

There is no Silver Bullet: Regionalization and Market Fragmentation in Greenhouse Gas Mitigation Strategies

Gerald M. Stokes

Director,
Joint Global Change Research Institute
College Park, Maryland

DEER 2004
San Diego
August 31, 2004

Battelle

Pacific Northwest
National Laboratory

 UNIVERSITY OF
MARYLAND

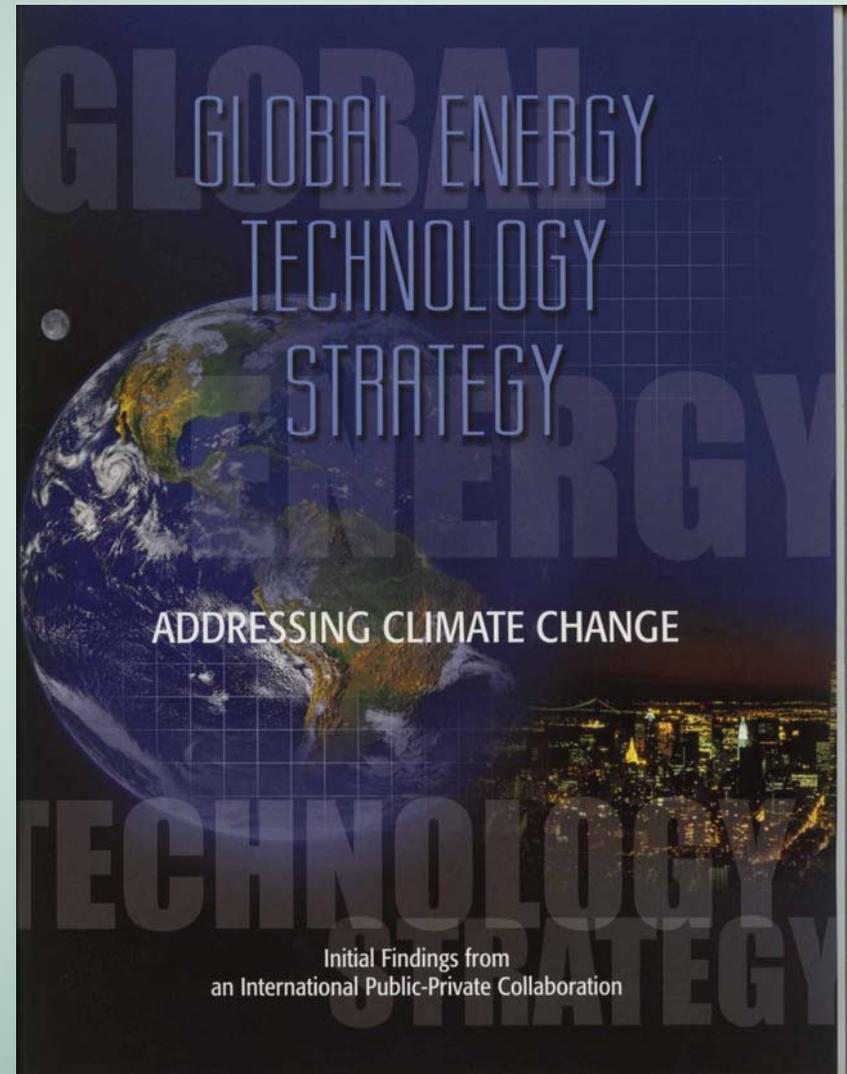


JGCRI

Joint Global Change Research Institute

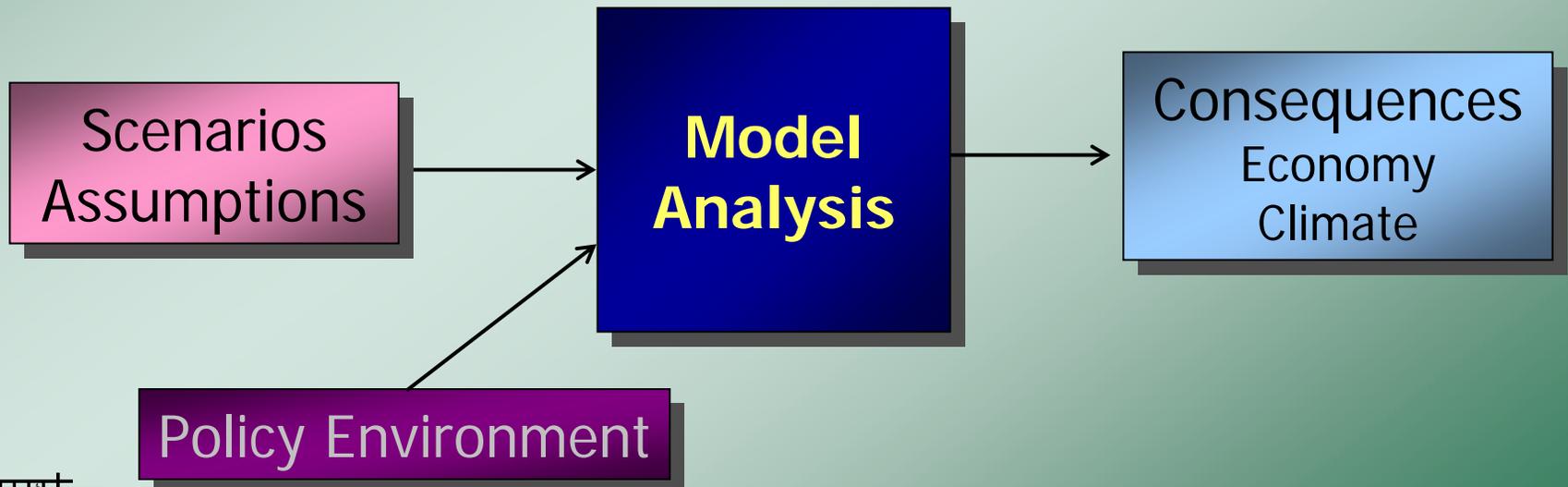
At COP-6 we rolled out several ideas about technology ...

- We challenged the view that we had 'enough' technology to stabilize concentrations
- And indicated that a portfolio of technology options was required and there was unlikely to be a "silver bullet" technology
- Since then everyone has been polishing their ammo



An Integrated Assessment EIS

- Unlike climate models which attempt to project the future of the climate system, Integrated Assessment models do not.
- Rather they take projections of the future and examine the relative impact of different policy options.
- The results today are meant to be illustrative of the key issues and insights of this kind of analysis, not predictions.

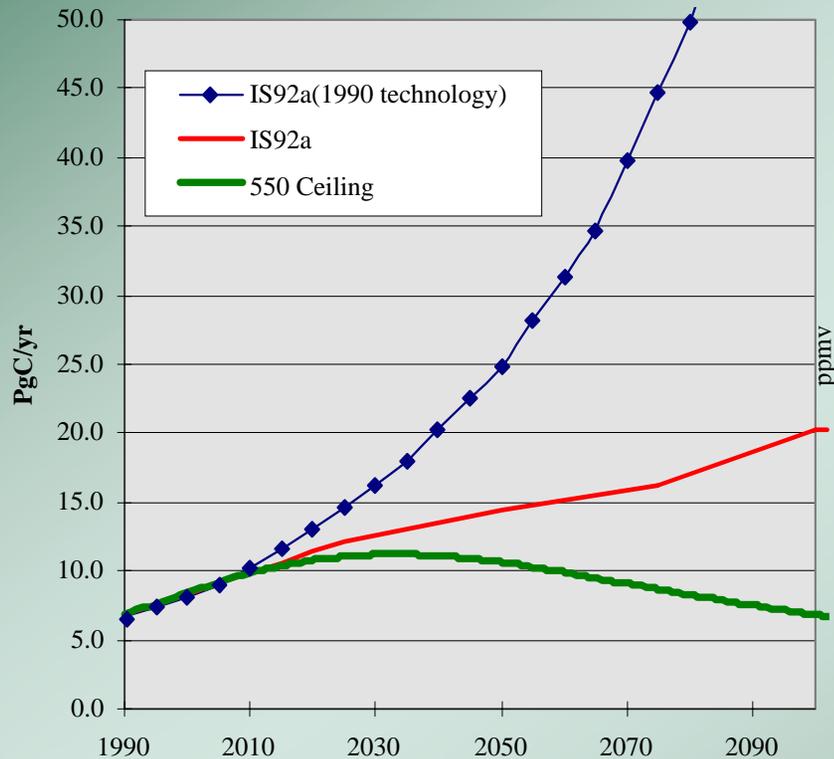


Point 1: For carbon dioxide, stabilizing climate impact is more than stabilizing emissions.

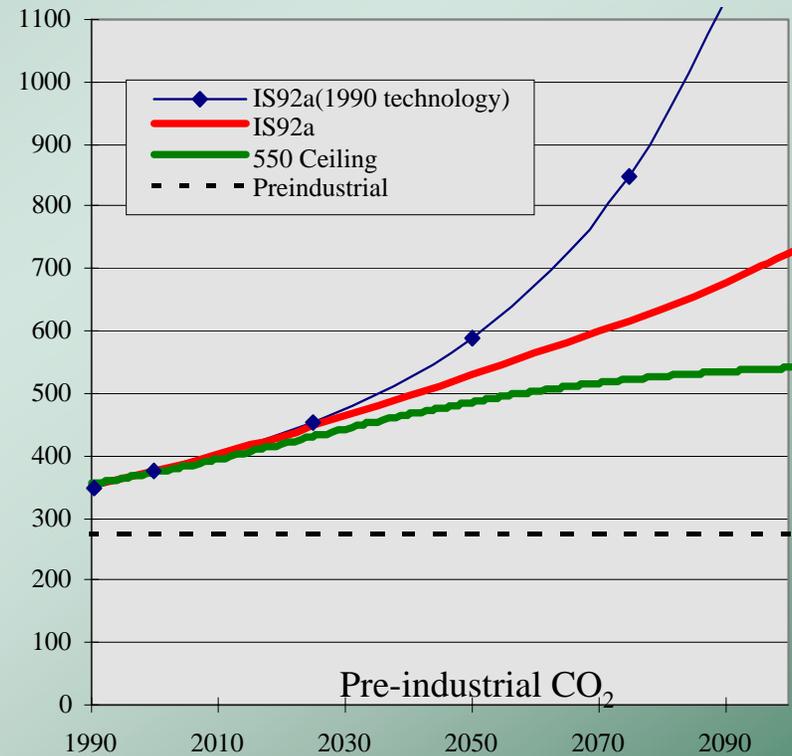


To stabilize concentrations, emissions of CO₂ must peak then decline - essentially to zero.

Emissions



Concentration



JGCRI

Joint Global Change Research Institute

Point 2: Reducing carbon dioxide emissions can either help solve the climate problem, or keep it from getting worse.

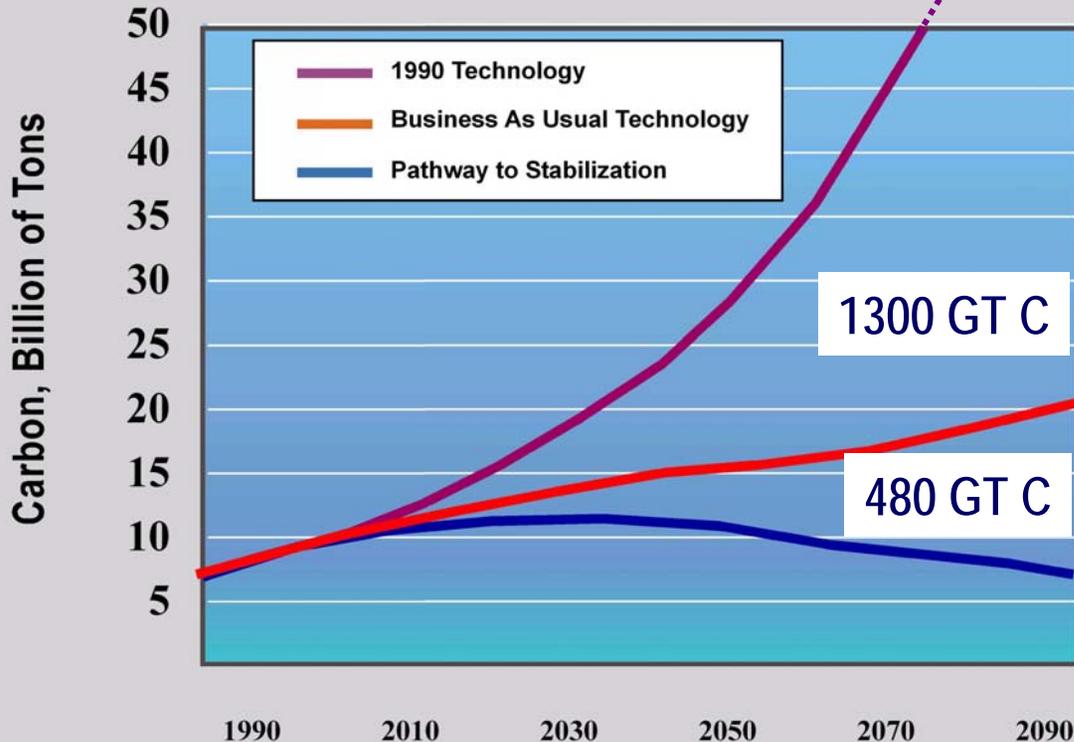


JGCRI

Joint Global Change Research Institute

Commitment to Stabilization Requires Closing TWO "Technology Gaps"

Carbon Emissions



"Business-As-Usual"
Technology Gap

"Stabilization"
Technology Gap



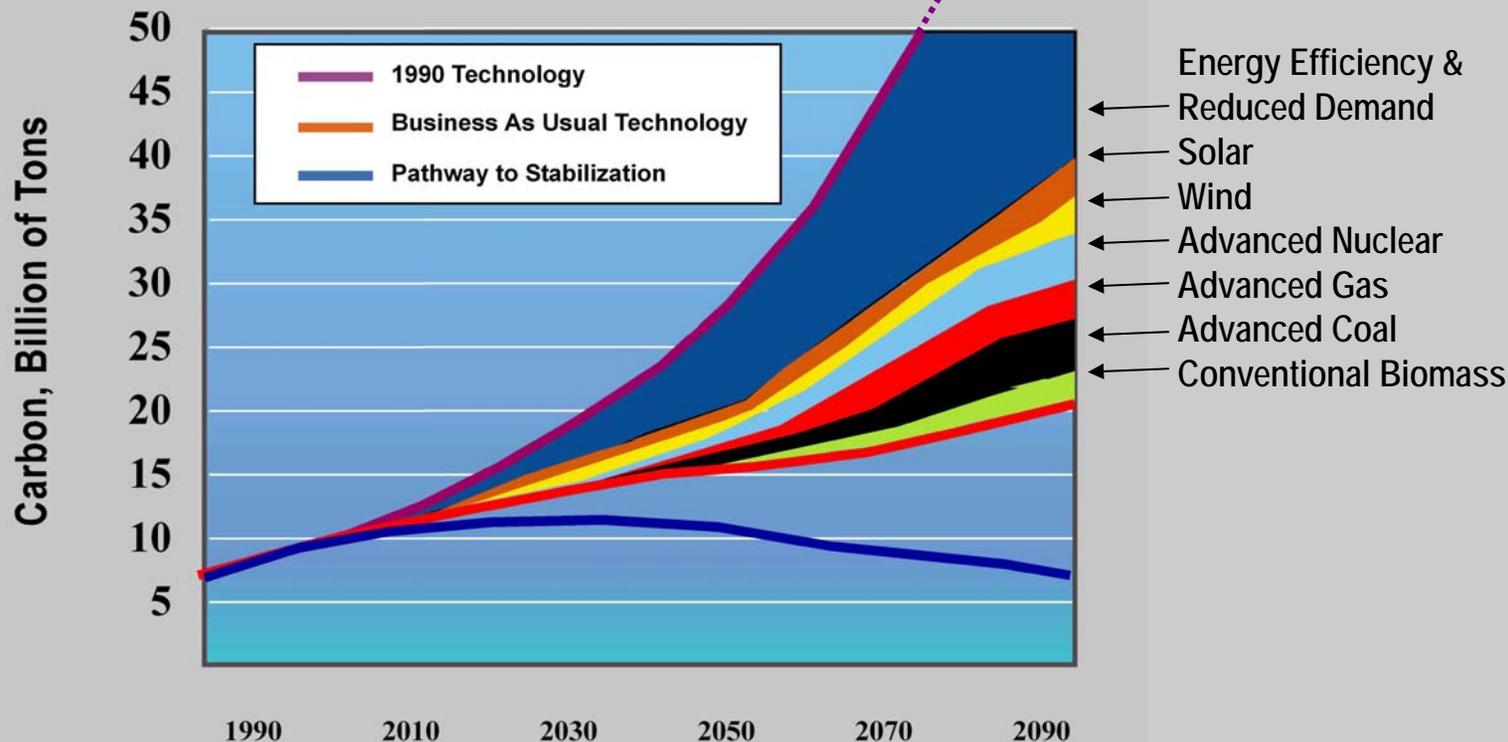
JGCRI

Joint Global Change Research Institute

Business-As-Usual Gap

Extraordinary Improvement is Built in to BAU

Carbon Emissions



“Business-As-Usual”
Technology Gap



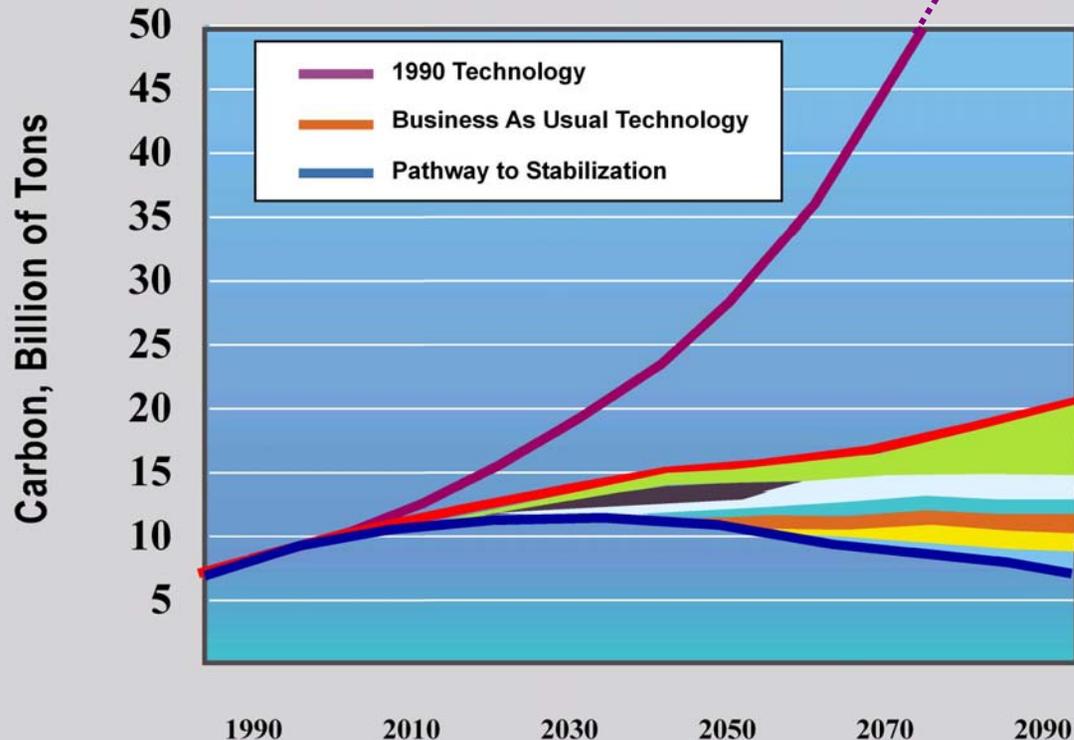
JGCRI

Joint Global Change Research Institute

Stabilization Gap

Tremendous Additional Technological Advance Required

Carbon Emissions



Advanced Biomass
Soil Sequestration
H2 w/Sequestration
Fossil Power w/Seq.
Addt'l Solar/Wind
Addt'l Nuclear
Addt'l Efficiency &
Reduced Demand

“Stabilization”
Technology Gap



JGCRI

Joint Global Change Research Institute

Point 3: Solving the climate problem requires placing a value on carbon:

- placing limits on emission,**
- increase price,**
- prescribe a technology path.**

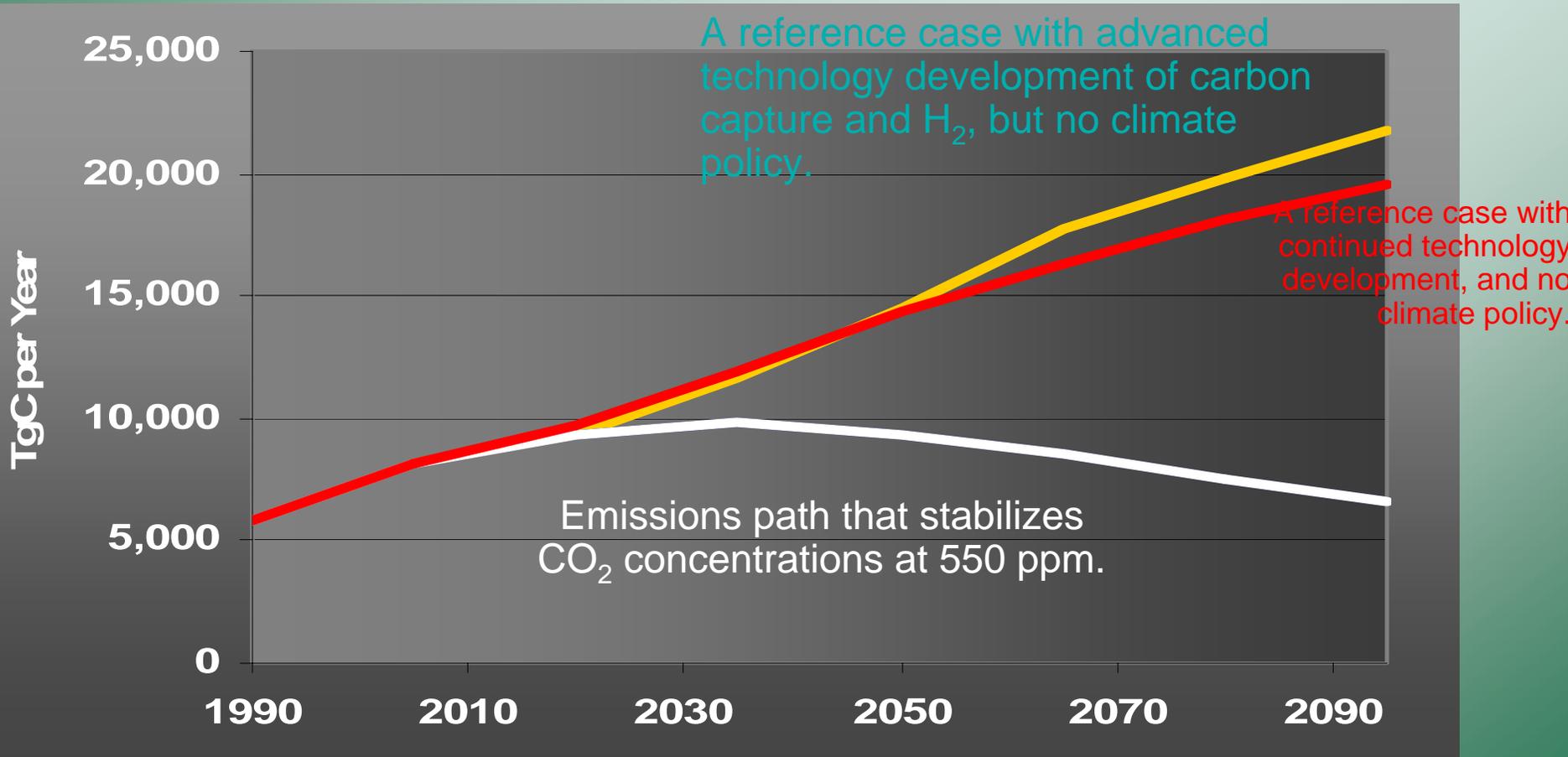


Point 4: Not all climate solutions work everywhere. Some have advantages over others in different parts of the world and the country.



Technology Alone Won't NECESSARILY Stabilize CO₂ Concentrations

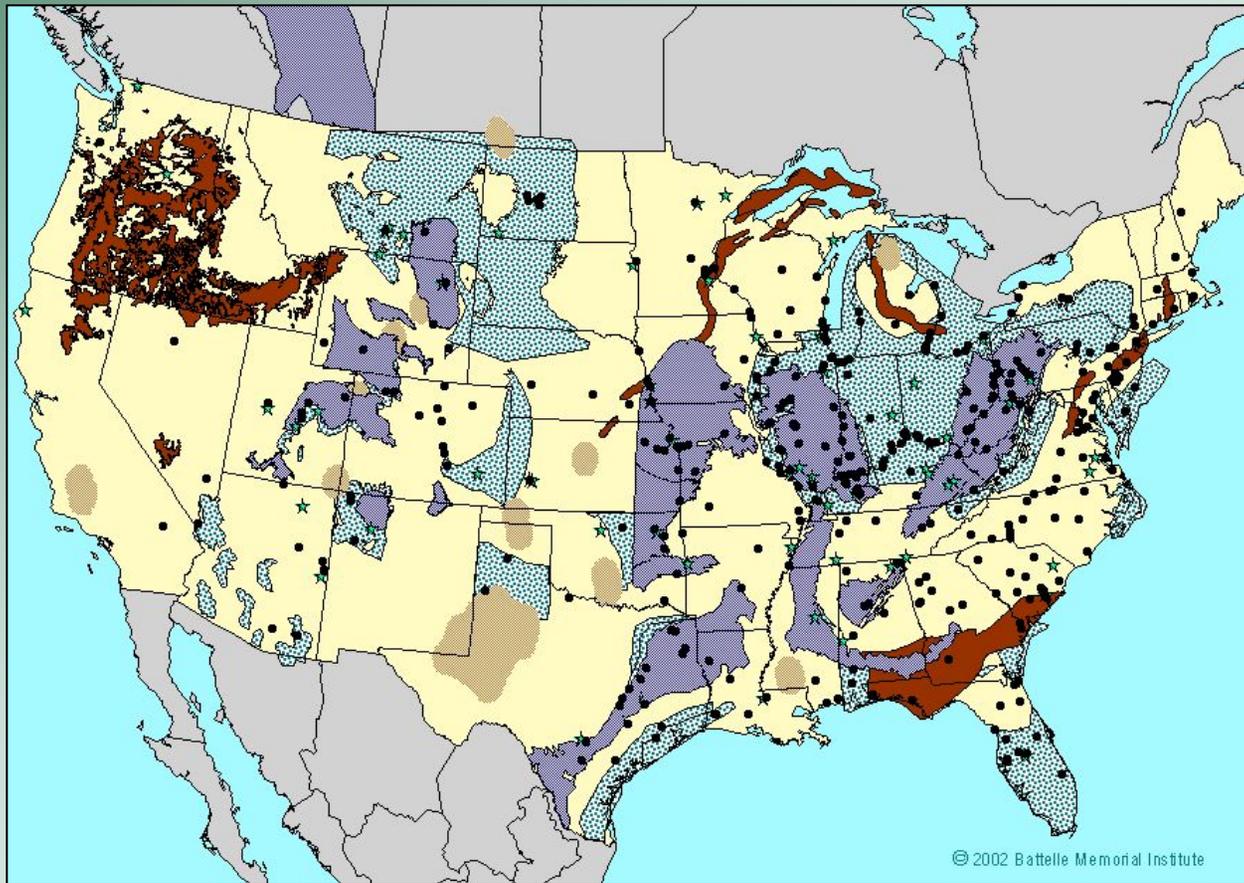
Energy Related Carbon Emissions



JGCRI

Joint Global Change Research Institute

Hydrogen economy in the U.S. will likely be tied to sequestration ... where will we put the carbon?



- There is some mismatch between capture and storage and existing power plants
- Even more so for motor vehicles.

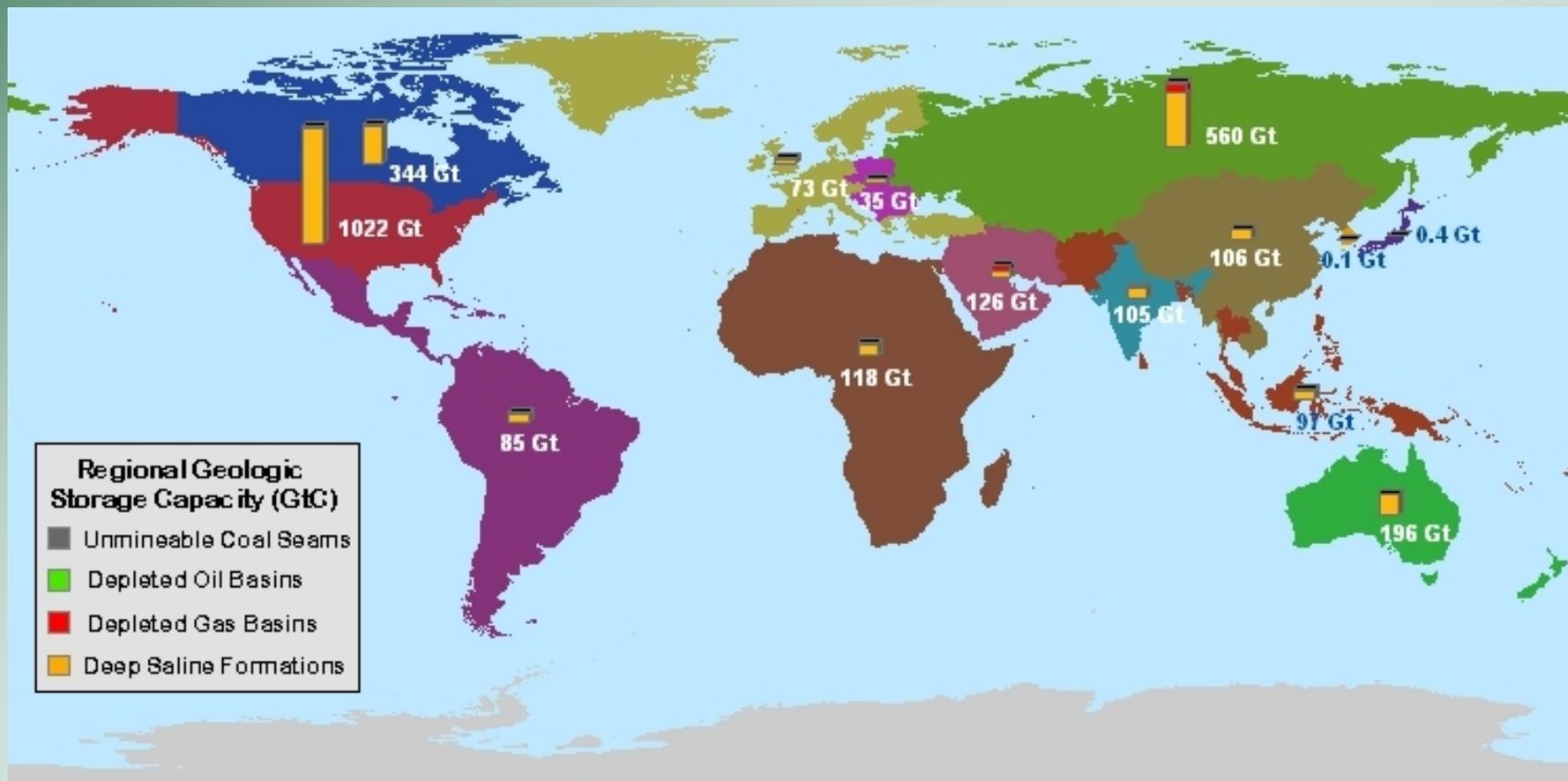


JGCRI

Joint Global Change Research Institute

Global CO₂ Storage Capacity: *A Very Heterogeneous Natural Resource*

Gigatons of Carbon



Based on current understanding of reservoirs
Courtesy Jim Dooley



JGCRI

Joint Global Change Research Institute

Point 4A: Factors like local pollution control and energy security can add to regionally preferred approaches.



Point 5: There is no reason to believe that the current fragmentation of fuel markets will decrease soon.



Market fragmentation is already a fact of life for transportation fuels.

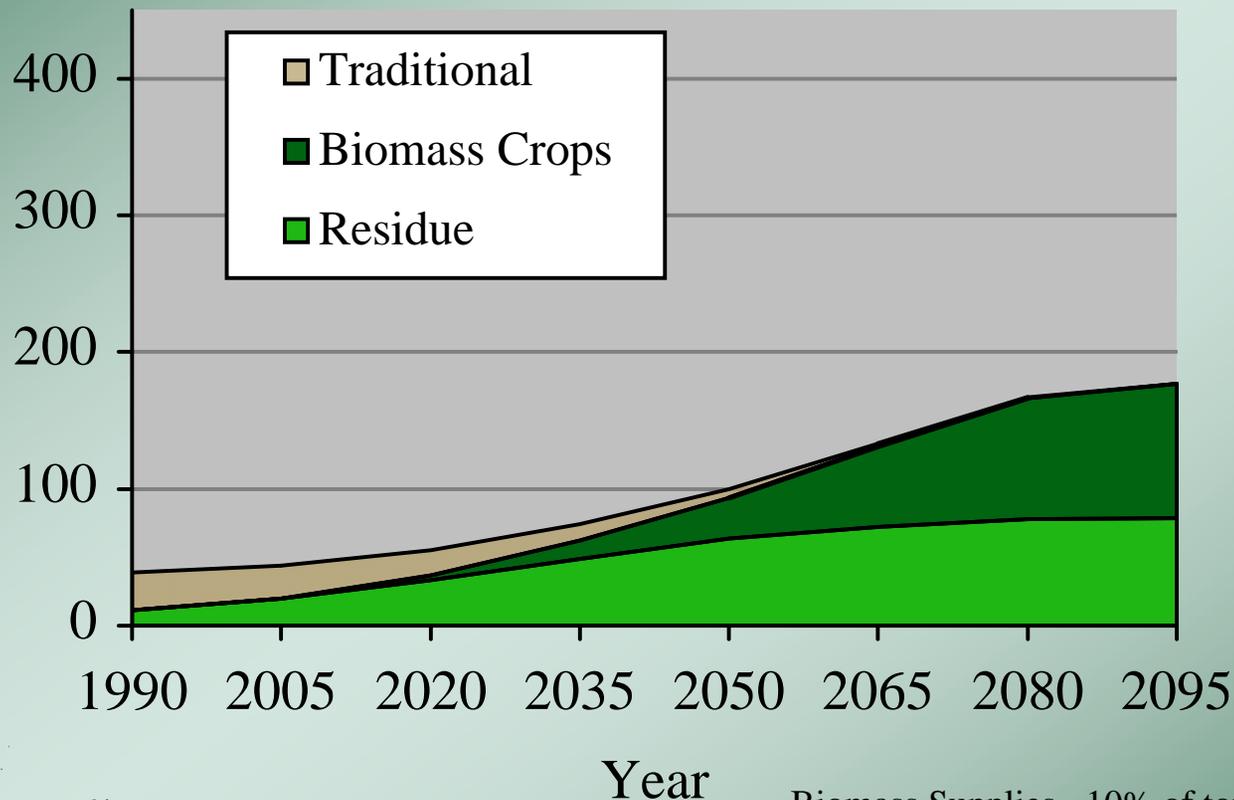
- Despite petroleum as a common source, there are many fuels in the current market.
 - Gasoline, diesel, kerosene
 - Multiple grades of fuels
 - Local reformulations for environmental reasons
- Fuels will continue to be matched to end-use
- Flexible fueling will grow
 - Bio-ethanol, gasohol etc.
 - Diesel and Bio-diesel
 - Hybrids and using information to create flexibility



Future fragmentation - the case of bio-ethanol

Global Biomass Supply

(Ethanol vehicles - no climate policy)



Use of “modern” biomass increases throughout the century in the base case.

The level of biomass use depends on the cost of biomass production and transformation, and the demand for products such as ethanol.

Source: OPIECTS 1.0 (MiniCAM)

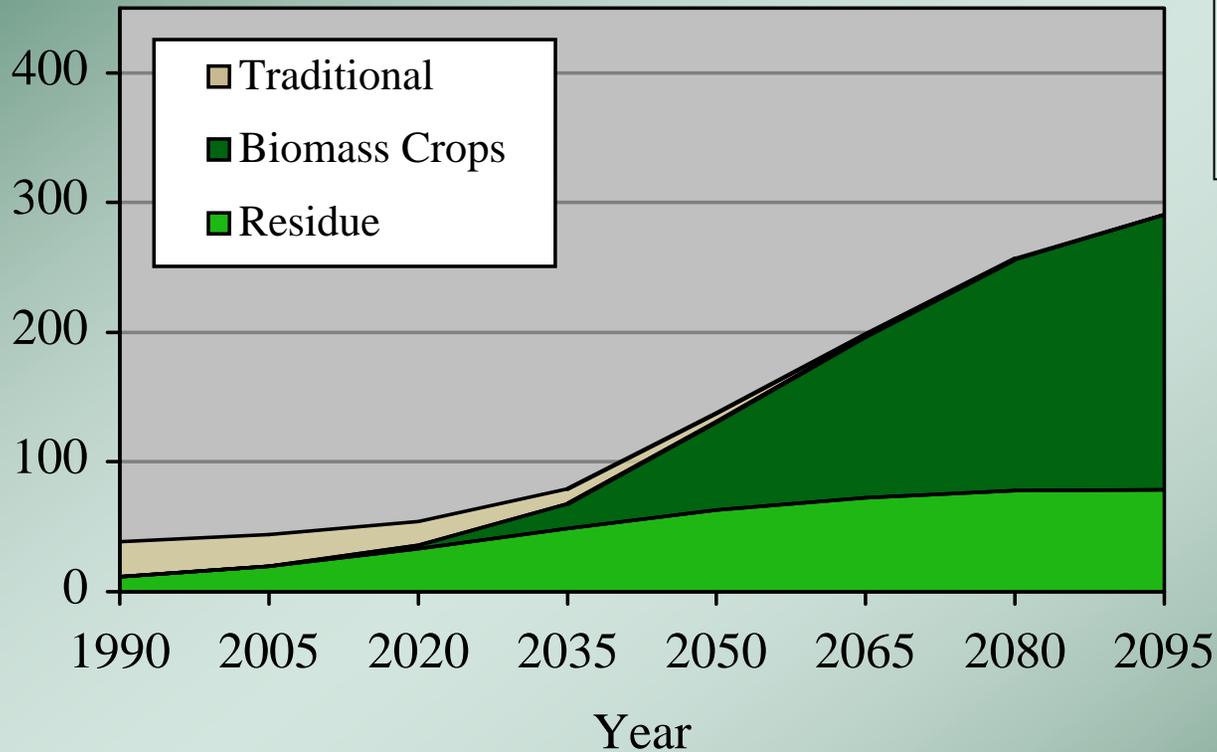


JGCRI

Biomass Supplies ~10% of total primary energy in this case

A stabilization regime (550ppm) increases biomass demand more than 50%

Global Biomass Supply
(B2 550 stabilization case)



While use of residue sources increases, most biomass supply by the end of the century is dedicated crops.

Questions:

Is this level of residue use or biomass crop production sustainable?

Growing biomass crops at a large scale results in land conversion — are the carbon consequences favorable?

Source: O^{pi}ECTS 1.0 (MiniCAM)

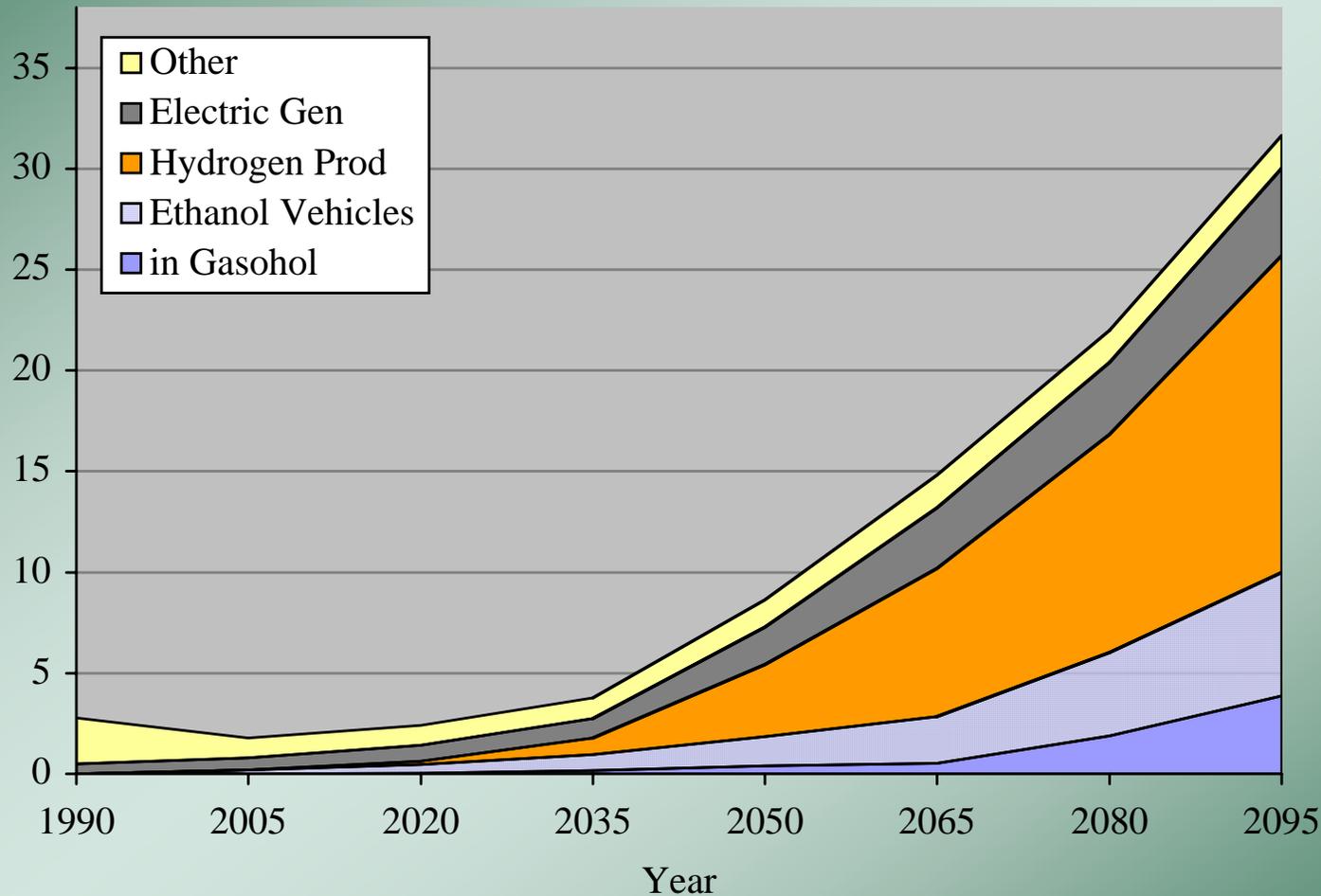


JGCRI

Joint Global Change Research Institute

But availability of vehicles determines how the biomass is used

Biomass Use (USA)
WRE 550 (few Ethanol Vehicles)



With a relatively small demand for biofuels, most biomass is used in other sectors.

Source: OpiECTS 1.0 (MiniCAM)

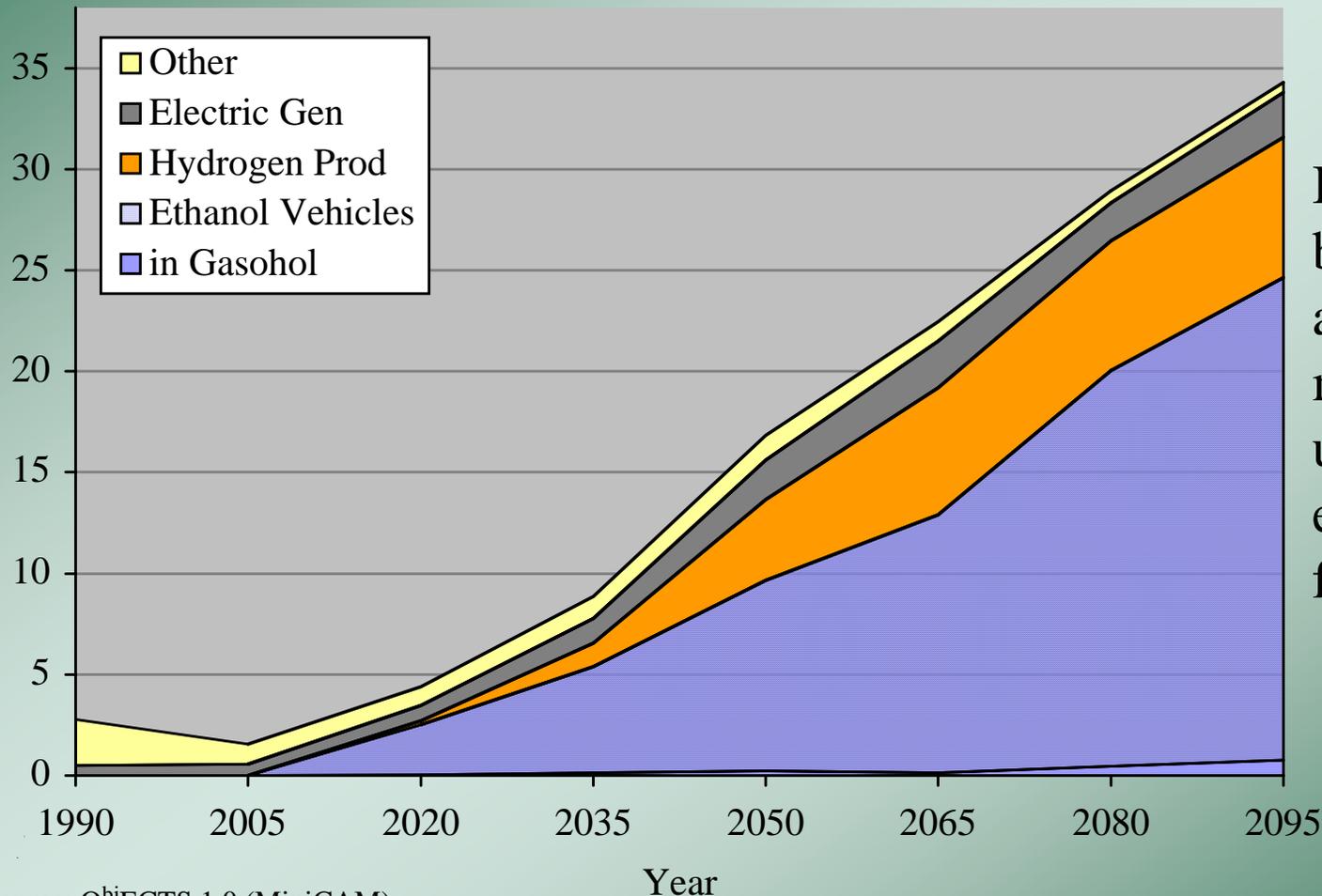


JGCRI

Joint Global Change Research Institute

More ethanol vehicles more demand

Biomass Use (USA)
WRE 550 (Ethanol Vehicles)



If vehicles using biofuels are available, then most biomass is used as an ethanol feedstock.

Source: O³JECTS 1.0 (MiniCAM)

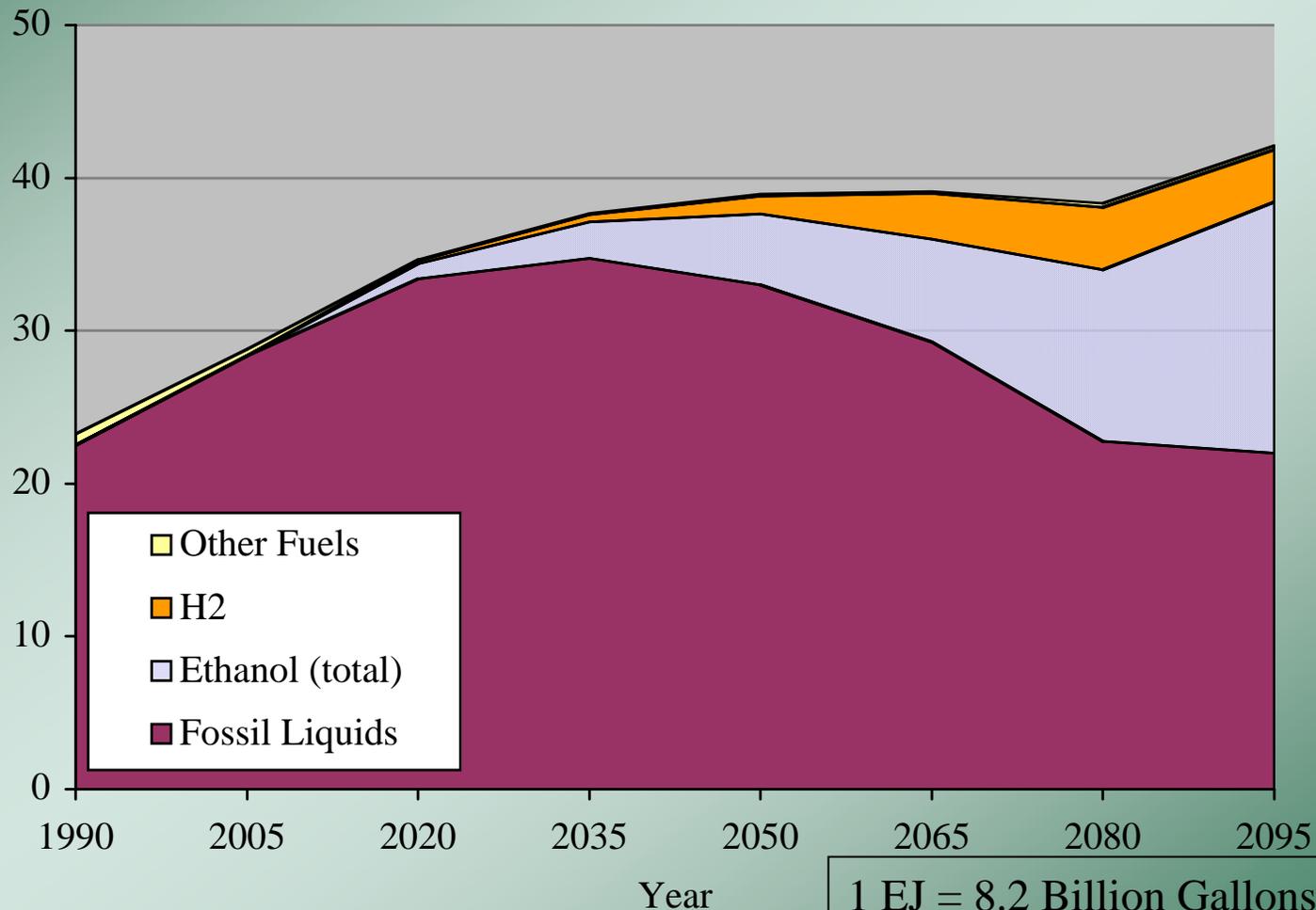


JGCRI

Joint Global Change Research Institute

But fossil fuel use continues to be high

**Transportation Energy Use (USA)
WRE 550 (Ethanol Vehicles)**



JGCRI

Joint Global Change Research Institute

In conclusion, when burnishing your ammunition, remember ...

- There are two parts to the climate solution.
 - Not making it worse - efficiency
 - Driving to zero-carbon emissions - renewable
- Geography will strongly affect the markets and the competition
 - Both local resources and local circumstance can give you an advantage in the market.
- During a period of changing value of carbon, facilitating consumer choice has great value.
 - Diesel engine fuel flexibility may be a critical factor in its developing role.

