

# **OIL-IN-THE-SEA**

## **2002**

**PRESENT & FUTURE PREDICTIONS**

**NATIONAL RESEARCH COUNCIL**

# **STATEMENT OF TASKS:**

**1. UPDATE 1975 & 1985 REPORTS**

**2. REVIEW FUTURE PETROLEUM  
RESERVES & CONSUMPTION**

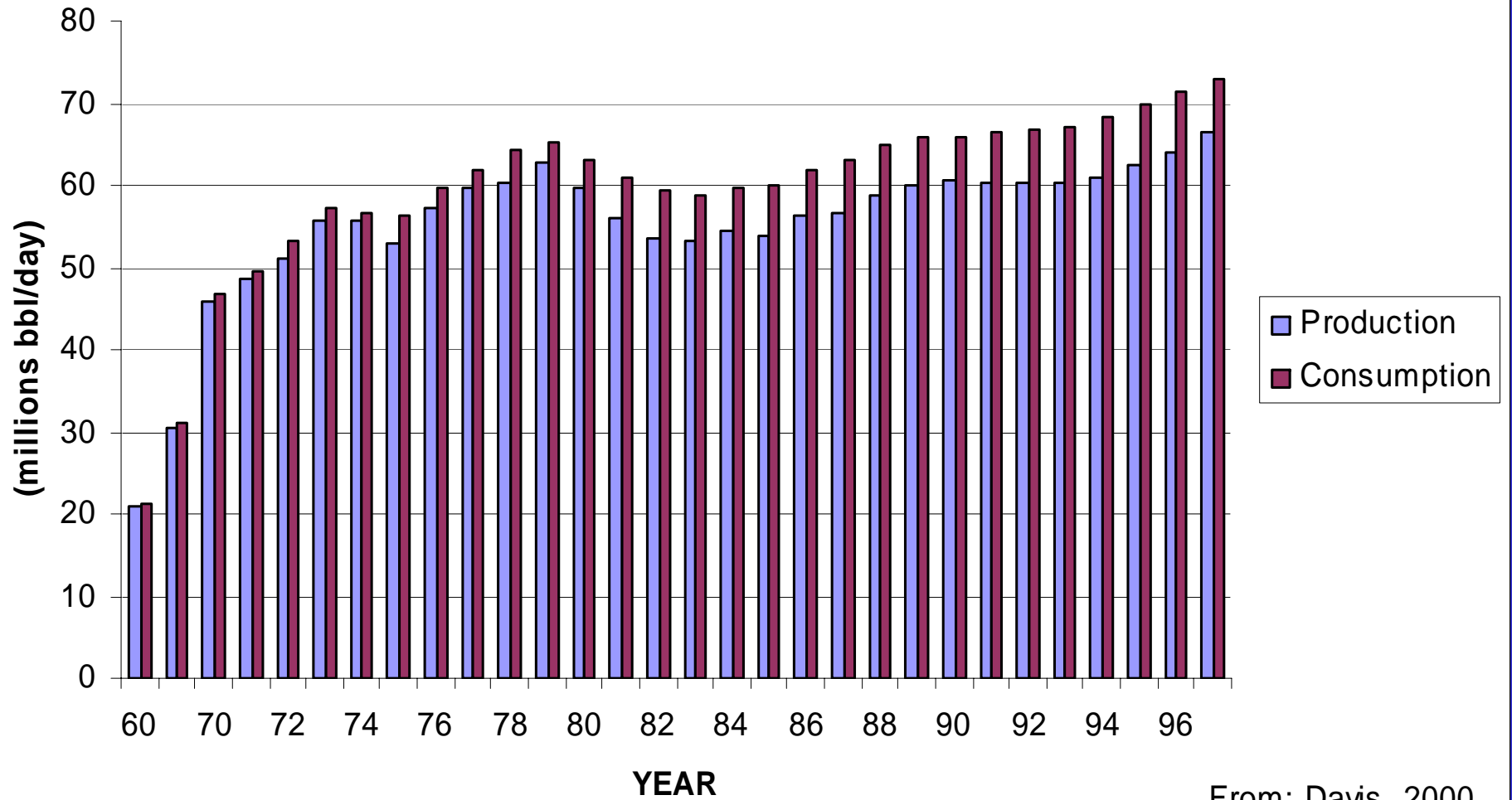
# AVERAGE ANNUAL RELEASES of PETROLEUM

	North America			Worldwide		
	Best est.	Min.	Max.	Best Est.	Min.	Max.
Natural Seeps	160	80	240	600	200	2000
Consumption of Petroleum	84	19	2000	480	130	6000
Transportation of Petroleum	9.1	7.4	11	150	120	260
Extraction of Petroleum	3.0	2.3	4.3	38	20	62
<b>TOTAL</b>	<b>260</b>	<b>110</b>	<b>2300</b>	<b>1300</b>	<b>470</b>	<b>8300</b>

**TRENDS IN PRODUCTION & CONSUMPTION**

**EXISTING STATUS OF RESERVES**

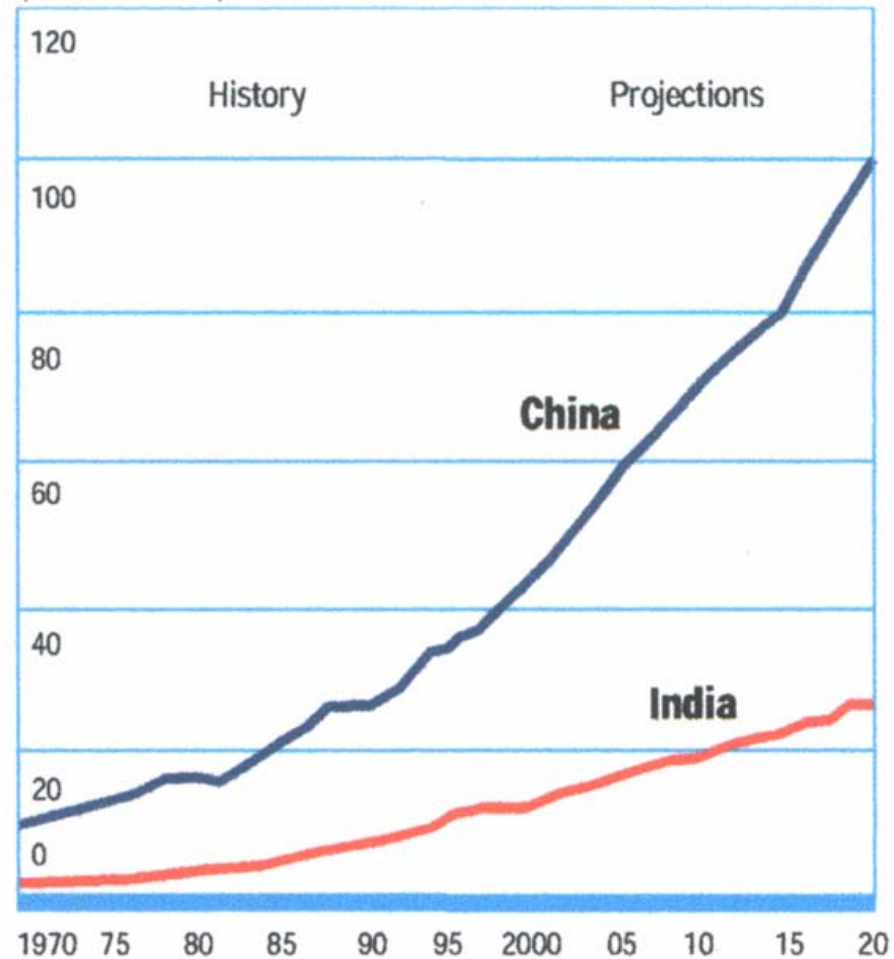
## WORLD OIL PRODUCTION AND CONSUMPTION



From: Davis, 2000

## Energy Consumption in China and India: 1970–2020

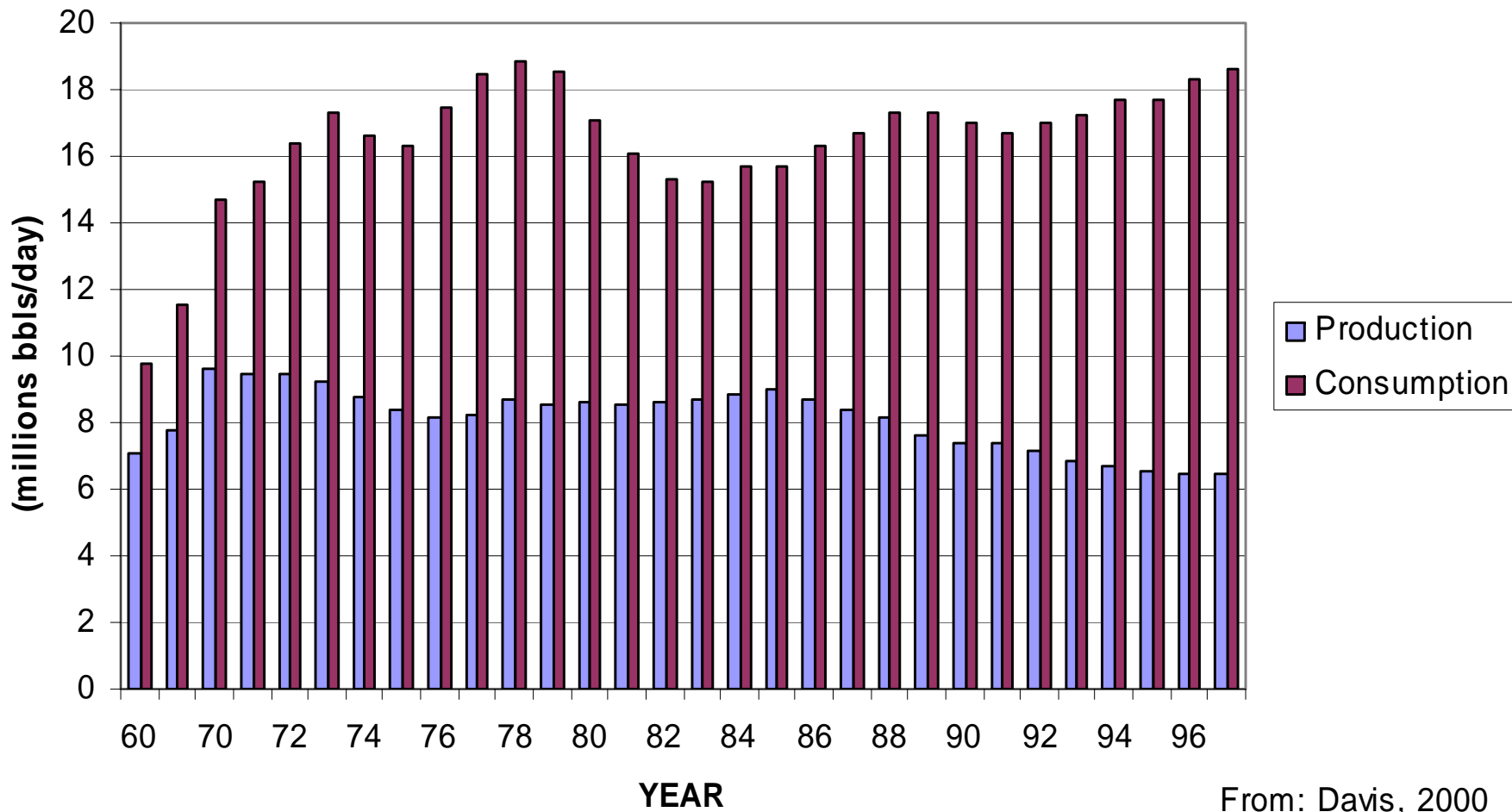
(Quadrillion Btus)



China and India account for the bulk of projected growth in oil demand in non-OECD countries.

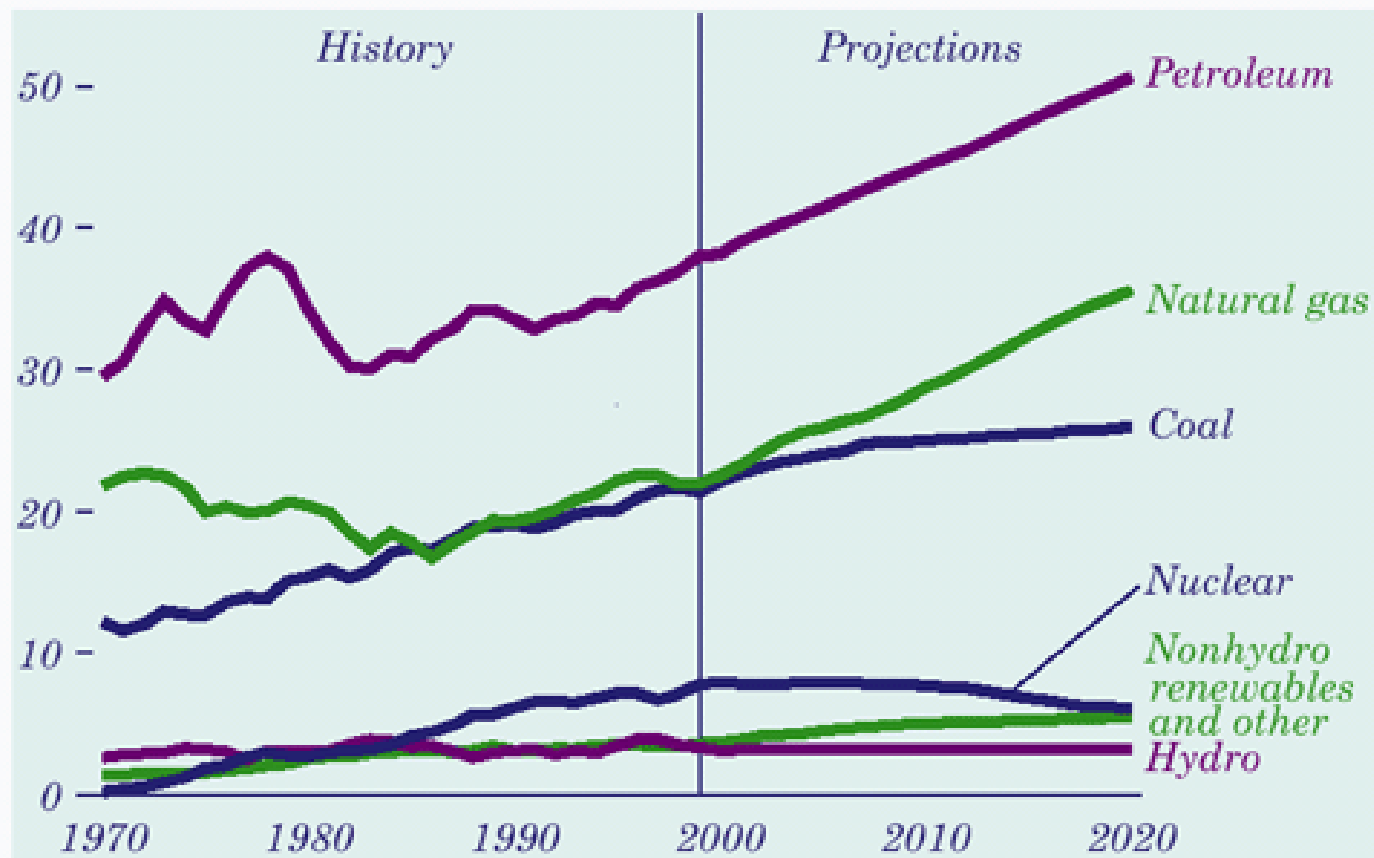
Source: U.S. Department of Energy, Energy Information Administration.

## U.S. OIL PRODUCTION AND CONSUMPTION



From: Davis, 2000

*Figure 21 Energy consumption by fuel, 1970-2020  
(quadrillion Btu)*

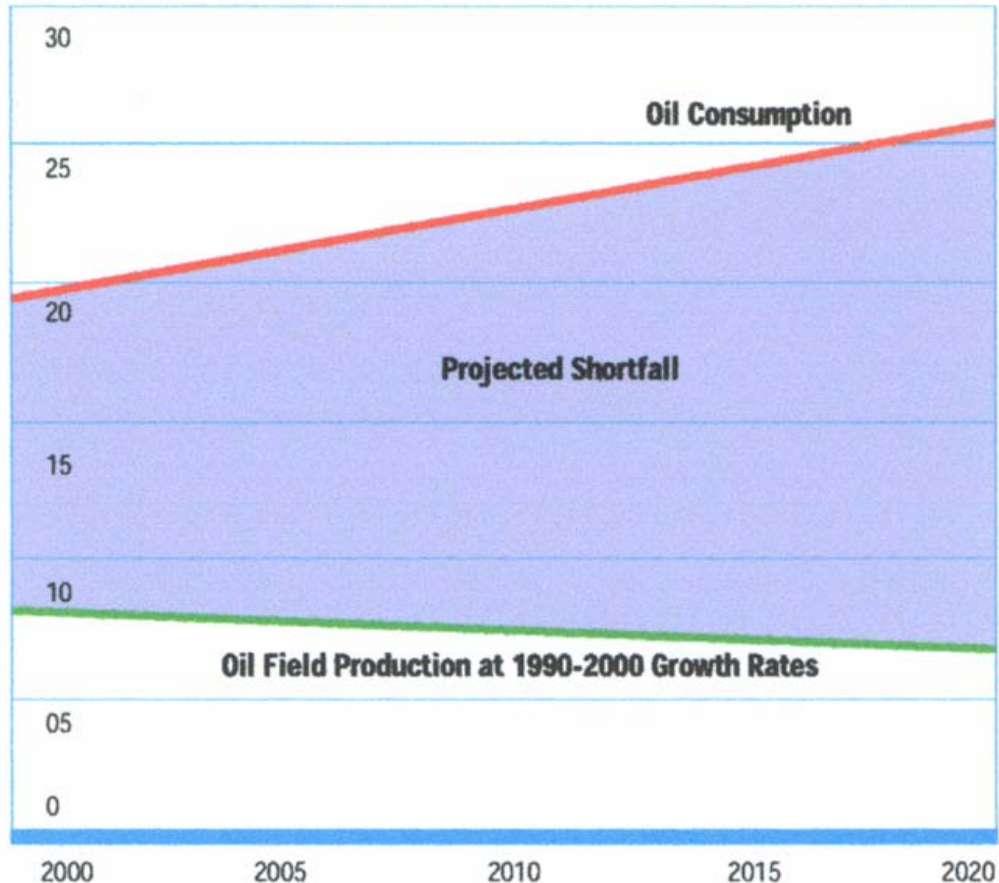


**History:** Energy Information Administration, *Annual Energy Review 1999*, DOE/EIA-0384(99) (Washington, DC, July 2000). **Projections:** Tables A1 and A18.



## U.S. Oil Consumption Will Continue to Exceed Production

(Millions of Barrels per Day)

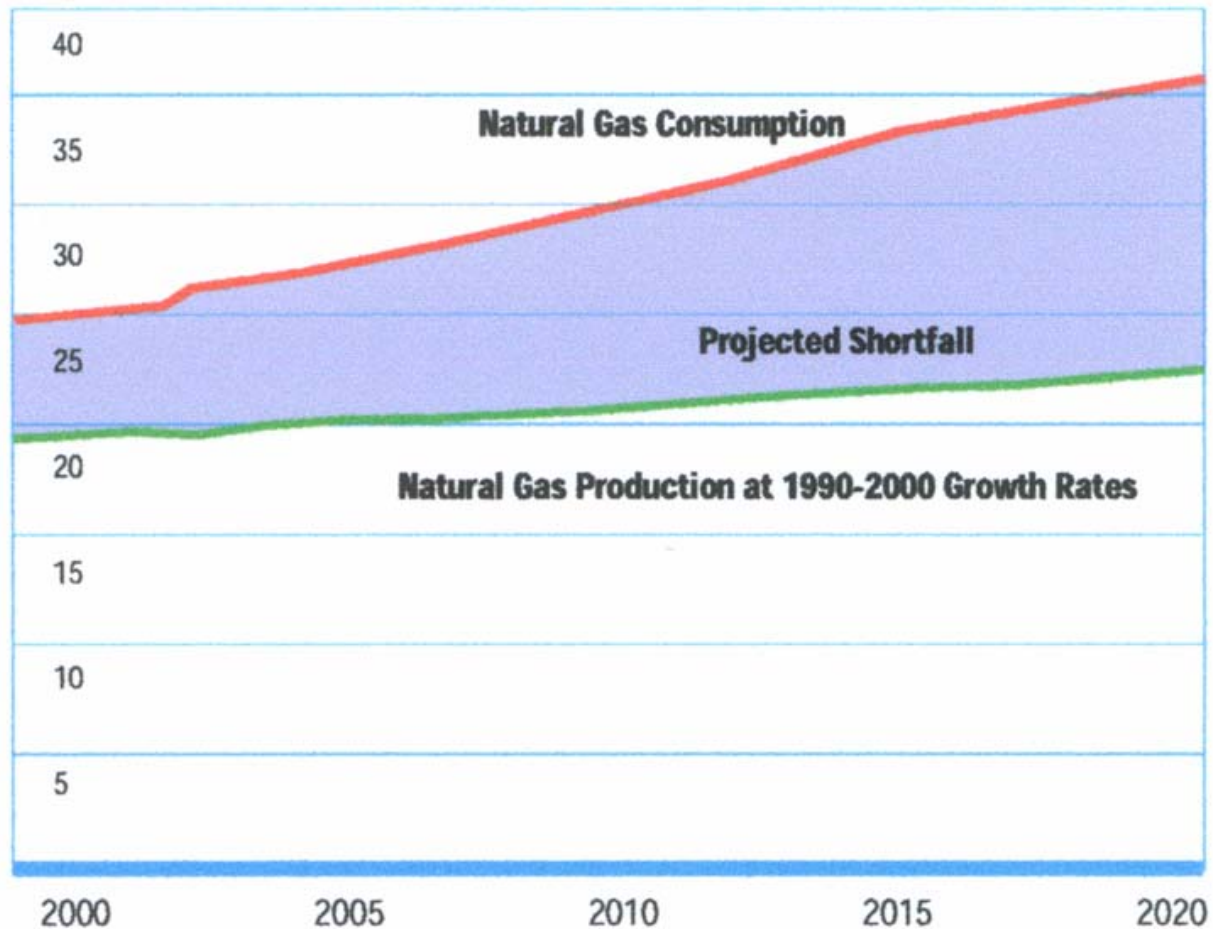


Over the next 20 years, U.S. oil consumption will grow by over 6 million barrels per day. If U.S. oil production follows the same historical pattern of the last 10 years, it will decline by 1.5 million barrels per day. To meet U.S. oil demand, oil and product imports would have to grow by a combined 7.5 million barrels per day. In 2020, U.S. oil production would supply less than 30 percent of U.S. oil needs.

Sources: Sandia National Laboratories and U.S. Department of Energy, Energy Information Administration.

## U.S. Natural Gas Consumption Is Outpacing Production

(Trillion Cubic Feet)



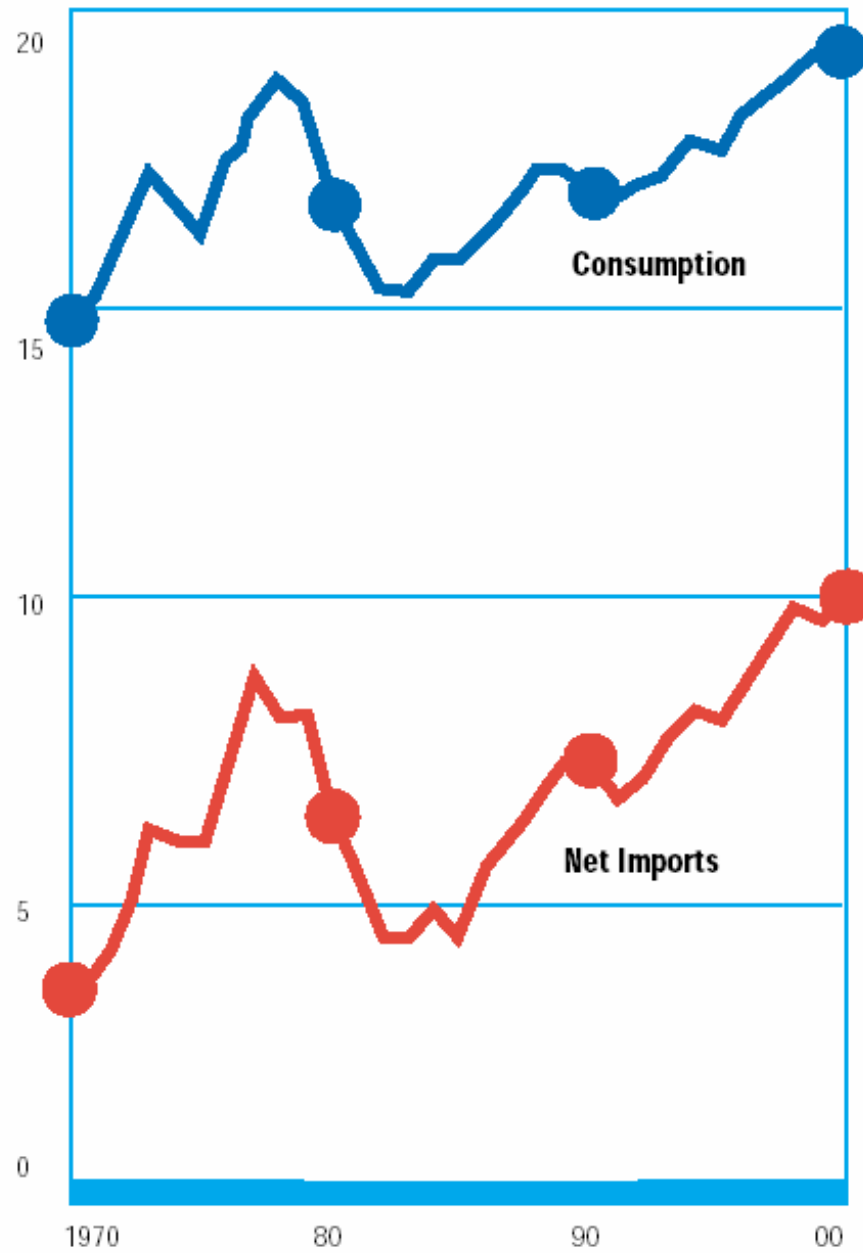
Over the next 20 years, U.S. natural gas consumption will grow by over 50 percent. At the same time, U.S. natural gas production will grow by only 14 percent, if it grows at the rate of the last 10 years.

Sources: Sandia National Laboratories and U.S. Department of Energy, Energy Information Administration.

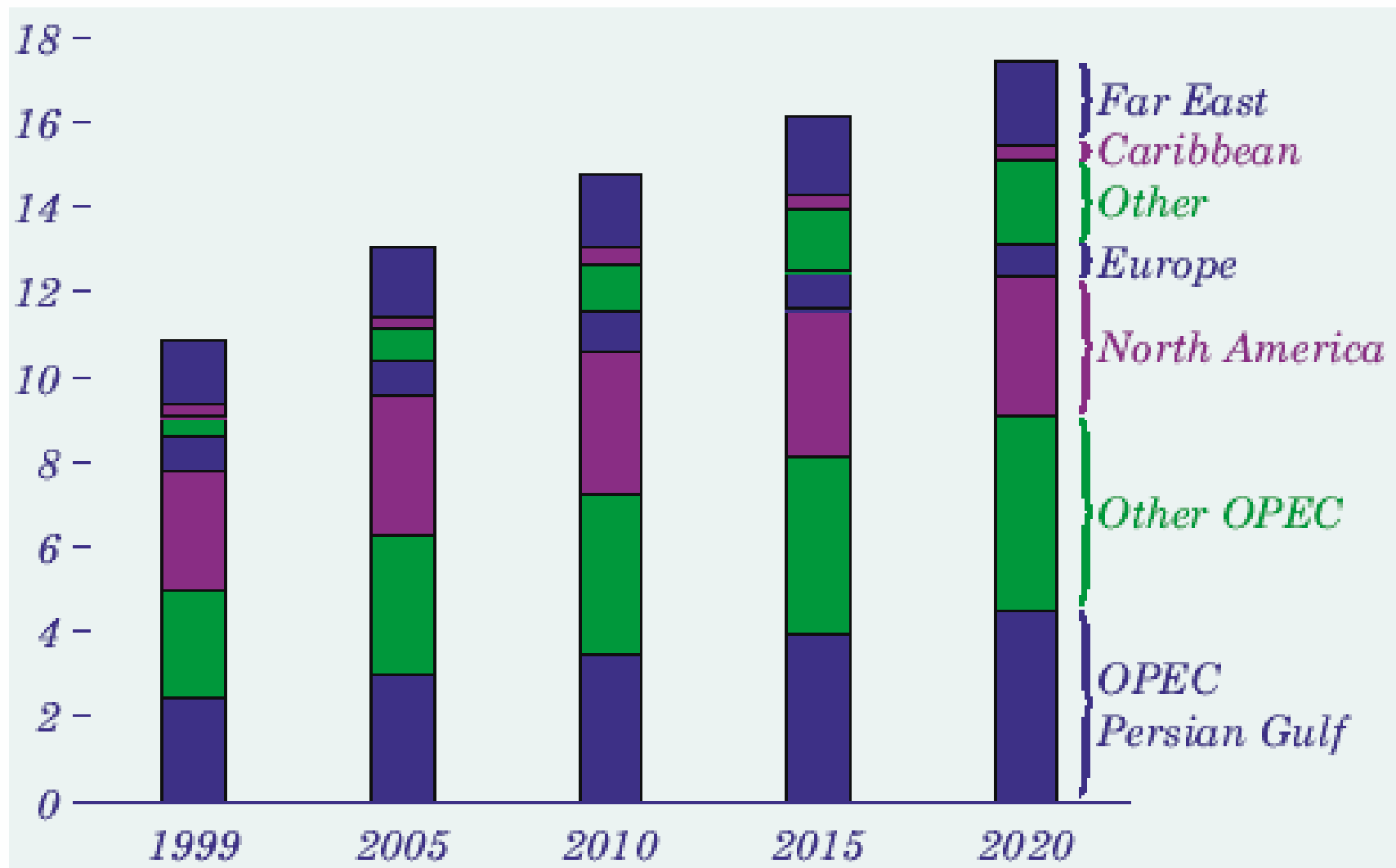
# **FUTURE TRENDS – OIL & GAS**

## Dependence on Foreign Sources of Oil

(Millions of Barrels a Day)



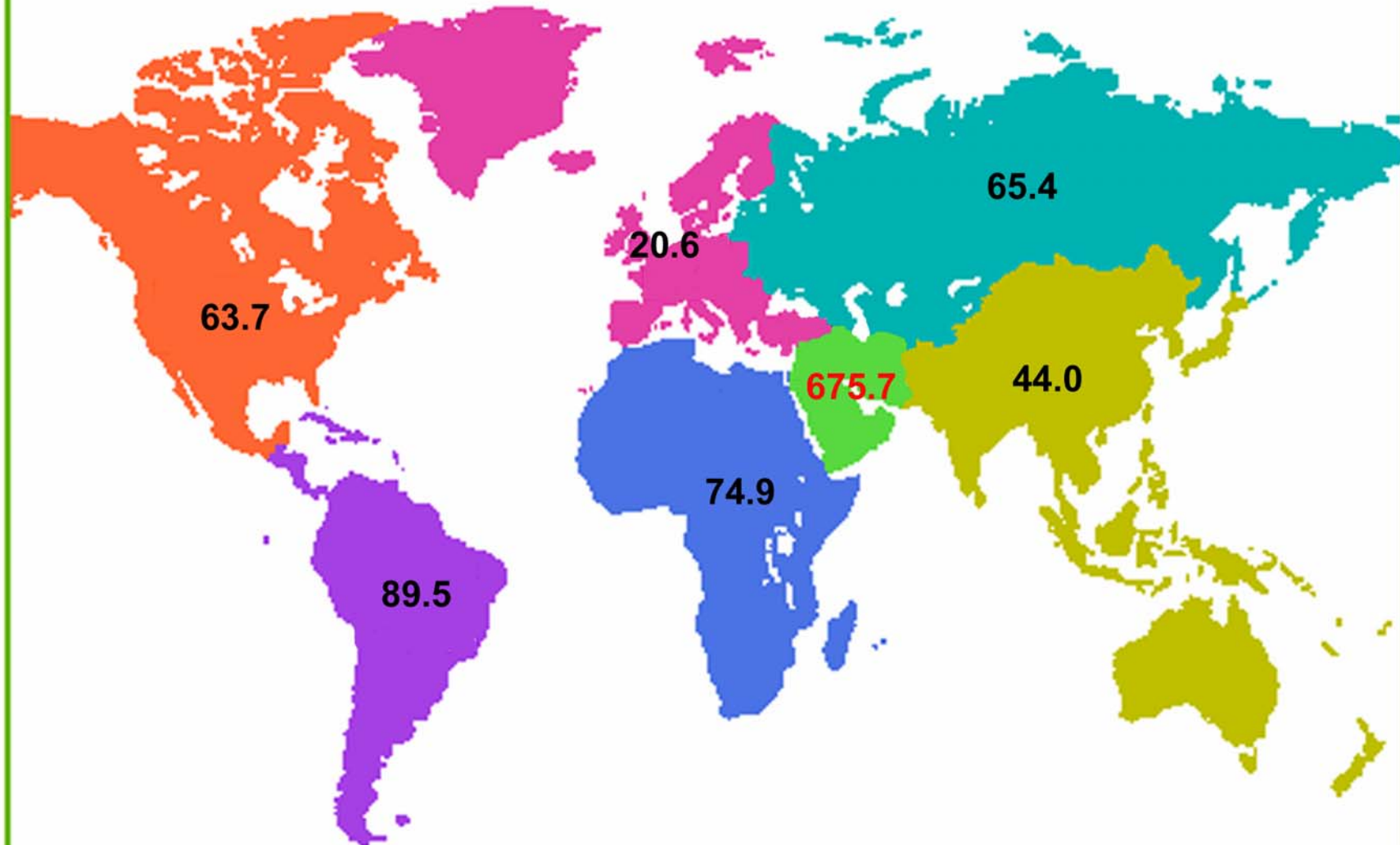
*Figure 45. Projected U.S. gross petroleum imports by source, 1999-2020 (million barrels per day)*



# ENERGY CONSUMPTION & IMPORTS

- IN NEXT 20 YEARS, U.S. OIL CONSUMPTION INCREASE BY 33% AND NATURAL GAS BY 50%
- U.S. IMPORTS WILL INCREASE SHARPLY IN NEXT 50 YRS.
- PRODUCTION IN U.S., CANADA, SOUTH AMERICA, EUROPE AND AFRICA WILL BE DEPLETED IN 50 YEARS
- IRAQ, SAUDI ARABIA, UAE, KUWAIT, & KAZAKHSTAN HAS RESERVES FOR NEXT CENTURY

# PROVED OIL RESERVES - 2000



BILLIONS BARRELS

## OIL SUSTAINABILITY - CURRENT RATE OF PRODUCTION

LESS THAN 10 YEARS	10 TO 50 YEARS
United States	China
Canada	Nigeria*
United Kingdom	Algeria
Indonesia*	Columbia
Norway	Oman
Egypt	India
Argentina	Qatar*
Australia	Romania
Ecuador	Yemen
	Brunei
50 TO 100 YEARS	MORE THAN 100 YEARS
Saudi Arabia	Iraq*
Russia	United Arab Republics*
Iran*	Kuwait*
Venezuela*	Kazakhstan
Mexico	Turmenistan
Libya*	Tunisia
Brazil	Uzbekistan
Azerbaijan	
Trinidad	(World's Remaining Oil in 75 Years)



*Is the U.S. destined to remain dependent on Middle East oil for the next 50 decades?*

# ***GAS HYDRATE SAMPLE***

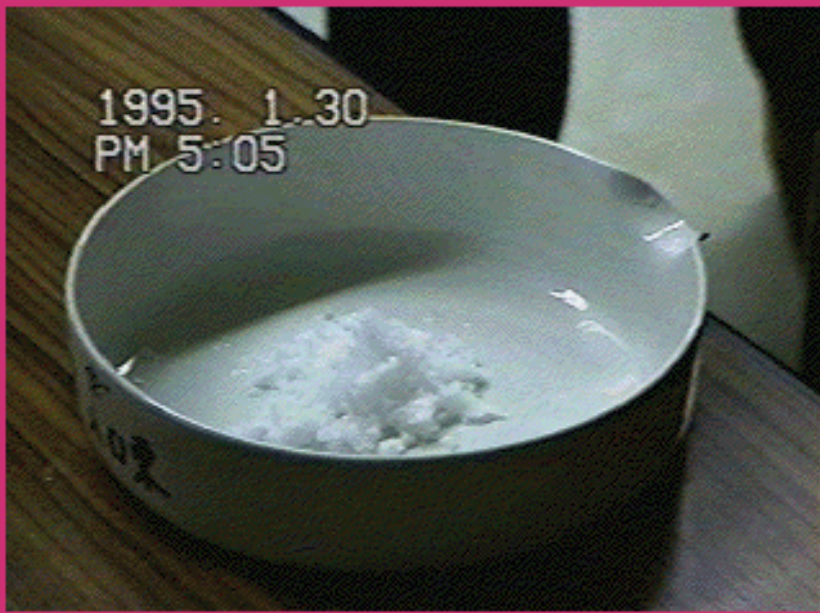




# ***GAS HYDRATE HILL IN GULF OF MEXICO***

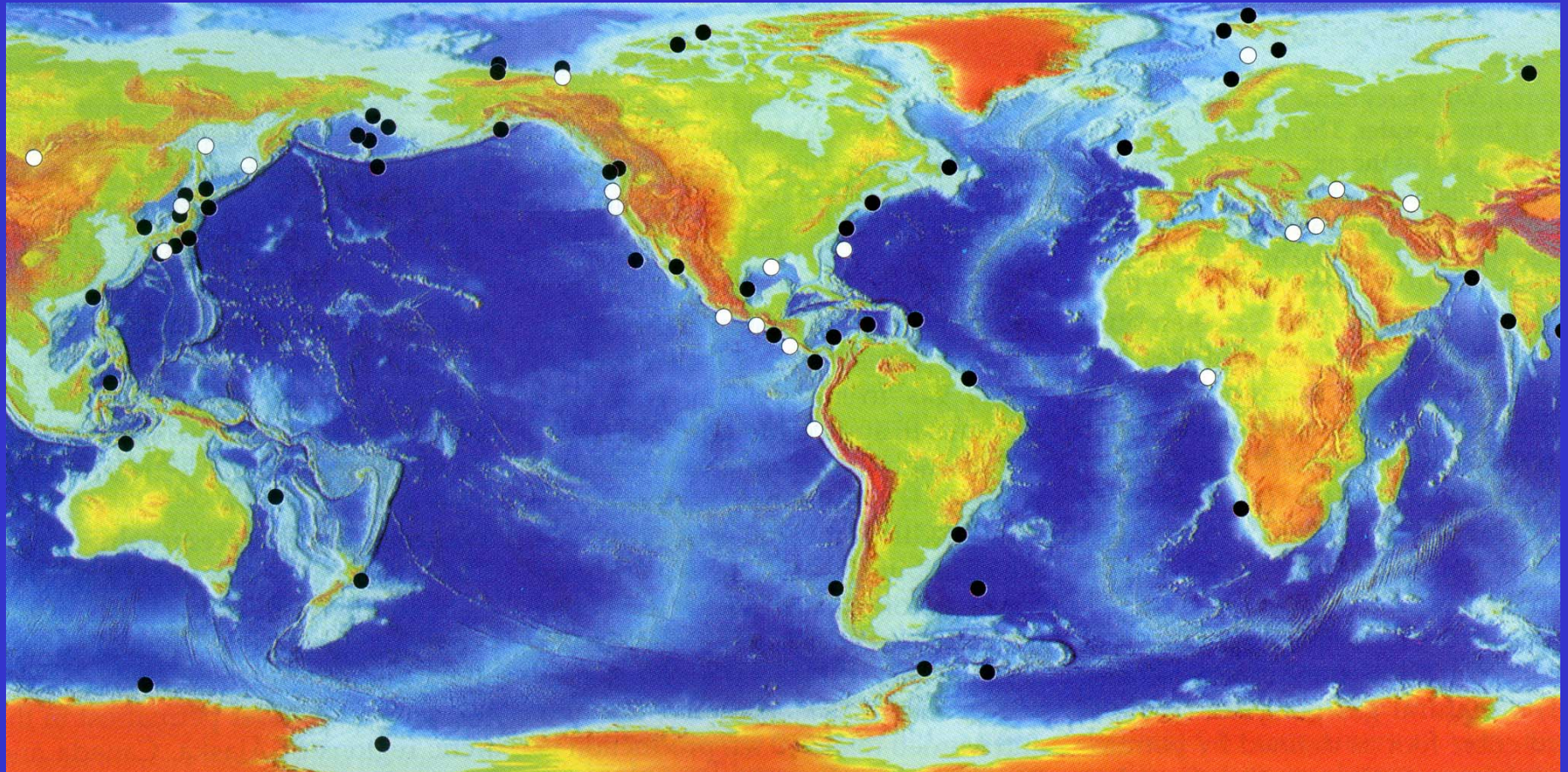




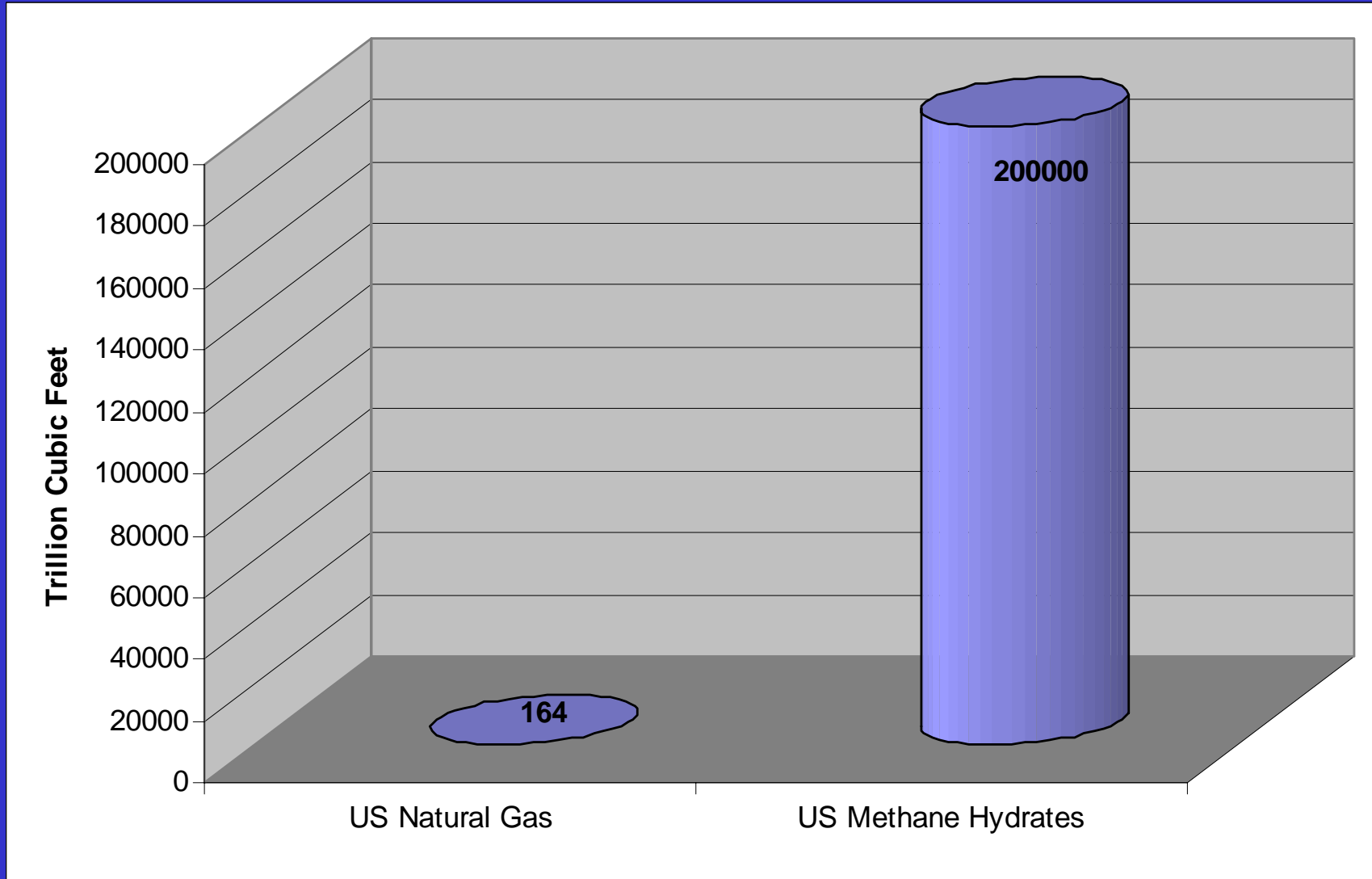




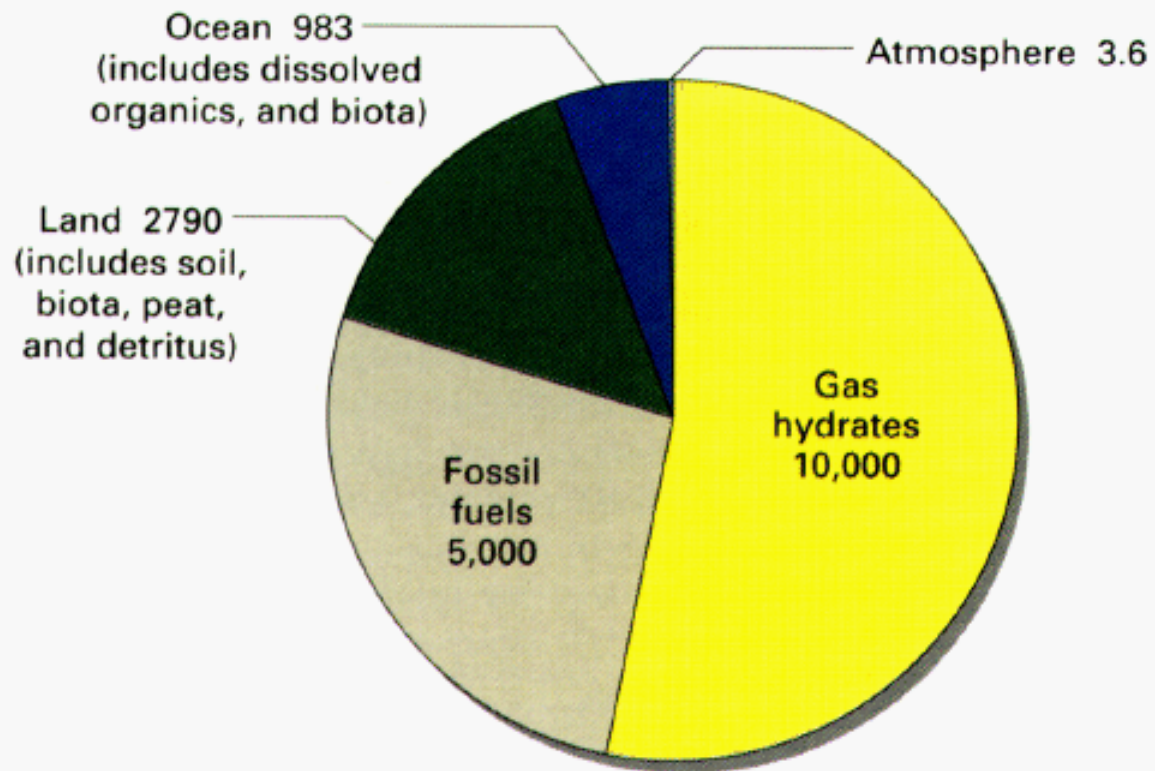
# ***WORLDWIDE DISTRIBUTION OF GAS HYDRATES***



*If only 1% of reserves recovered – 2,000 tcf*

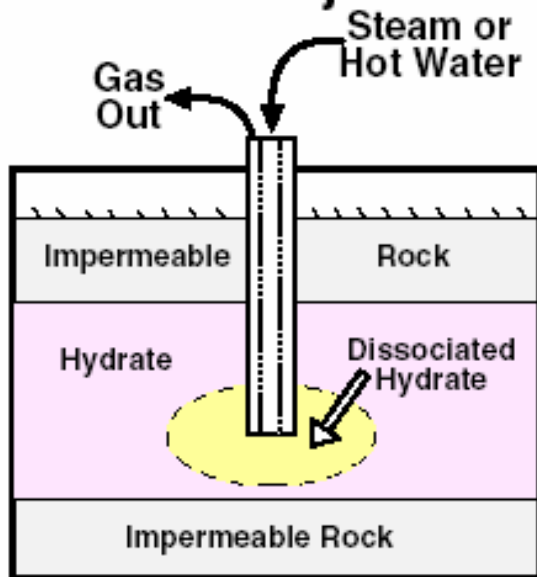




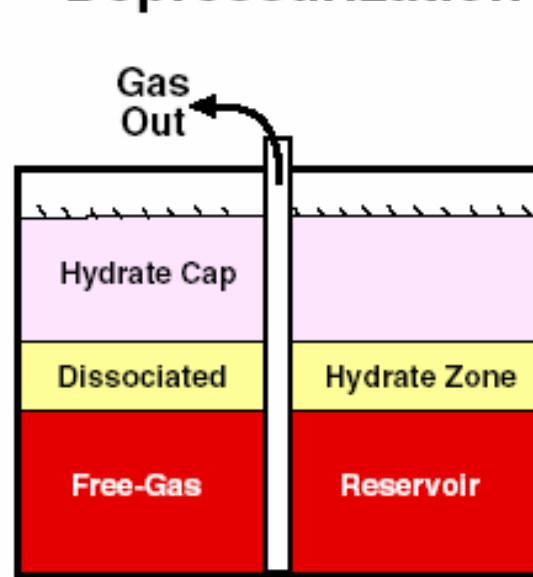


*Distribution of organic carbon in Earth reservoirs (excluding dispersed carbon in rocks and sediments, which equals nearly 1,000 times this total amount). Numbers in gigatons ( $10^{15}$  tons) of carbon.*

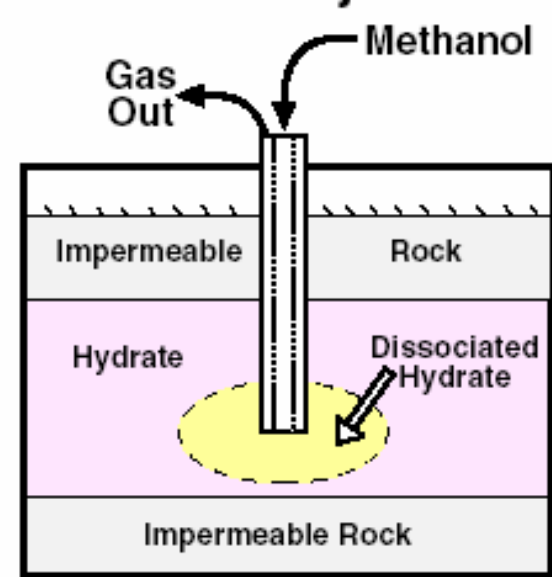
### Thermal Injection



### Depressurization



### Inhibitor Injection





## NEXT FIVE DECADES

- ENERGY CONSUMPTION IN US WILL CONTINUE TO INCREASE
- PRODUCTION IN US WILL DECLINE & BE DEPLETED
- IMPORTS TO NORTH AMERICA WILL SIGNIFICANTLY INCREASE
- MORE MARITIME TRAFFIC – INCREASE CHANCE OF SPILLS
- PETROLEUM HYDROCARBON POLLUTION FROM COASTAL FACILITIES WILL INCREASE
- POLLUTION FROM O&G OPERATIONS WILL DECREASE
- TO REDUCE PETROLEUM HYDROCARBON POLLUTION, NEW REGULATIONS WILL HAVE TO BE PUT INTO PLACE TO CURB URBAN RUNOFF
- NATURAL SEEPS WILL CONTINUE TO BE MAIN SOURCE OF POLLUTION
- **U.S. MUST ACCELERATE RESEARCH ON GAS HYDRATES**