

Fifty-Year Crude Oil Supply Scenarios: Saudi Aramco's Perspective

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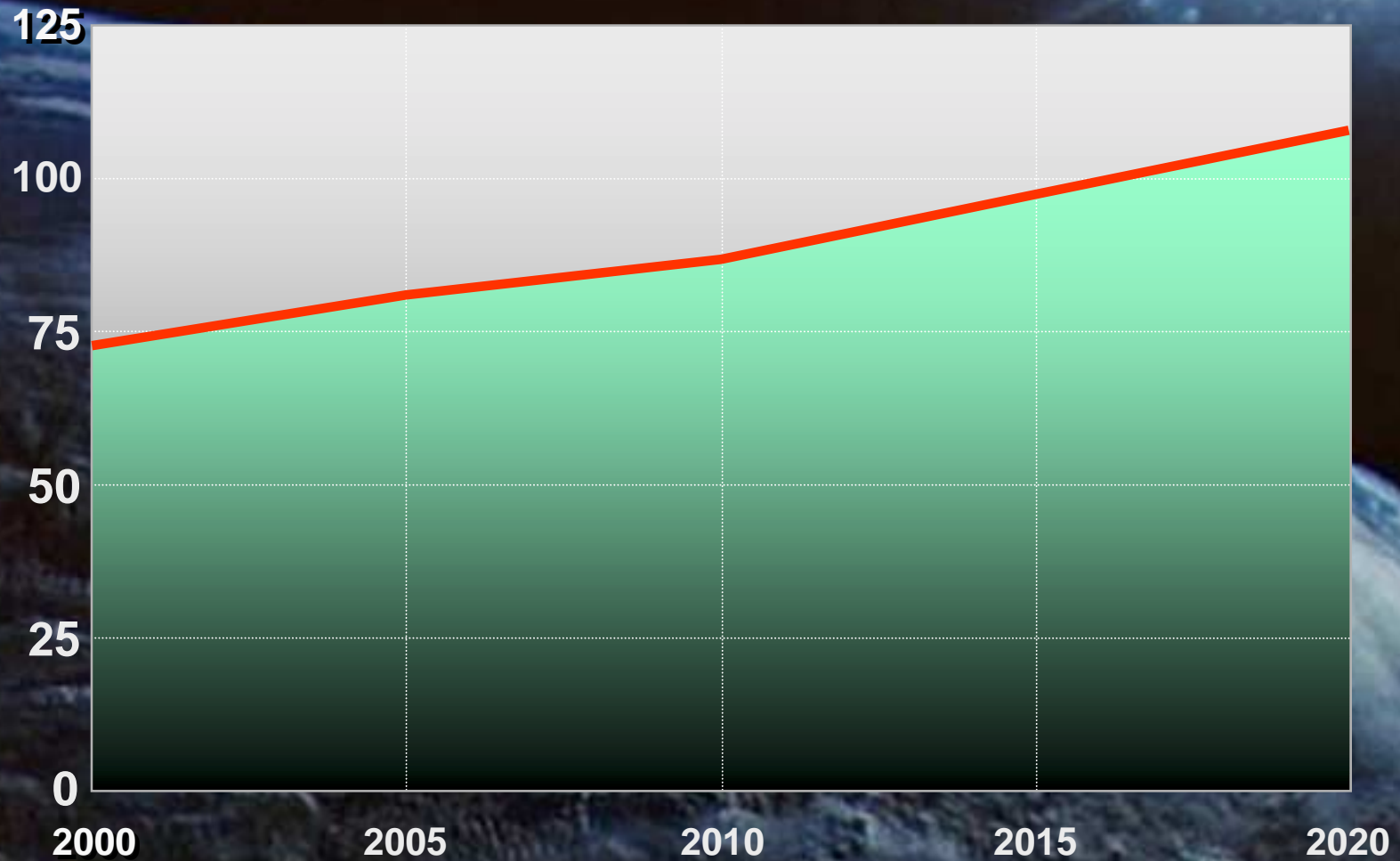
Saudi Aramco

**February 24, 2004
CSIS, Washington D.C.**

**أرامكو السعودية
Saudi Aramco**



World Oil Demand (Million Barrels / Day)



Source: OPEC OWEM (2002)

2002 Year-End Conventional Oil Reserves (1050 Billion Barrels)

North America
50 Billion Barrels

Europe
19 Billion Barrels

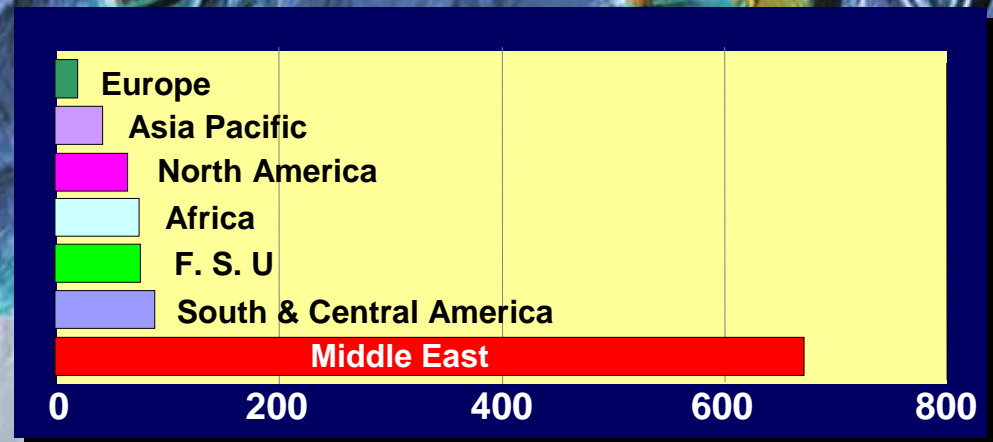
F. S. U
77 Billion Barrels

Asia Pacific
39 Billion Barrels

South & Central America
99 Billion Barrels

Middle East
686 Billion Barrels

Africa
77 Billion Barrels



Saudi Aramco's Perspective

Principles:

- **Sustainable Performance**
- **Maximum Hydrocarbon Recovery**
- **Life-Cycle Economics**
- **Prudent Reserves Management**
- **Excellence in Safety and Environmental Practices**



Reliable Supplier of Oil

Current Operations

Area: 579,000 Square Miles

Fields: 85

Reservoirs: 320

Global Oil Reserves: 25%

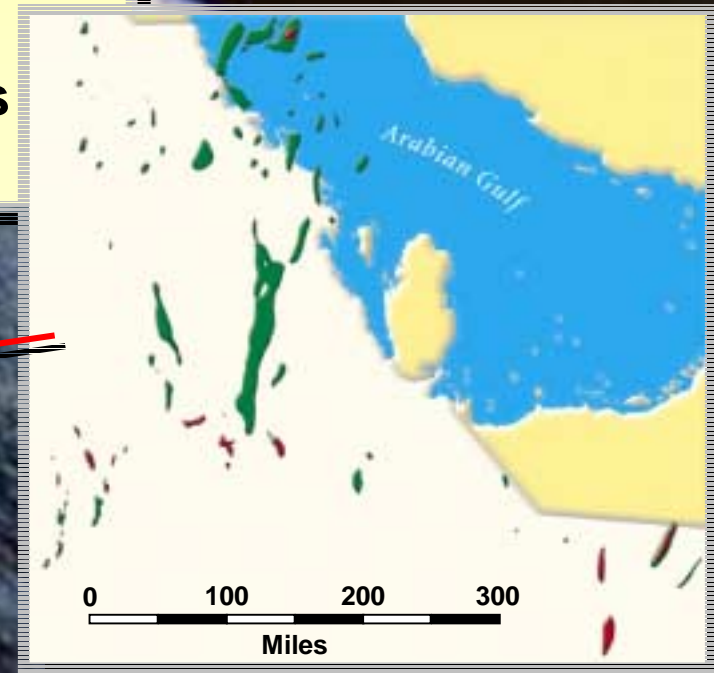
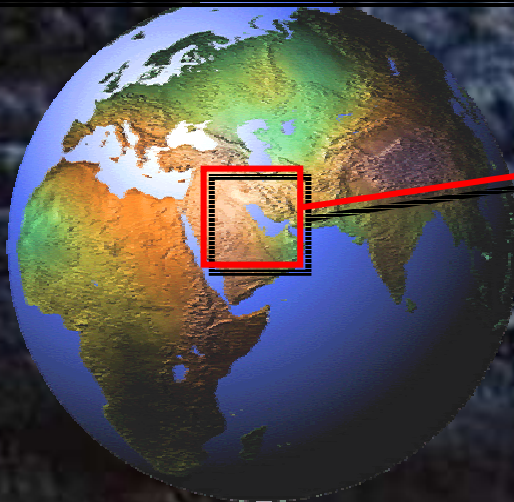
**Current Capacity: 10 Million Barrels/Day &
9.6 Billion Cubic Feet/Day**

Seismic Crews: 9

Rigs: 48

Replace Annual Oil Prod: 3 Billion Barrels

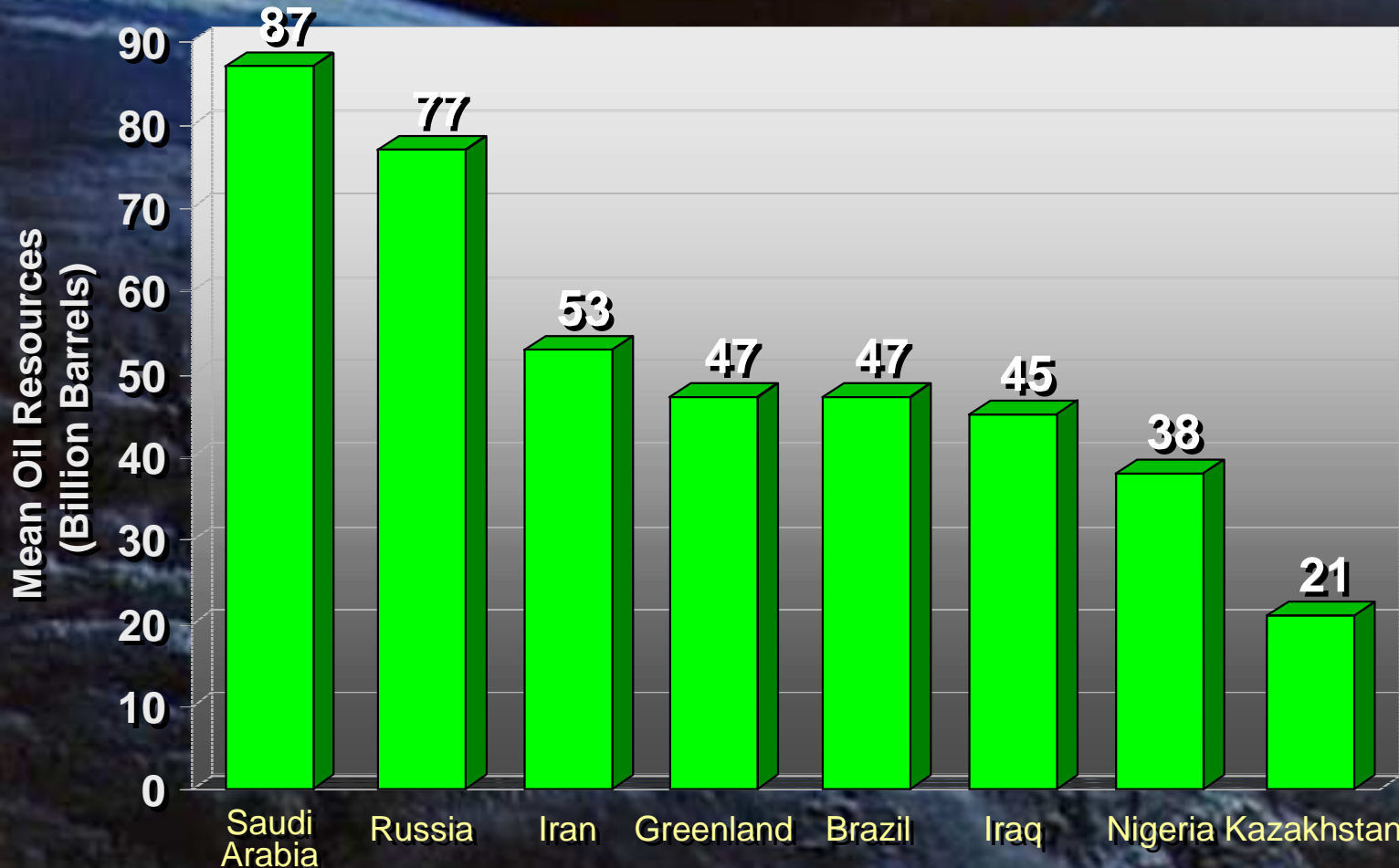
Add Annual Gas: 5 Trillion Cubic Feet



Exploration Wells in Saudi Arabia

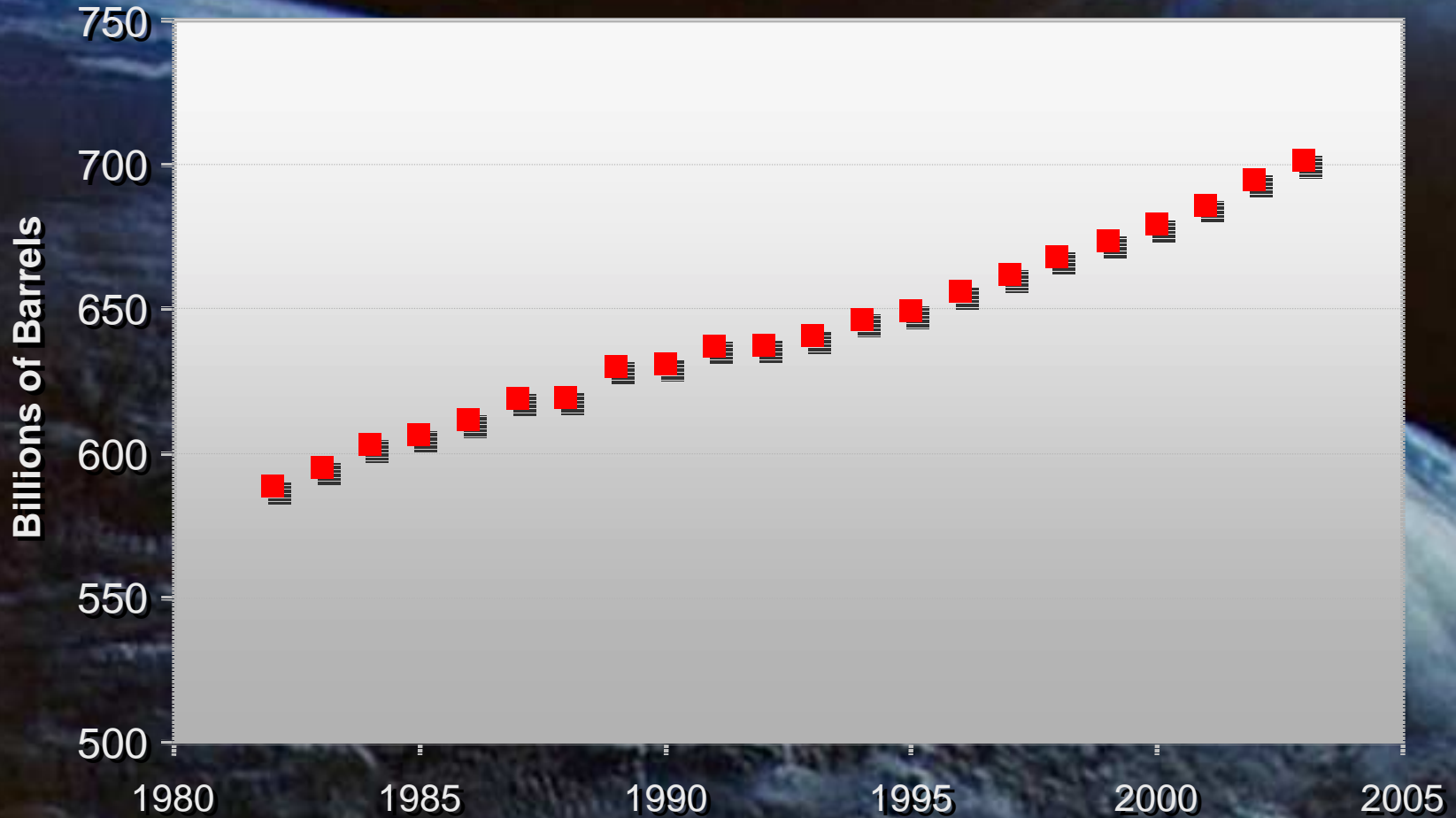


US Geological Survey 2000 Estimate of Top 8 Regions of Undiscovered Recoverable Oil Resources

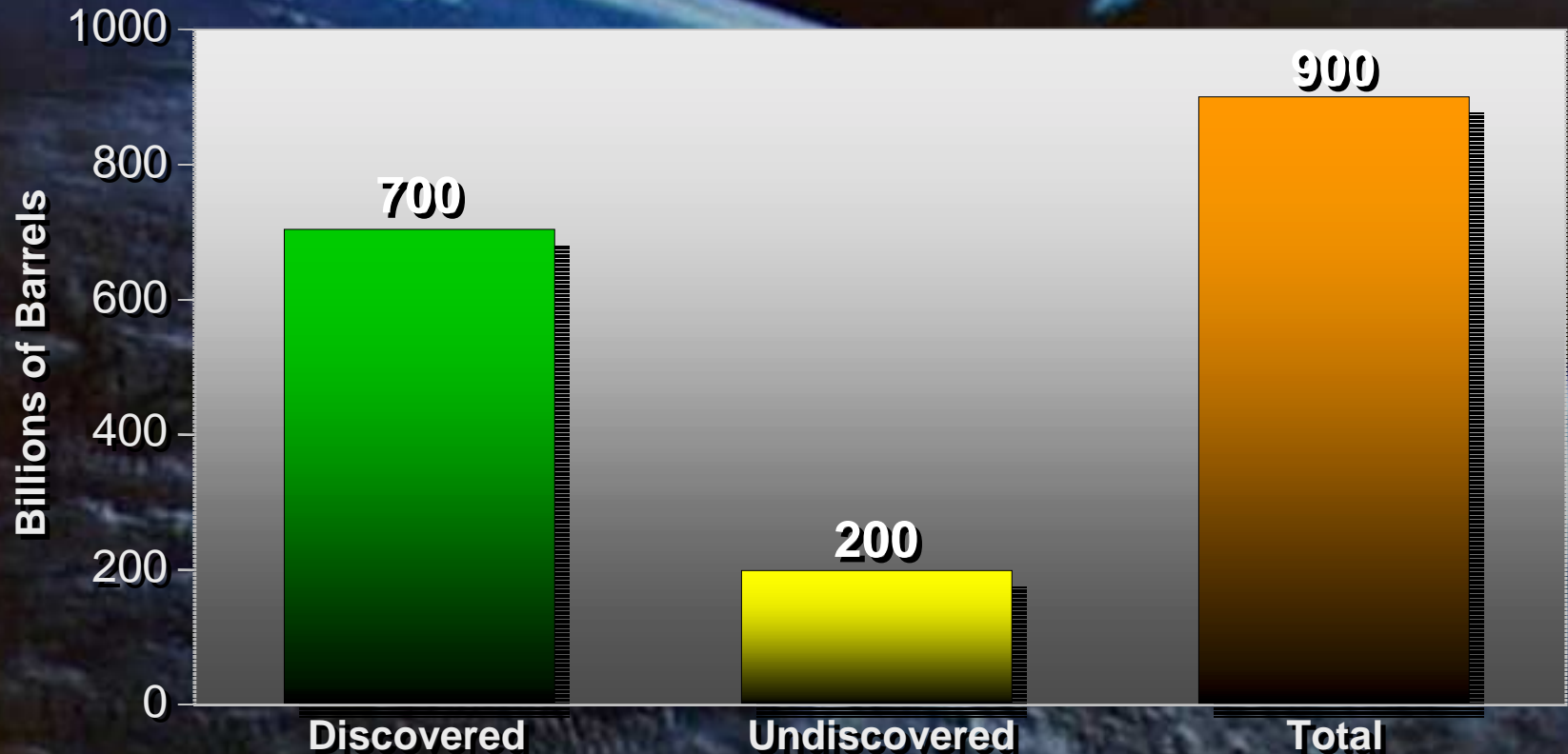


Source: USGS 2000

Growth Of Oil Initially In Place



Discovered & Undiscovered Oil Initially in Place by 2025 in Saudi Arabia



Proved Reserves

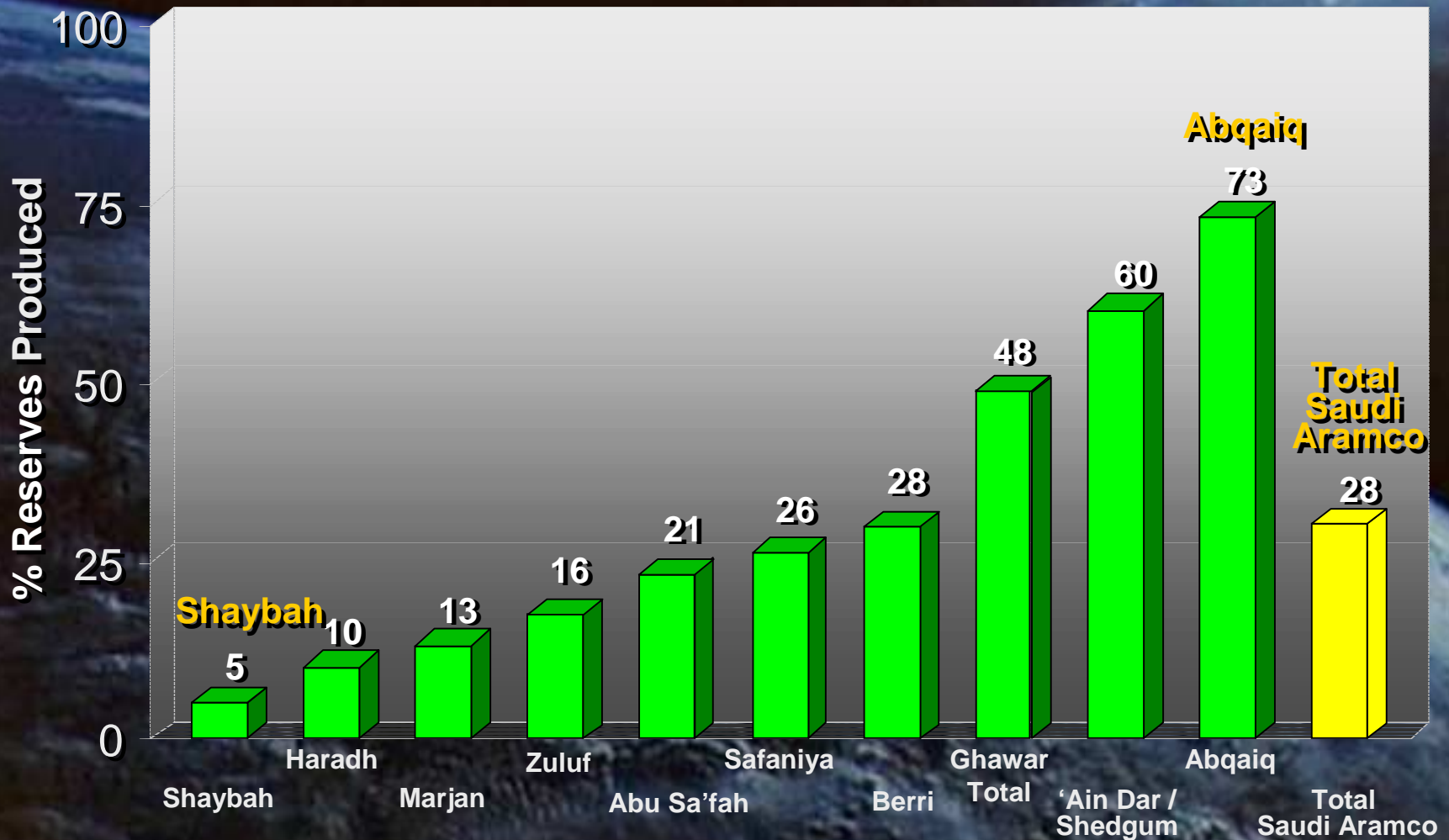
(Saudi Aramco vs. Industry)

	<u>SPE/WPC/AAPG</u>	<u>Saudi Aramco</u>
Commercial (Current)		
- Prices	✓	✓
- Operating Methods	✓	✓
Areal Extent		
- Hydrocarbon Water Contact	✓	✓
- Deepest Known Hydrocarbon Depth	✓	✓
Improved Recovery	✓	✓
- Pressure Maintenance	✓	✓
- All Other EOR Methods	✓	none
Degree of Certainty	90%	90%

Saudi Arabia's Oil Reserves are Conservative

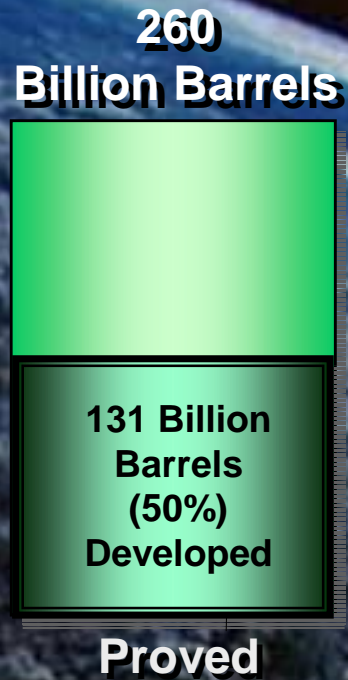
Extent of Proved Reserves Depletion

Select Fields (1/1/2004)



Note: Haradh and 'Ain Dar / Shedgum are part of Ghawar

Discovered Oil Reserves Development Status (1/1/2004)



Saudi Aramco's Reservoir Management "Learning Model"

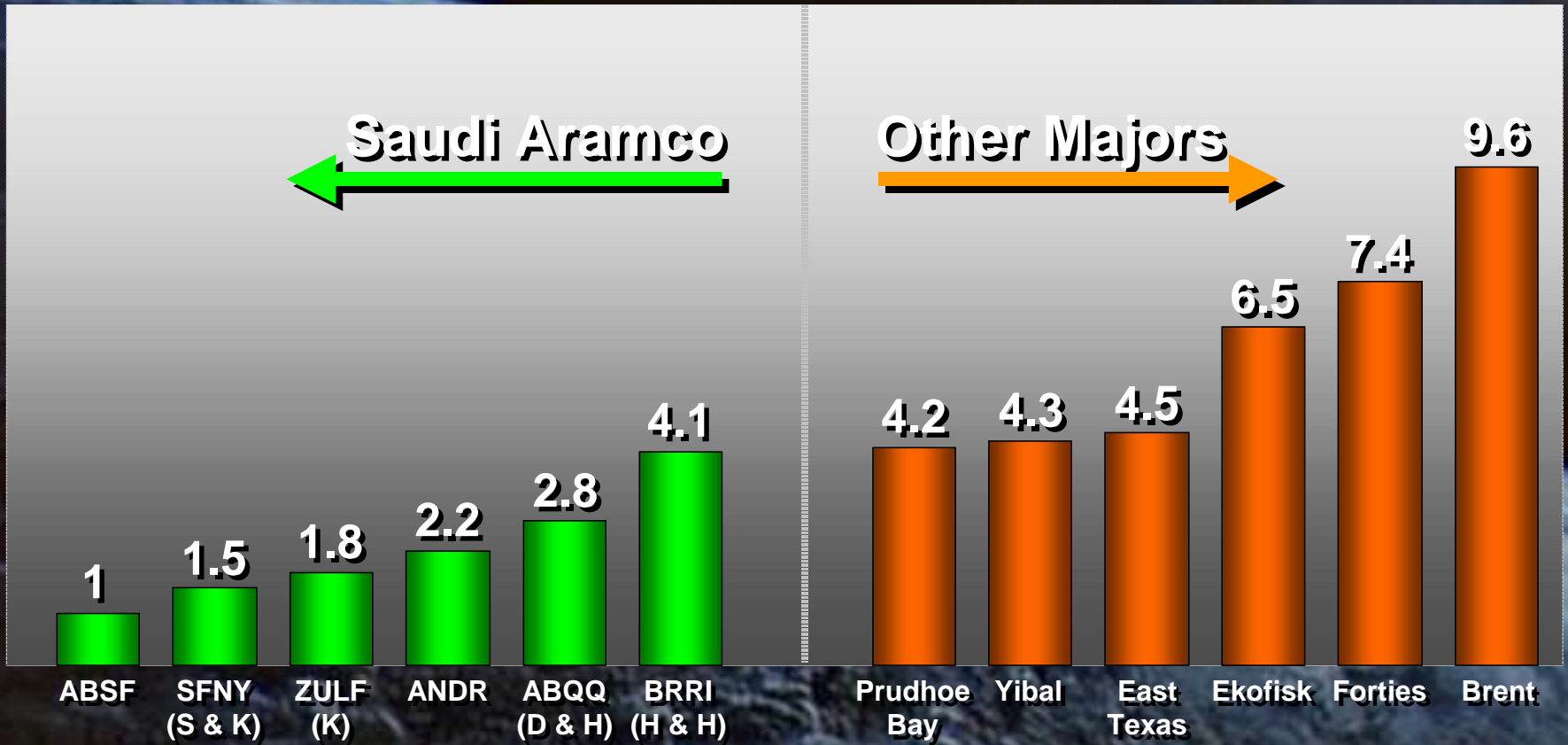
Emphasis:

- **Maximum Hydrocarbon Recovery**
- **Reservoir Monitoring**
- **Low Depletion Rates**
- **Advanced Diagnostics**
- **Cutting Edge Technologies**



Continual Improvement

Maximum Annual Depletion Rates (% of Initial Proved Reserves)

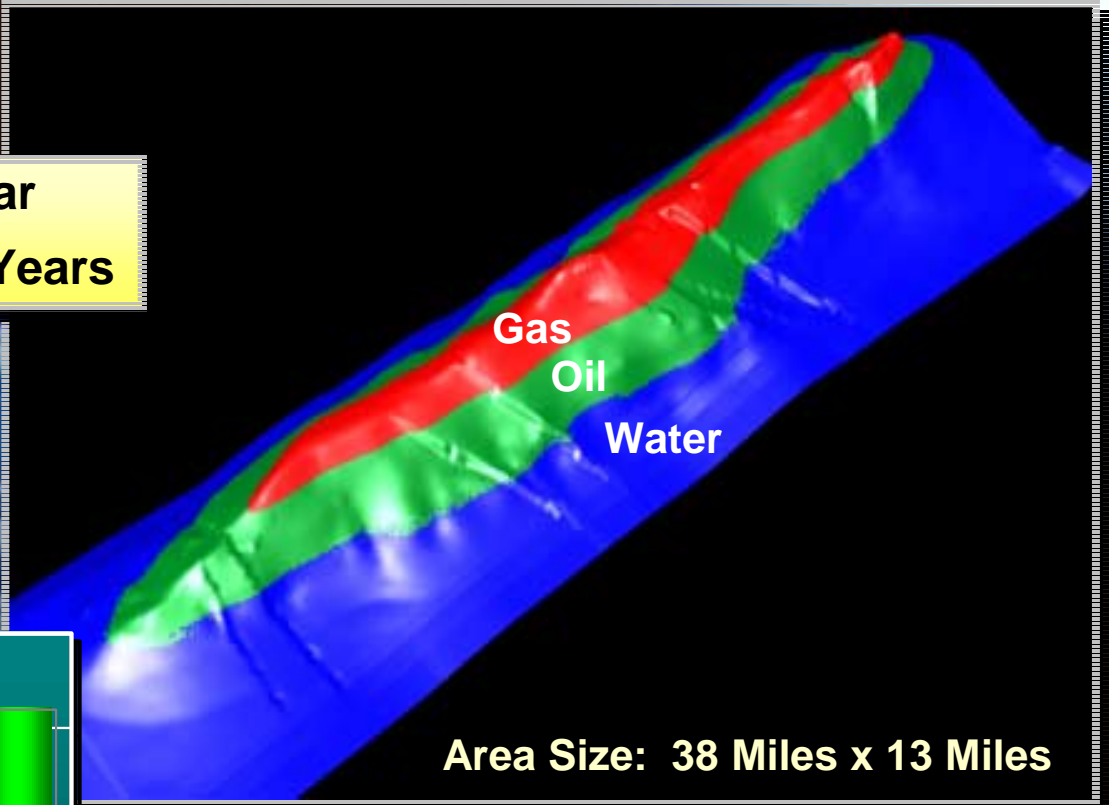


Source: Saudi Aramco

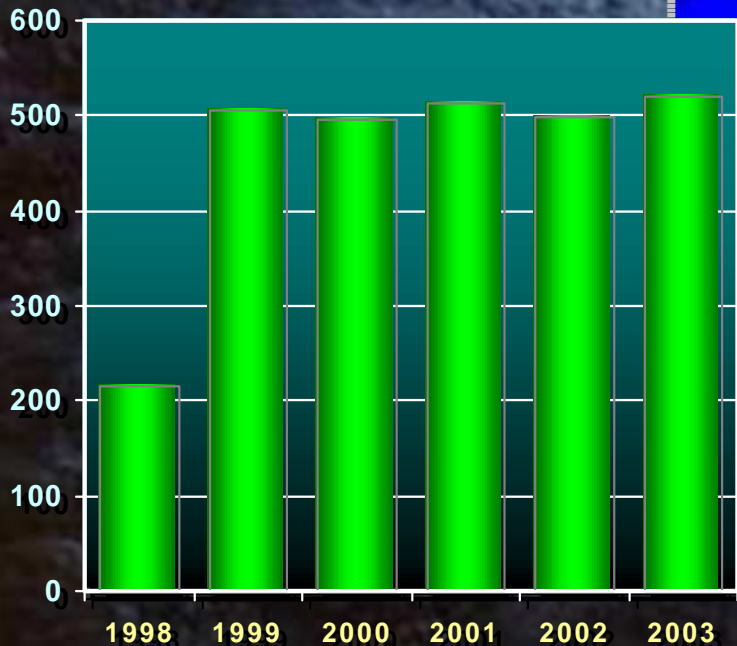
Source: SPE Publications

Shaybah Field

Depletion Rate: 1% per Year
Production Plateau: > 50 Years



Production Rate
B/D x 1000



Area Size: 38 Miles x 13 Miles

Production Start: July 1, 1998
500,000 B/D

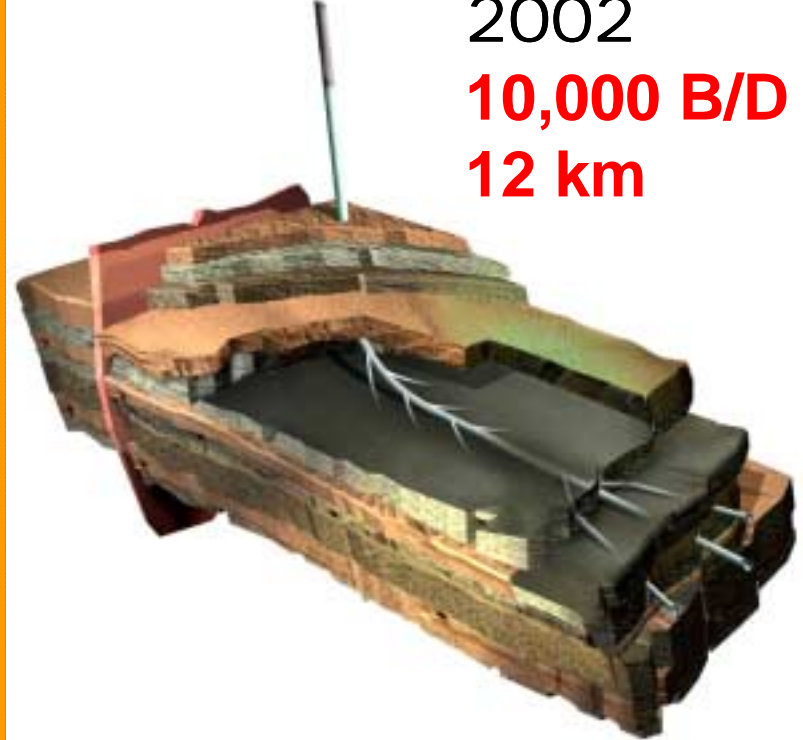
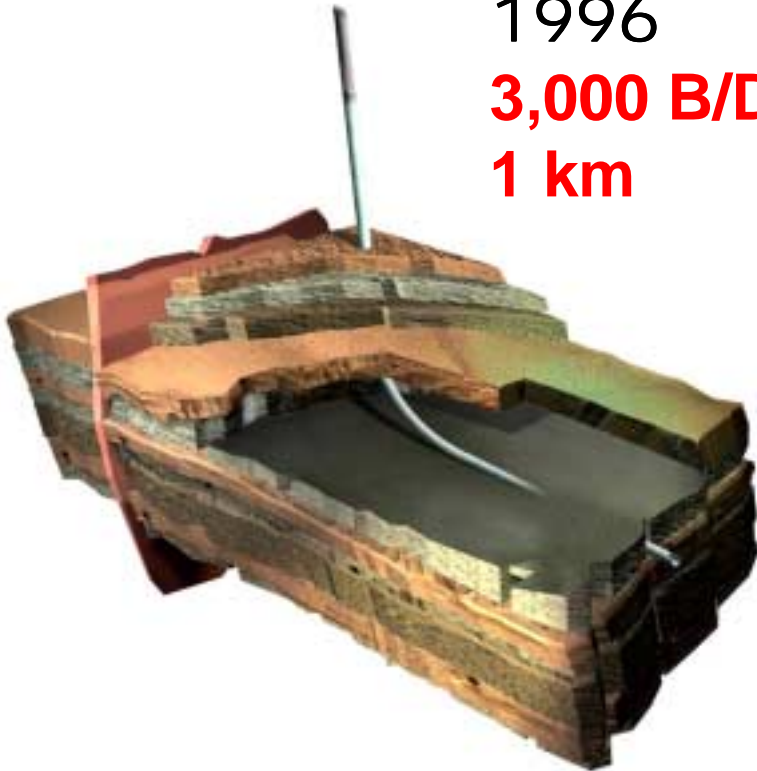
Evolution of Horizontal Drilling Technology (South Shaybah)

Horizontal

Maximum Reservoir Contact

1996
3,000 B/D
1 km

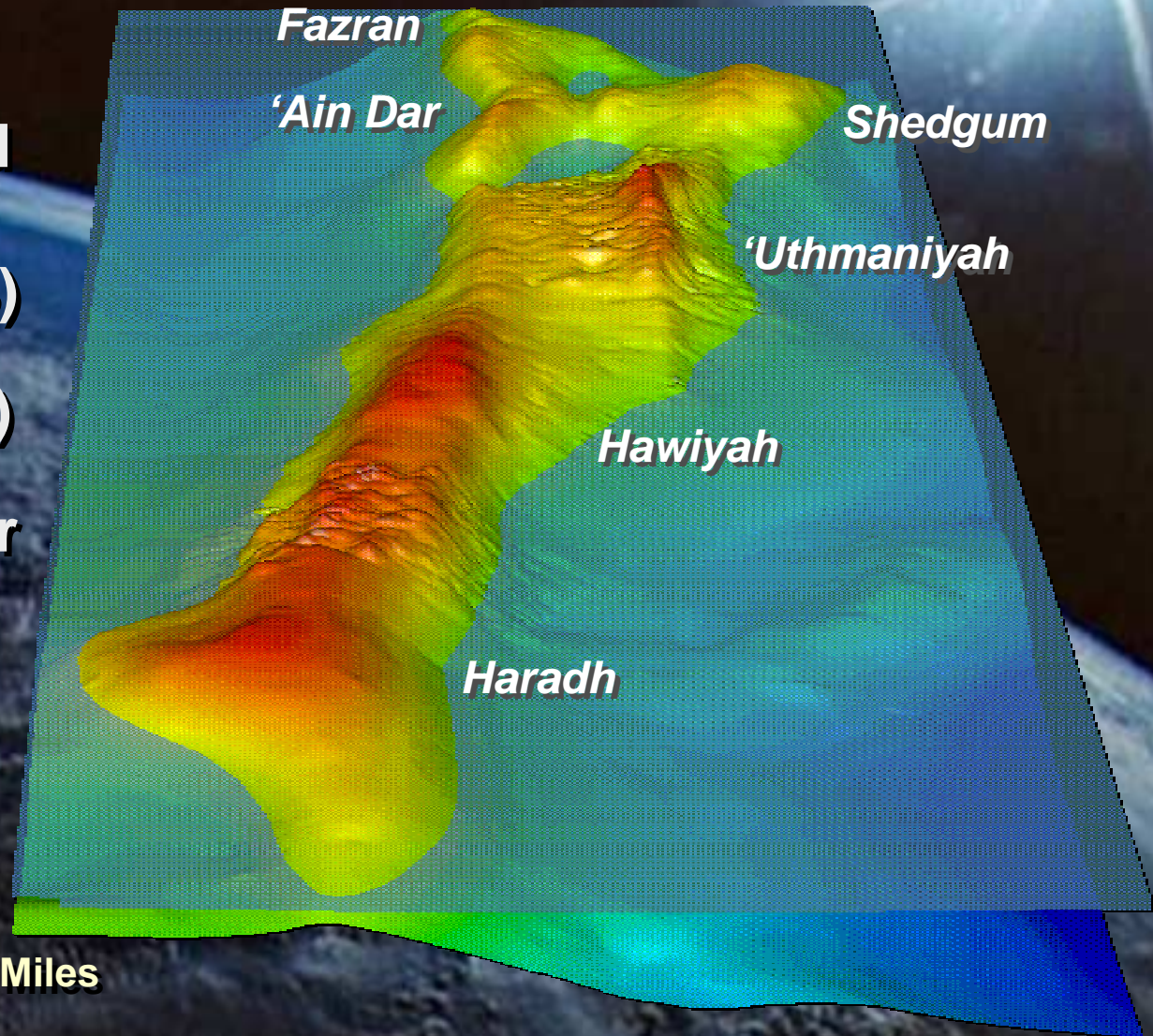
2002
10,000 B/D
12 km



Ghawwar Field

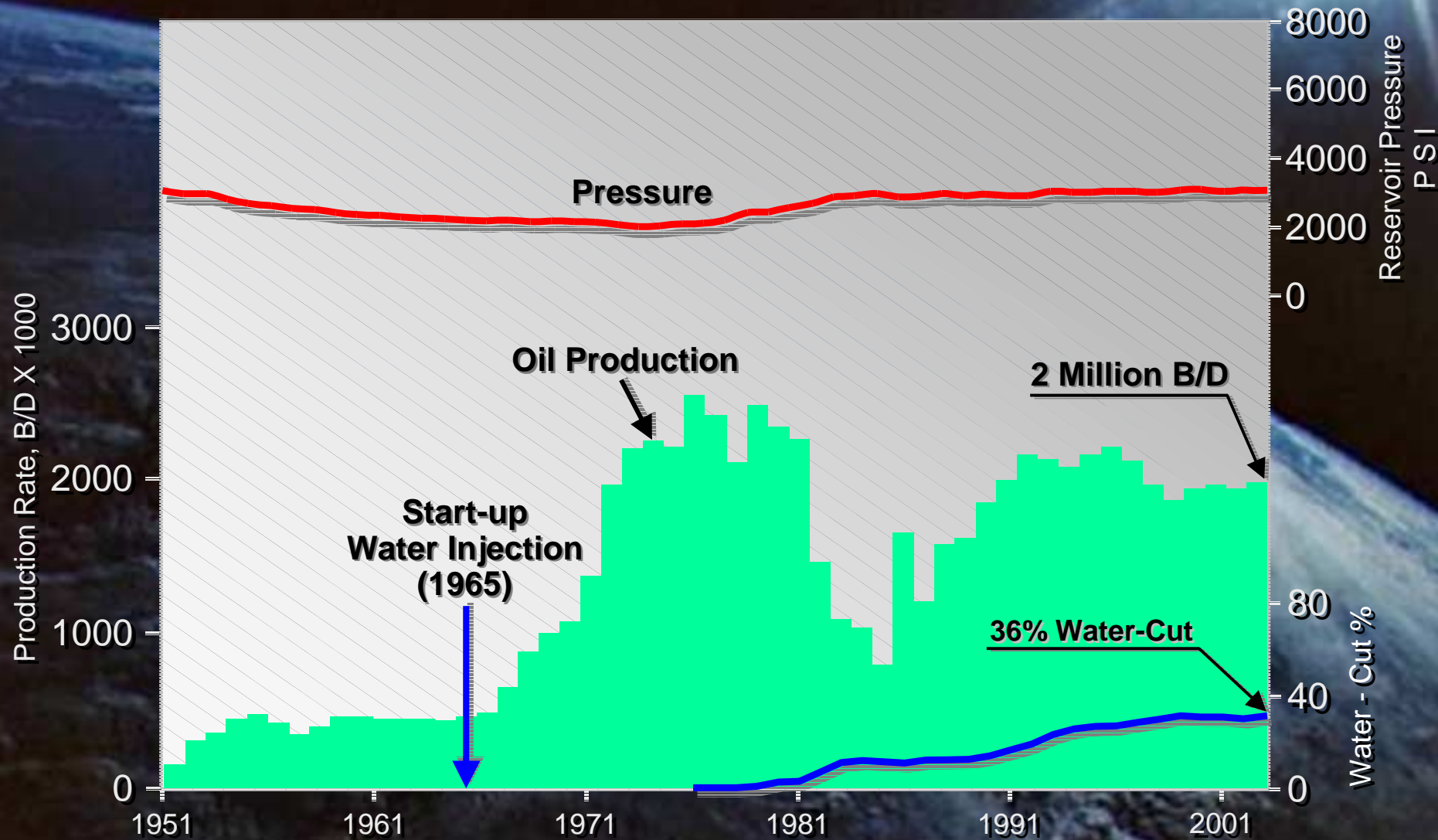
The Super Giant

- Largest Oil Field in the World
- Discovery (1948)
- Onstream (1951)
- Peripheral Water Injection (1965)

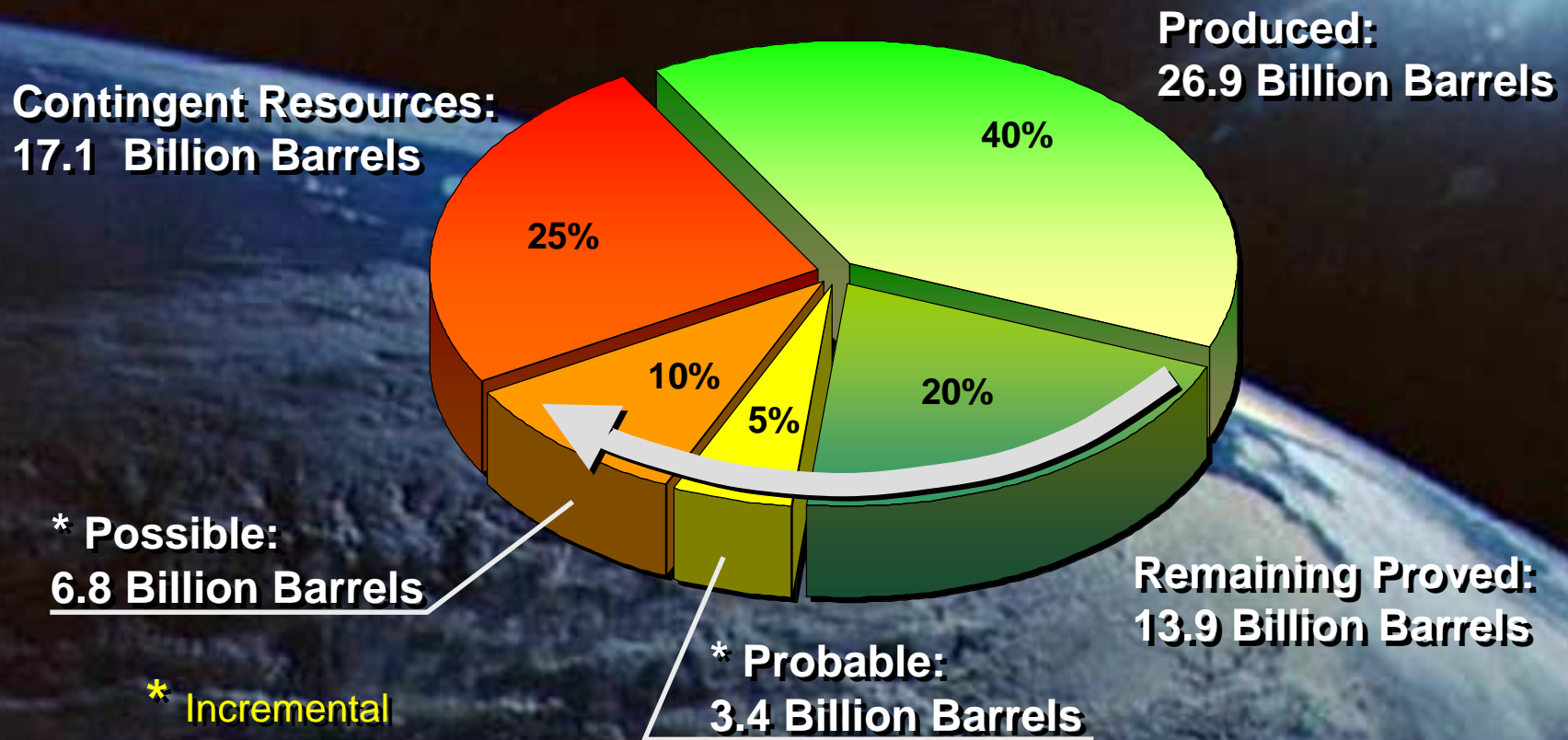


Area Size: 174 Miles x 16 Miles

'Ain Dar/Shedgum Area Arab D Production History



'Ain Dar/Shedgum Area / Arab D Resources Depletion State (1/1/2004)



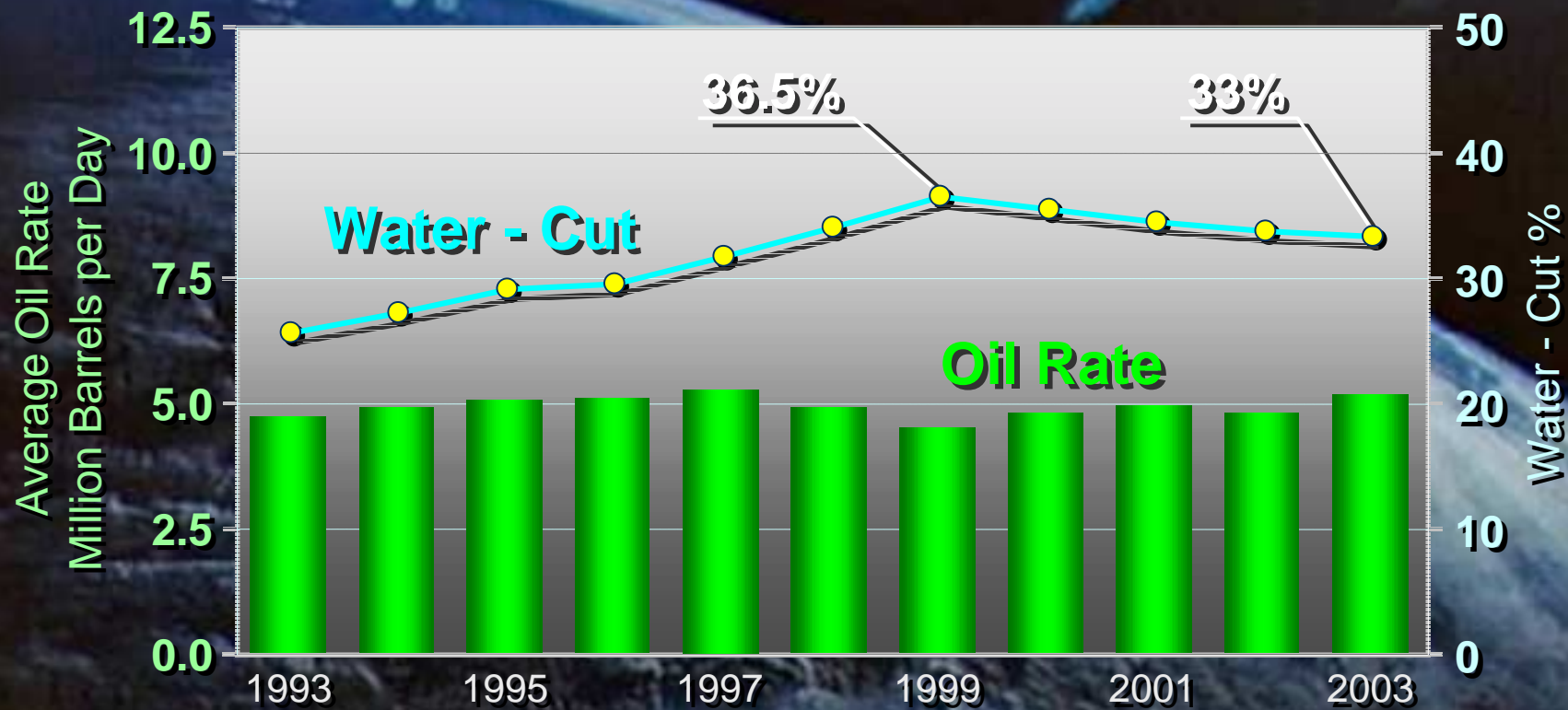
OIP: 68.1 Billion Barrels

Proved Reserves: 40.8 Billion Barrels (60% of OIP)

Estimated Ultimate Recovery: 51 Billion Barrels (75% of OIP)

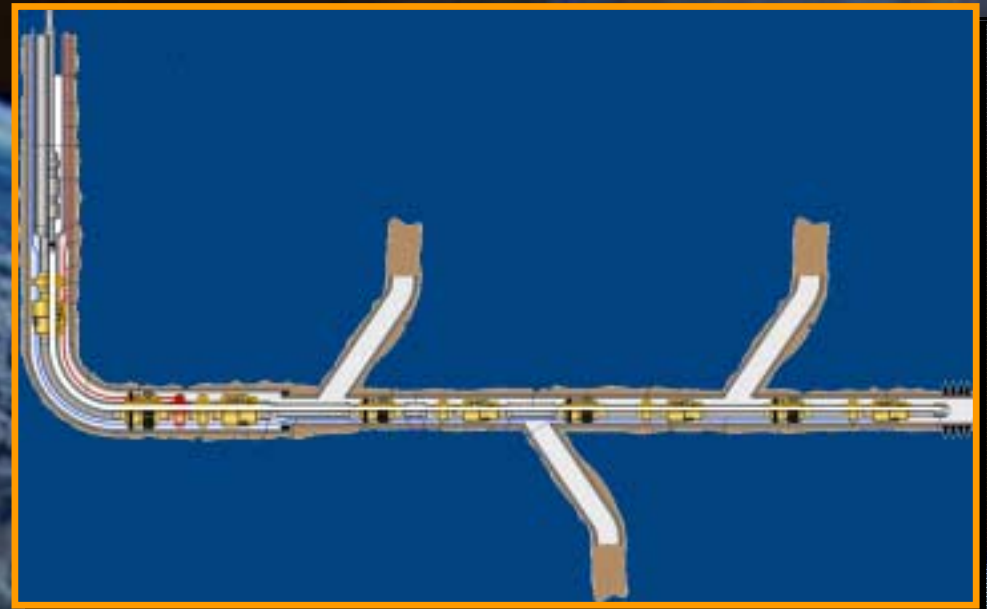
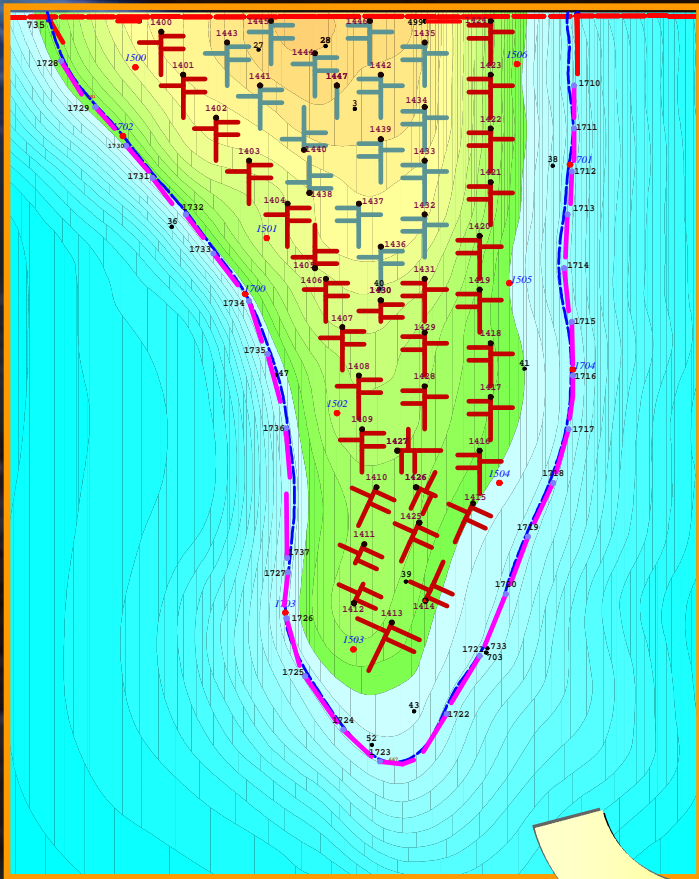
Ghawar Field

Water Management



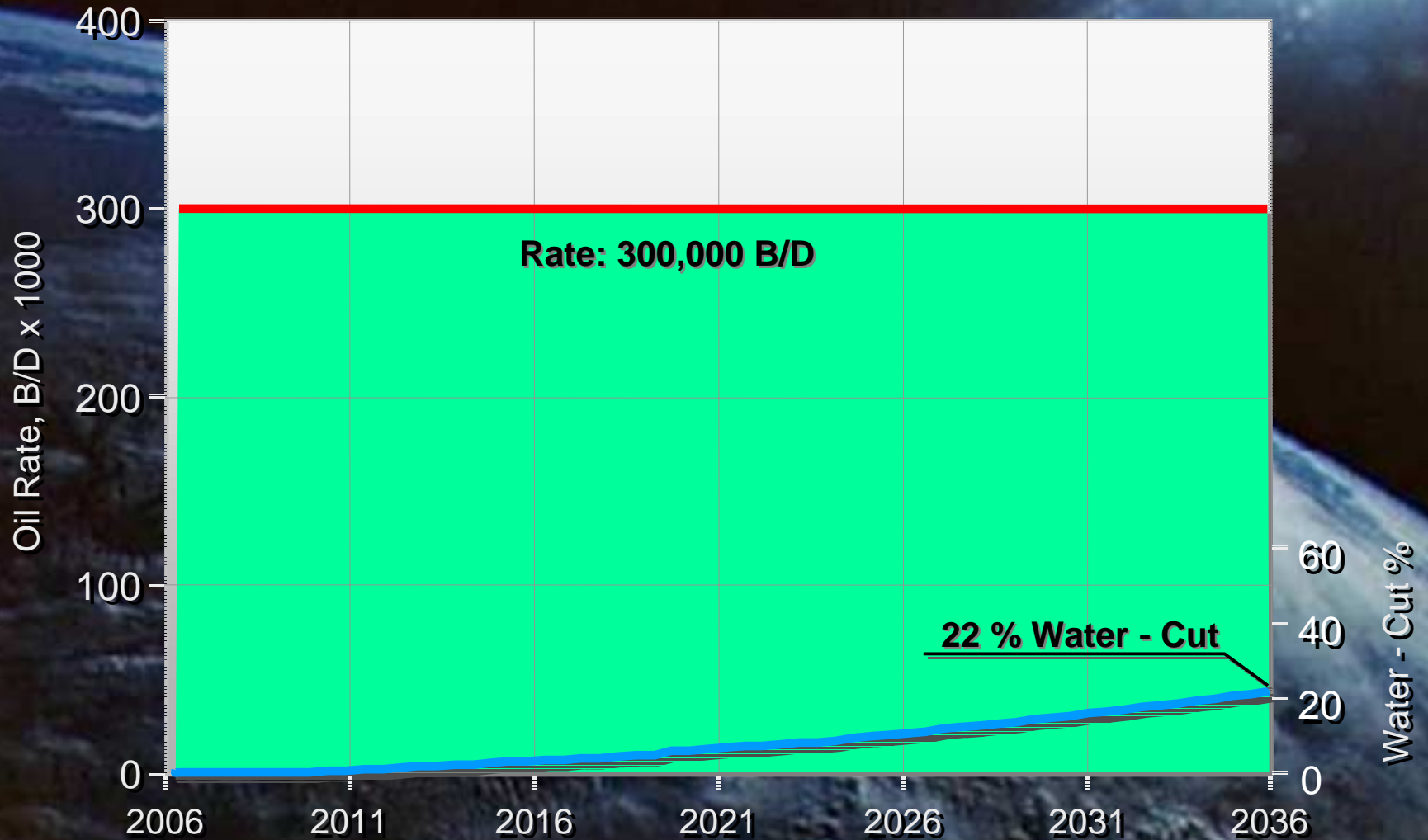
e-Field/Smart Wells Haradh Increment III

Quad-Lateral Smart Completion



Onstream: July 2006
Rate: 300,000 B/D
Plateau: 30 Years
Depletion: 1.7% per Year

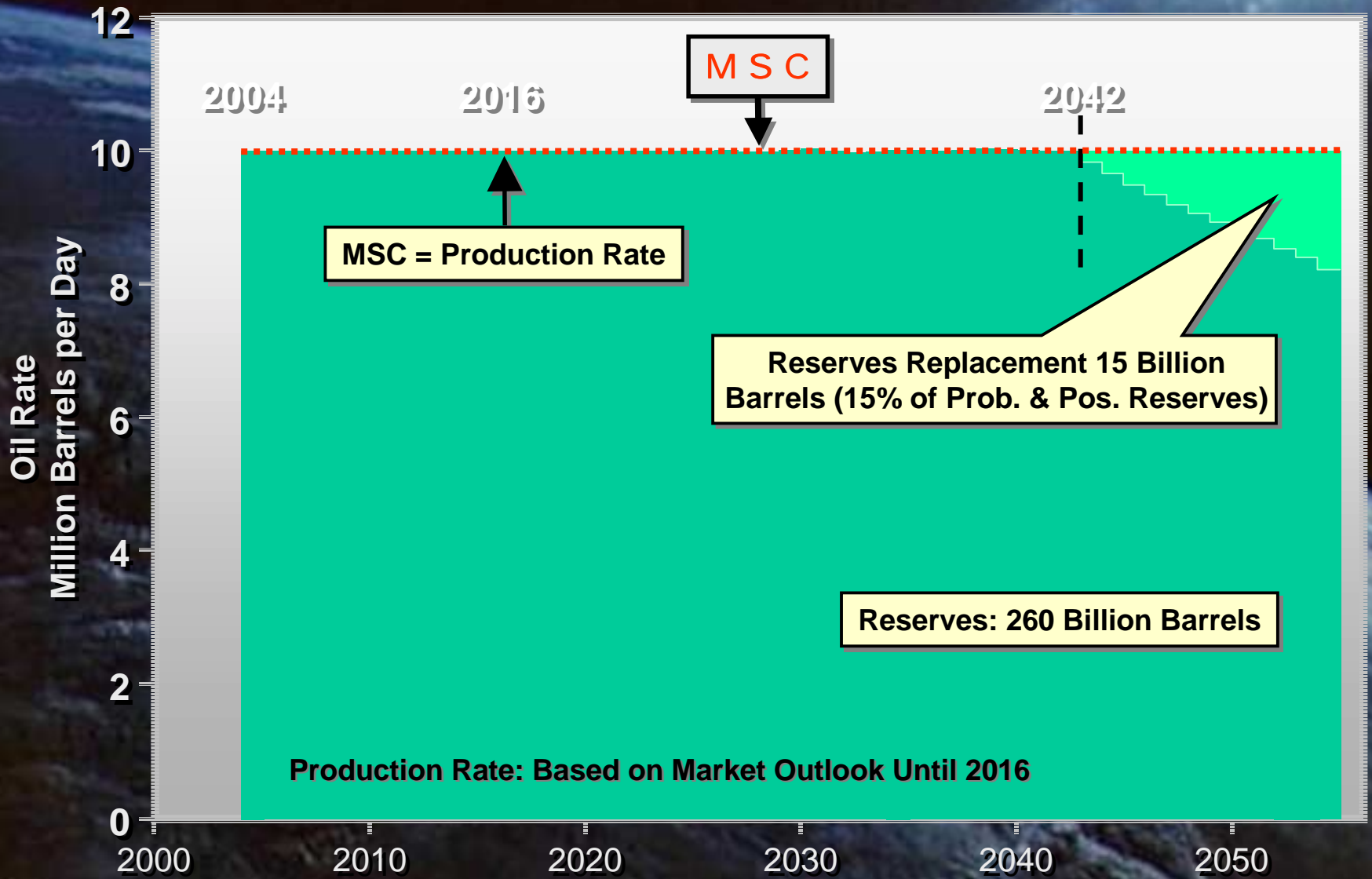
Haradh Increment III Forecast



50-Year Crude Scenarios

10 Million Barrels / Day

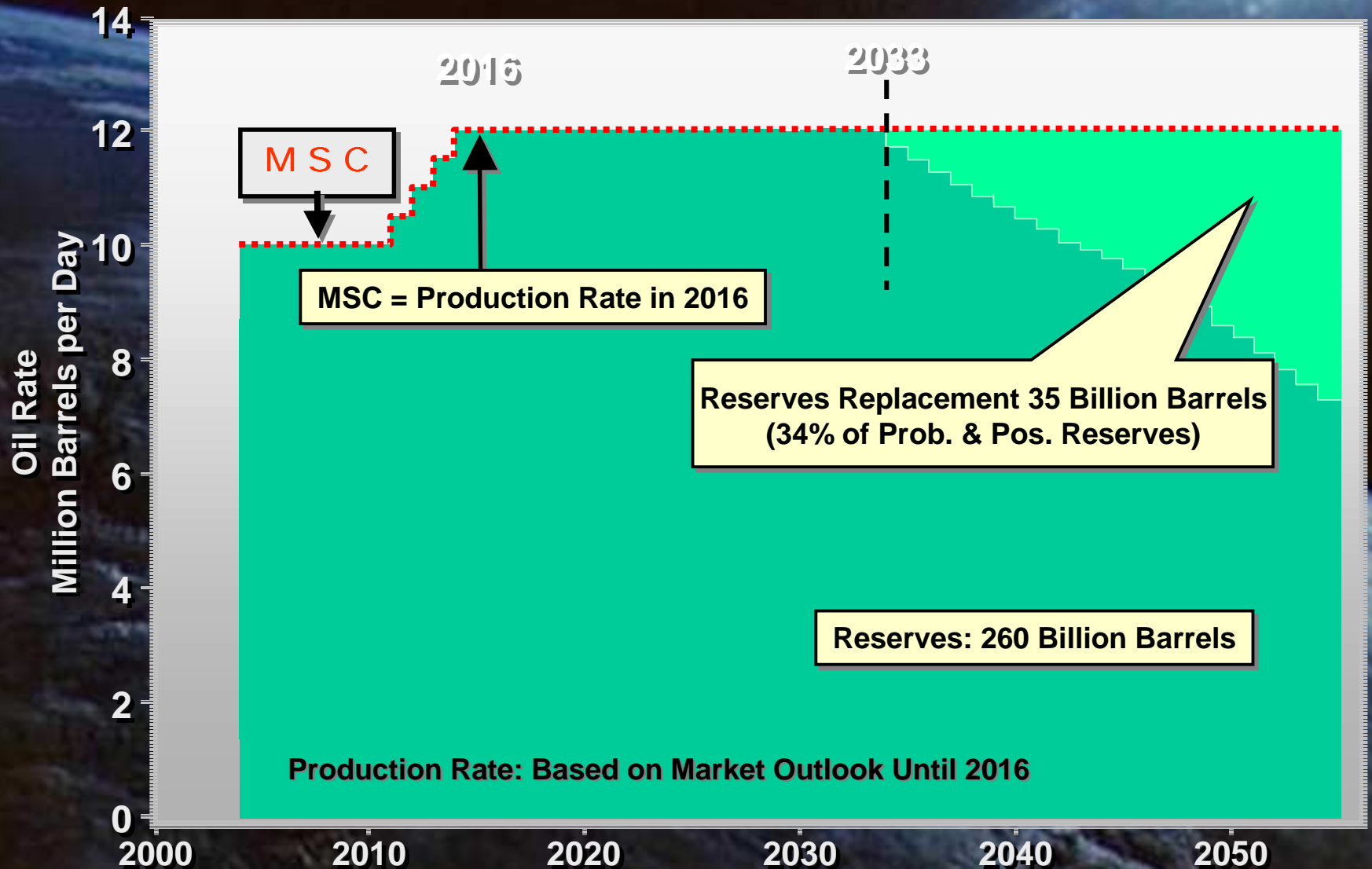
Maximum Sustainable Capacity - MSC



50-Year Crude Scenarios

12 Million Barrels / Day

Maximum Sustainable Capacity - MSC



The Future

- **Real-Time Reservoir Management**
- **Intelligent Wells / e-Field**
- **100 Million Cell Models**
- **Best-in-Class Practices**



- **Lower Unit Costs**
- **Increase Recovery**

Synopsis

- **Conservative Reserves with Significant Upward Potential**
- **Capacity and Commitment to Continue as a Reliable and Cost-Effective Global Oil Supplier**
- **Sustained Production Levels at 10, 12 and 15 Million Barrels per Day, Well Beyond 2054**