



New Energy/Climate Change Directions in the Obama Administration

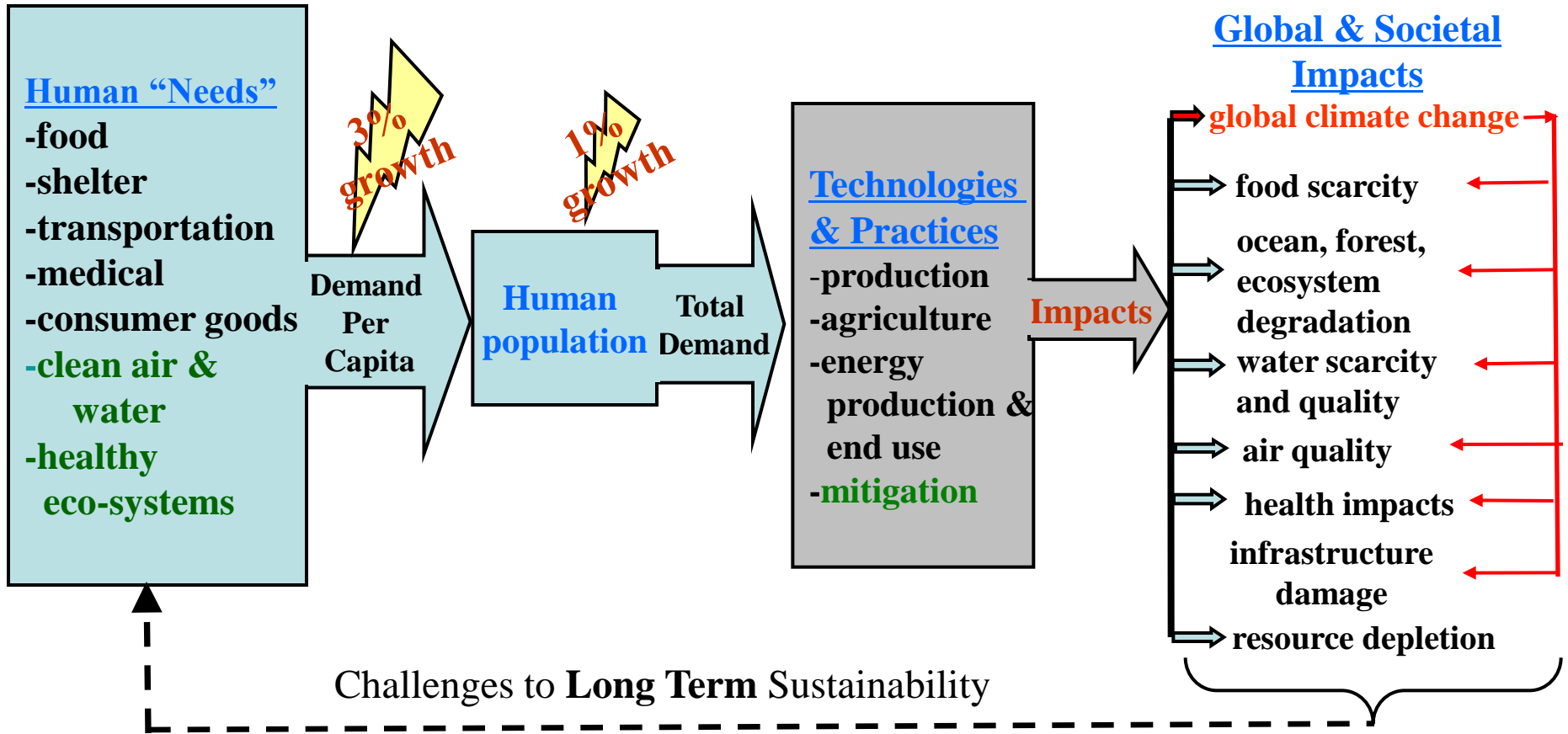
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LCS-RNet First Annual Meeting Bologna, Italy

*The views expressed in this presentation are
those of the author and do not necessarily
reflect the views or policies of the U.S.
Environmental Protection Agency.*



Relationship of Climate Change to Sustainability and the Role of Technology



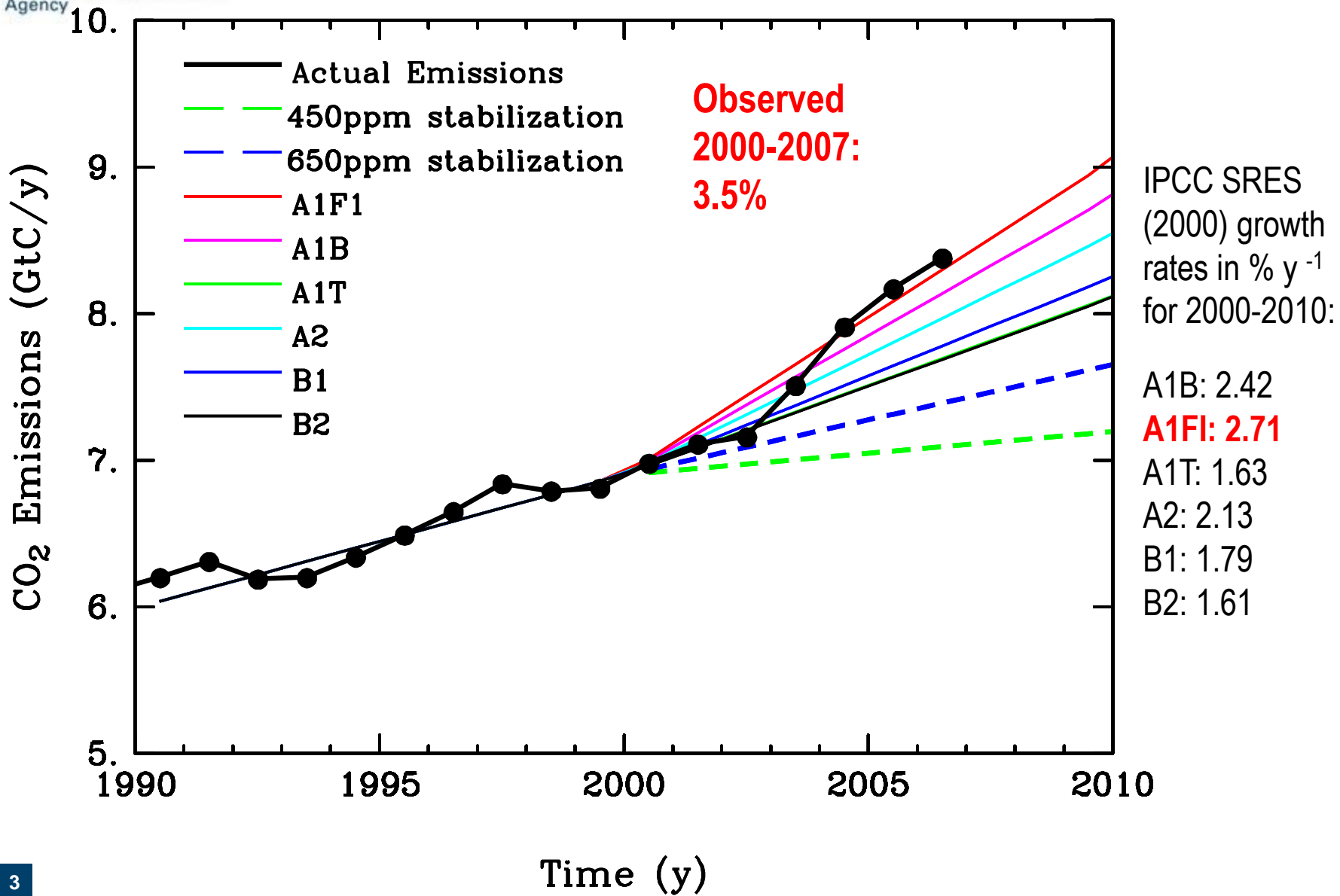
Earth's Thin And Delicate Atmosphere

- Only one millionth of earth's mass
- 90% within ten miles of earth's surface
- *Sustains life: Provides oxygen*
- *Protects against harmful radiation*
- *Moderates temperature*

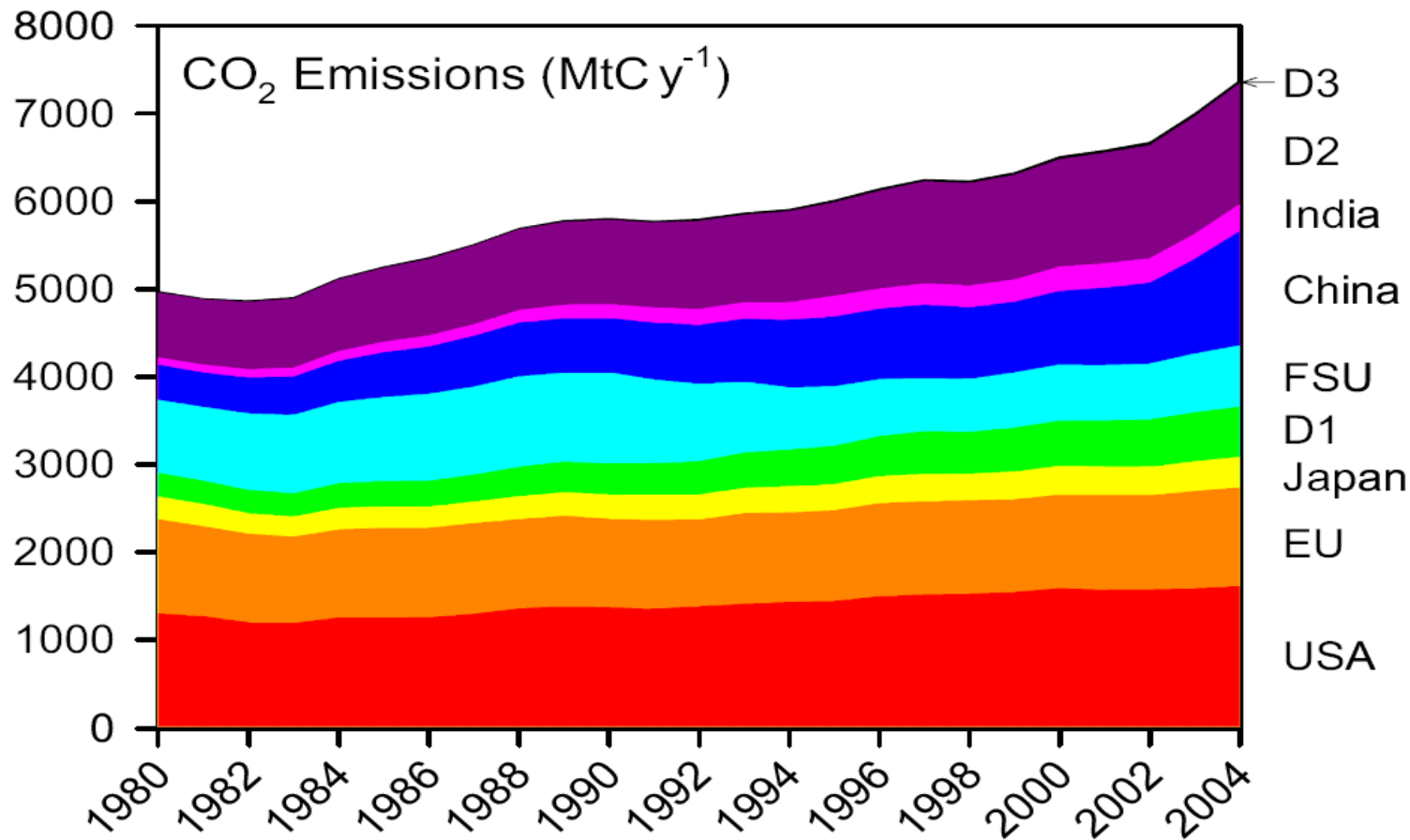


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John Glenn's images made
with an Ansco Autaset
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Trajectory of Global Fossil Fuel Emissions

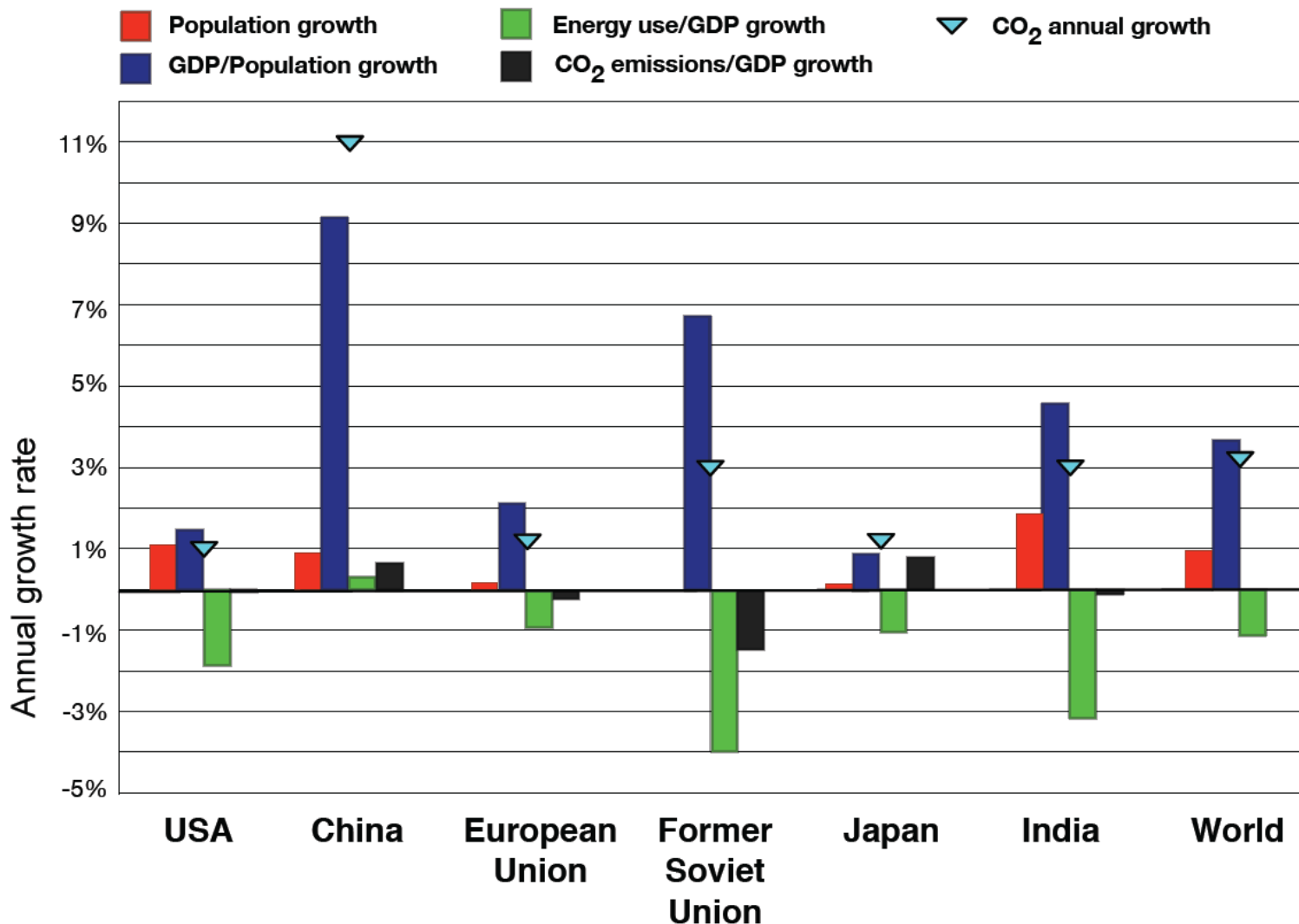


Most Recent CO₂ Emission Data by Countries and Sectors



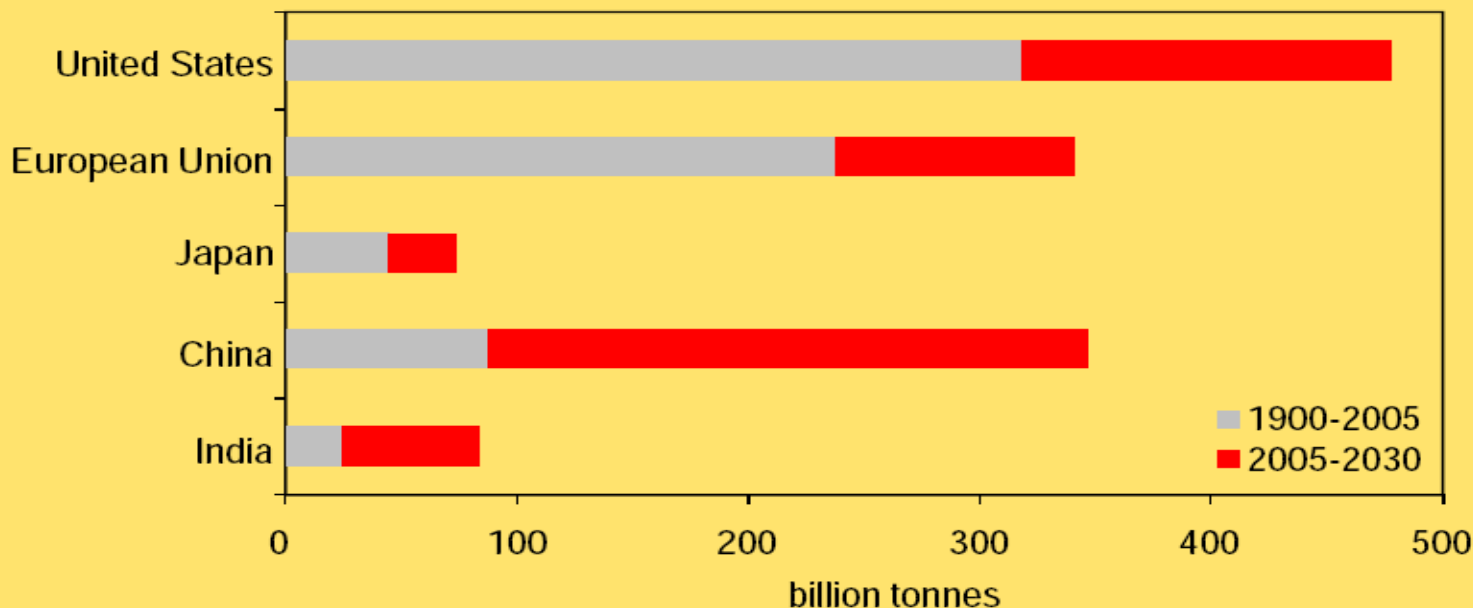
FSU=republics of the former Soviet Union,
D1=15 other developed nations, including Australia, Canada, S. Korea and Taiwan,
D2=102 actively developing countries, from Albania to Zimbabwe and
D3= 52 least developed countries, from Afghanistan to Zambia.

Factors Influencing CO₂ Growth Rate; 2000 to 2004



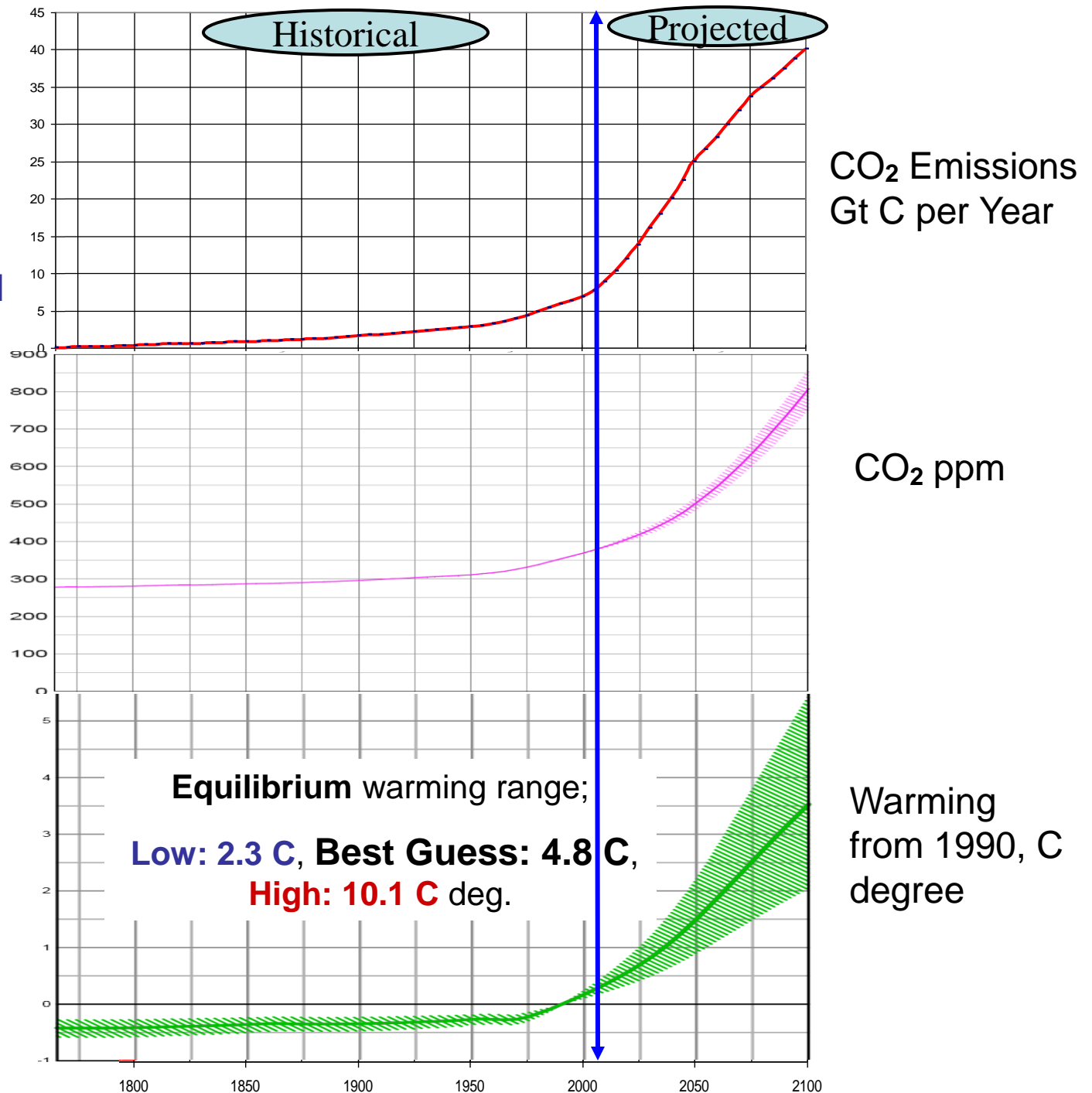
China & India in Global CO₂ Emissions WEO2007 Reference Scenario

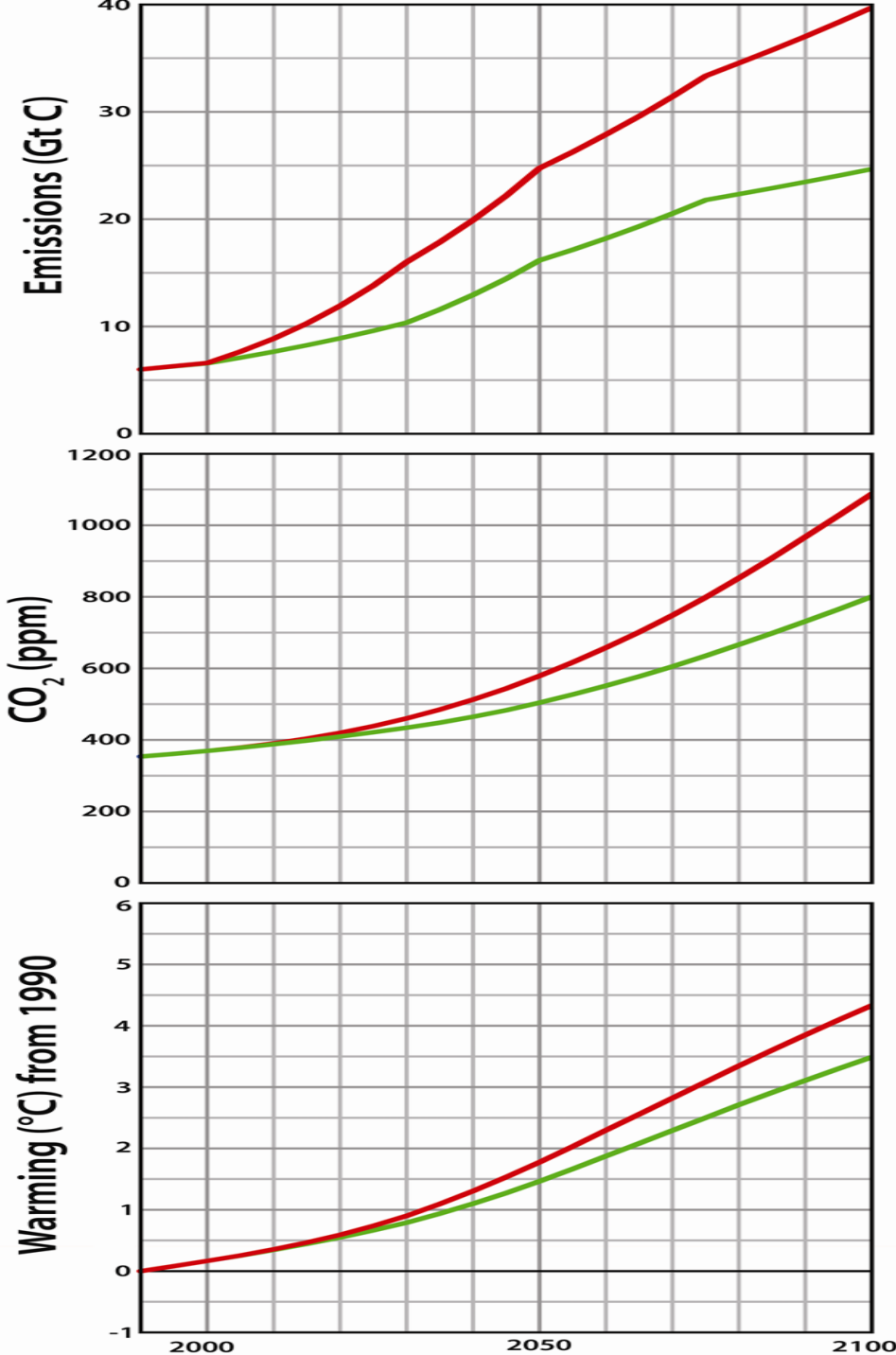
Cumulative Energy-Related CO₂ Emissions



***Around 60% of the global increase in emissions in 2005-2030
comes from China & India***

Assumed Business as Usual emission scenario per IEA (to 2050) extended to 2100 by author, concentration and warming calculations via MAGICC 5.3

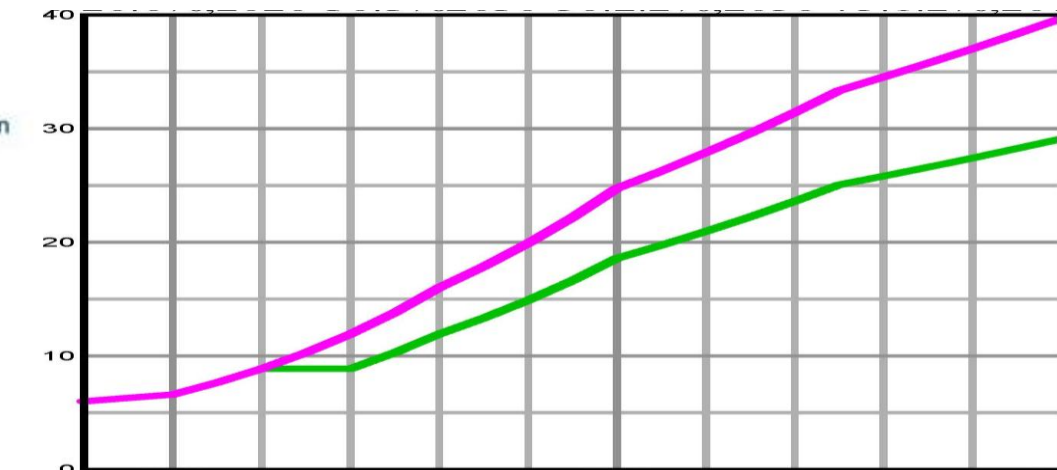




Two Emission Scenarios: IEA base: **Original** assumed growth rate from 2000 to 2030 of 1.6%; **Revised** growth rate from 2000 to 2030 of 3.0%

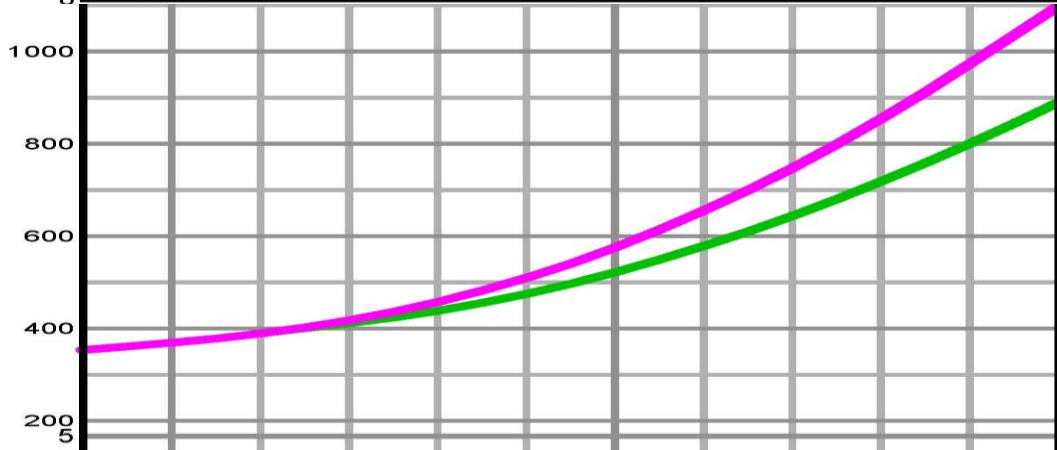
Atm. Sensitivity = 3.0 C

Emissions,
Gt C



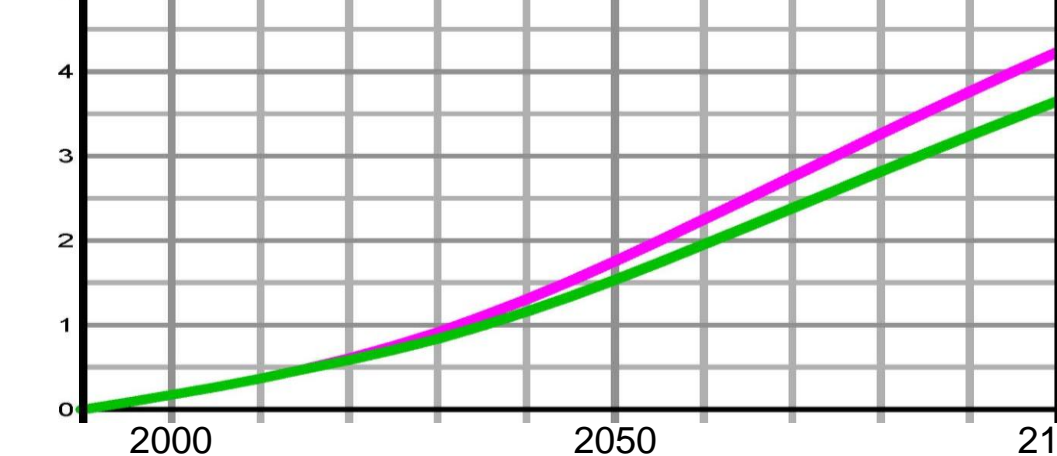
What are potential warming impacts for prolonged, 2010 to 2020, *Global Recession* (0% emission growth)?

CO2
ppm





Growth rate from 2000 to 2030 of 3.0% then lower growth rates:
2030 to 2050: 2.2%,
2050 to 2075: 1.2%,
2075 to 2100: 0.7%



Warming,
C deg.
from
1990



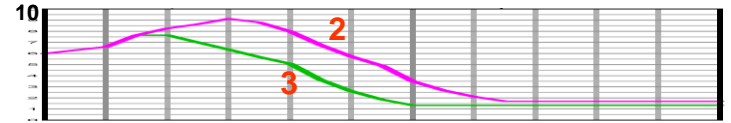
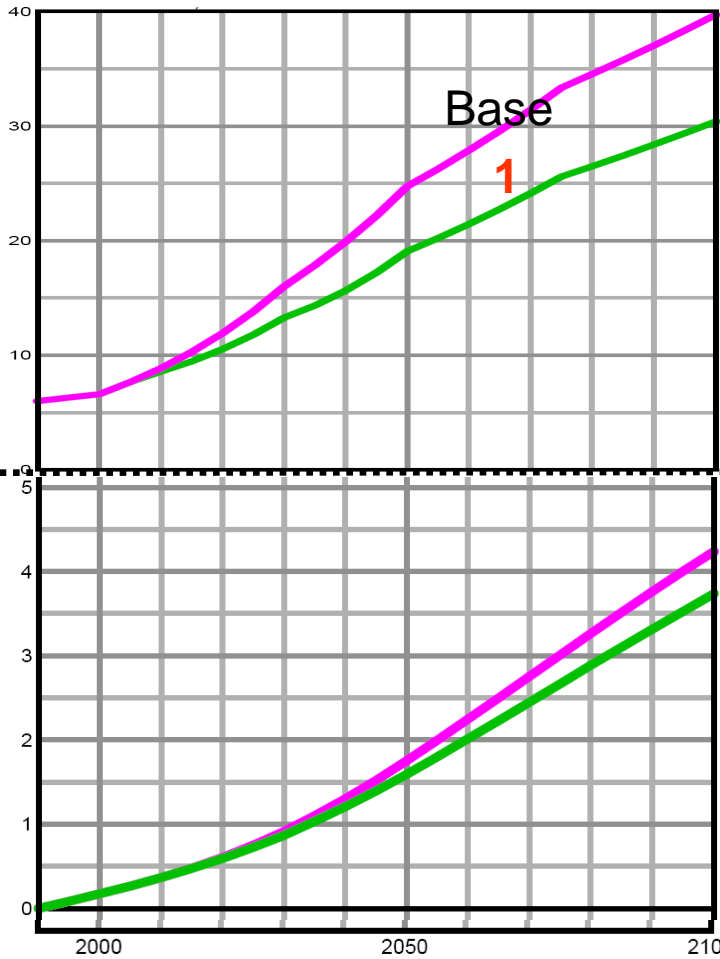
Global recession 2010 to 2020 then 10 years of 3% growth, then same reduced growth rates

US vs. World CO₂ Emission Reductions: Base Case & 3 Aggressive Mitigation Cases:

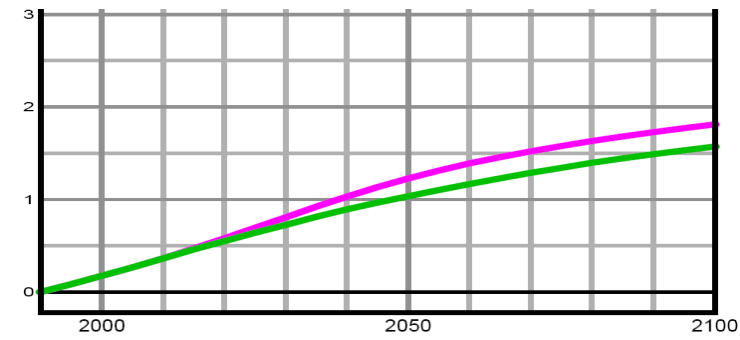
Base Case 
 1) US only 

2) All developed countries + developing countries > **delayed 15 yrs.** 
 3) World, all countries 

CO₂ Emissions
Gt C per Year



Warming from 1990,
C degree



In June 2008 IEA Released the 2008 version of Energy Technology Perspectives

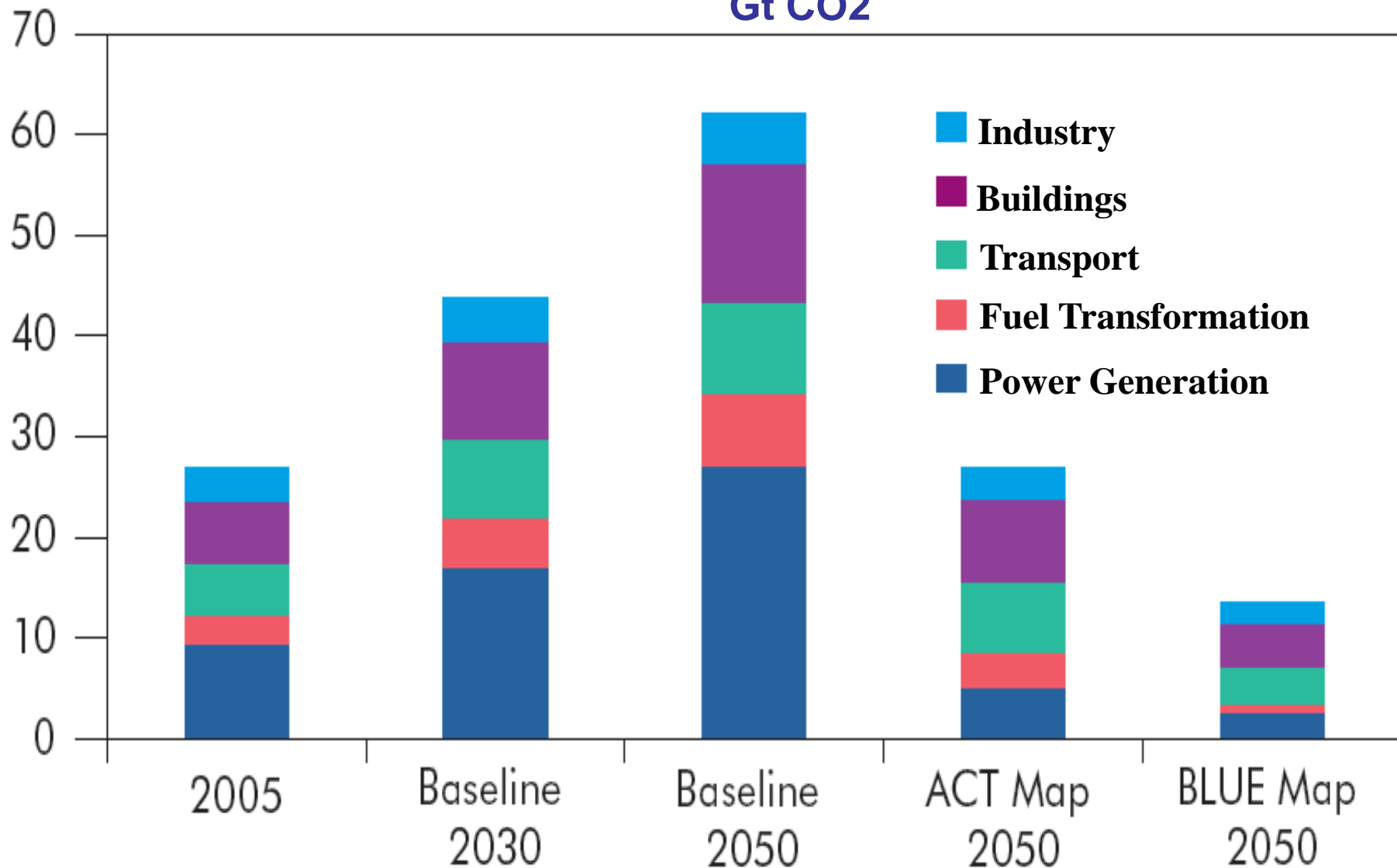
- Mandate by G-8 Leaders and Energy Ministers
- in 2006 their *ACT* scenario (2050 =2005 emissions) still yielded ~3.1 C warming
- In light of IPCC (2007), they analyzed new *Blue* scenario to limit warming to ~ 2.4 C; this requires 2050 emissions to be 1/2 of 2005 values (1.5% annual reduction for 45+ years)
- They concluded:
 - “We are facing serious challenges in energy sector”
 - “The situation is getting worse”
 - “A global revolution is needed in ways that energy is supplied and used”
 - “The *Blue* scenarios require urgent implementation of unprecedented and far reaching new policies in the energy sector”

In June 2008 IEA Released the 2008 version of Energy Technology Perspectives (Continued)

- Key technologies not available: “a huge effort of RD&D will ... be needed”
- “Critical technologies: solar PV, advanced coal and biomass, CCS, batteries, fuel cells and H₂”
- “There is an urgent need for full scale CCS demonstration”
- **Blue** scenario requires **\$13 to \$16** trillion for Research, Development Demonstration & Deployment (RDD&D)
- **Blue** scenario requires marginal costs up to **200 to 500 \$/ton**; the more modest ACT scenario (2050 emissions=2005 emissions) *revised* from **\$25 to 50\$/ton**
- Additional *investment* needs in the **Blue** scenario is **\$45** trillion; about **\$43** in energy cost savings

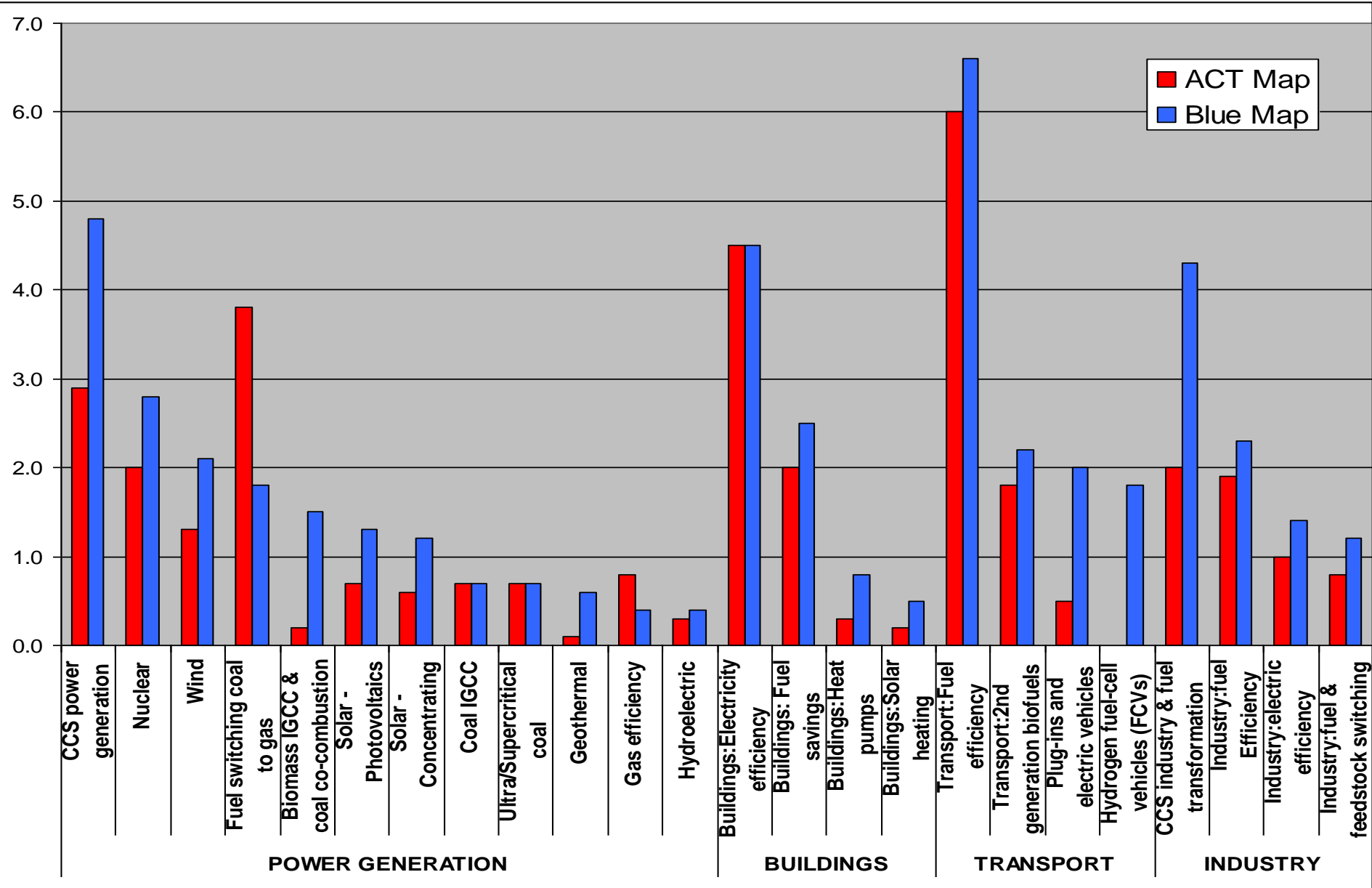
IEA CO2 Projections: Base, ACT and Blue Scenarios

Gt CO2

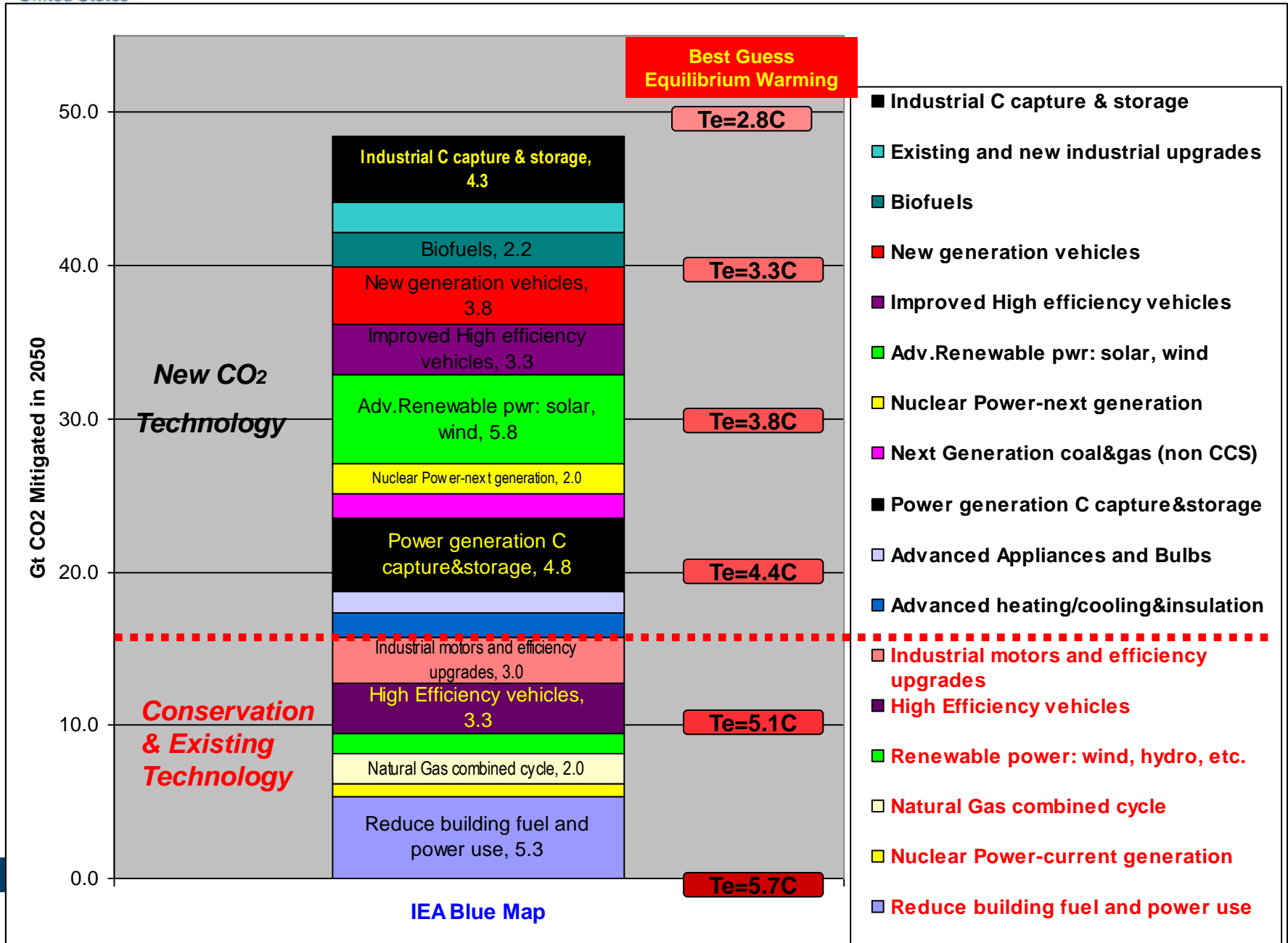


Summary Of IEA Technology Scenarios;

Total: 35 Gt in 2050 for ACT, 48 Gt for Blue



Energy Technology Categories-existing & new: their potential to mitigate global Gt CO₂ in 2050 and impact on next century equilibrium warming, T_{eq}



The Climate Change Technology Challenge

- **Man is pumping CO₂ in the atmosphere at unprecedented rates; 30 billion tons last year, and growing at 3% annually from 2000 to 2006. Although US is large emitter, much of recent growth is due to China; key drivers: economic and population growth**
- **It is too late to avoid substantial warming and significant impacts; at least 2 C inevitable, the challenge remaining: avoid catastrophic warming**
- **Limiting warming to below 2.5 C will be a monumental challenge; growth rate of 3% must change to -1 to -2%; sooner control starts, the better**
- **Available technology if aggressively utilized, will only avoid about 40%% of required CO₂ by 2050; *next generation low emission/high efficiency technologies need to be developed and utilized ASAP***

- **Major technology advances necessary, especially in critical power generation and mobile source sectors; *carbon capture and storage, nuclear reactors, and low emission vehicles are critical technologies***
- **No “silver bullets”, all promising technologies should be pursued**
- **Research funding is grossly inadequate; “too few eggs in too few baskets”**
- **Focused fundamental research aiming at breakthrough technologies important**
- ***IEA, 2008: “A global revolution is needed in ways that energy is supplied and used”***
- **Technology is necessary but not sufficient, aggressive global mitigation commitments needed**

- President Obama: “The issue of climate change is one that we ignore at our own peril. ... what we can be scientifically certain of is that our continued use of fossil fuels is pushing us to a point of no return. And unless we free ourselves from a dependence on these fossil fuels and chart a new course on energy in this country, we are condemning future generations to global catastrophe.”
- President Obama has put in place strong leaders who have stated global climate change mitigation a high priority: Carol Browner, White House Advisor, John Holdren, Science Advisor, Steve Chu, DOE Secretary, Lisa Jackson, EPA Administrator
- In April 2007, Supreme Court: GHGs meet Clean Air Act definition of “air pollutant,” authorizes regulation subject to determination that emissions ***endanger public health or welfare***. EPA proposed that the current & projected concentrations of the mix of six key GHGs threaten the public health & welfare. EPA further proposed to find that combined emissions of CO₂, CH₄, N₂O, and HFCs from vehicles contribute to atmospheric concentrations of GHGs and hence to the threat of climate change.

Current Status of GHG Mitigation Policy in Obama Administration, continued

- Administration committed to cap-and-trade program to reduce GHGs **14%** below 2005 levels by 2020 & 83% below 2005 by 2050.
- House of Representatives passed American Clean Energy and Security Act: a cap & trade bill to reduce GHGs **17%** below 2005 levels by 2020 & 83% below 2005 by 2050
- Senate bill just released out of committee; it calls for a ceiling on GHG emissions in three years, to be tightened annually so emissions would be 20 % lower in 2020 than in 2005. Emissions would have to be 83 %t lower by 2050
- Obama announced \$1.2 billion in basic research for DOE's national labs; also money to upgrade national lab facilities, for research in renewable energy, such as solar & biofuels, as well as in nuclear energy, underground CO2 storage, & H2 production
- Obama revived the FutureGen IGCC CCS project, final decision later this year
- Through stimulus package, US set aside \$59 billion in direct spending and in tax incentives to promote clean energy and energy efficiency; primary focus: green buildings
- Obama announced new CAFÉ standards; by 2016, 35.5 mpg fleet average for cars & trucks (to grow 5%/yr from 2011). Will reduce oil use by ~1.8 billion barrels and prevent GHG emissions of ~950 million metric tons, saving consumers more than \$3,000 in fuel costs.

Current Status of GHG Mitigation Policy in Obama Administration, continued

- **California Waiver** By law, states are permitted to be more stringent than EPA in establishing air pollution controls standards, except for motor vehicle standards. However, since California has been a leader in air pollution control, the Clean Air Act allows California to petition EPA for a waiver. If granted, other States may adopt the California standards. California's request for a waiver was denied in March 2008. However, on June 30, 2009, EPA granted the waiver.
- **Greenhouse Gas Reporting Rule** On September 22, 2009, EPA issued rule that requires ~10,000 industrial facilities accounting for roughly 85% of the nation's greenhouse gas emissions to report emissions on a regularly beginning in 2011.
- **Proposed Carbon capture and sequestration** On July 8, 2008, EPA proposed requirements for the underground injection control program for CO₂ sequestration wells, with a public comment period that closed on December, 2008. EPA published requirements in August 2009
- **Proposed Permitting Requirements for Large Industrial Facilities** On September 30, 2009, EPA utilizing current Clean Air Act authority, proposed thresholds for new & modified stationary sources of GHG emissions which require the largest sources to obtain permits and establish GHG limitations. Under this rule, facilities emitting more than 25,000 tons of CO₂ each year are required to adopt the best, most efficient technologies available when constructed or upgraded, helping reduce GHGs from sectors that account for nearly 70 percent of non-vehicle emissions.

American Clean Energy and Security Act of 2009

- Passed US House of Representatives; President said he would sign
- Three key titles:
 - (1) a “**clean energy**” title that promotes renewable sources of energy and carbon capture and sequestration technologies, low-carbon transportation fuels, clean electric vehicles, and the smart grid and electricity transmission
 - (2) an “**energy efficiency**” title that increases energy efficiency across all sectors, including buildings, appliances, transportation, and industry
 - (3) a “**global warming**” title that places limits on the emissions of heat-trapping pollutants

The American Clean Energy and Security Act of 2009

Title I, Clean Energy:

- Renewable electricity requirement starts at 6% in 2012 & gradually rises to 25% in 2025.
- Promotes development of carbon capture and sequestration (CCS) technologies
- Establishes a new low-C transportation fuel standard to promote advanced biofuels and other clean transportation fuels. It authorizes funding for large-scale demos of electric vehicles

Title II, Energy Efficiency:

- Promotes new building energy efficiency by providing training & funding to states & authorizes funding for retrofitting commercial & residential buildings to improve efficiency.
- Improve industrial efficiency & appliance/lighting energy efficiency via DOE standards
- Requires states to establish goals for reducing GHGs from transportation & directs EPA to set standards for locomotives, marine vessels, and nonroad sources
- Establishes efficiency standard for electricity & natural gas distribution companies.

Title III, Reducing Global Warming Pollution

- Establishes market-based program for reducing GHGs from electric utilities, oil companies, large industrial sources via “allowances” for each ton emitted. Program reduces annual allowances to ensure aggregate emissions reduced by 3% below 2005 levels in 2012, 17% below 2005 levels in 2020, and 83% below 2005 levels in 2050.
- Directs EPA to achieve *additional* GHG reductions via prevention of international deforestation. By 2020, will achieve reductions equiv. to 10% of 2005 U.S. emissions
- Allows covered entities to increase emissions above their allowances if they can obtain “offsetting” reductions at lower cost from other sources
- Directs EPA to set emission standards on sources not covered by allowance system; special programs to reduce emissions of hydrofluorocarbons (HFCs) and black Carbon
- Provides that GHGs *may not* be regulated as criteria or hazardous air pollutants on the basis of global warming. Also provides that new source review does not apply to GHGs
- Imposes a mandatory carbon tariff on imports from countries that don't adopt their own climate programs by 2020

- The Senate bill just released out of *committee*, includes an economy-wide cap and trade system that would require power plants, industrial facilities and refineries to cut carbon dioxide and other GHGs
- Emissions would be 20 percent lower in 2020 than they were in 2005. Emissions would have to be 83 percent lower by 2050.
- While there would be an overall emission cap, polluters would be able to purchase emission allowances to limit reductions. The bill, however, does not lay out how emission allowances would be distributed, a contentious issue left for later resolution
- Includes incentives for encouraging more nuclear power
- The bill will become the starting point for Senate negotiations in coming months

Our Stakeholders Count on Us; *They will reap from seeds we sow*

