

Kentucky Professional Engineers in Mining Seminar

NRC Study: Coal Research and Development to Support National Energy Policy



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State Geologist and Director



Purpose of the report

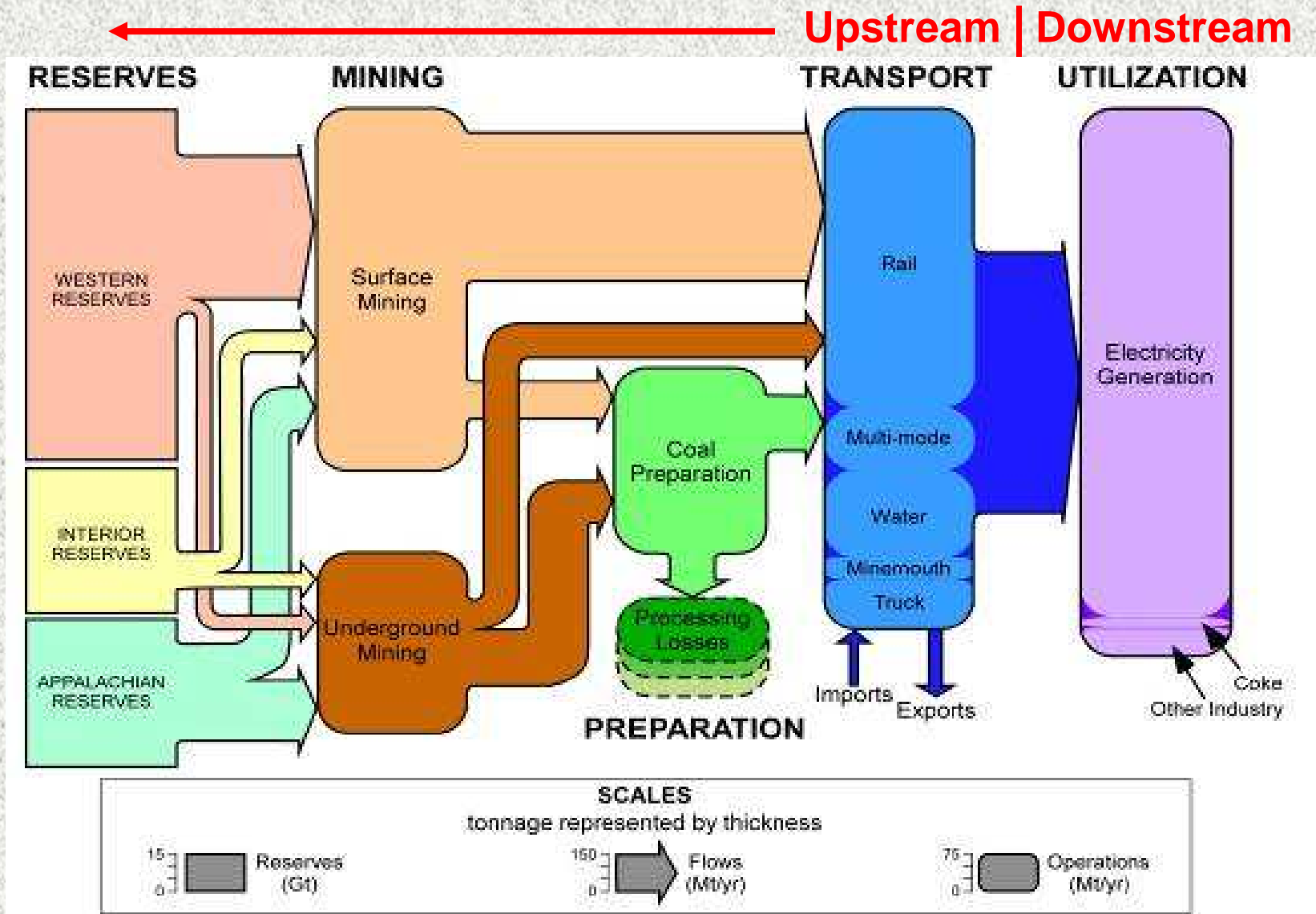
This report focused on the “upstream” side of the coal industry including: *coal reserves, miner health and safety, environmental protection and CO₂ management, and mine productivity and optimizing resources.*

By 2030 coal production will increase 60 to 70%.

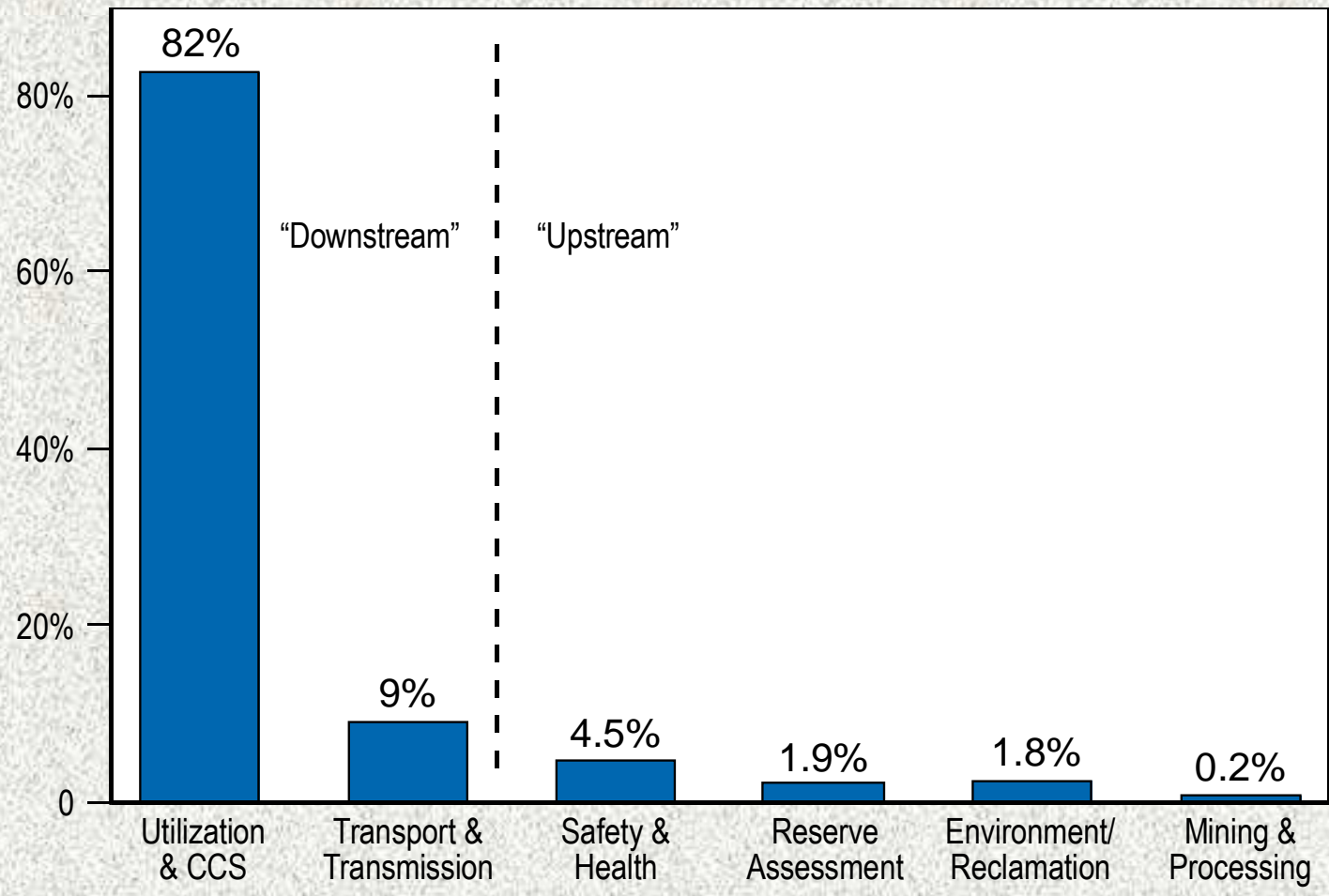
US has more than adequate reserves to accommodate this increase.

Approximately 90 percent of federal R & D goes for “downstream” activities while only 10 percent goes for “upstream” activities in the coal cycle.

U.S. Coal Fuel Cycle



Distribution of Federal Funding for Coal-Related R & D



“Coal will continue to provide a substantial portion of U.S. energy for at least the next several decades, a major increase in federal support for coal R & D is needed to ensure that this natural resource is extracted efficiently, safely, and in an environmentally responsible manner,” says a new congressionally mandated report from the National Research Council.

“Policymakers also need a more accurate assessment of the extent and location of the nation's coal reserves, the report adds.” It recommends an increase of about \$144 million annually in new federal funding across a variety of areas.

Source: NRC 2007



- **No new mega-agency like Bureau of Mines**
- **Greatly improved coordination among federal agencies**
- **Increase research for federal agencies such as:**

OSM

NIOSH

MSHA

USGS

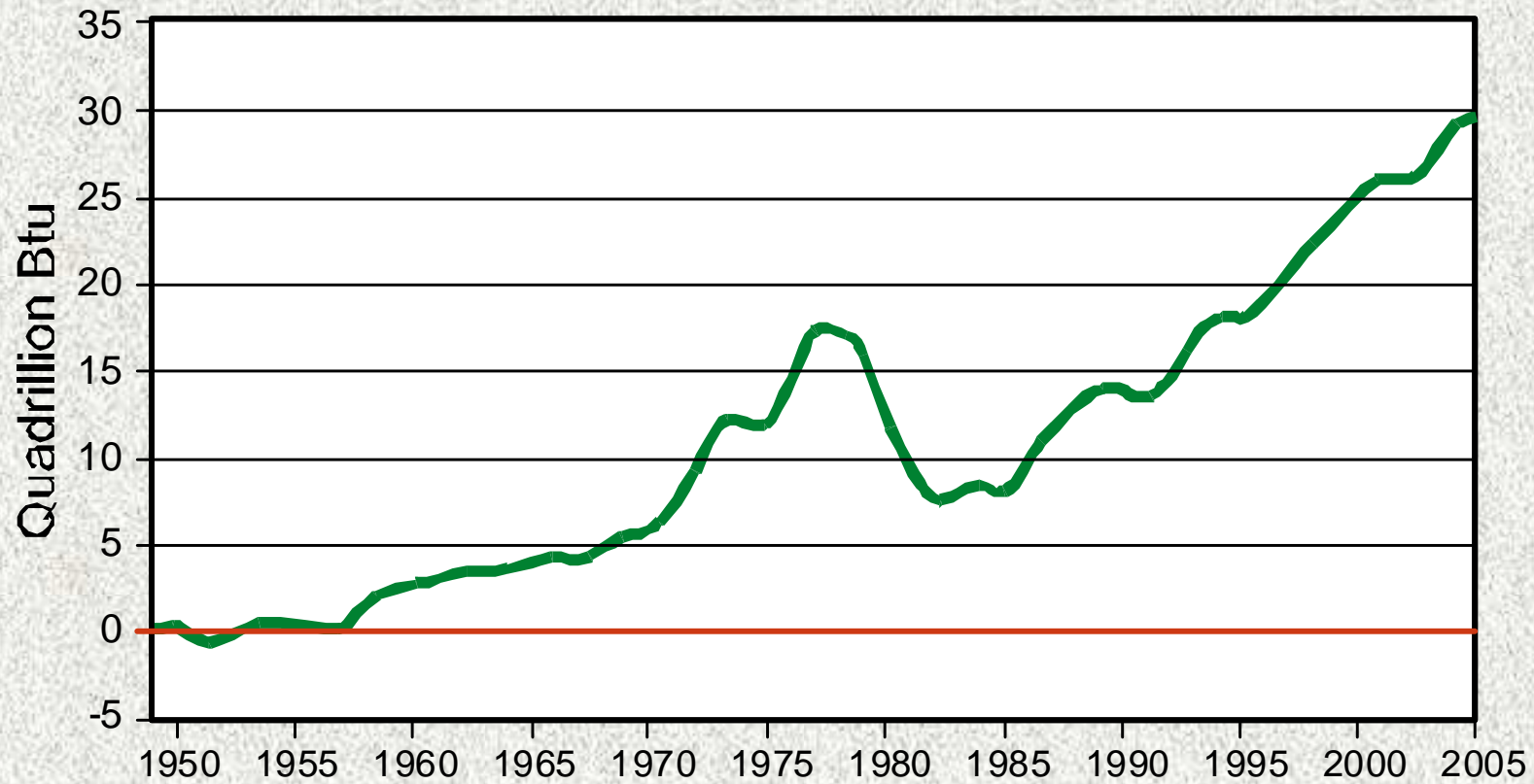
Others

Findings and Priority Areas-Research Leading to improvements in:

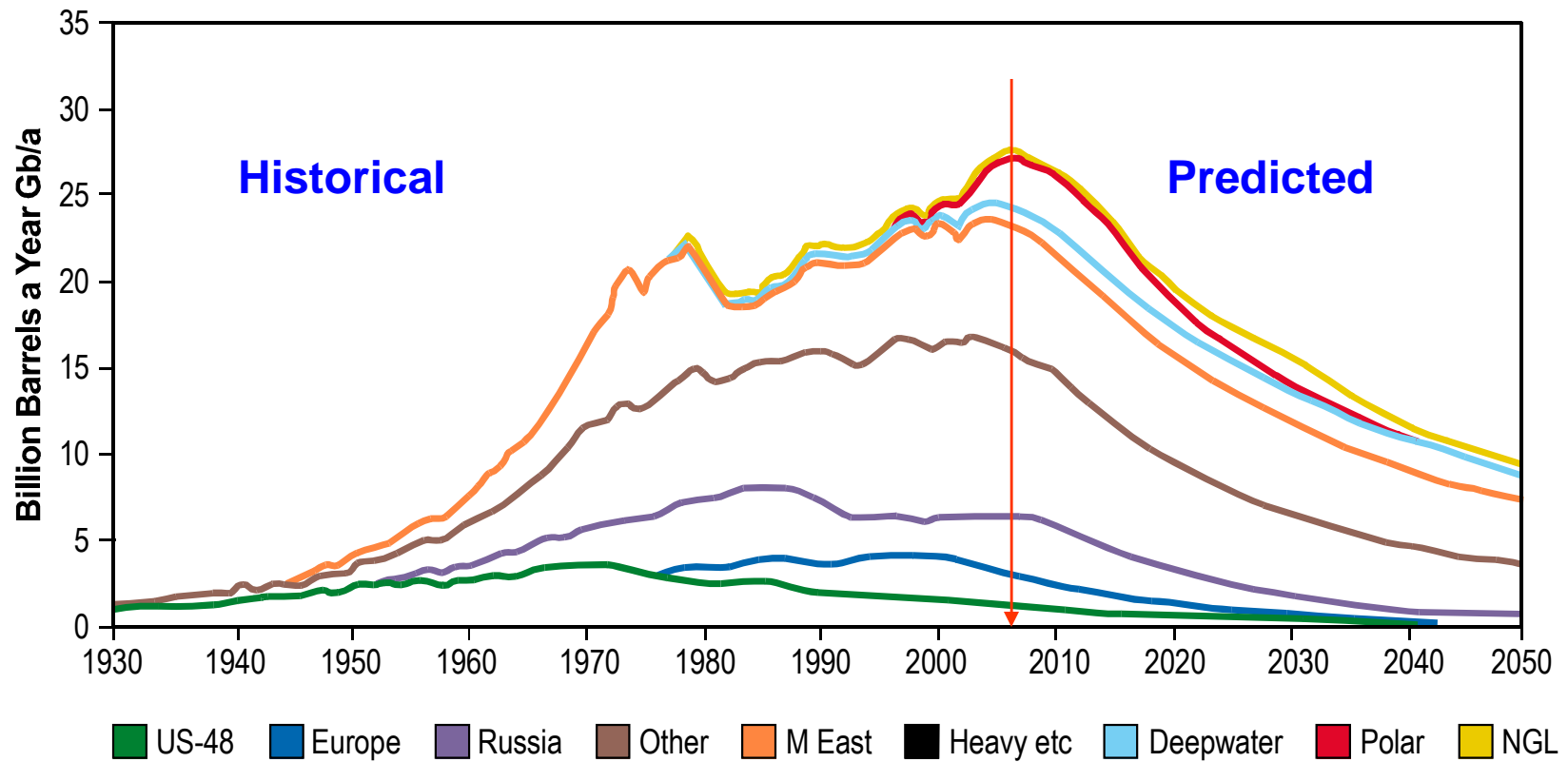
- Mining workforce and education**
- Assessments of coal reserves**
- Improvements in coal mining and
processing**
- Improvements in worker health and
safety**
- Improvements in environmental
protection**

- **Carbon dioxide emissions associated with global climate change pose the greatest constraint on future coal utilization.**
- **Large-scale demonstrations of carbon management technologies—especially carbon capture and sequestration (CCS)—are needed to prove the commercial readiness of technologies.**

U.S. Energy Imports 1950 to 2005



Peak of World Petroleum Production?



Uppsala Hydrocarbon Depletion Group (2004)

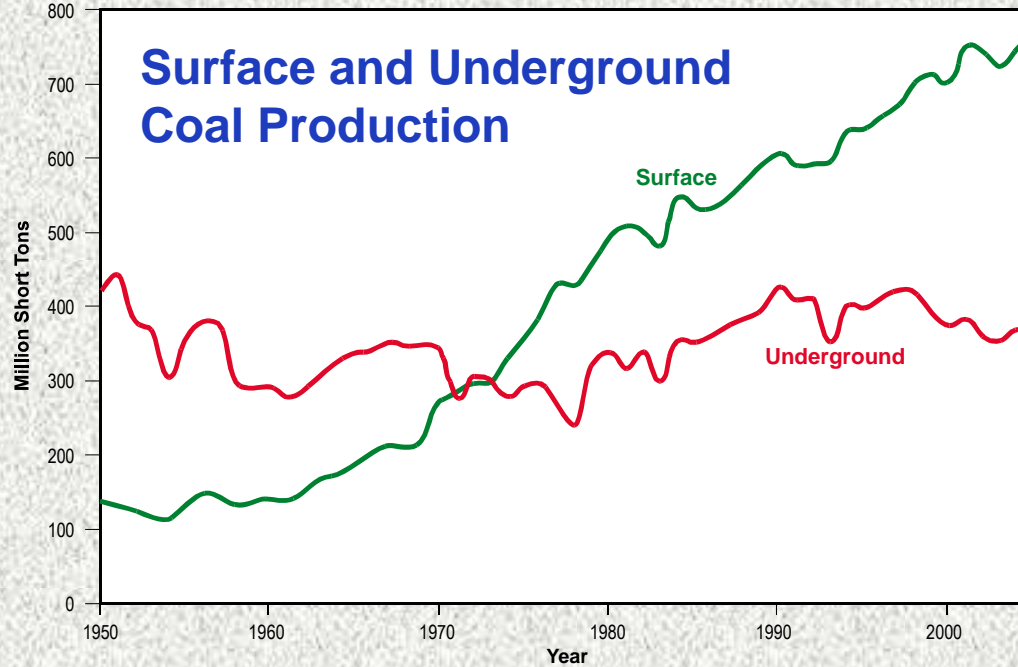
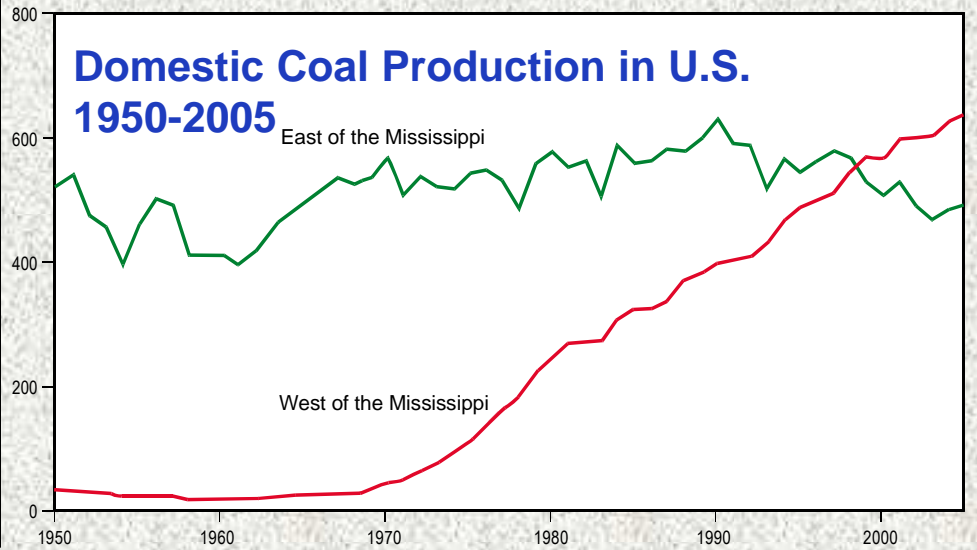
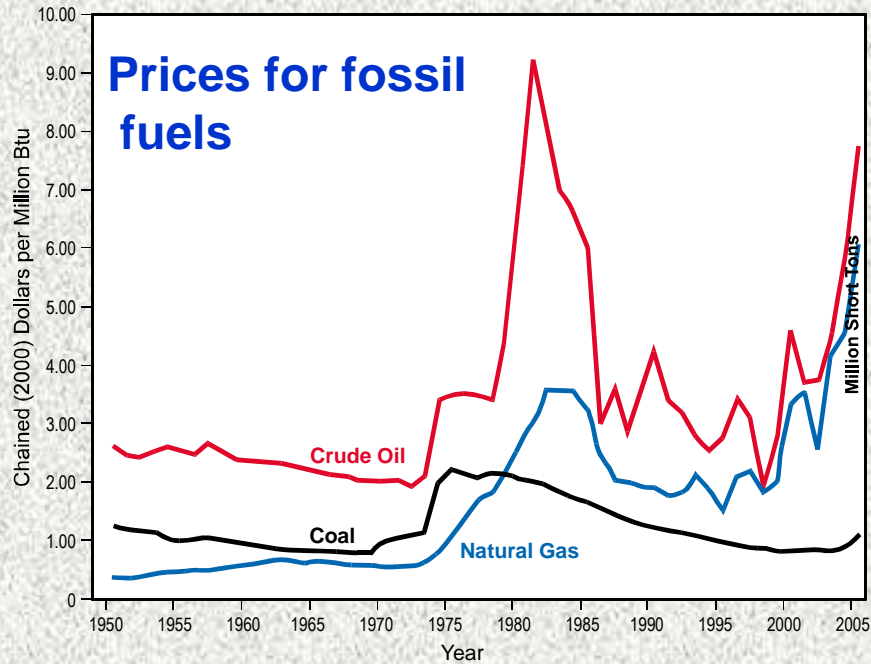


China's Coal Plants



Platts and American Magazine

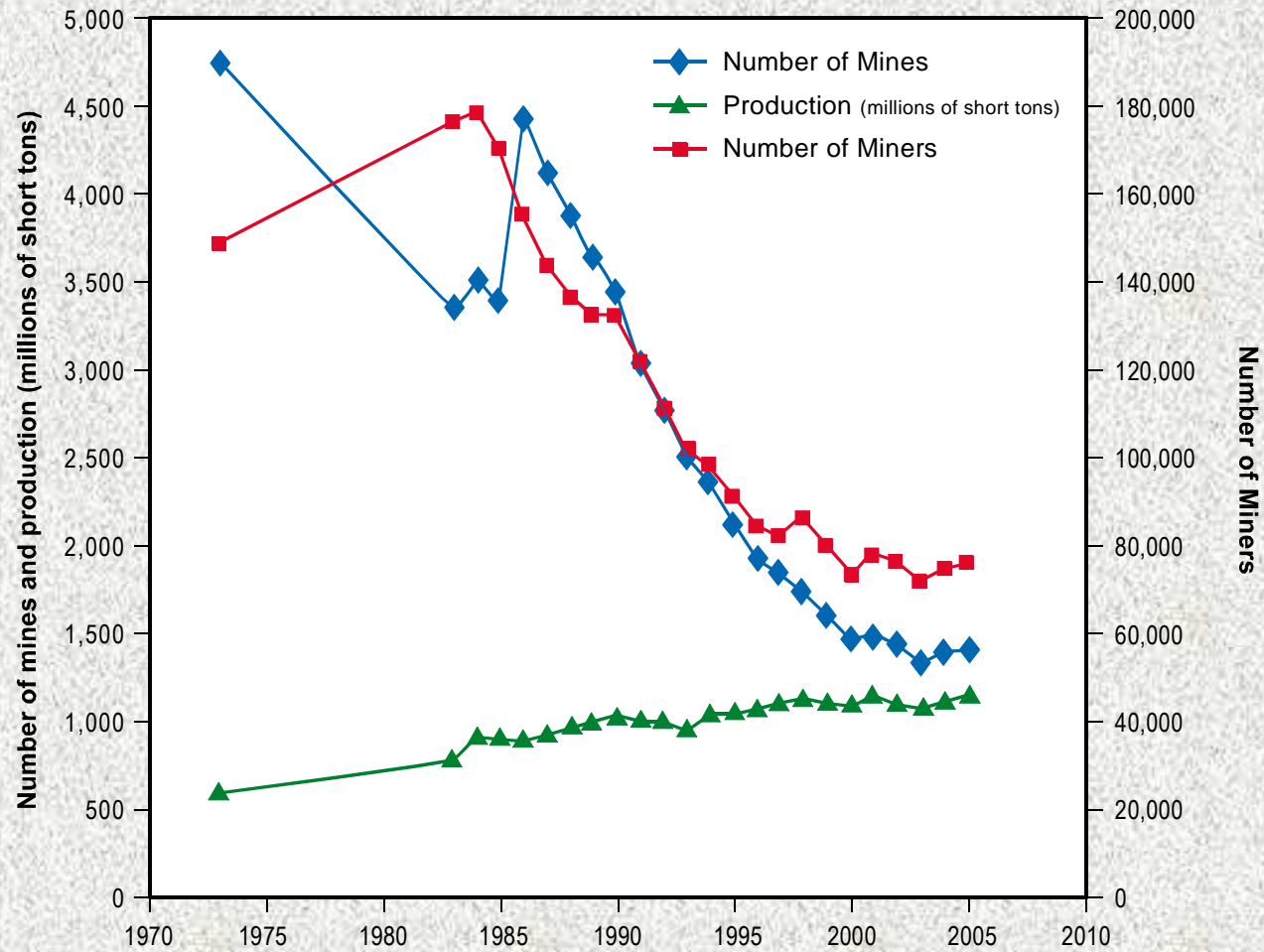
The Past



Source: EIA 2006



Trends for U.S. Coal Production, Mines, and Employment

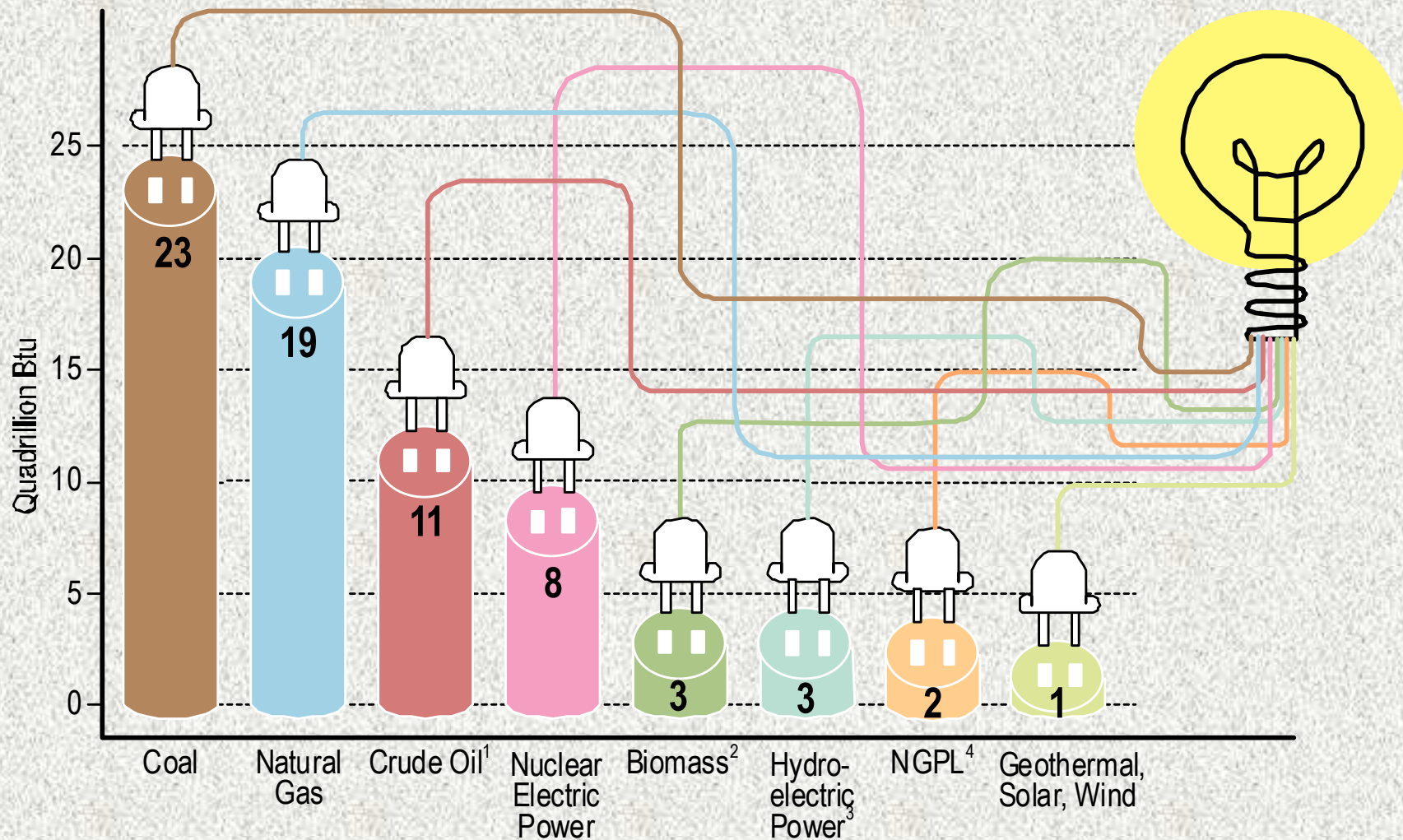


Source: NMA 2006



The Present

Sources of U.S. Electrical Energy



Source: EIA 2006 and American Magazine, 2007





U.S. Coal Resources and Reserves

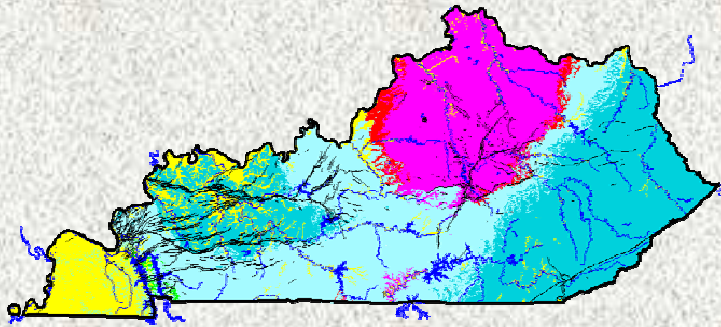
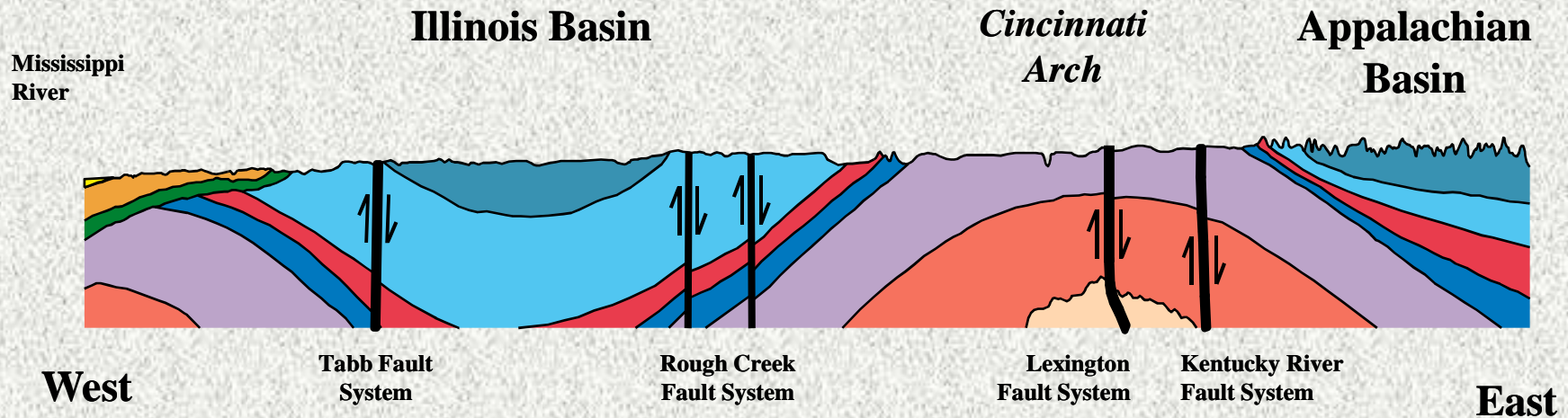
Recoverable Reserves at Active Mines (RRAM)	18.9 billion tons
Estimated Recoverable Reserves (ERR)	267.6 billion tons
Demonstrated Reserve Base (DRB)	492.9 billion tons
Identified Resources (from Averitt, 1974)	1700.0 billion tons
Total Resources (above plus undiscovered resources)	4000.0 billion tons

Source: EIA (2006)

The Future

Carbon Capture and Storage (CCS)

2007 Special Session on Energy- \$5 million for KGS to investigate CO₂ sequestration, EOR and EGR in Kentucky.



Two major basins separated by an arch.

Public Opinion of Global Warming

- **Generally exaggerated.....33%**
- **Generally correct.....29%**
- **Generally underestimated.....35%**

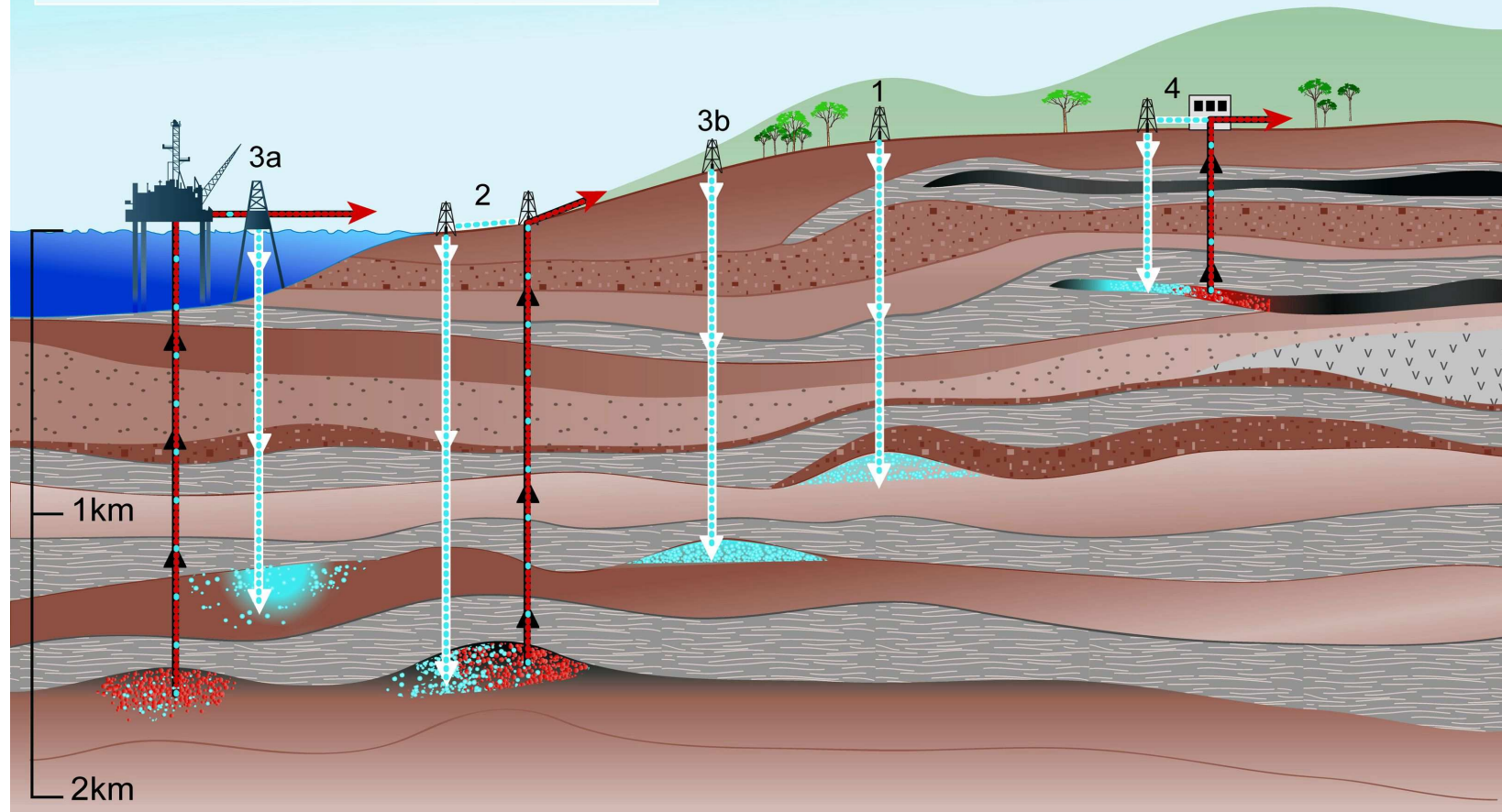


Cobb, 2006

Methods for storing CO₂ in deep underground geological formations

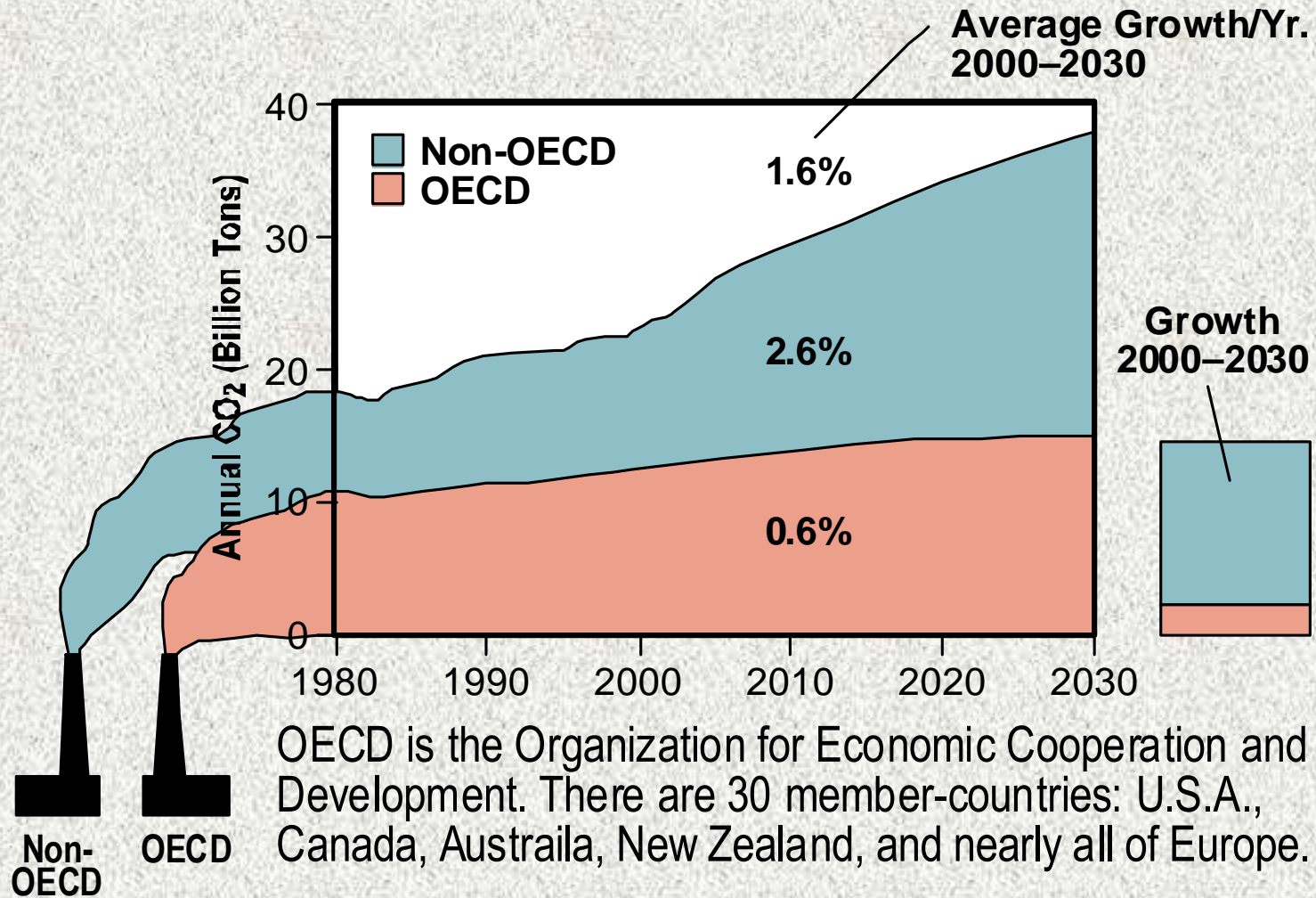
Overview of Geological Storage Options

- 1 Depleted oil and gas reservoirs
- 2 Use of CO₂ in enhanced oil and gas recovery
- 3 Deep saline formations — (a) offshore (b) onshore
- 4 Use of CO₂ in enhanced coal bed methane recovery

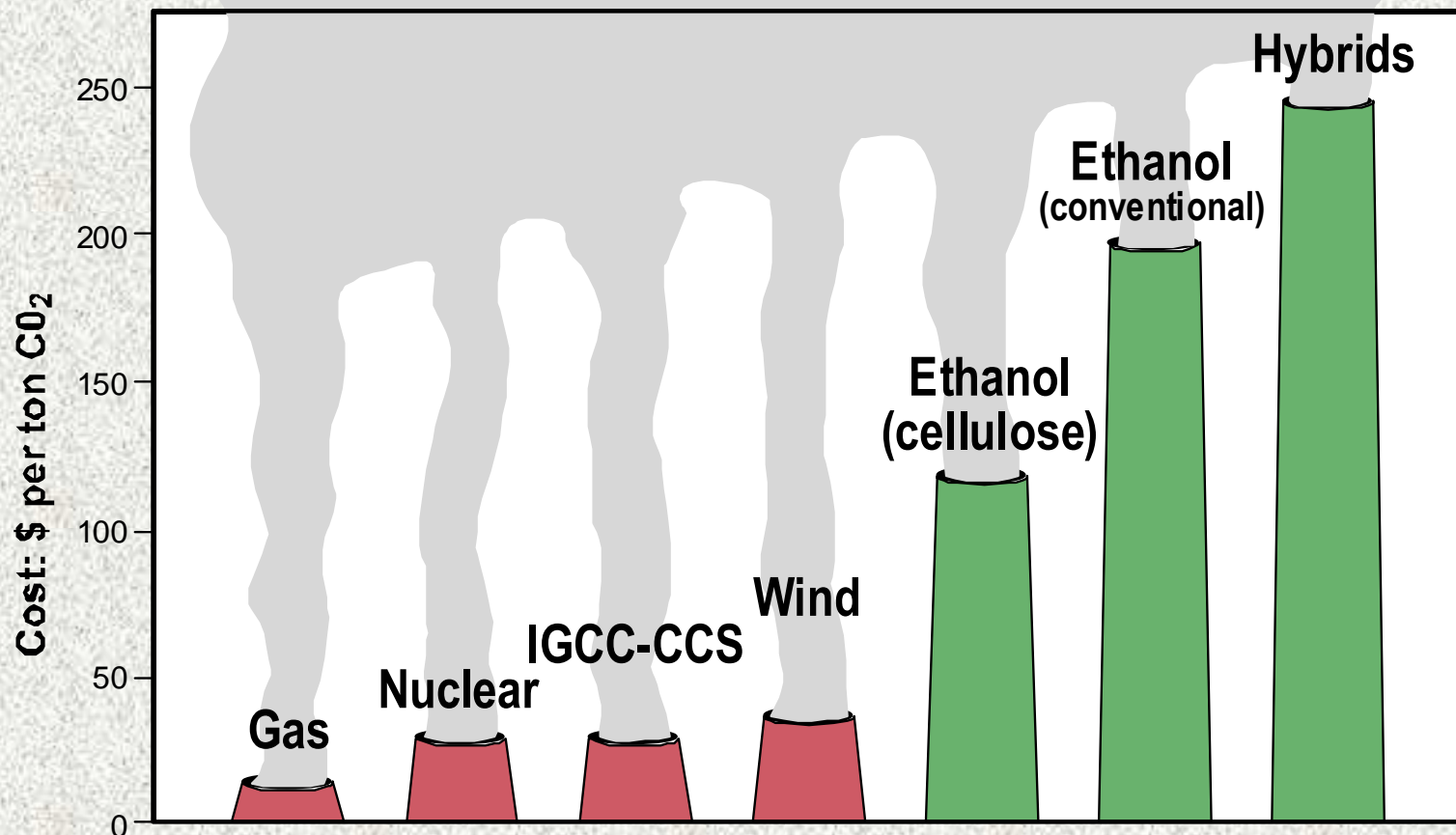


SRCCS Figure TS-7

The Source of Future CO₂ Emissions



Least Expensive Methods to Cut CO₂ Emissions



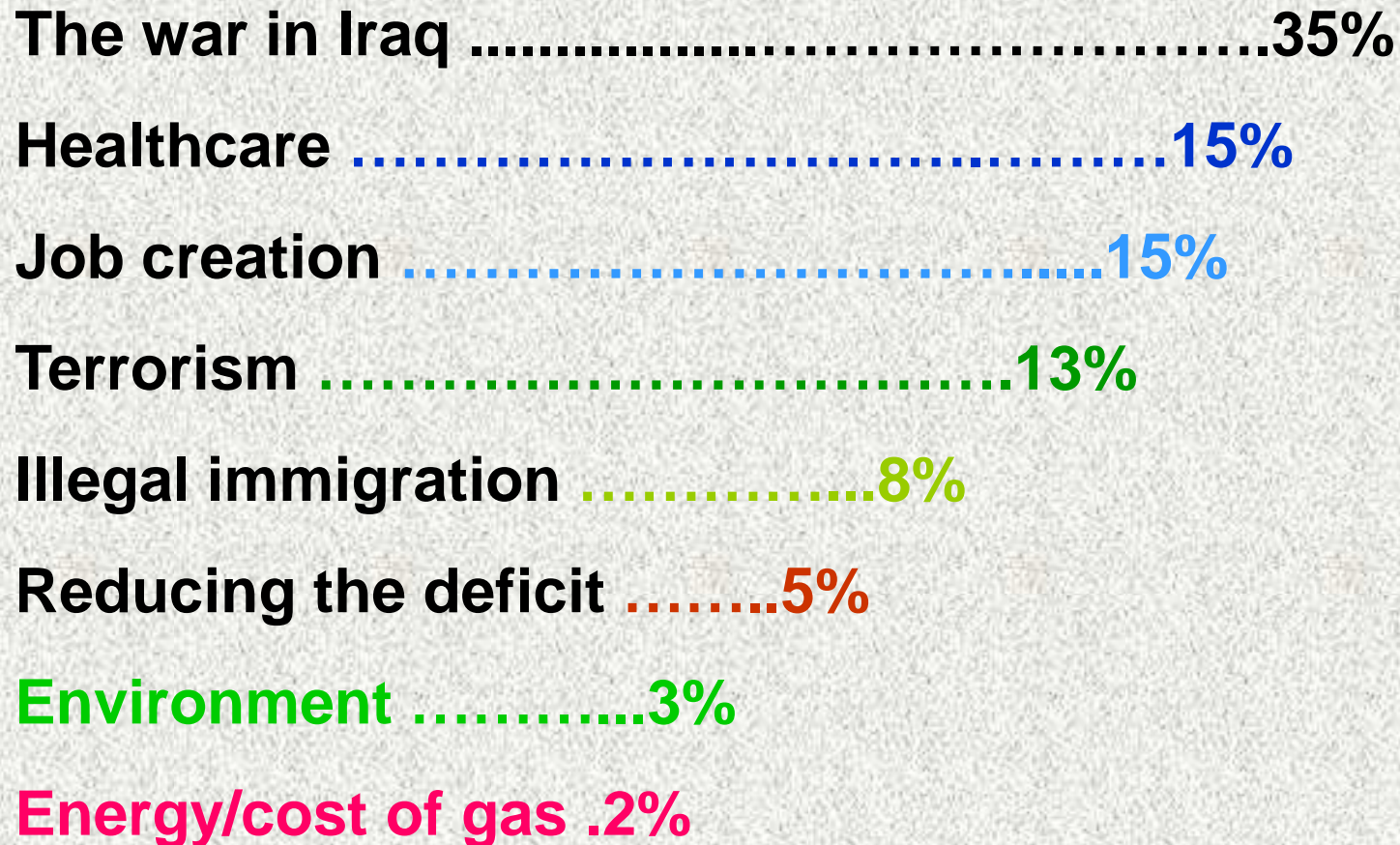
Source: SFA Pacific, JEC Study, American Magazine, 2007



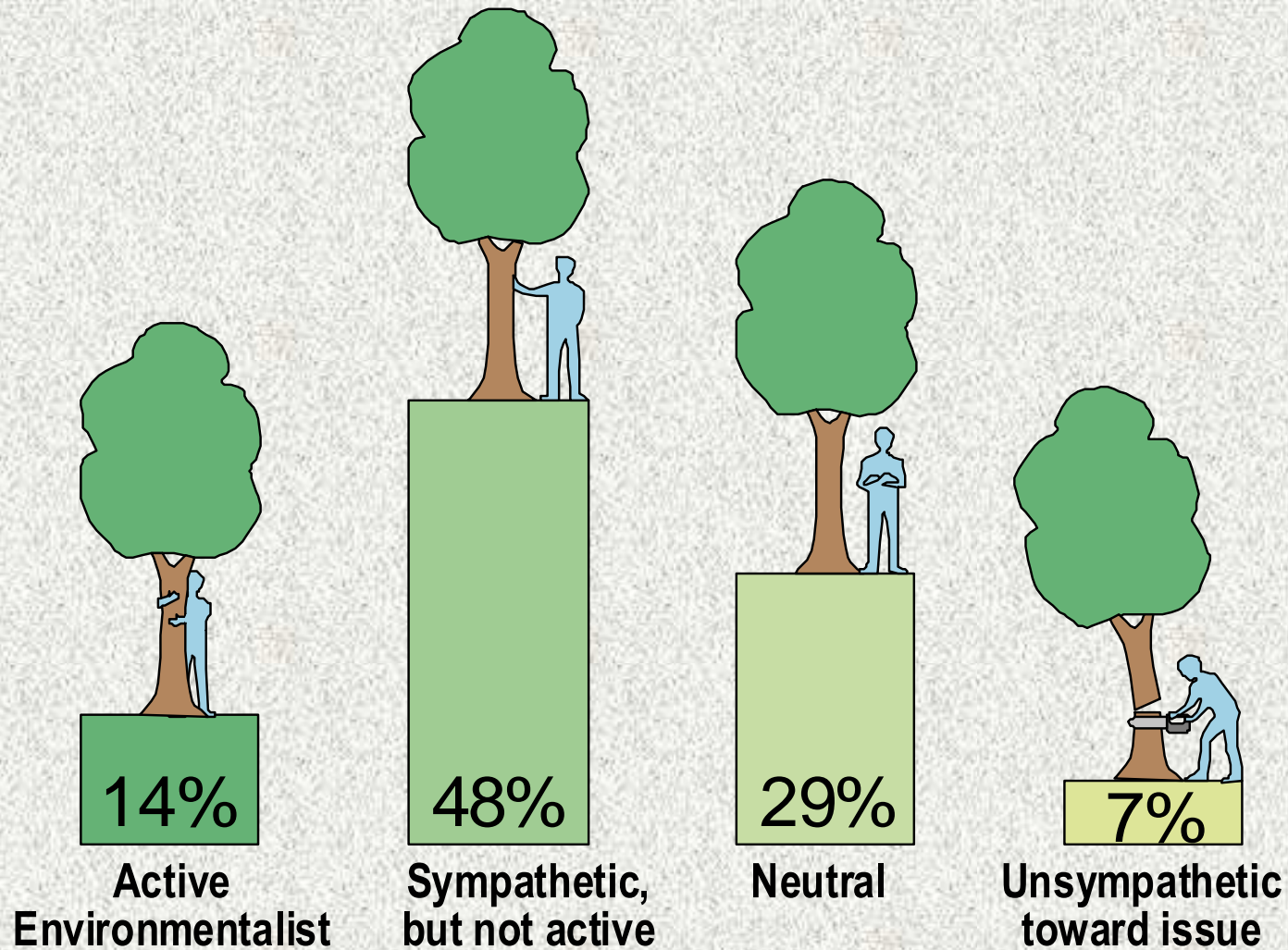


American Public Opinion Poll

Top Concerns of Americans in 2007:



Public Opinion on the Environment



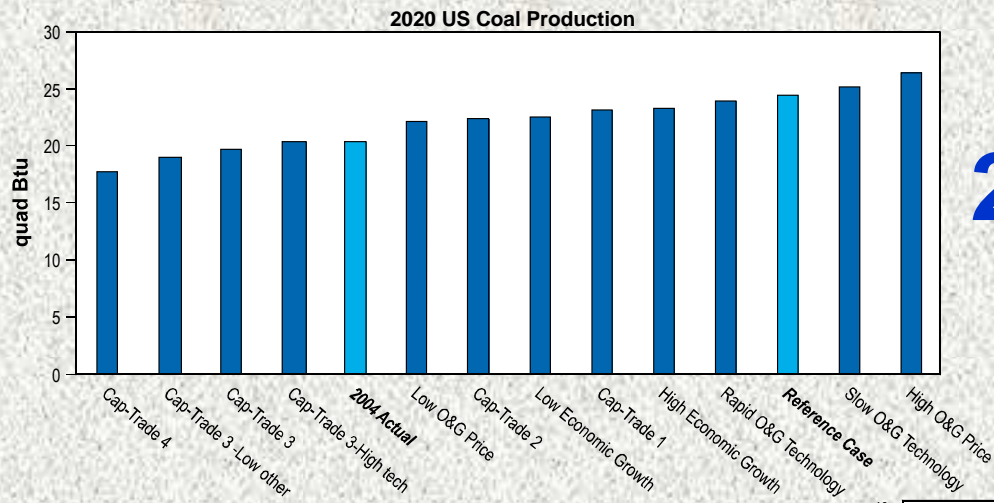
Source: Gallup/USA Today and American Magazine, 2007



Thank You!



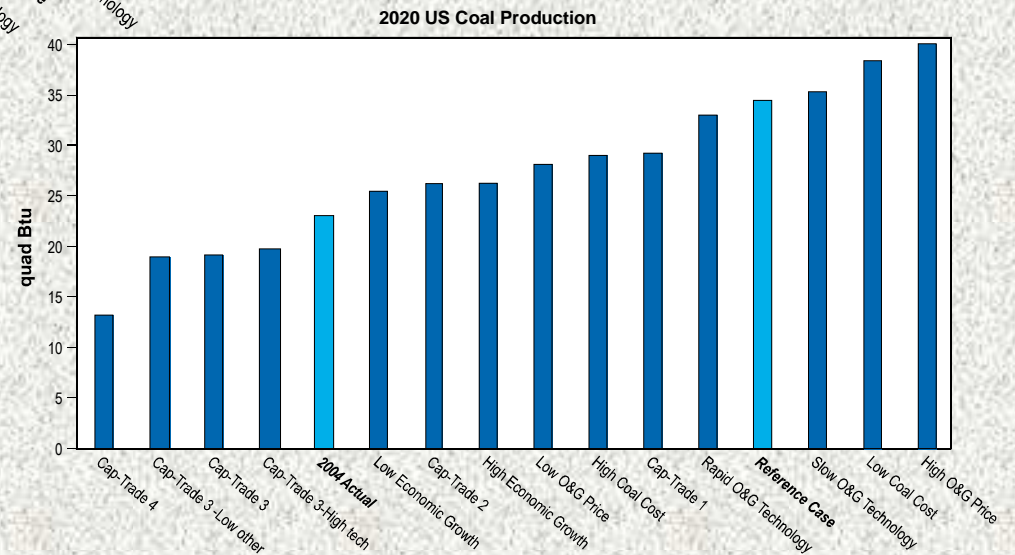
Coal Use for Projected Emissions Scenarios



2020

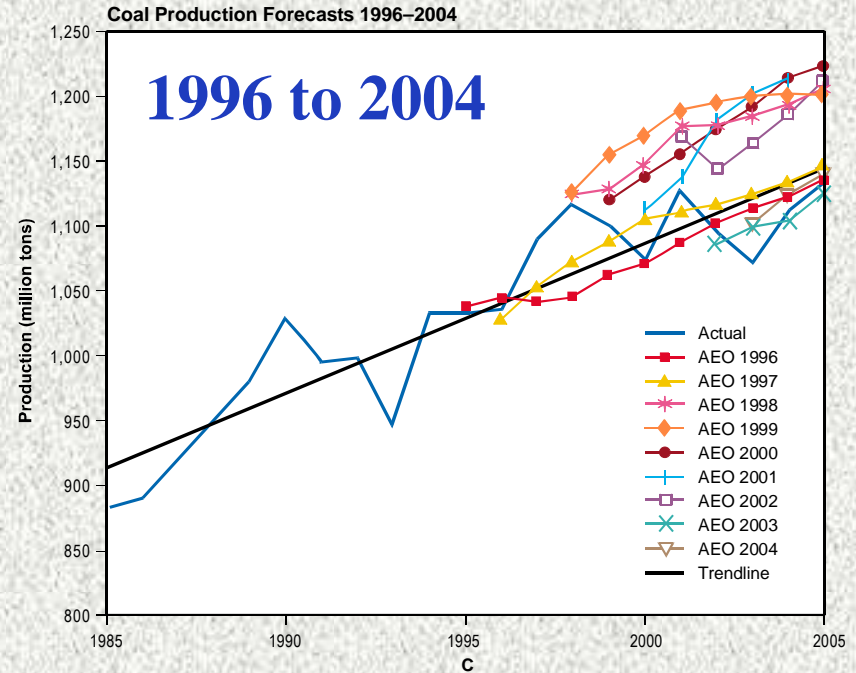
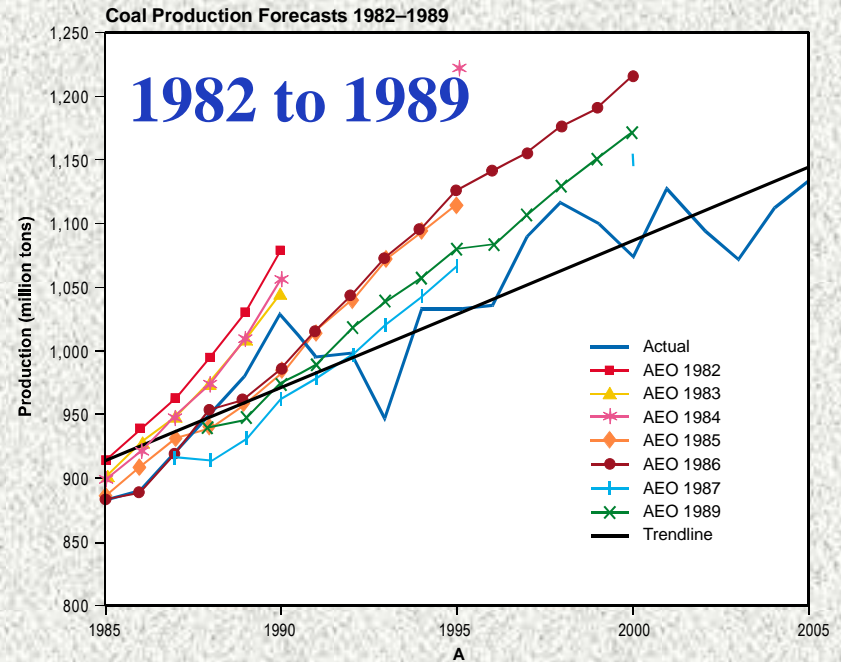
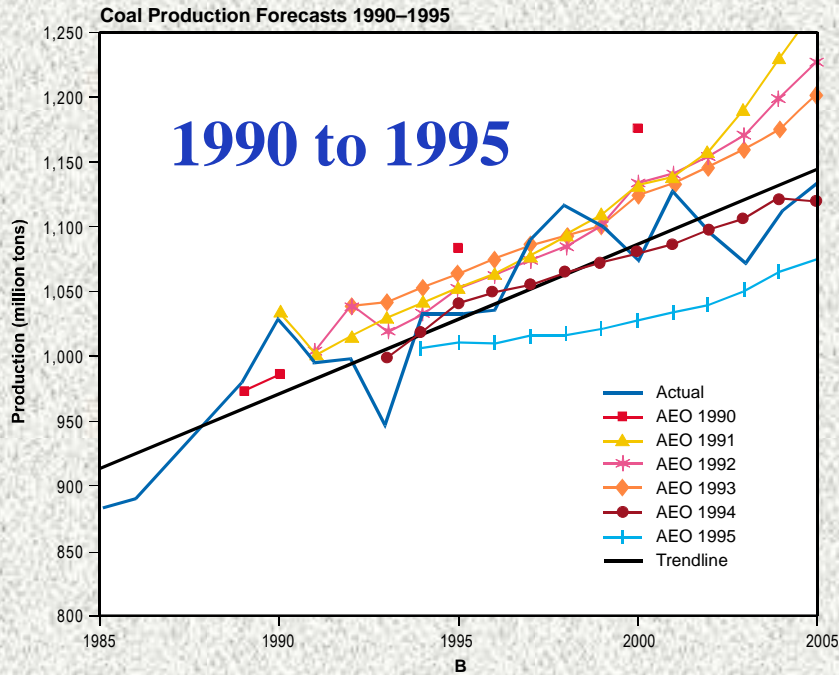
Cases A

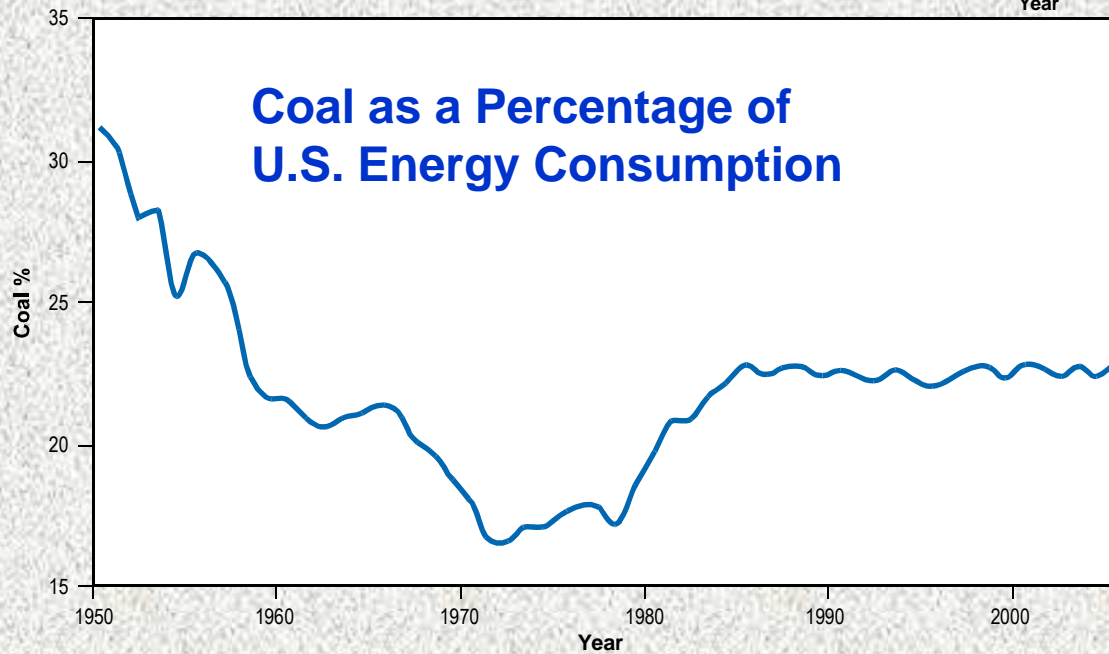
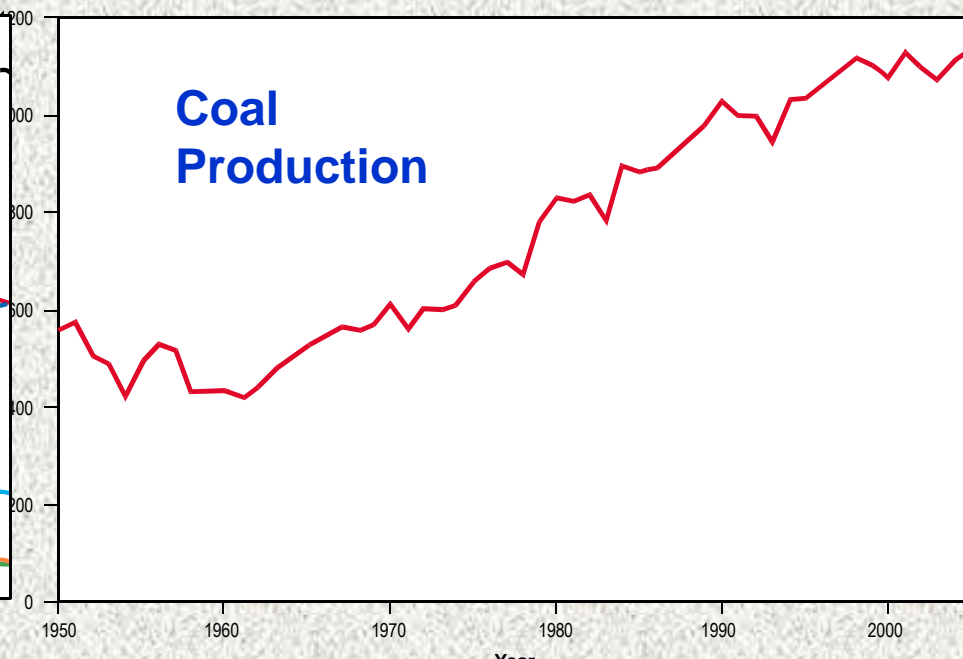
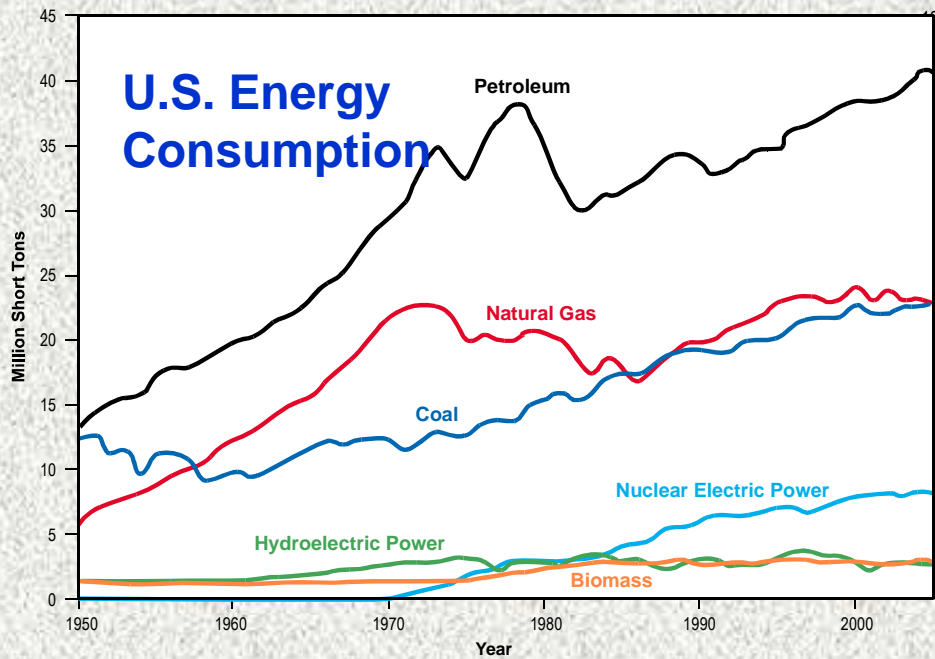
2030



Cases B

Predicting Future Coal Production





Source: EIA 2006



U.S. Coal Resources and Reserves

At January 1, 1997

