Carbon Sequestration

Media Background Briefing

June 16, 2003

Scott Klara

Carbon Sequestration
Product Manager

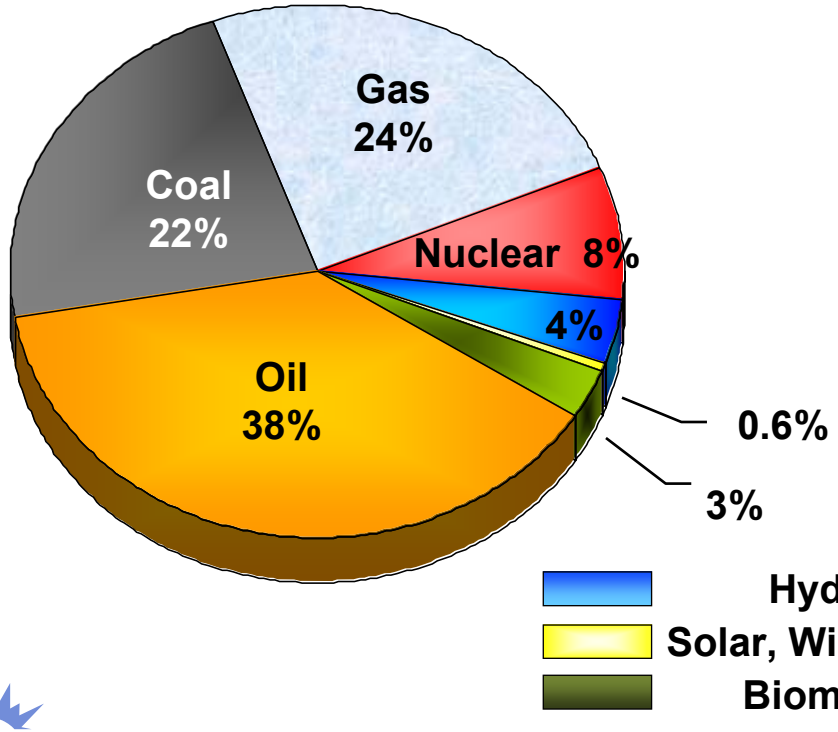
National Energy Technology Laboratory

Office of Fossil Energy

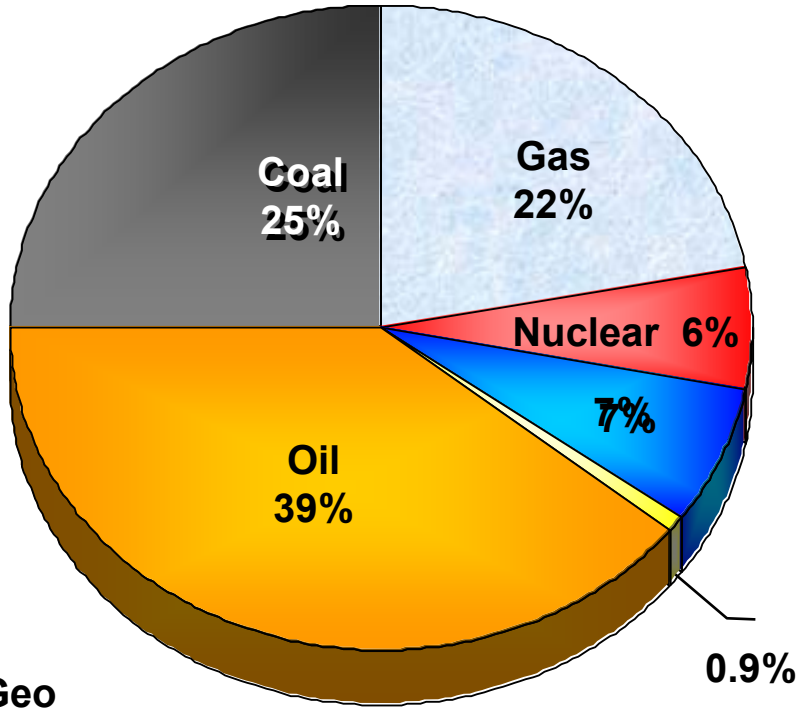
The Fossil Energy Situation

Fossil Fuels
World's Dominant Energy Source

United States
99 QBtu/yr; 85% Fossil Energy



World
382 Quads/yr; 86% Fossil Energy



Word Data from EIA96. Does not include non-grid-connected biomass.
U.S. Data from Table 2 of EIA REA 97 & AEO 2002 Table A2

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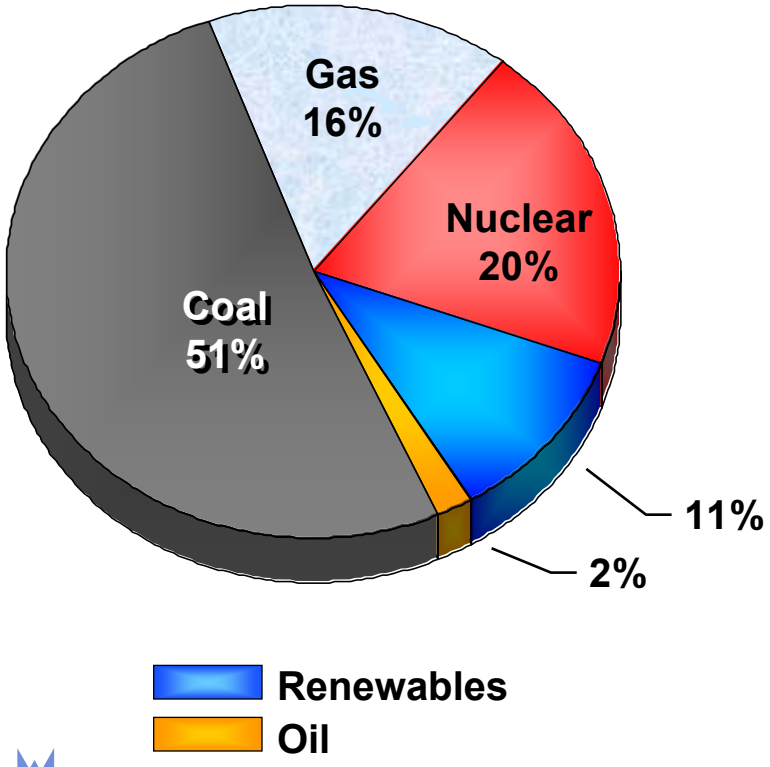
Fossil Fuels

World's Dominant Electricity Source

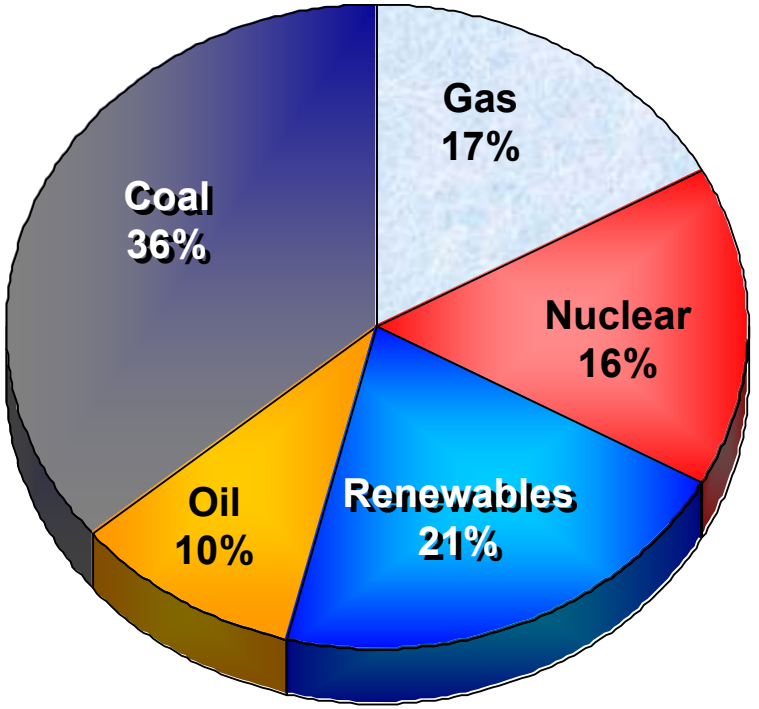
United States - 1999

3.2 Trillion kWh - 69% Fossil Energy



World - 1999

12.8 Trillion kWh - 63% Fossil Energy



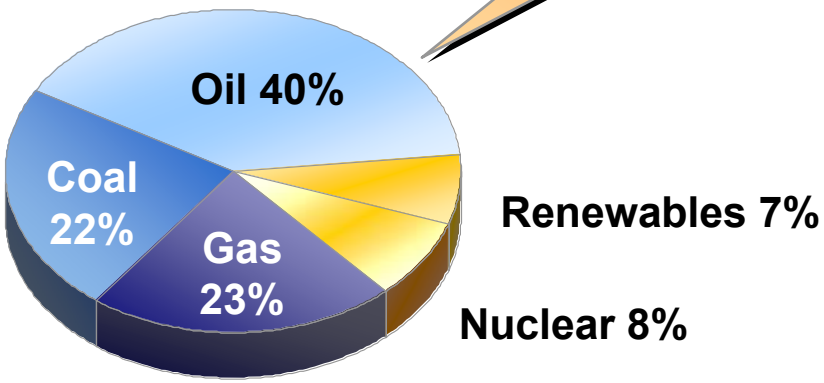
Source: EIA International Energy Outlook 2001
Edison Electric Institute 2001

Fossil Energy - America's Energy Foundation

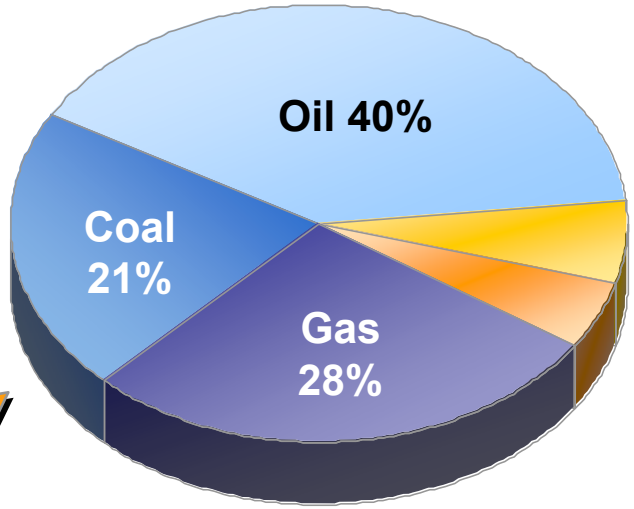
1999

96.1 Quads

Fossil fuels provide 85% of energy (67% of electricity)



+32%



2020

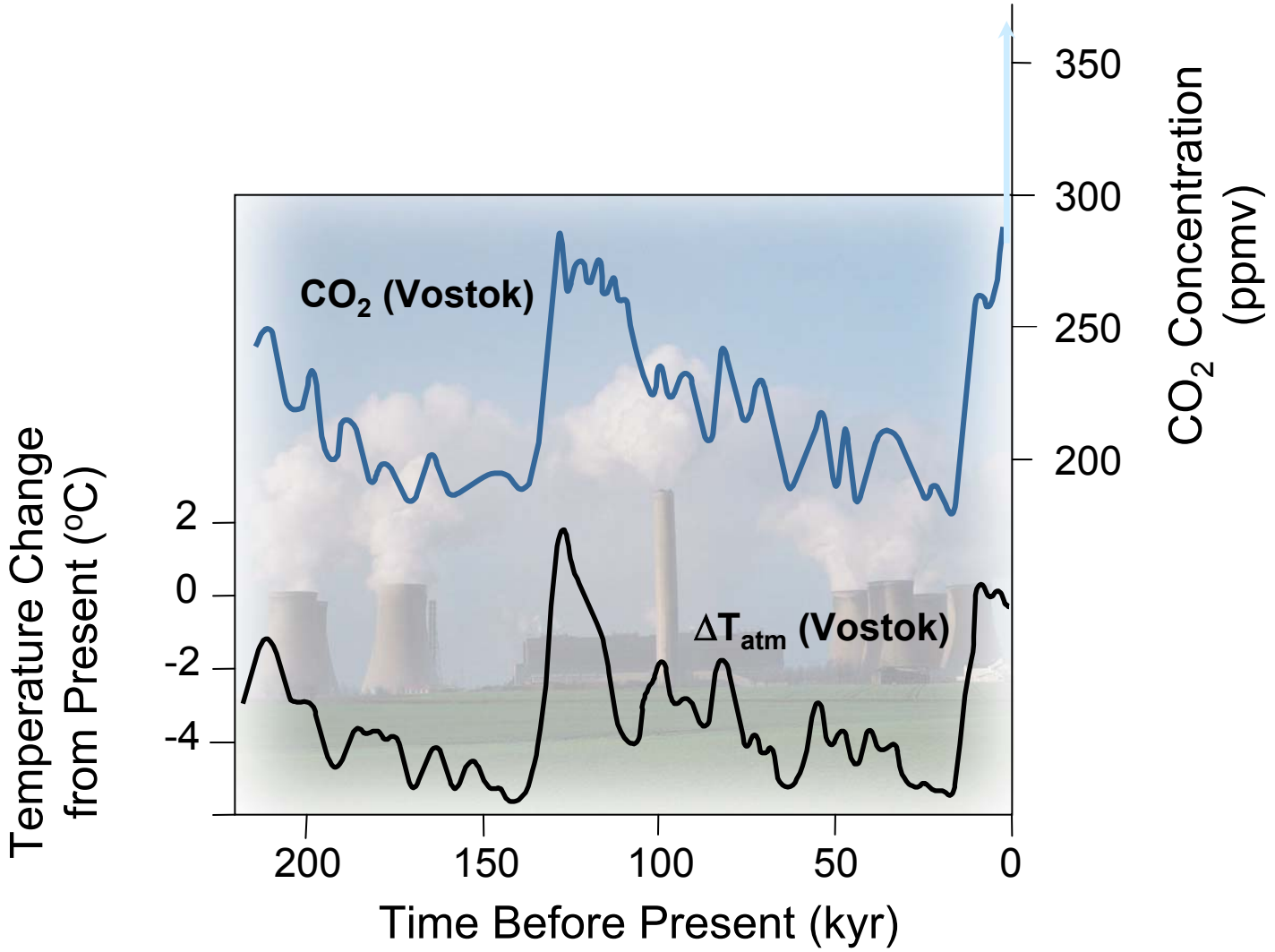
127.0 Quads

By 2020, reliance on fossil fuels could grow to 90%

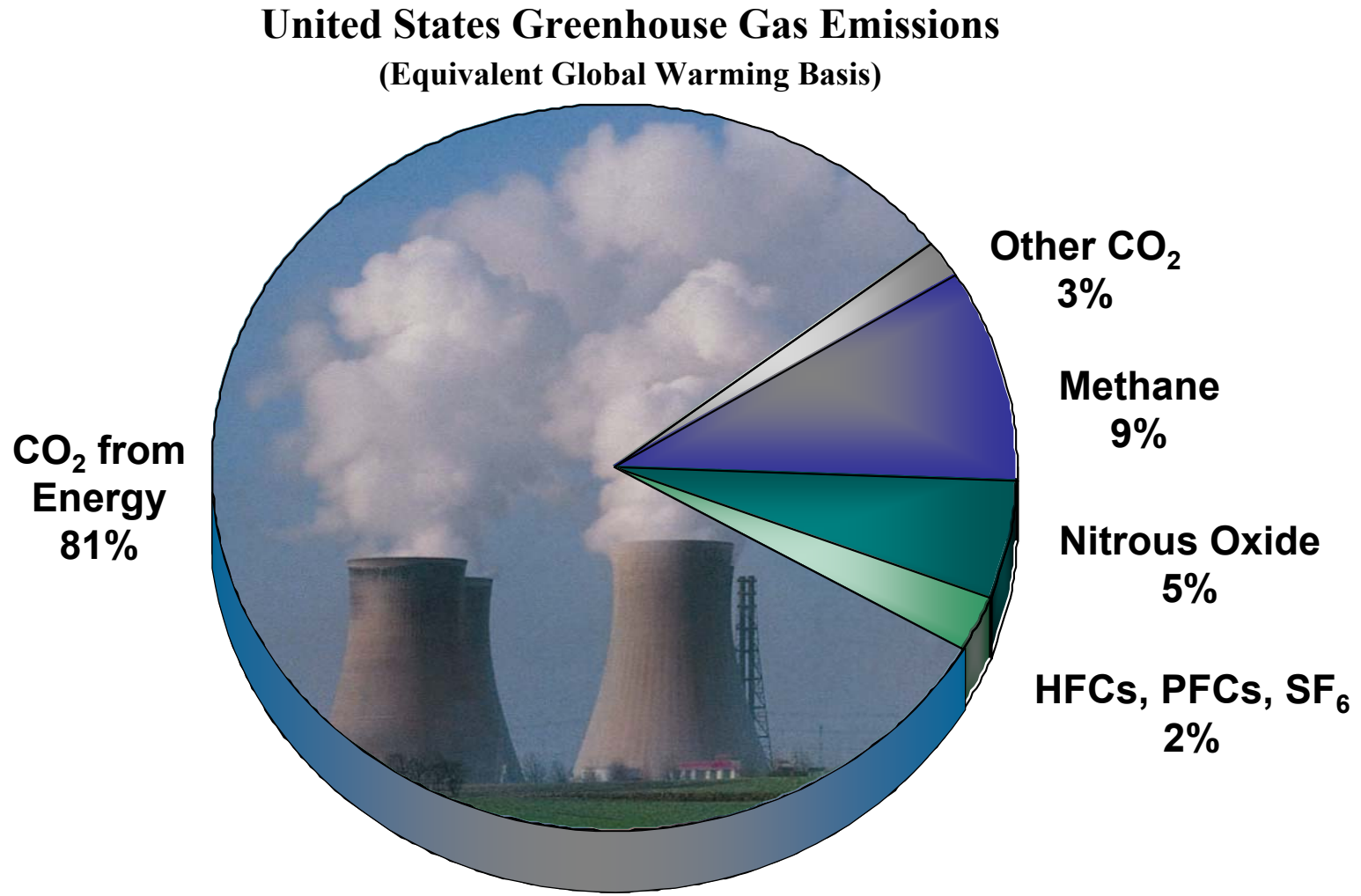
Source: AEO 2001, Table A1

Greenhouse Gas Implications

CO_2 Concentrations On The Rise
(~280 ppm to 370 ppm over last 100 years)

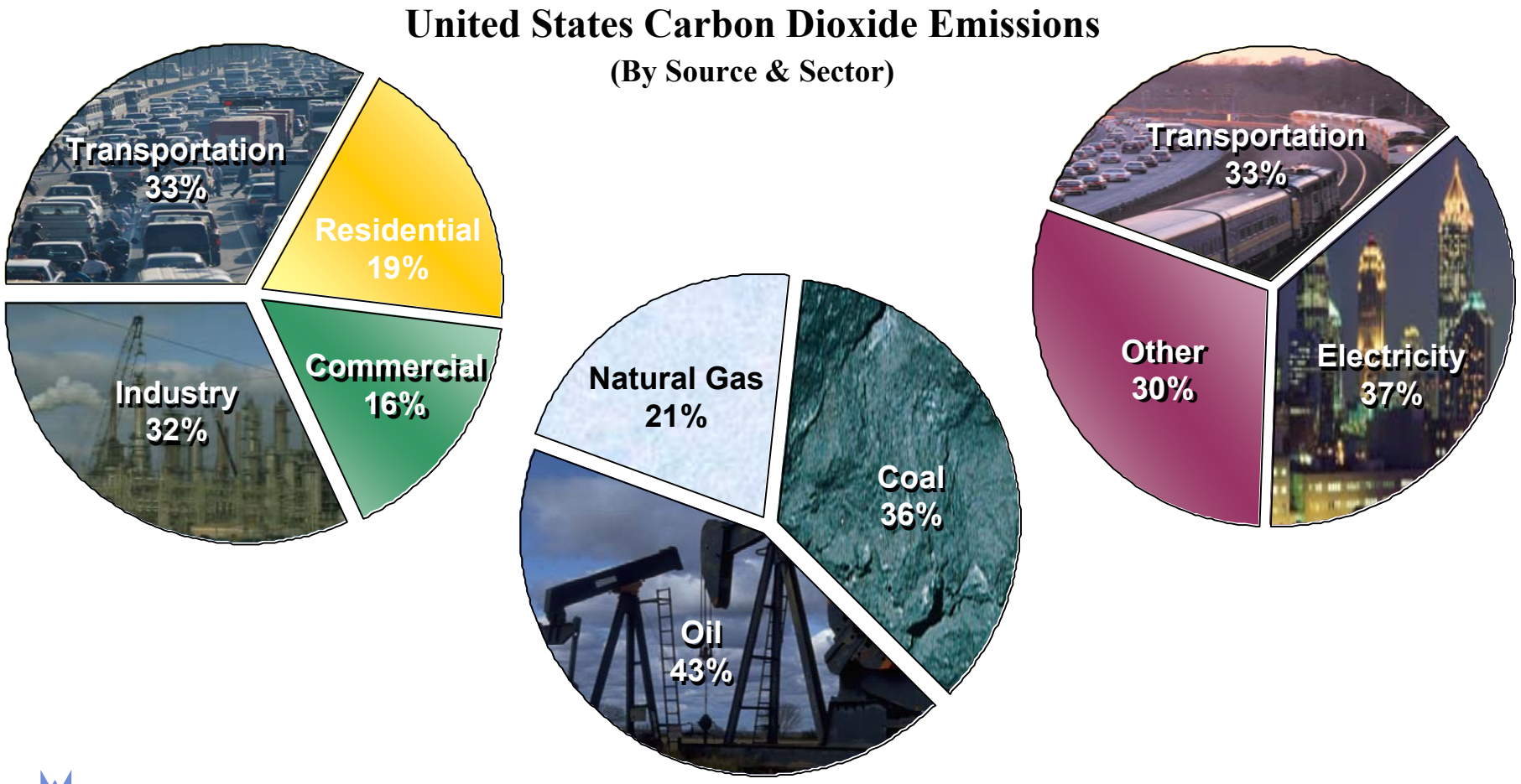


CO_2 & CH_4 - The Primary GHG Contributors



"EIA Emissions of Greenhouse Gases in the U.S.: 2000"

All Fossil Fuels & Energy Sectors Contribute CO_2 Emissions



Carbon Management

&

Carbon Sequestration

“Pathways to Greenhouse Gas Stabilization”

Technological Carbon Management Options

Reduce Carbon Intensity

- Renewables
- Nuclear
- Fuel Switching

Improve Efficiency

- Demand Side
- Supply Side

Sequester Carbon

- Capture & Store
- Enhance Natural Sinks

All options needed to:

- Affordably meet energy demand
- Address environmental objectives

Presidential Direction

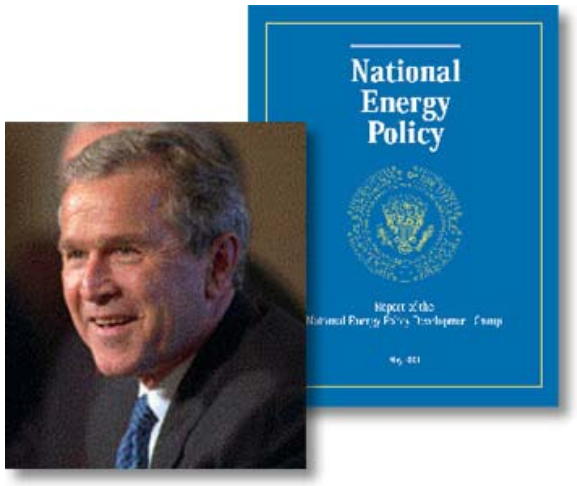
Current Drivers for Carbon Sequestration

NCCTI
June 11, 2001

- Third option for global climate change
- Enables continued use of domestic energy resources and infrastructure
- Geologic formations have potential for essentially unlimited storage capacity
- Demonstrated industry interest, participation, and cost-sharing in public/private partnerships
- "We all believe technology offer great promise to significantly reduce emissions -- especially carbon capture, storage and sequestration technologies."

GCCI
February 14, 2002

- Sustain economic growth
- Reduce GHG intensity by 18% in next 10 years
- Reevaluate science & path in 2012



White House photo: Paul Morse

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What is Carbon Sequestration?

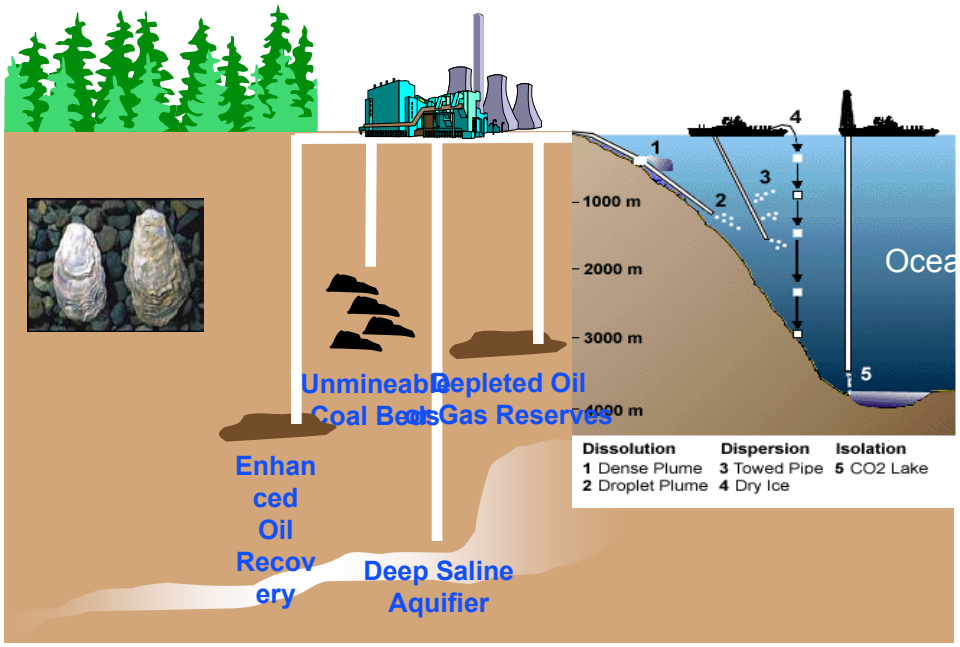
Capture and storage of CO_2 and other Greenhouse Gases that would otherwise be emitted to the atmosphere

Capture can occur:

- at the point of emission
- when absorbed from air

Storage locations include:

- underground reservoirs
- dissolved in deep oceans
- converted to solid materials
- trees, grasses, soils, or algae



Approaches to Sequester Carbon

Capture and Storage

Unmineable Coal Seams

Ocean Uptake

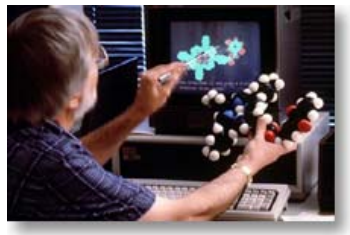
Depleted Oil / Gas Wells, Saline Reservoirs

Mineral Carbonation

Enhance Natural Processes

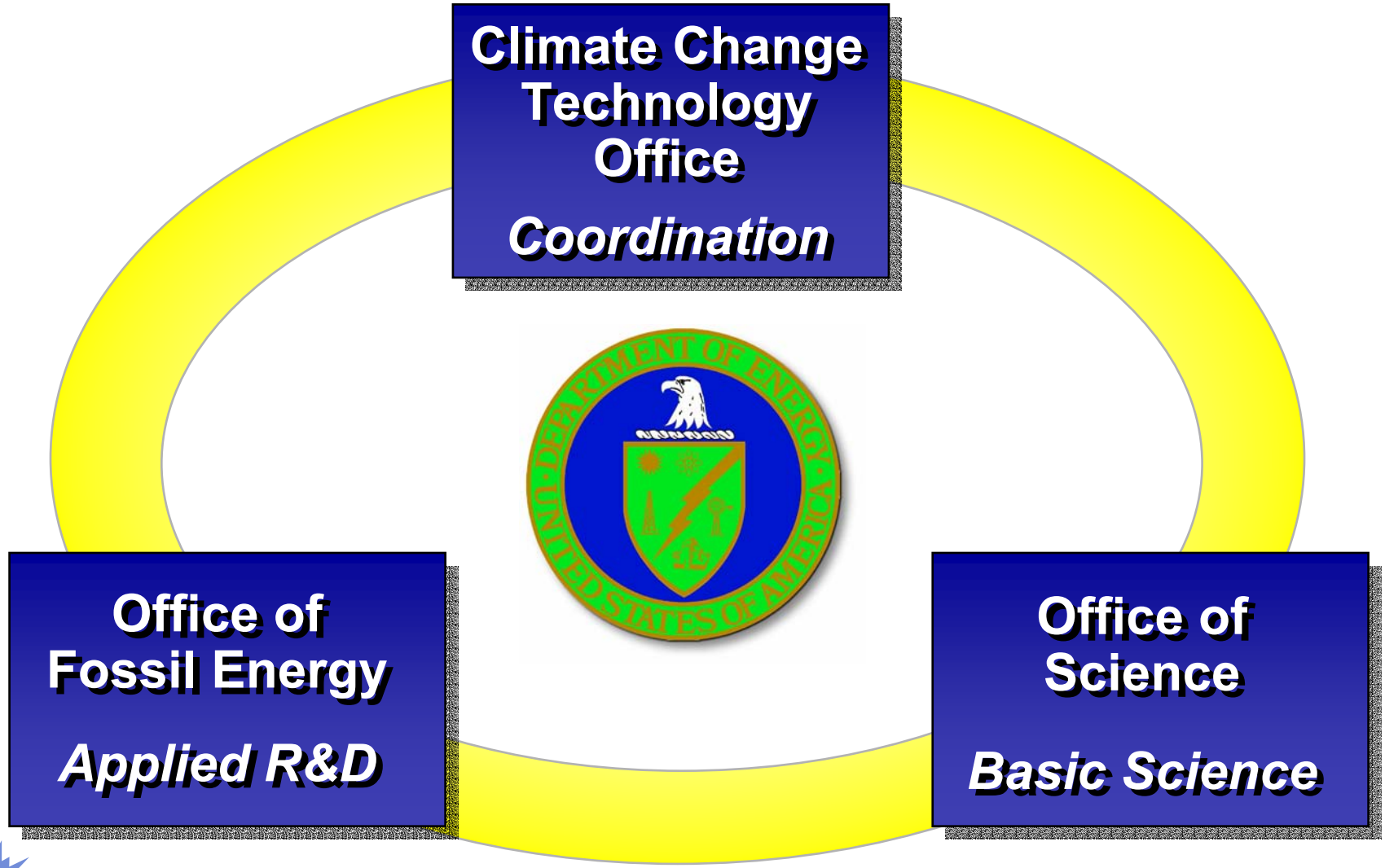
Forestation

Iron or Nitrogen Fertilization of Ocean



Enhanced Photosynthesis

Sequestration at DOE



Agencies Conducting Sequestration-Related Research

USGS
Geologic sequestration research

NASA
Space-based studies of earth as integrated system

EPA
Inventory of greenhouse gases

OSM
Carbon sequestration on abandoned mine sites

USAID
Tropical reforestation in developing countries

NOAA
Atmospheric and oceanic global observations

NSF
Science of CO_2 and N_2 cycles in oceans

USDA
Terrestrial sequestration, soil carbon database, sequestration models

U.S. Dept. of State
Facilitate International collaboration and activities

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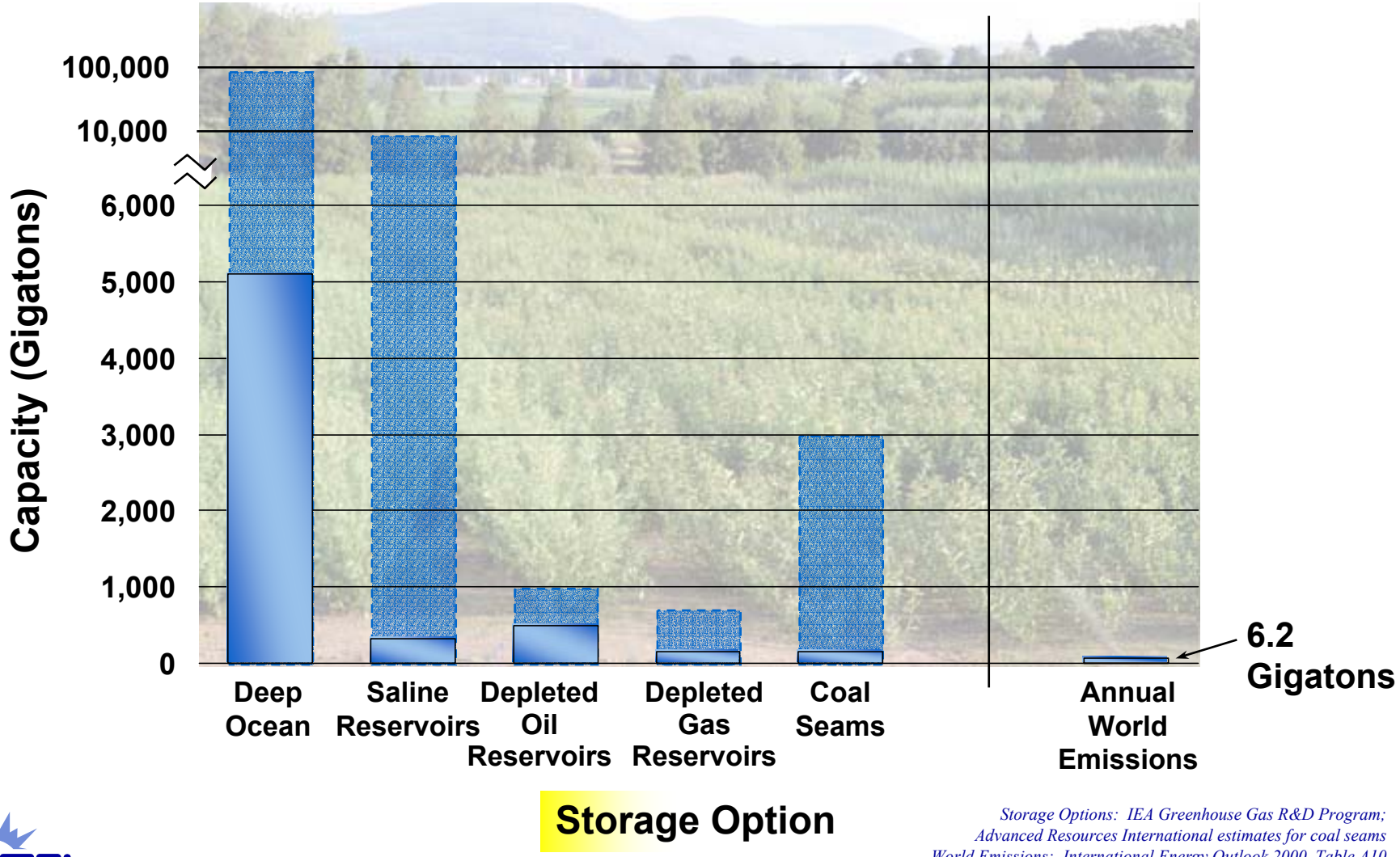
Large Potential Worldwide Storage Capacity

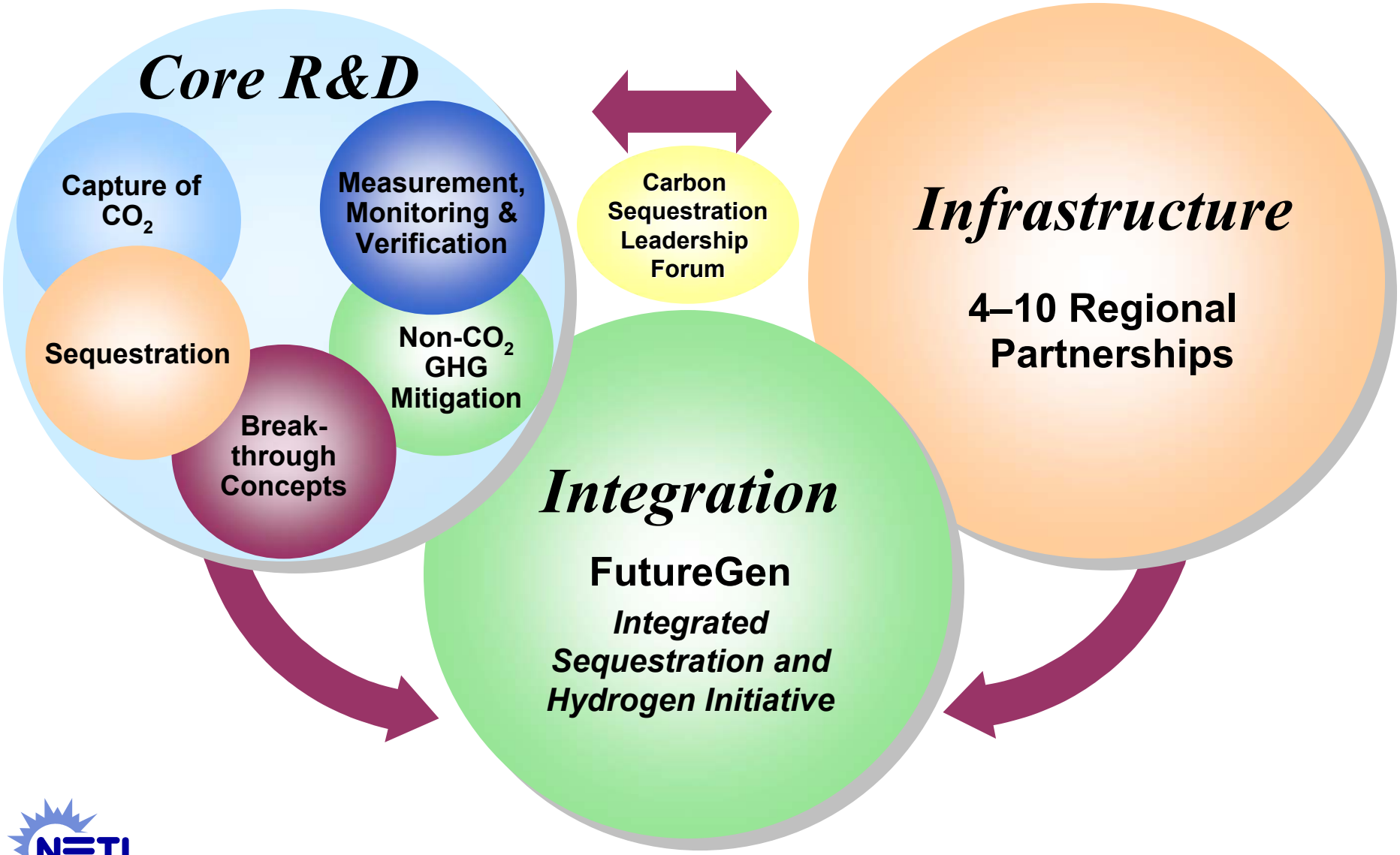


Storage Options: IEA Greenhouse Gas R&D Program;
Advanced Resources International estimates for coal seams
World Emissions: International Energy Outlook 2000, Table A10

Requirements for Sequestration

- **Environmentally acceptable**
  - No legacy for future generations
  - Respect existing ecosystems
- **Safe**
  - No sudden large-scale CO_2 discharges
- **Verifiable**
  - Ability to verify amount of CO_2 sequestered
- **Economically viable**

Fossil Energy Sequestration Program Structure



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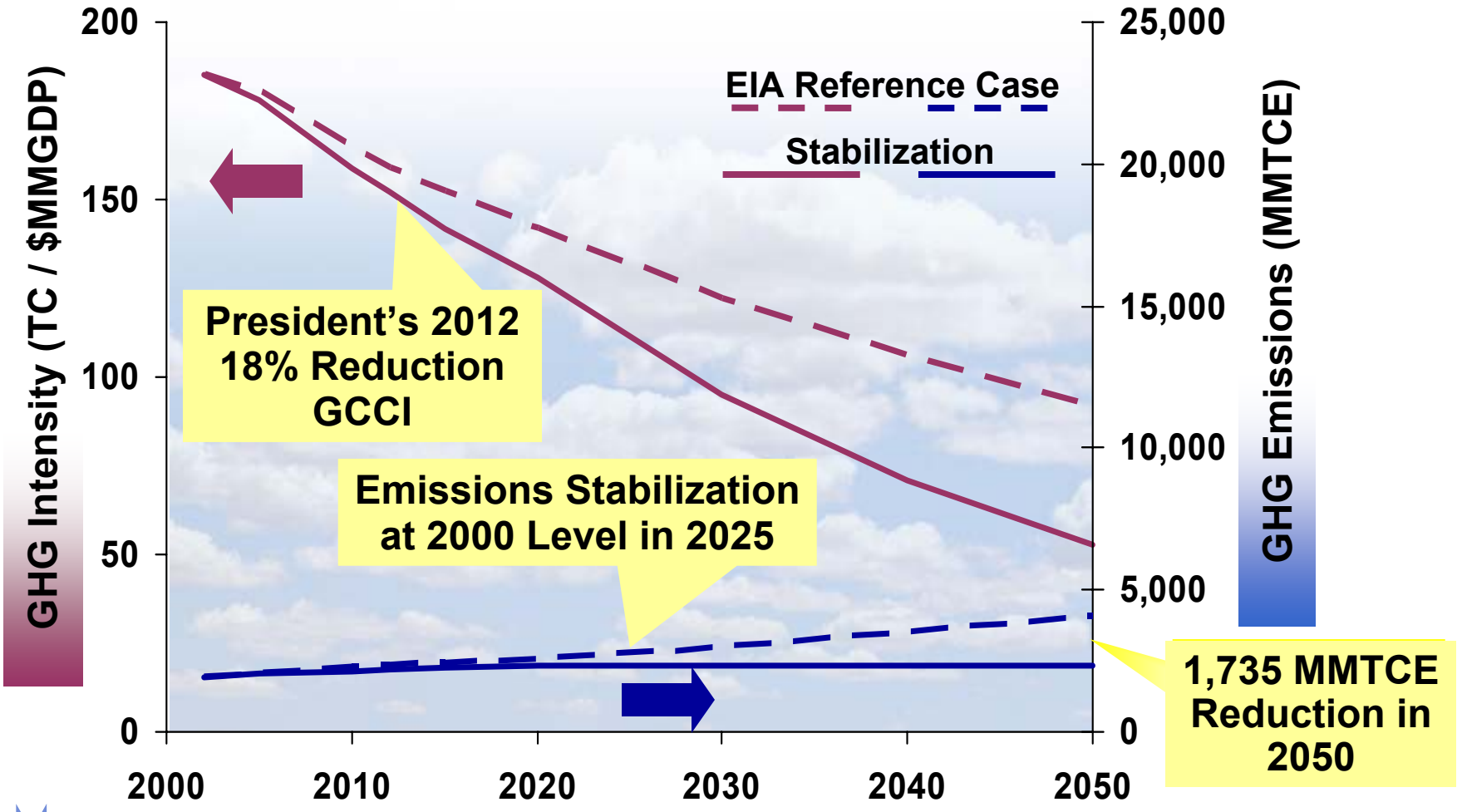
Possible Pathway to Emissions Stabilization

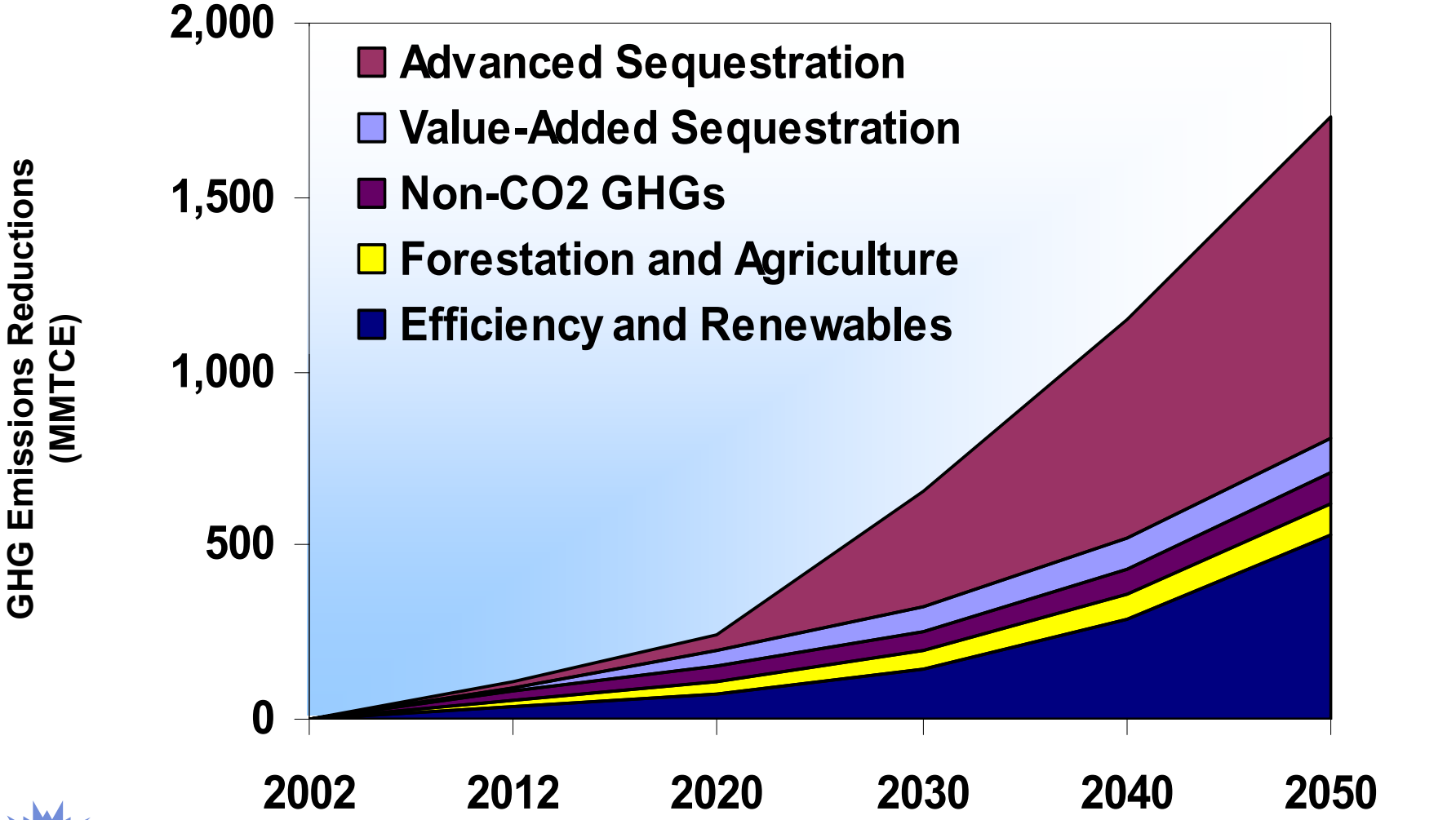
A Significant Undertaking



EIA Annual Energy Outlook 2002; EPA special studies;
DOE/FE/NETL Sequestration Benefits Model

Sequestration = Stabilization

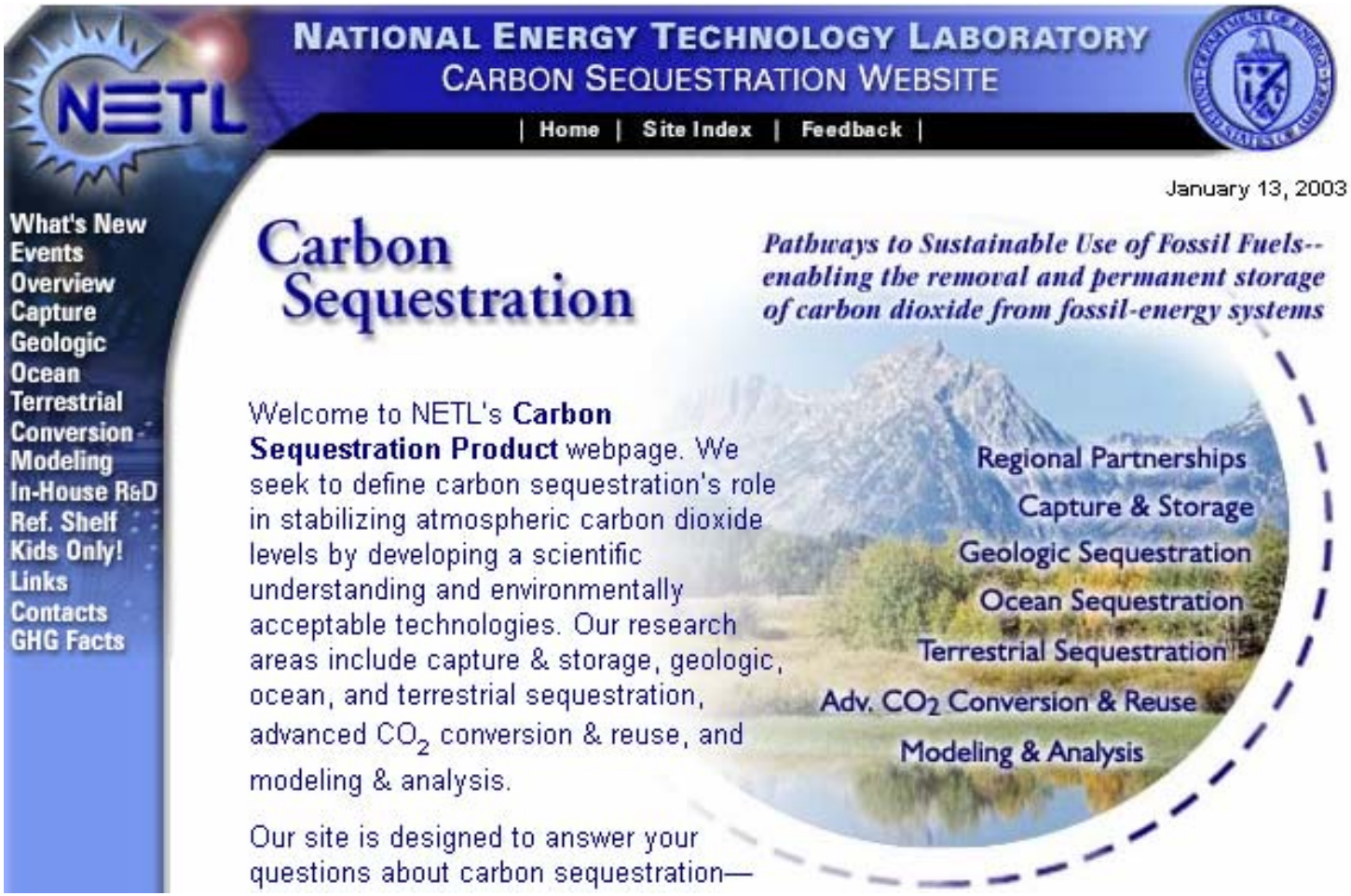
Plausible Scenario to Stop GHG Emissions Growth



EIA Annual Energy Outlook 2002; EPA special studies; DOE/FE/NETL Sequestration Benefits Model

Visit the NETL Sequestration Website

www.netl.doe.gov/coalpower/sequestration/



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