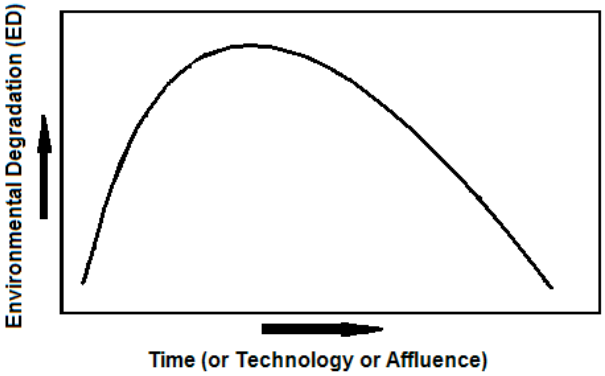
Science and Technology for Energy Security and Clean Development

Hon. James L. Connaughton
Chairman
Council on Environmental Quality

The Environmental Transition

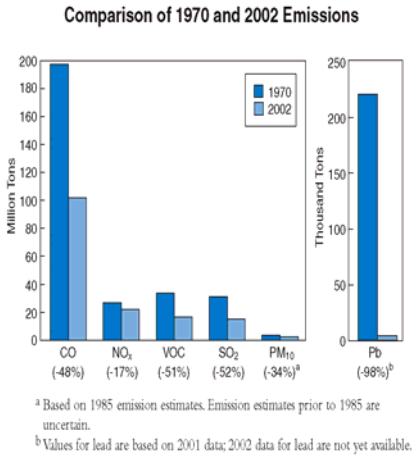
"My approach recognizes that sustained economic growth is the solution, not the problem – because a nation that grows its economy is a nation that can afford investments in efficiency, new technologies, and a cleaner environment."

- President Bush, February 14, 2002

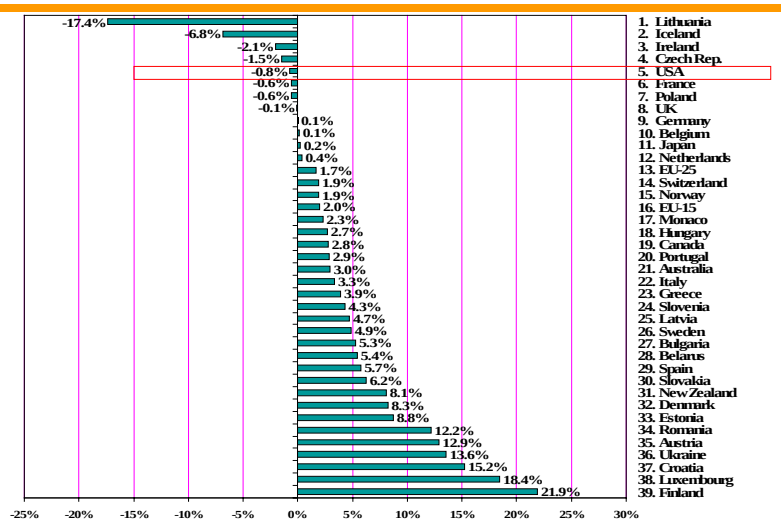


Real Environmental Results

- **Air Pollution Down 54% Since 1970**
  - 10% in 2001-2004
  - Population Up 40%
  - Energy Use Up 47%
  - Economy Up 187%
- **GHG Down 0.8% from 2000 to 2003**
  - Added Combined Population of Norway and Ireland (8.6 Million)
  - Added Economy of China in 2002 ($1.23 Trillion)



Trends in GHG Emissions 2000-2003



Source: 2005 National Inventory Reports and Common Reporting Formats at http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/2761.php

Domestic Clean Air Policy

- **Reduce Power Plant Pollution by 70%**
  - Market-Based Cap and Trade System
  - 1300 Coal-Fired Power Plants; Two Phases (2010, 2015)
  - Technology Innovation and Cost Reduction
  - Regulatory Certainty for Capital Planning Decisions
  - $50+ Billion in Pollution Controls, Efficiency Upgrades
  - $100+ Billion Health Savings and Work Days
  - Only Several Dozen Government Officials Needed
  - Nearly 100 Percent Compliance Assured

Minimizes Electricity Price Impact (approx. 1.7-3%)

Domestic Clean Air Policy

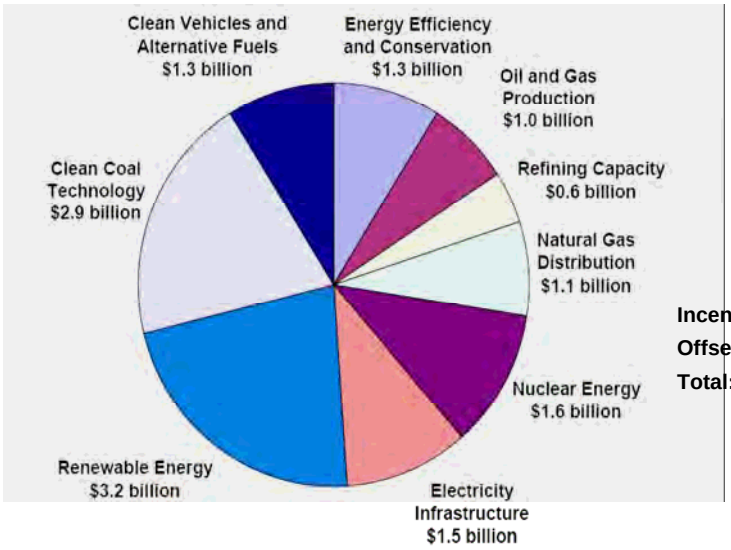
- **Reduce Diesel Engine Pollution by 90%+**
  - Performance Standard – Promotes Innovation
  - Fuel Sulfur Dioxide Reduced 99+% in 2007
  - New Engine Nitrogen Oxide Reduced 90%
  - Large Trucks, Construction and Farm Equipment, Locomotives, Marine Vessels
  - Commercially Feasible Timelines
  - Assures Reliability and Affordability of New Engines
  - Enables Larger U.S. Market in Fuel Efficient Vehicles (up to 30% improved fuel economy)

"we're going to make that black puff of smoke from diesel vehicles a thing of the past …"

Domestic Energy Policy

- **Tax Law Changes**
  - **Promotes Investment in New, Efficient Equipment**
  - **Improve Productivity, Reduce Pollution and GHG**
- **Energy Policy Act of 2005**
  - **$11.5 Billion Clean Technology Tax Incentives**
  - **7.5 Billion Gallon Ethanol and Biodiesel Mandate**
  - **Appliance and Building Energy Efficiency Standards**
  - **Regulatory Reform: Renewables, Nuclear, Electricity Markets**
- **Fuel Economy Improvements**
  - **15% increase in light trucks/SUVs over 6 years**
  - **Sensible reforms to save fuel, save lives, save jobs**

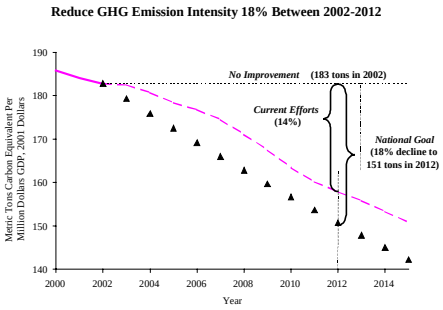
Energy Bill Tax Incentives



Incentives: $14.5 billion
Offsets: $3 billion
Total: $11.5 billion

Climate Policy Components

- **Slowing the Growth of Net Greenhouse Gas (GHG) Emissions**
  - ➢ **National Goal: Reduce GHG Intensity by 18% Over 10-Year Period (2002-2012)**



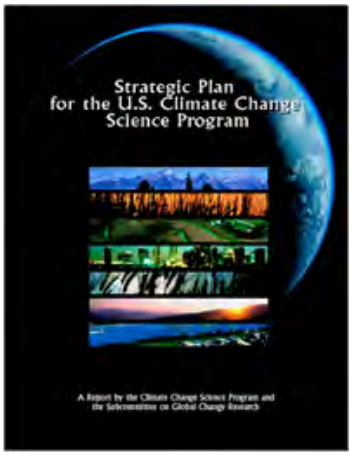
- **Laying the Groundwork for Current and Future Action: Investments in Science and Technology**
  - ➢ **Climate Change Science Program (~$2 billion/year)**
  - ➢ **Climate Change Technology Program (~$3 billion/year)**
- **Promoting International Cooperation**

Near-Term Domestic Actions

- **More than 60 Federal programs designed to help reduce emissions by 500 million metric tons of carbon- equivalent through 2012**
- **Numerous Department of Energy (DOE) and Environmental Protection Agency (EPA) partnership programs to help consumers, corporations, and government reduce their GHG emissions**
  - ➢ **Energy Savings Performance Contracts (47 mmtCO_2 avoided)**
  - ➢ **Climate VISION**
  - ➢ **Climate Leaders**
  - ➢ **SmartWay Transport Partnership**
  - ➢ **Greenhouse Gas Reporting Program**
- **U.S. Fiscal Year 2006 budget request of nearly $5.5 billion for climate change programs and energy tax incentives**
  - ➢ **Supports our near-term objectives as well as future actions through major investments in science and technology**

Climate Change Science Program

- **World's Largest Climate Change Scientific Research Program**
- **~ $2 billion/year on activities to:**
  - **Improve knowledge of climate and environment**
  - **Improve quantification of forces driving changes to climate**
  - **Reduce uncertainty in projections of future climate changes**
  - **Understand sensitivity and adaptability of natural and manmade ecosystems**
  - **Explore uses and limits of managing risks and opportunities**



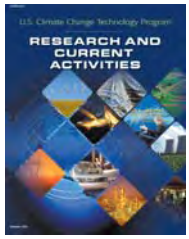
www.climatescience.gov

National Research Council CCSP Review

- "The Strategic Plan for the U.S. Climate Change Science Program ***articulates a guiding vision, and is appropriately ambitious, and is broad in scope***."
- "In fact, the approaches taken by the CCSP to receive and respond to comments from a large and broad group of scientists and stakeholders, including a two-stage independent review of the plan, ***set a high standard for government research programs***."
- "As a result, the revised strategic plan is much improved over its November 2002 draft, and now includes the elements of a strategic management framework that could permit it to ***effectively guide research on climate and associated global changes over the next decades***."
- "The plan ***addresses much of the critical science in a strategic framework that places the research it proposes in the context of national needs***."

Climate Change Technology Program

- **Ambitious Program of RD&D ~ $3 Billion/Year**
  - **Reduce emissions from energy use and infrastructure**
  - **Advance CO_2 capture and sequestration**
  - **Reduce emissions from non-CO_2 gases**
  - **Enhance measurement & monitoring**
  - **Bolster the contributions of basic science**

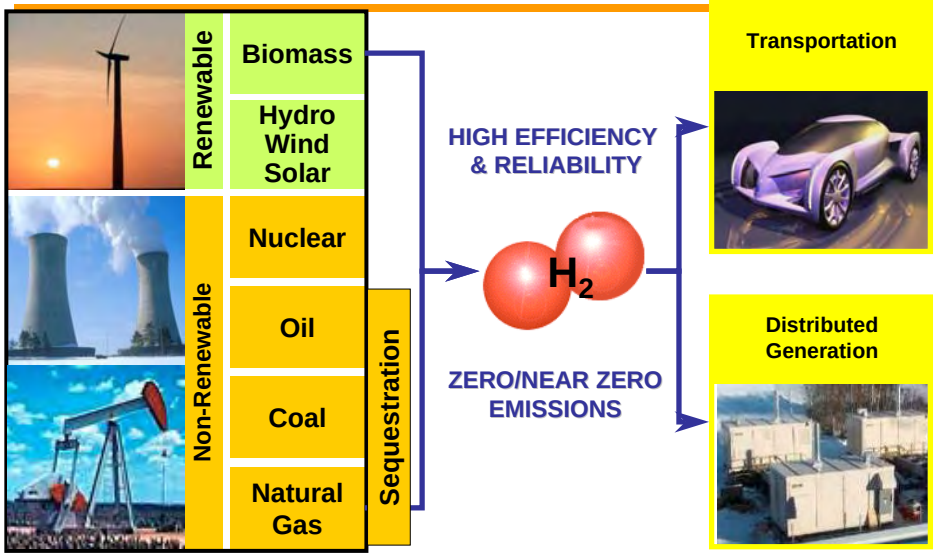


www.climatetechnology.gov

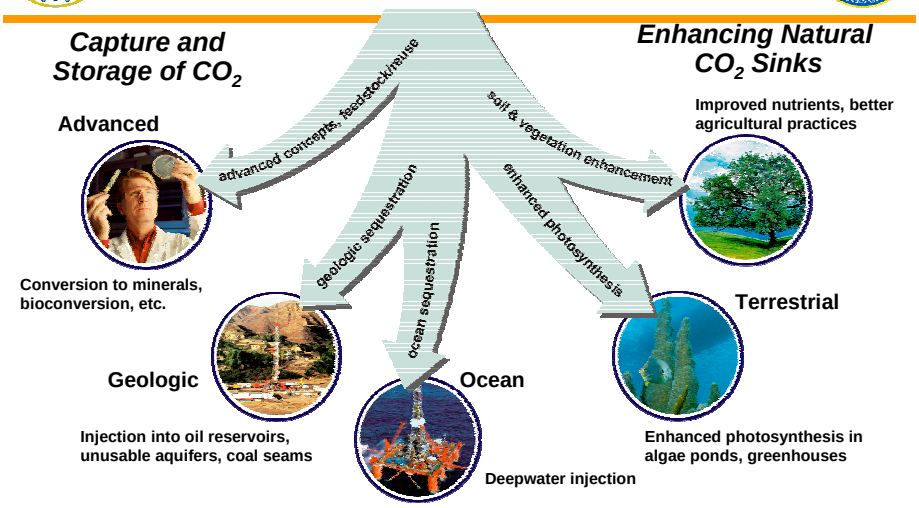
Technology Options for the Near-, Mid-, and Long-Term

- Transportation
- Buildings
- Infrastructure (Grid)
- Industry
- Low-emissions fossil-based power and fuels
- Hydrogen
- Renewable energy and fuels
- Nuclear fission
- Nuclear fusion
- Geologic sequestration
- Terrestrial sequestration
- Ocean sequestration
- Methane emissions
- Other High GWP Gases
- Tropospheric Ozone Precursors and Black Carbon
- Measurement and Monitoring

Hydrogen Fuel Initiative

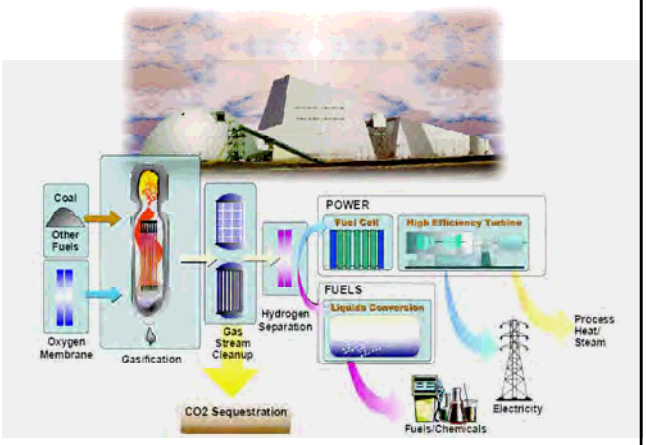


Carbon Sequestration



Clean Coal Technology

- **Multiple products**
  - Electricity
  - Fuels/Chemicals
  - Hydrogen
  - Process Heat
- **Near-Zero GHG**
  - CO_2 sequestered
  - FutureGen



Nuclear Energy

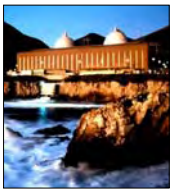
Generation I

Early Prototype Reactors

- Shippingport
- Dresden, Fermi
- Magnox

Generation II

Commercial Power Reactors



- LWR-PWR, BWR
- CANDU
- VVER/RBMK
- AGR

Generation III

Advanced LWRs

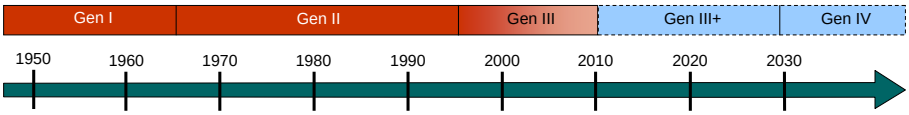
- ABWR
- System 80+
- AP600
- EPR

Generation III+

Generation III Evolutionary Designs Offering Improved Economics

Generation IV

- Highly Economical
- Enhanced Safety
- Minimize Wastes
- Proliferation Resistant



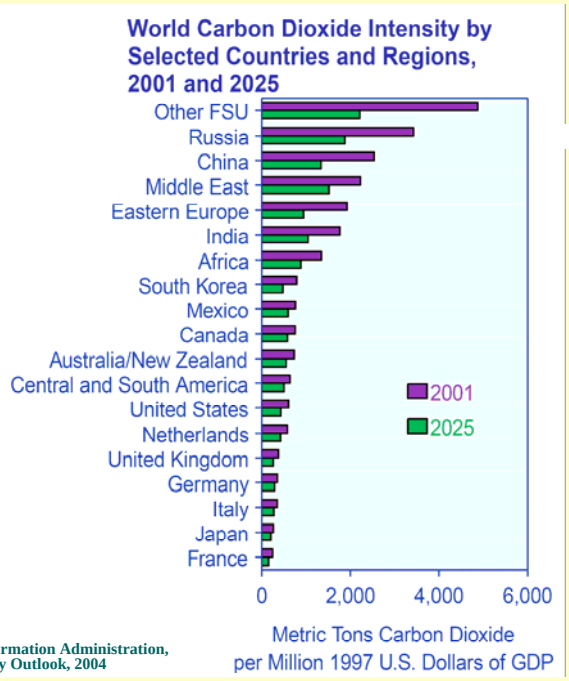
Innovative International Technology Partnerships

- *Methane to Markets Partnership* ? 17 members: Recovery and use of methane from landfills, mines, agriculture, and natural gas production systems. Aims to capture 50 million metric tons CO_2 equivalent by 2015.
- *Group on Earth Observations* ? 59 members and more than 40 participating organizations: Design and implementation of a new Global Earth Observation System of Systems (GEOSS).
- *Carbon Sequestration Leadership Forum (CSLF)* ? 21 members: Focused on CO_2 capture & storage technologies
- *International Partnership for the Hydrogen Economy (IPHE)*? 17 members: Organizes, coordinates, and leverages hydrogen RD&D programs
- *Generation IV International Forum (GIF)* ? 11 members: Devoted to R&D of next generation of nuclear systems
- *ITER* ? 6 members: Project to demonstrate the scientific and technological feasibility of fusion energy.

Principles for Effective International Action

- **Action must focus on broad development agenda, not climate change alone:**
  - **Promote economic growth and reduce poverty**
  - **Enhance energy security**
  - **Reduce pollution**
  - **Mitigate greenhouse gas emissions**
- **G8 Gleneagles Plan of Action for Climate Change, Clean Energy and Sustainable Development (June 2005)**
  - **Reinforced 2002 WSSD Johannesburg Plan of Action**
- **Asia-Pacific Partnership on Clean Development and Climate (July 2005)**

Focus Now on Implementation



Source: Energy Information Administration, International Energy Outlook, 2004