

Addressing Global Warming

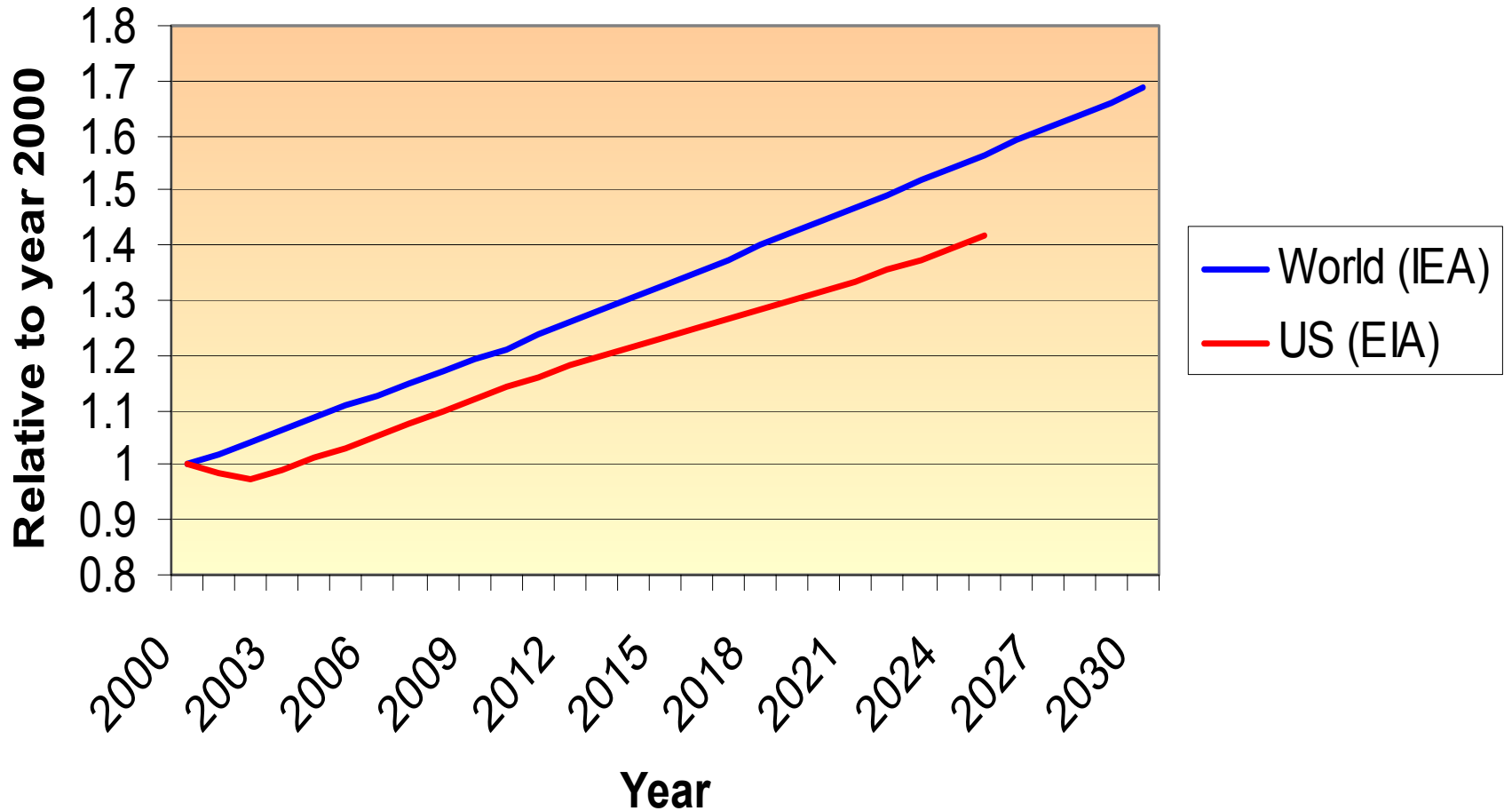


David G. Hawkins, NRDC
June 23, 2003

Self-Interest = Cooperation

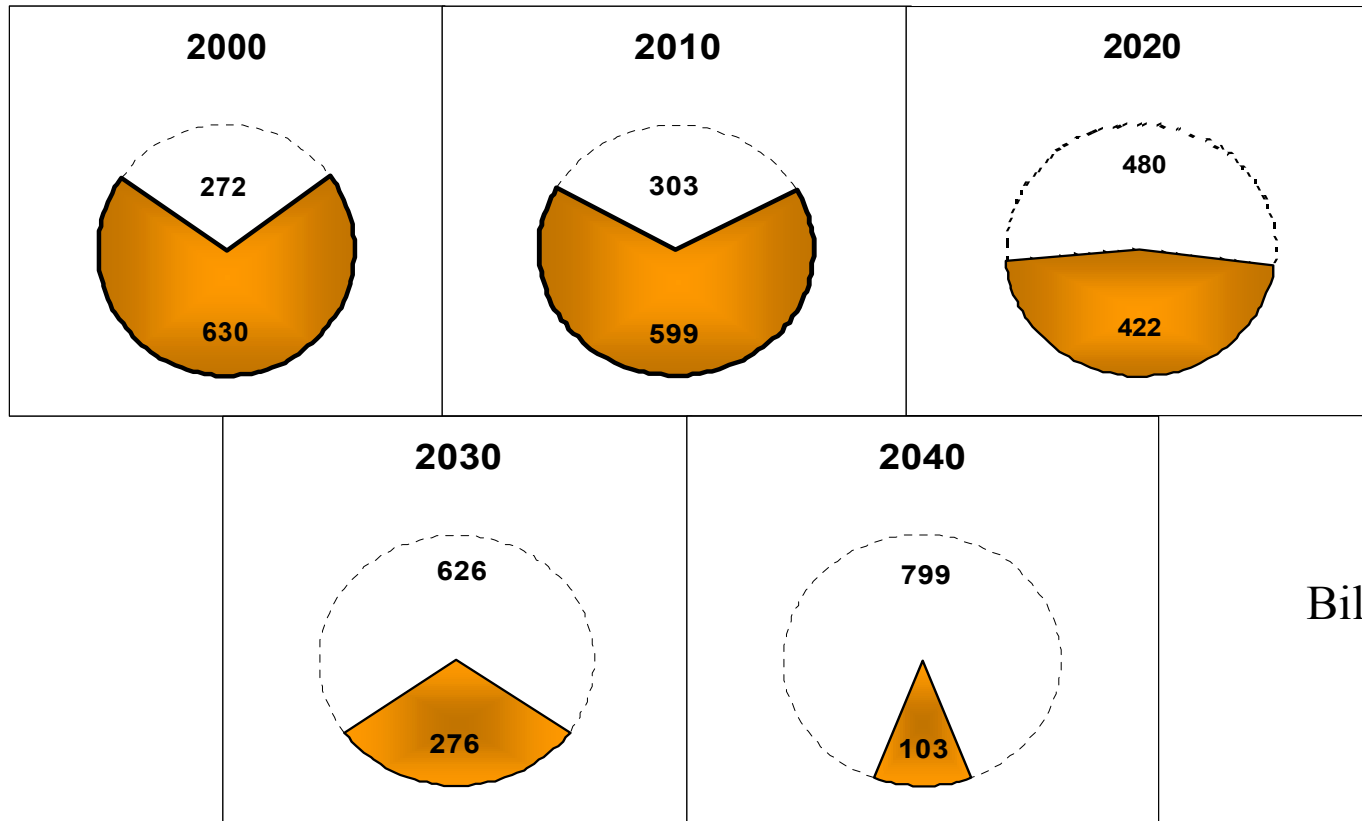
- No country acting alone can manage the finite global carbon budget
- Common strategic interest in minimizing consumption of global carbon budget
- Action required now to avoid high-carbon lock-in
- Delay sacrifices safer targets
- Opportunities for cooperation

Growth in Energy CO2 Emissions



SHRINKING CARBON BUDGET

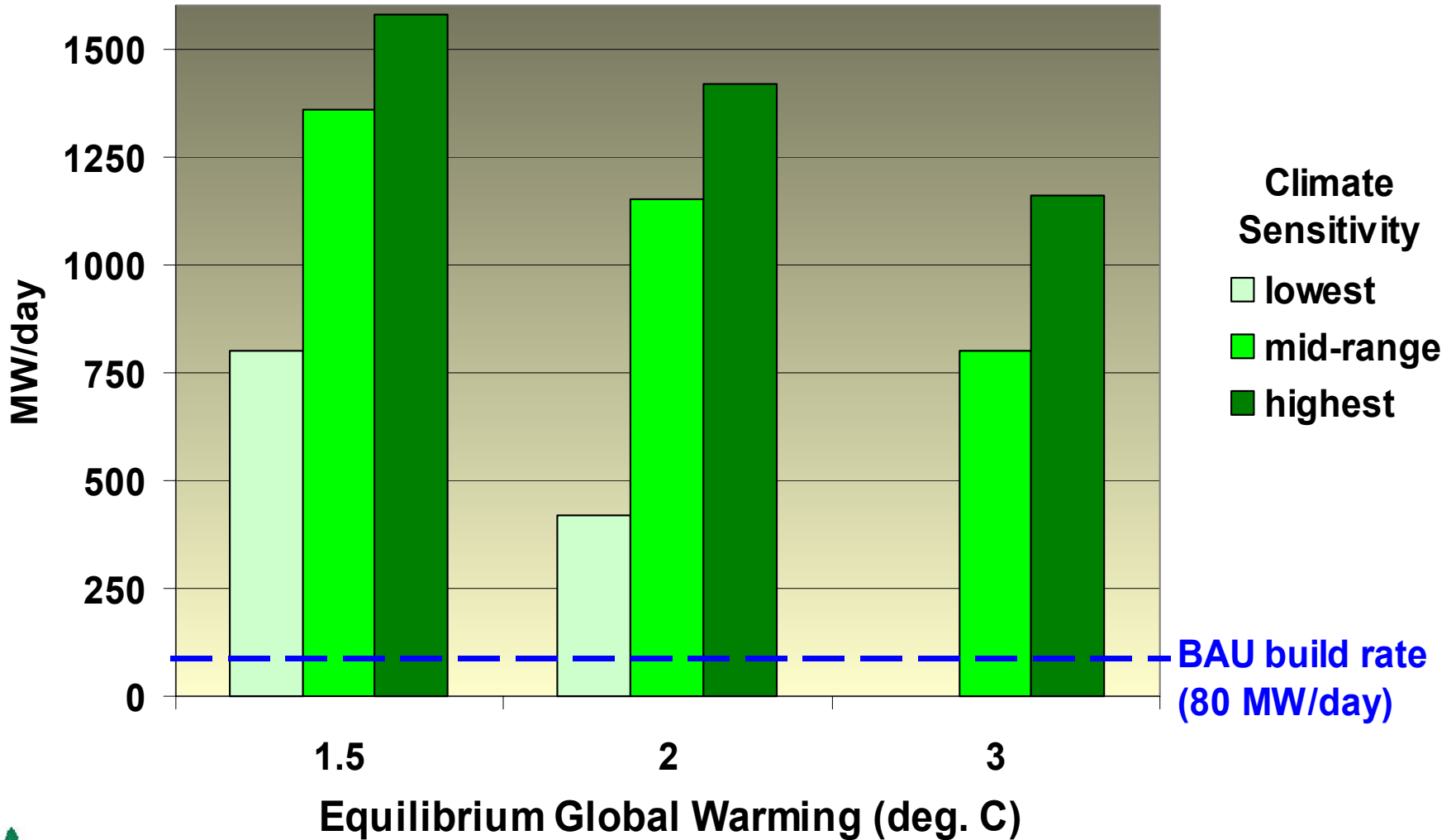
Ask not, “How big is the pie?”
Ask, “How much of the pie is left?”



Billion tonnes
carbon

Budget for 450 ppm Stabilization (1900-2100)

Required Clean Energy Build Rates



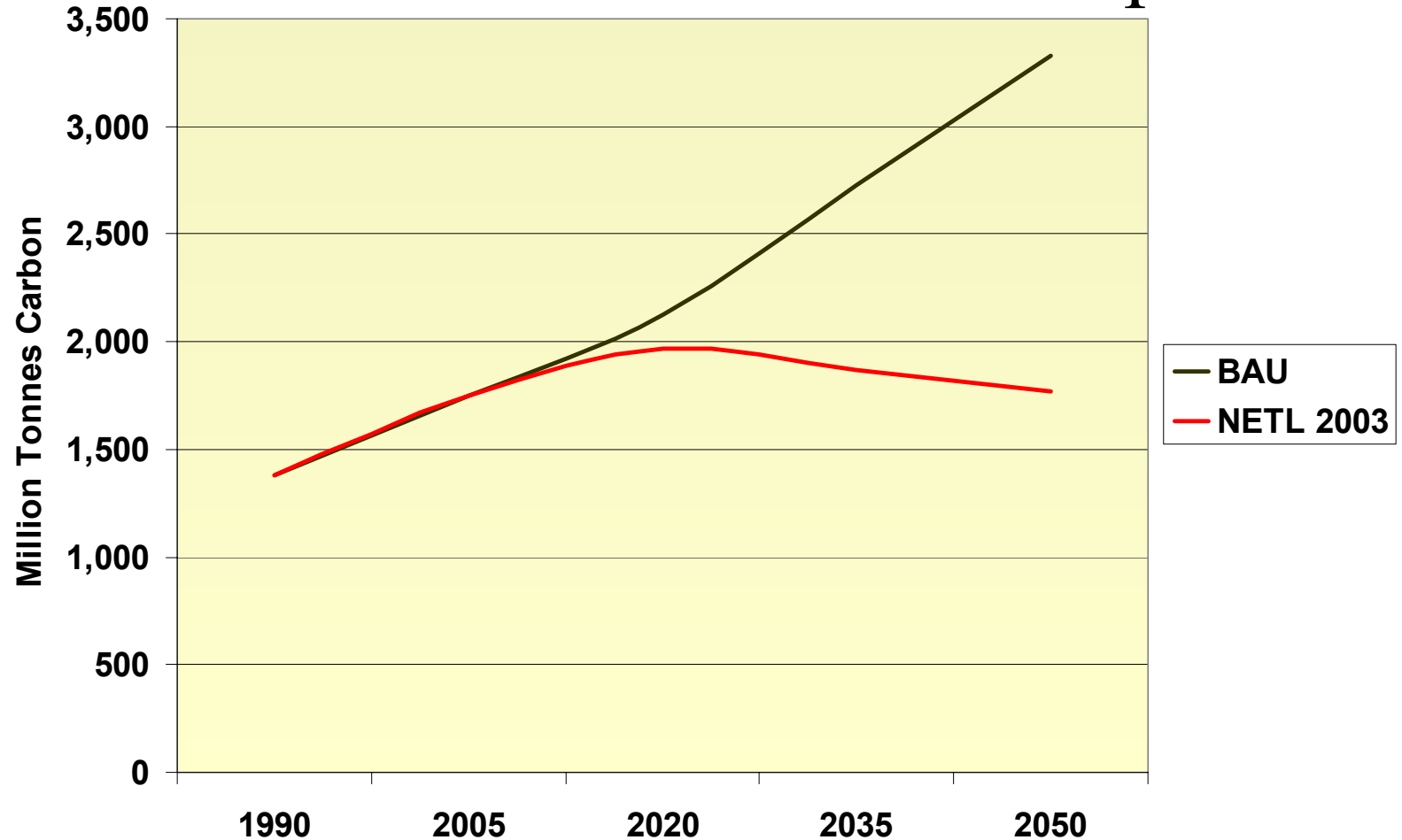
Sources: Caldeira, et al, Science, 3/28/03 and IEA, WEO 2002

No Time to Waste: U.S. Example

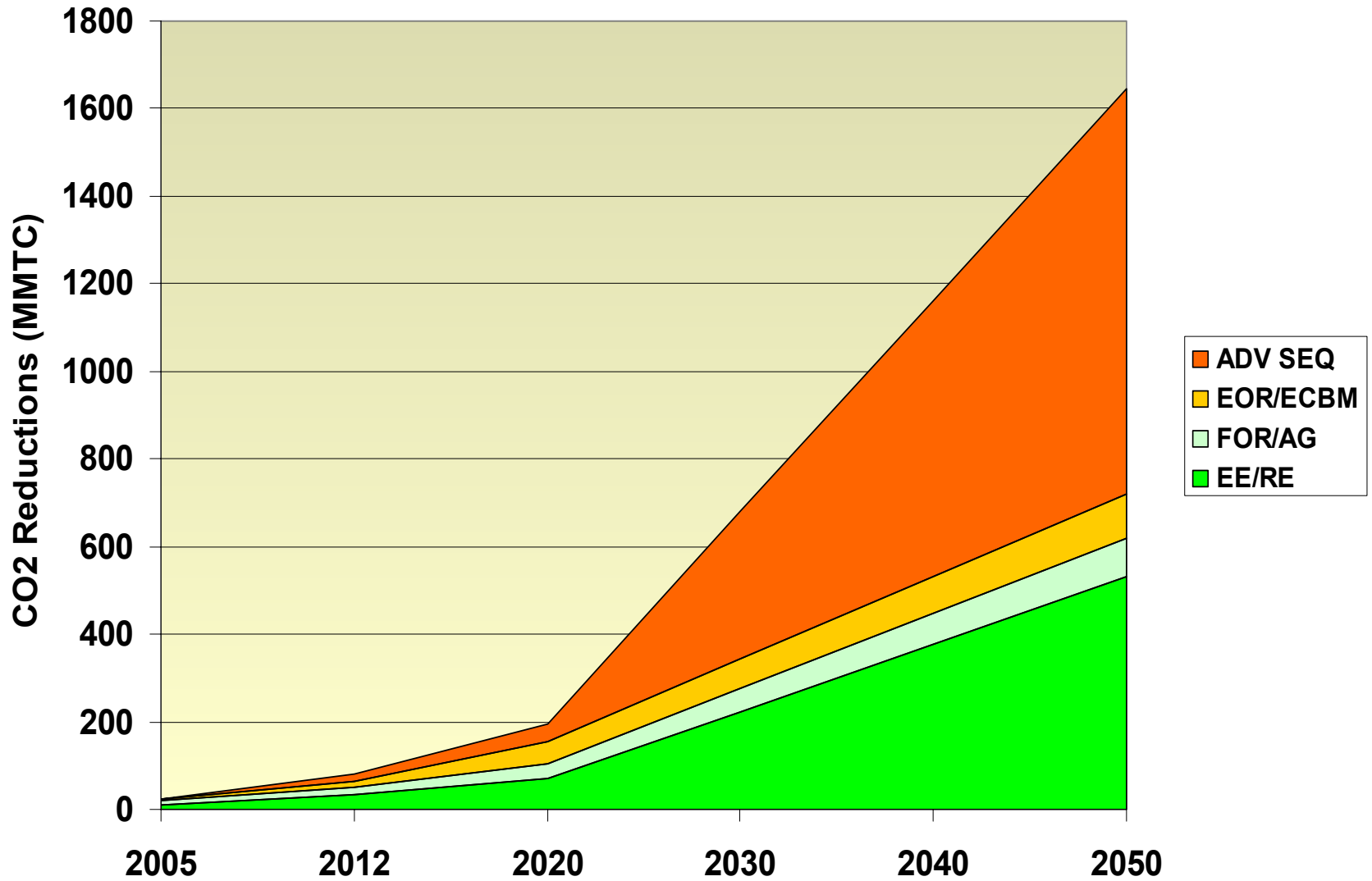
- Compare three scenarios—
 - BAU
 - DOE Carbon Sequestration Roadmap
 - Stabilization of CO₂ Concentrations
- Major effort needed to go from BAU to Roadmap and from Roadmap to Stabilization

U.S. CO2 Forecasts to 2050

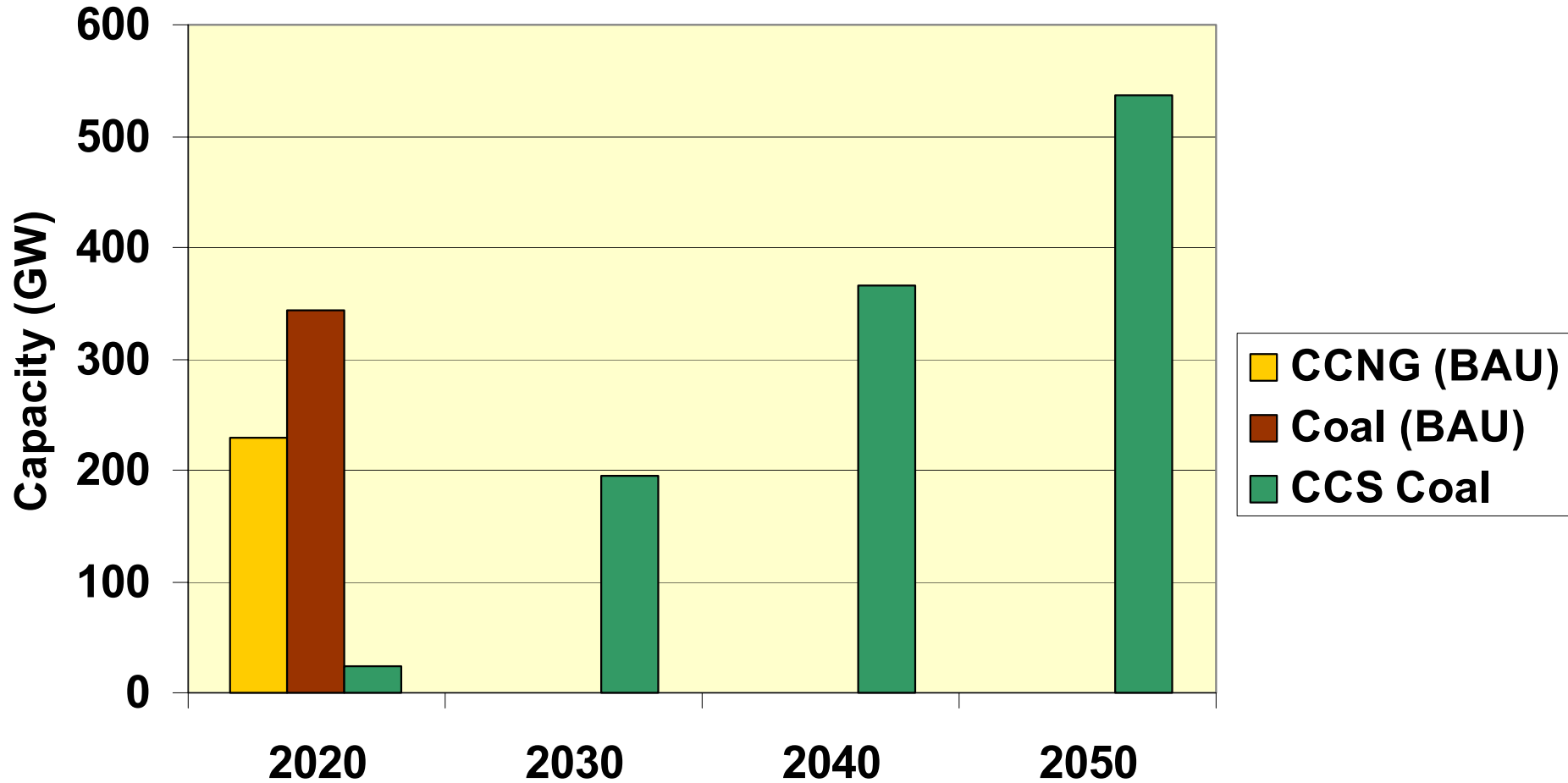
BAU v. DOE CCS Roadmap



CO2 Reductions in DOE Roadmap

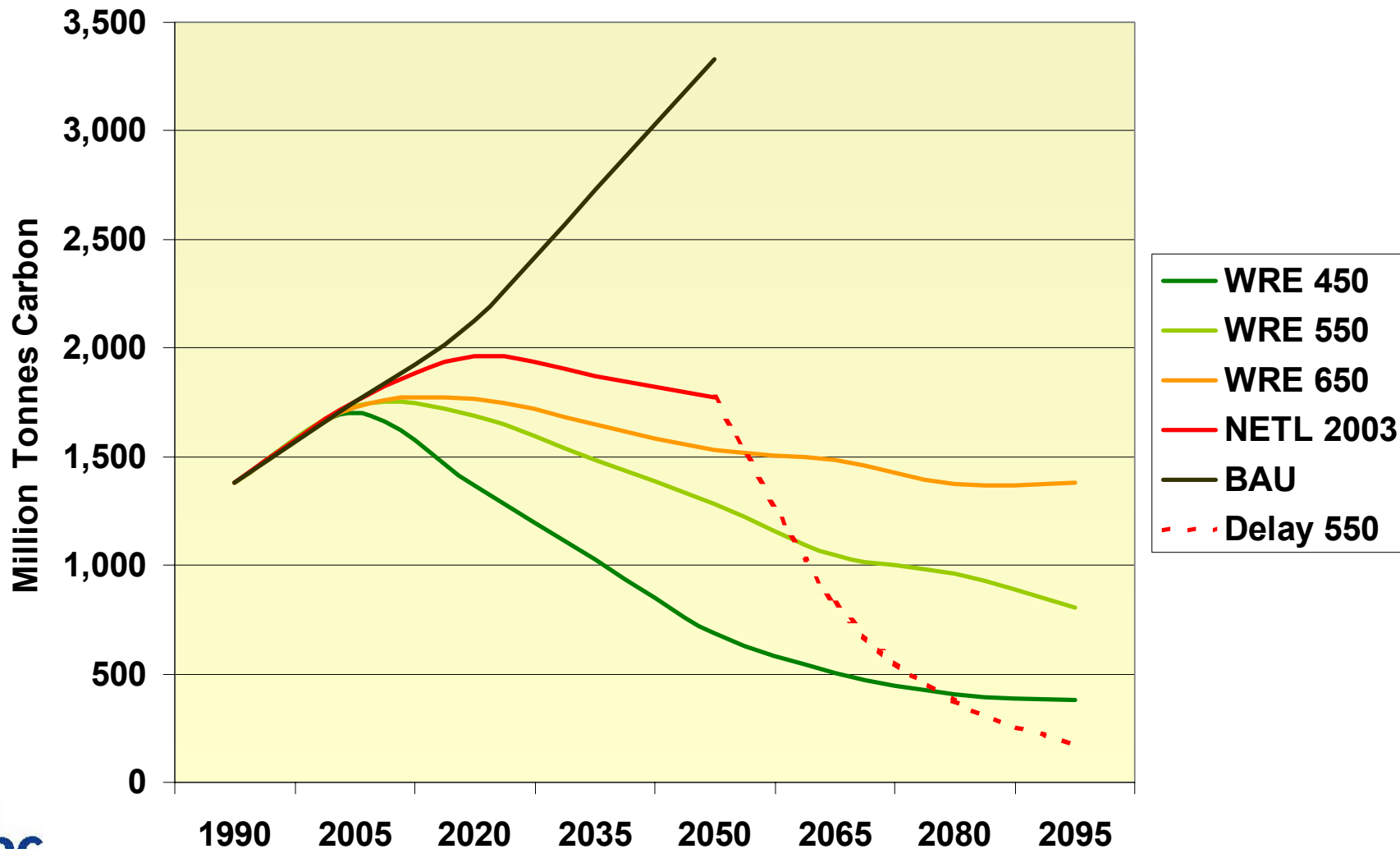


CCS Capacity in Roadmap



Future U.S. CO2 Emissions

Impact of Delay on Stabilization Options



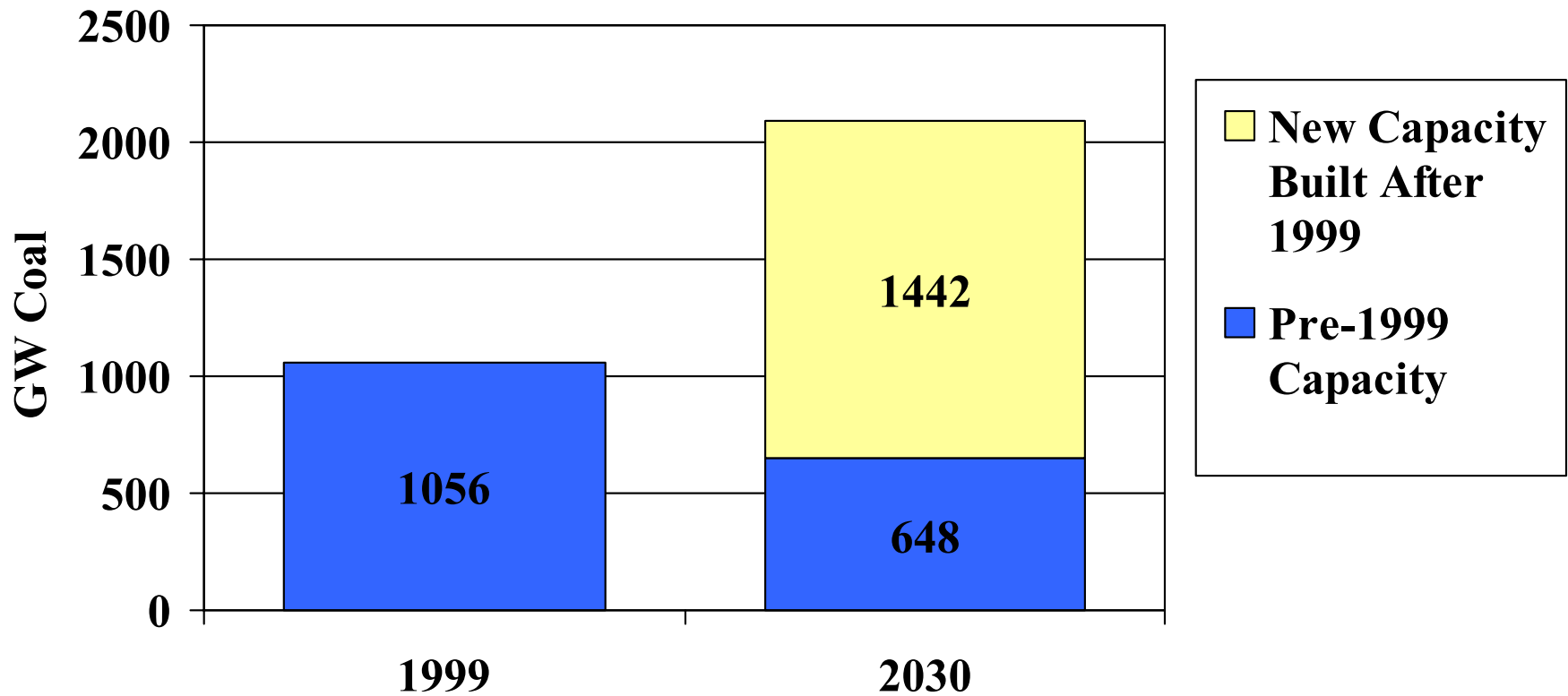
Role of Carbon Capture and Storage

- Potential third horse in Troika:
 - Energy Efficiency
 - Renewable Energy
 - “Emission-free” fossil fuel (CCS)
- Large technical and policy challenges:
 - Keep priority on efficiency and renewables
 - Demonstrate CCS viability to both business and the public

Some Opportunities for International Cooperation

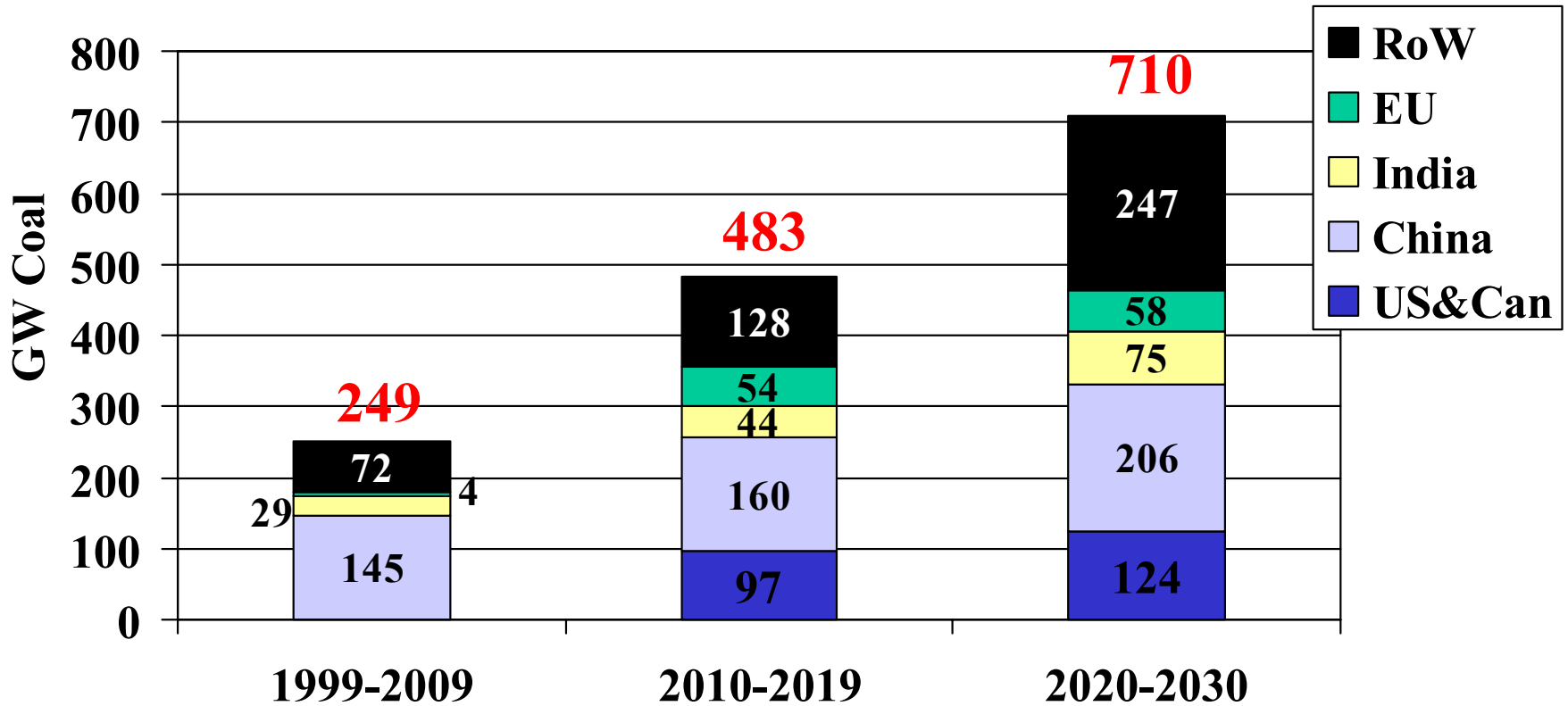
- Use “capture ready technology for new coal plants
- Pursue early low-cost demonstrations of geologic storage using existing, CO₂-rich industrial gas streams

Two-Thirds of World Coal Capacity in 2030 is NOT Yet Built



World New Coal Additions by Decade.

Catch the Wave or Miss the Wave?



Incremental new coal by decade

Economics of capture-ready coal

Costs for 100 GW of new coal capacity:

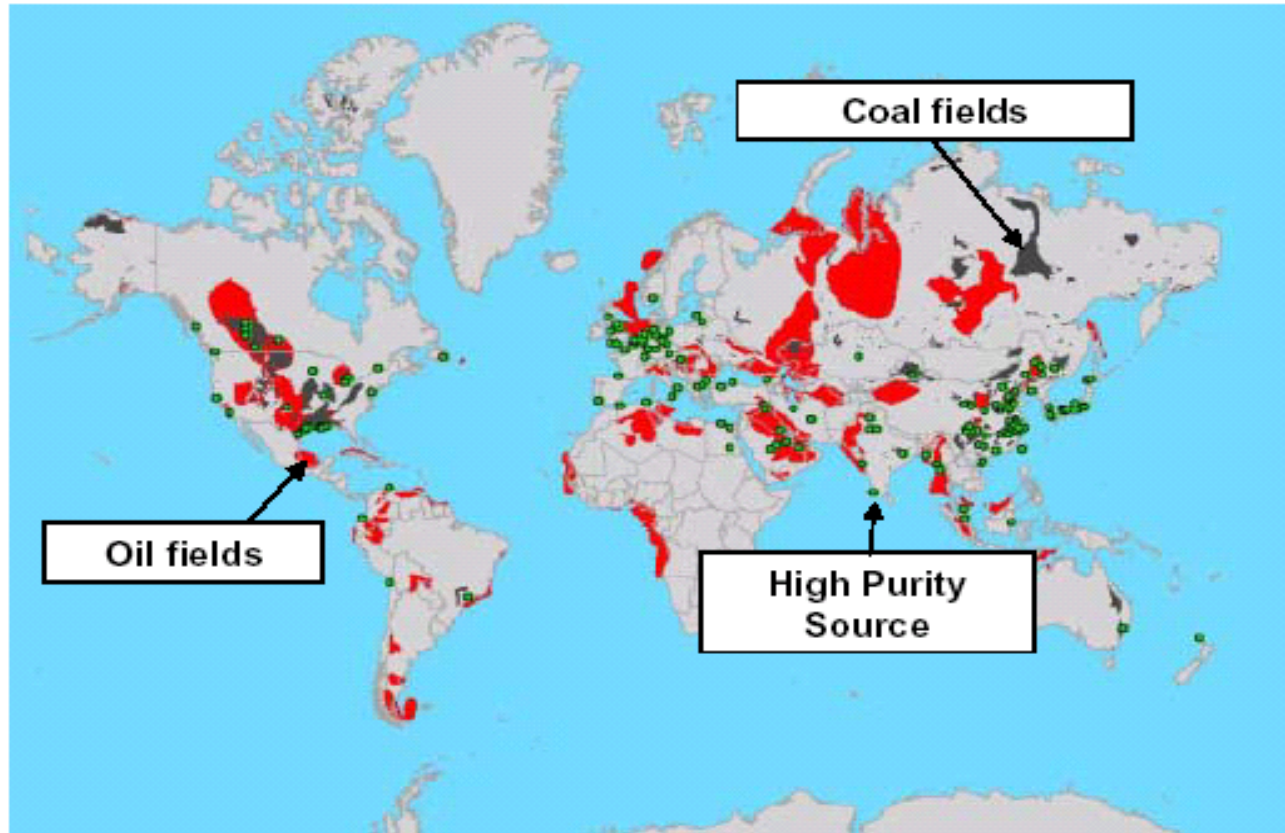
- Baseline: \$126 billion (USC w/ SO₂ scrubber)
- Capture-ready: \$138 billion (IGCC w/ pre-investment for carbon capture)
- Increment: \$12 billion (9%)

Cooperative Geologic Storage Demos

- Need multiple early full-scale experiences with geologic injection of CO₂
- Lowest cost opportunities would use CO₂-rich industrial gas streams
- Large CO₂-rich sources operating in a number of regions (U.S., China, Europe)
- Resource: IEA GHG Programme database on point sources and reservoirs

Sources and Reservoirs

Early opportunities study



Source: John Gale, IEA Greenhouse Gas R&D Programme

Policy Matters!

“While technology and market development is driven by the private sector, government has a key role to play in sending clear signals to the market about the public good outcomes it wishes to achieve.”

IEA, *Creating Markets for Energy Technologies* (Paris, 2003).

Policy Matters!

U.S. Refrigerator Energy Use v. Time

