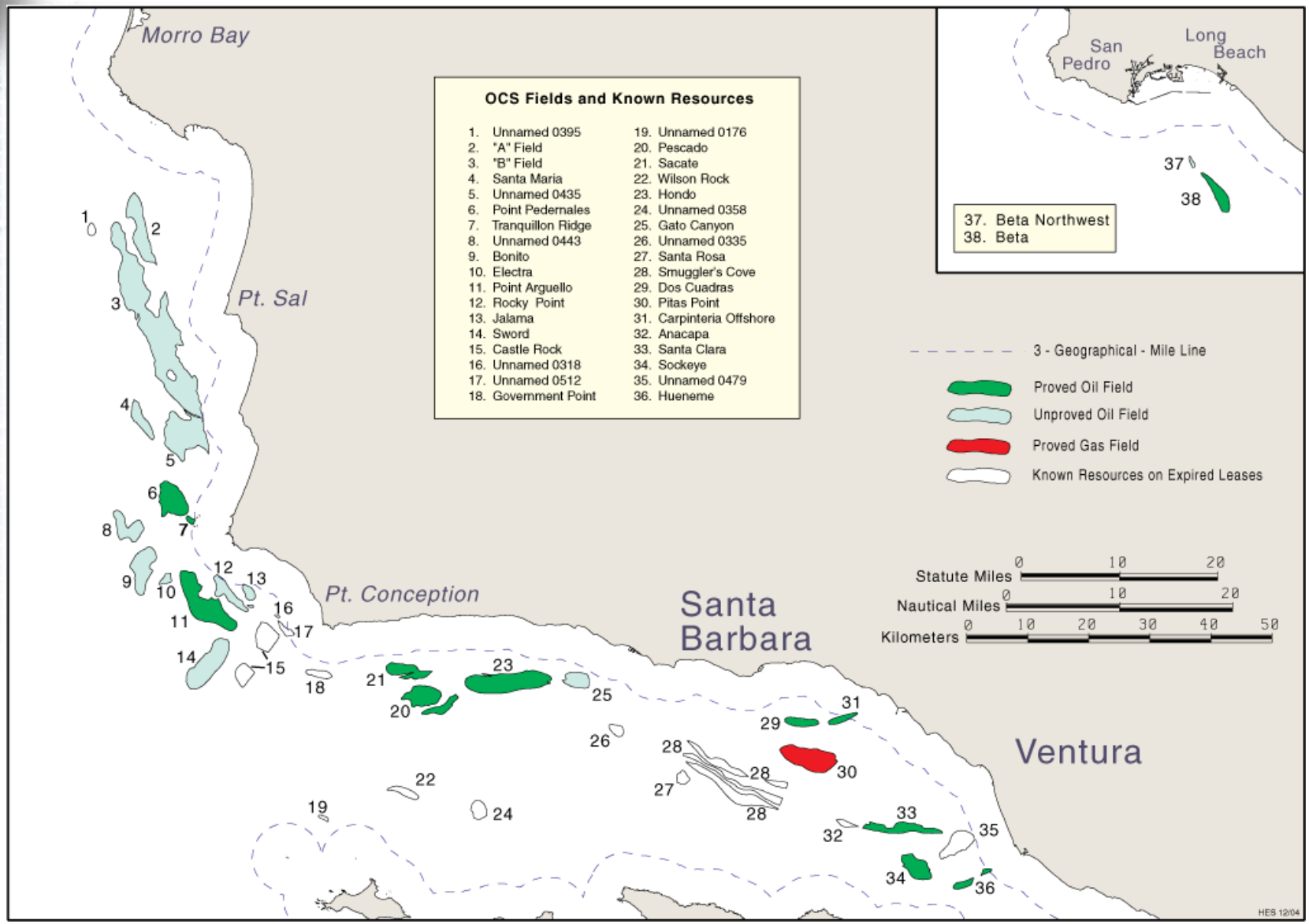
Photo from Enterprise Products Partners L.P. 2008

# Independence Hub

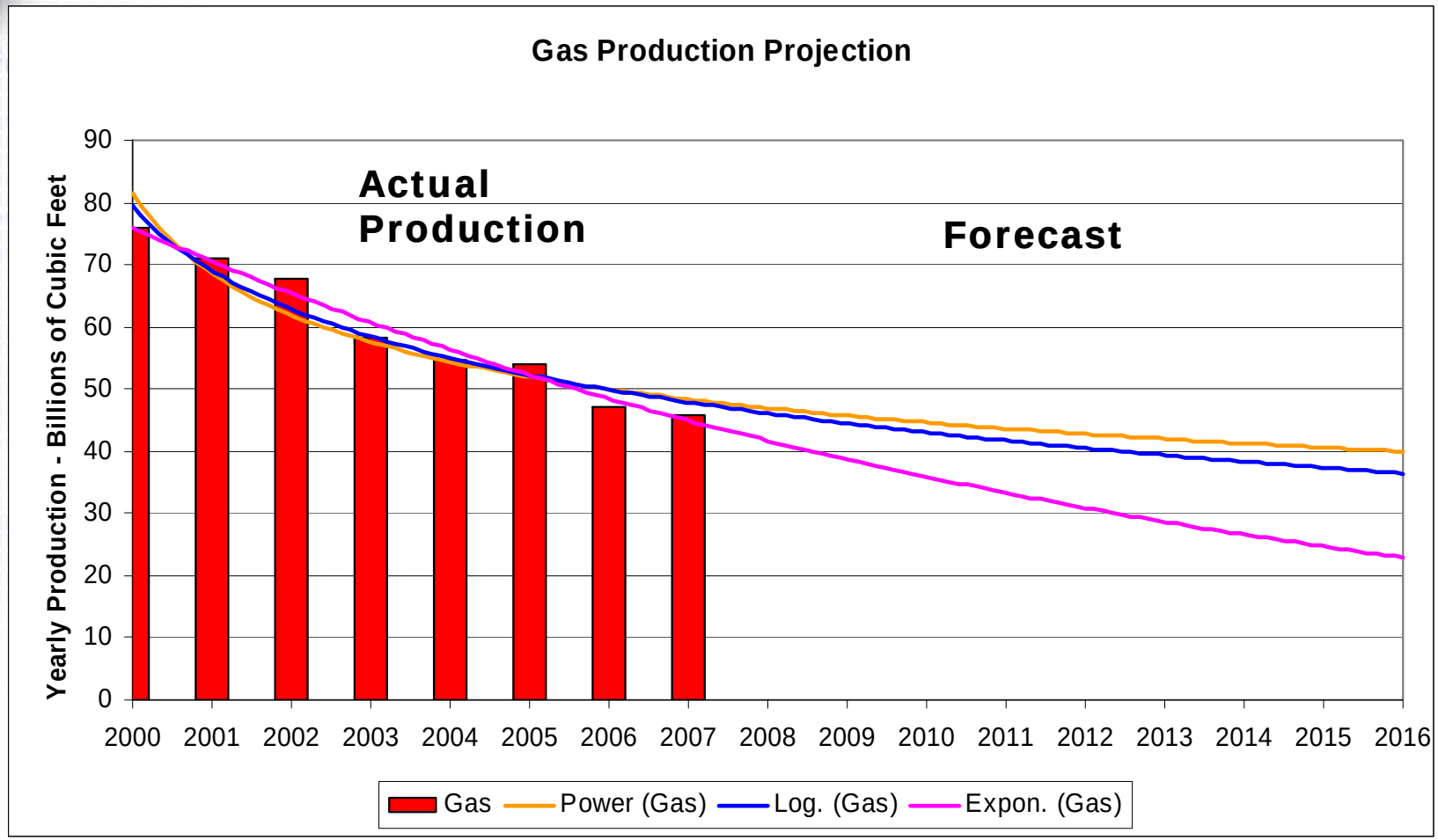
- 10 initial fields, 15 wells.
- Gas production from the GOMR would increase >10% when Independence Hub is operating at full capacity.



# Pacific OCS Region



# Pacific OCS Region

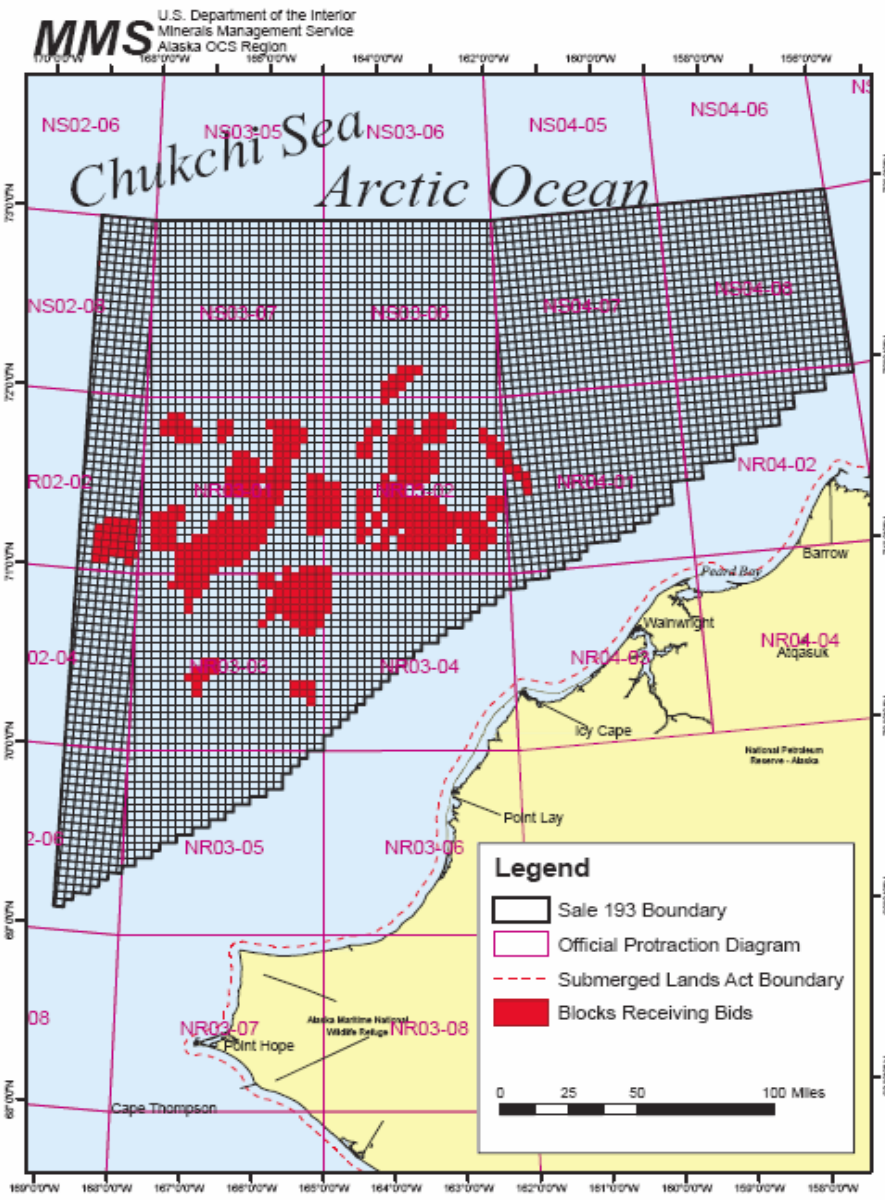


# Pacific OCS Region

- In the most likely near term scenario production will come from the existing developed leases off southern California.
- These reserves will be nearly depleted by 2030 at which time annual gas production is projected to be about 4 Bcf.

# Alaska OCS Region

- **Chukchi Sale 193**
  February 6, 2008
- 488 Blocks Bid On
- $2,662,059,883 High Bids
- $3,389,919,469 Total Bids

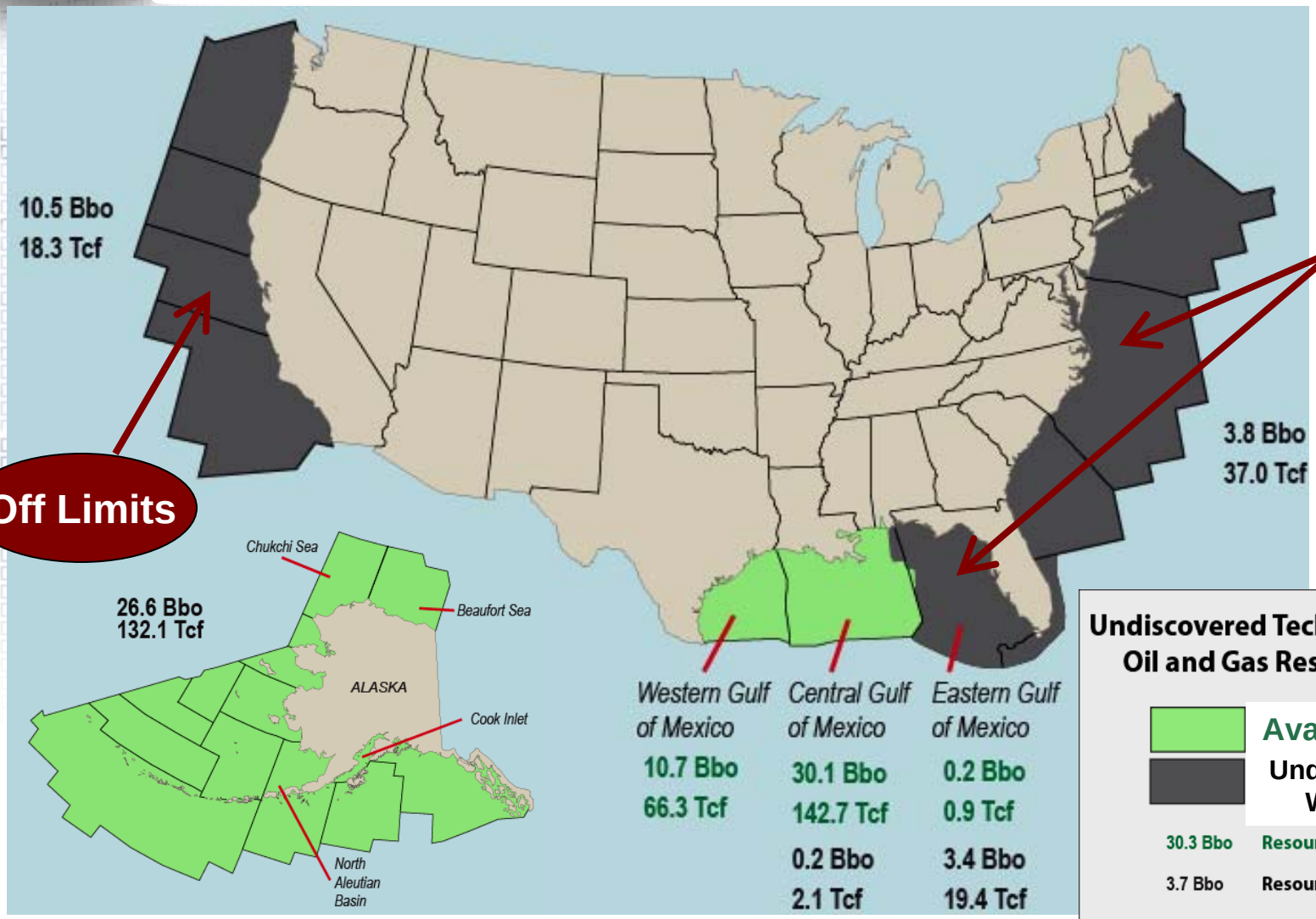



# Alaska OCS Region

- The Alaska OCS will be a major source of natural gas in the future.
- 10-15 years will be required to explore and develop the Chukchi sale area.
- Transportation system issues must be solved:
  - Trans Alaska Gas Pipeline?
  - LNG?

# OCS Areas Off Limits

**For Lower 48: <u>Unavailable:</u> 85% of Acres—30% of the Oil—27% of the Natural Gas**

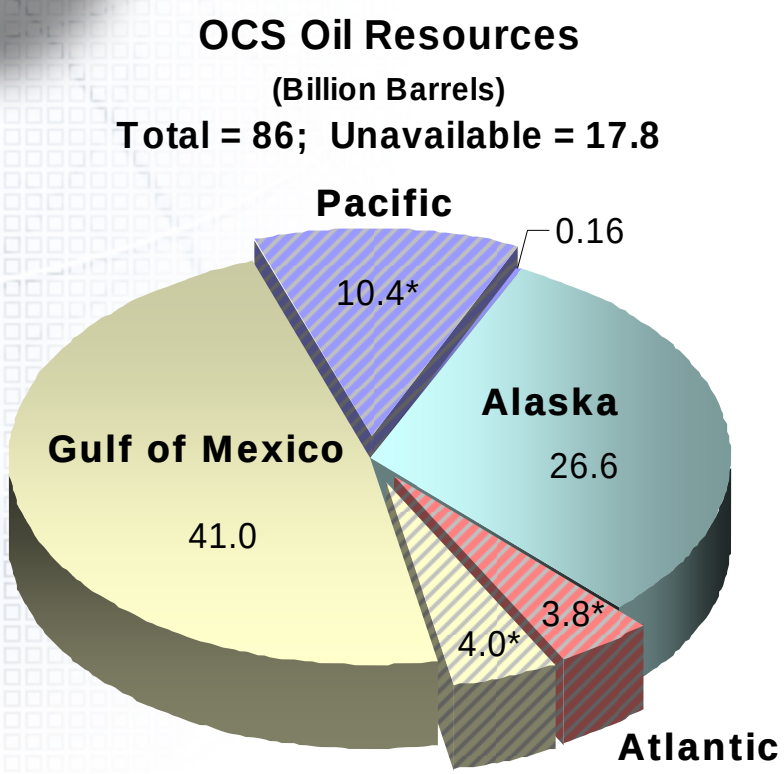


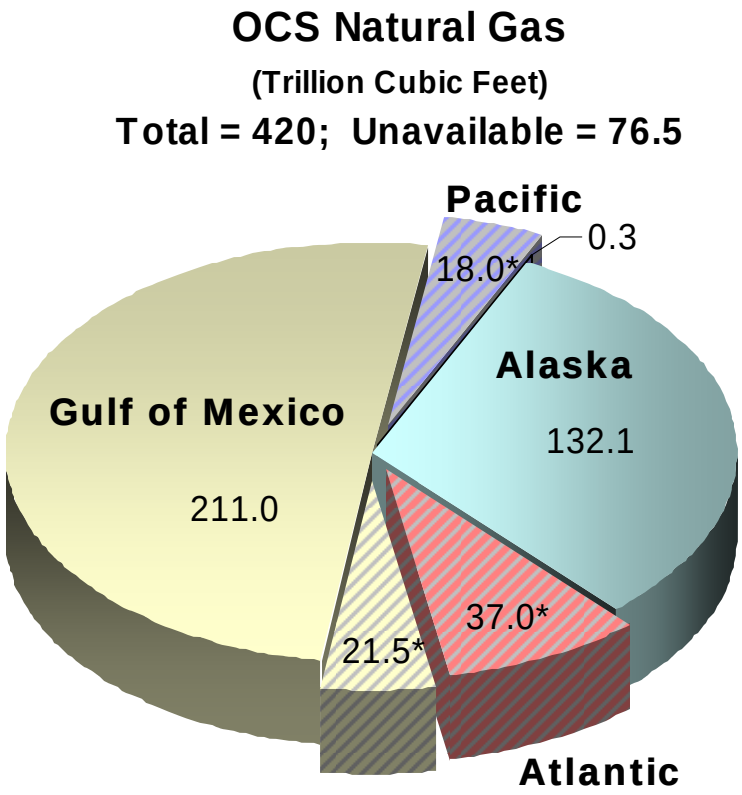

**Undiscovered Technically Recoverable Oil and Gas Resources of the OCS**

| | |
|---|---|
| | **Available** |
| | **Under Moratoria/ Withdrawal** |
| 30.3 Bbo | **Resource Amount Available** |
| 3.7 Bbo | **Resource Amount Unavailable** |

*Oil in Billion Barrels and Gas in Trillion Cubic Feet*

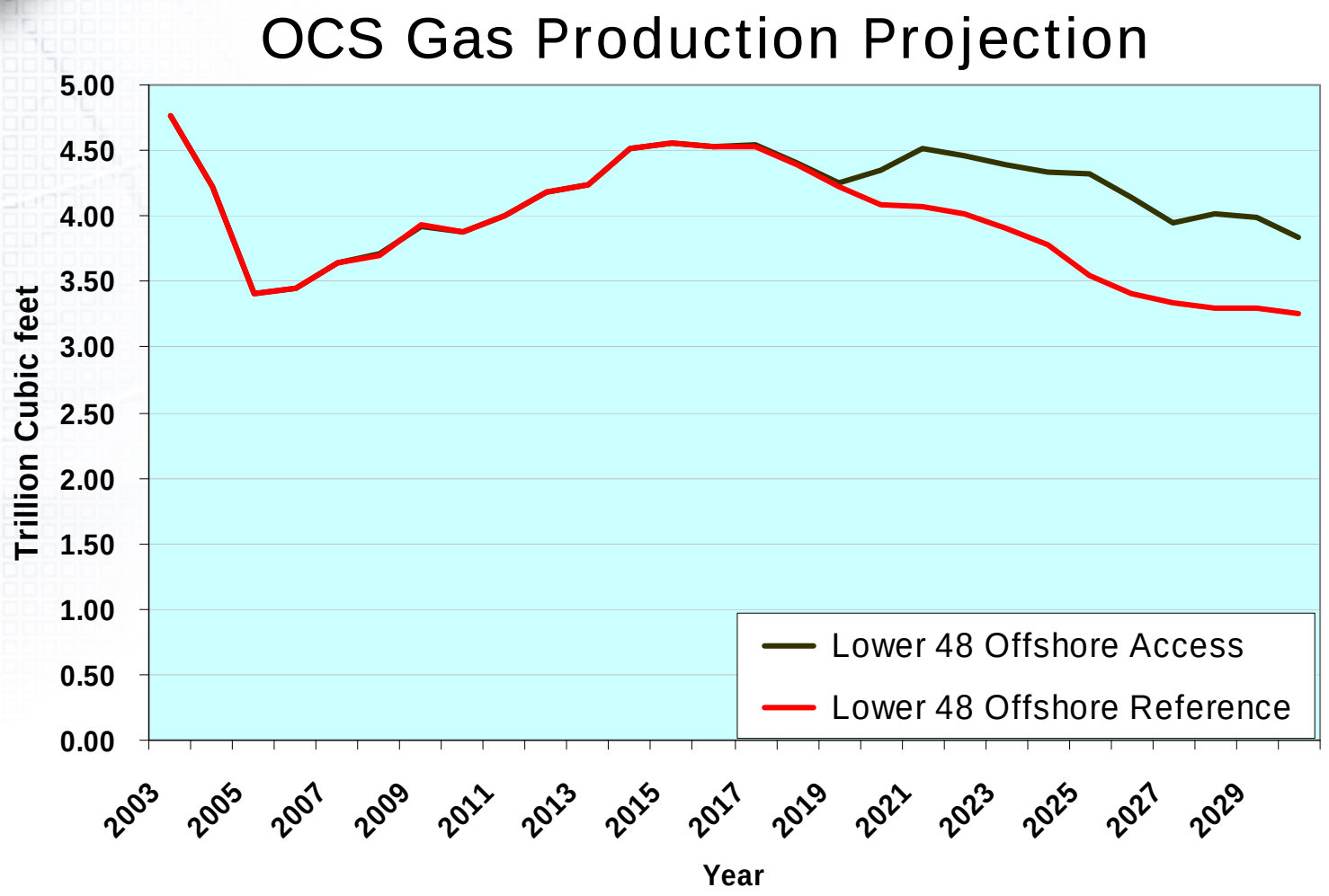
# OCS Areas Off Limits




* All of the Atlantic, most of the Pacific and some of the eastern and central Gulf of Mexico oil and gas resources are unavailable for leasing and development (see hatch-marked wedges) due to the current congressional moratoria and presidential withdrawal through 2012.

# OCS Areas Off Limits



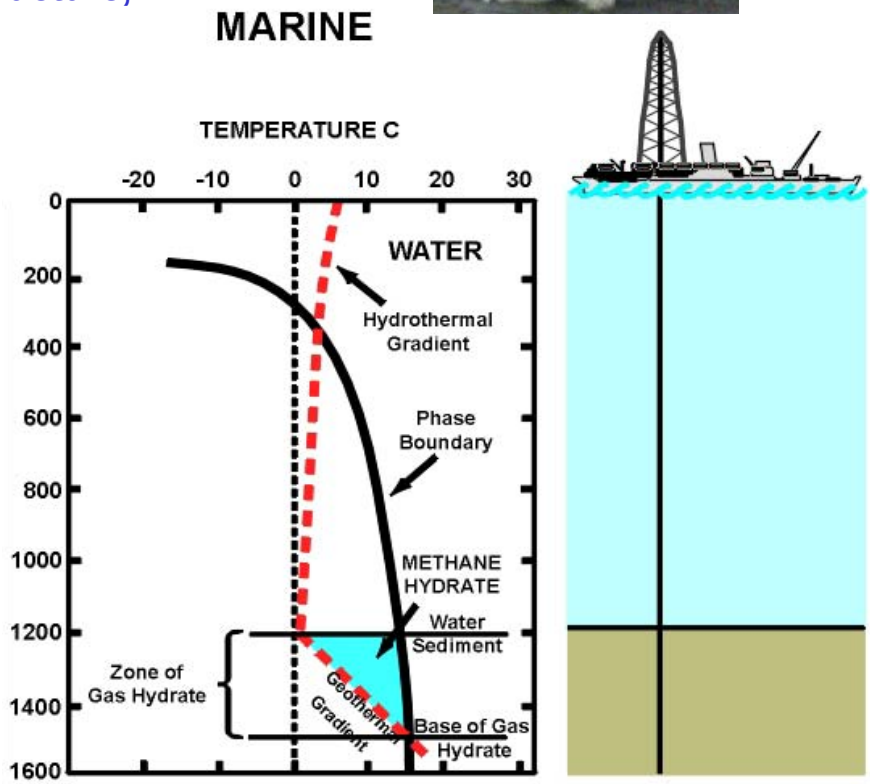

Incremental Production Increase

# Potential Future Gas Source – Gas Hydrates

**What is Gas Hydrate?**

**Gas hydrates are ice-like crystalline substances occurring in nature where a solid water lattice accommodates gas molecules (primarily methane, the major component of natural gas) in a cage-like structure, known as a clathrate.**

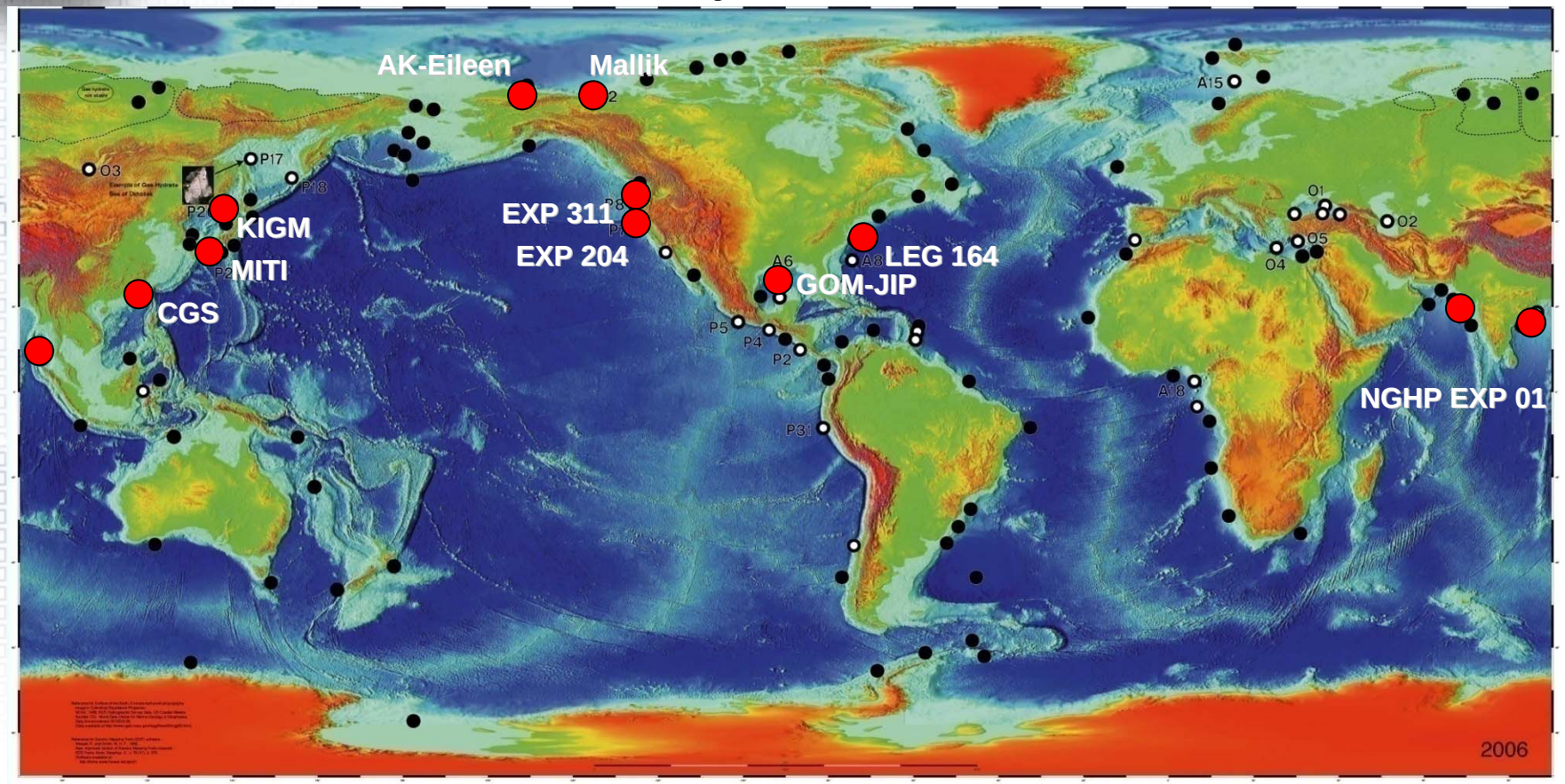
- Gas Hydrates are stable only in high pressure - low temperature environments
- P/T conditions are favorable on OCS where water depth > 350 meters
- Hydrate Stability Zone thickness increases as water depth increases (HSZ exceeds 1000 m thick in GOM)




From Tim Collett, USGS

# Potential Future Gas Source – Gas Hydrates

## Global Gas Hydrate Occurrences




From Tim Collett, USGS Thomas D. Lorenson and Keith A. Kvenvolden

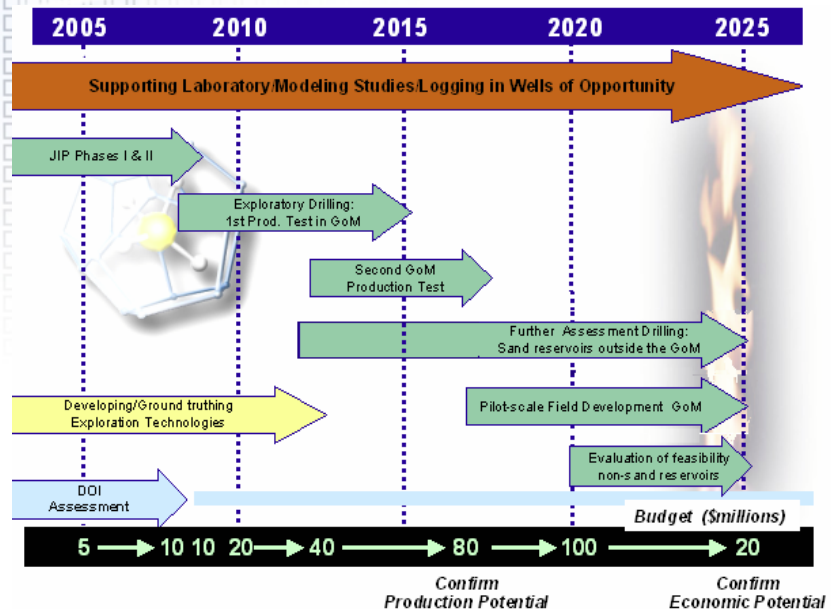
- Recent targeted gas hydrate exploration
- Gas hydrate recovered
- Gas hydrate inferred from other data

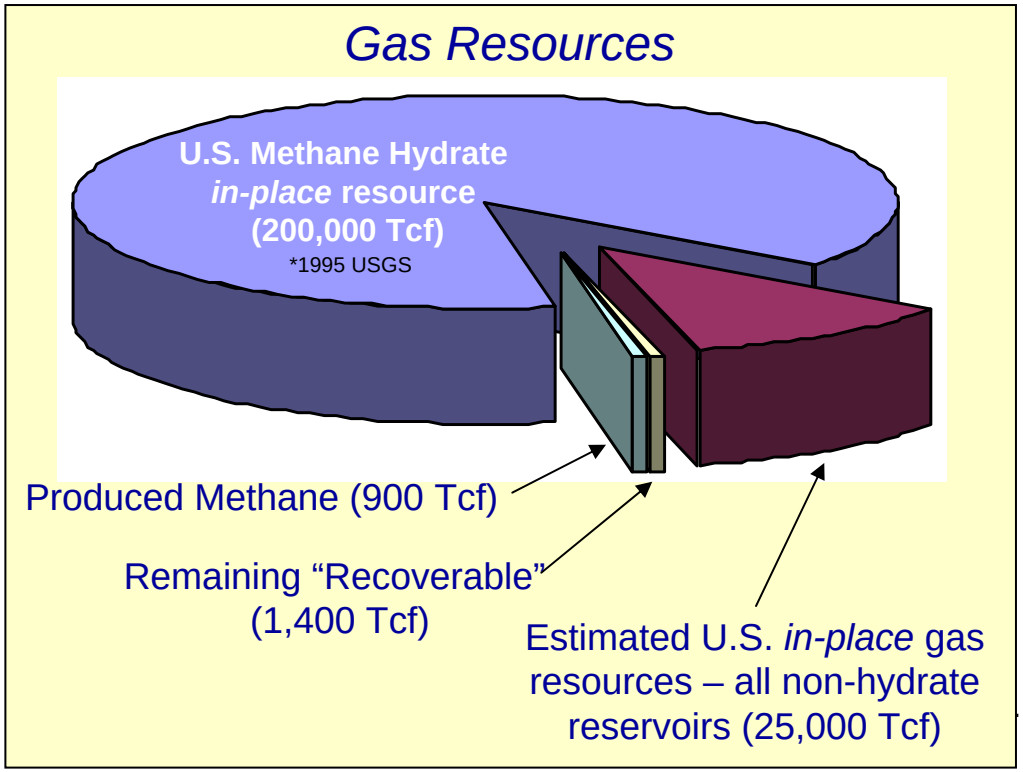
# Potential Future Gas Source – Gas Hydrates

**Why are we interested in Gas Hydrate?**

**Gas hydrate dissociates into methane and water as temperature increases or pressure decreases.**

**•Recoverable energy resource**



# Conclusions

- OCS gas production accounts for over 15% of total U.S. production.
- Currently 98% of OCS gas production is in the Gulf of Mexico.
- Alaska OCS offers significant potential for future gas production.
- About 27% of estimated undiscovered gas resources in the lower 48 are off limits to exploration and development.
- Gas hydrates are an unconventional resource that may become an important source of natural gas in the future.