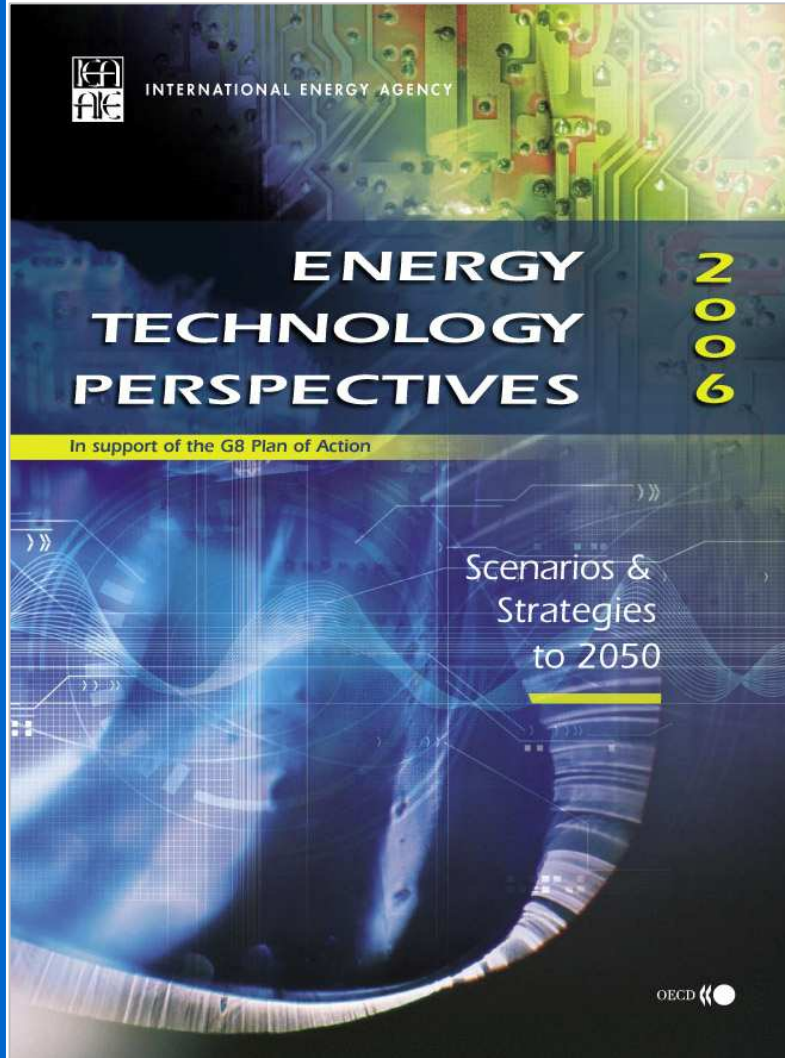




Energy Technology Perspectives Scenarios & Strategies to 2050



H207
Aberdeen
24 May

Michael Taylor

**Energy Technology Policy Division
International Energy Agency**

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INTERNATIONAL ENERGY AGENCY

AGENCE INTERNATIONALE DE L'ENERGIE



G8 - Gleneagles Communiqué July 2005



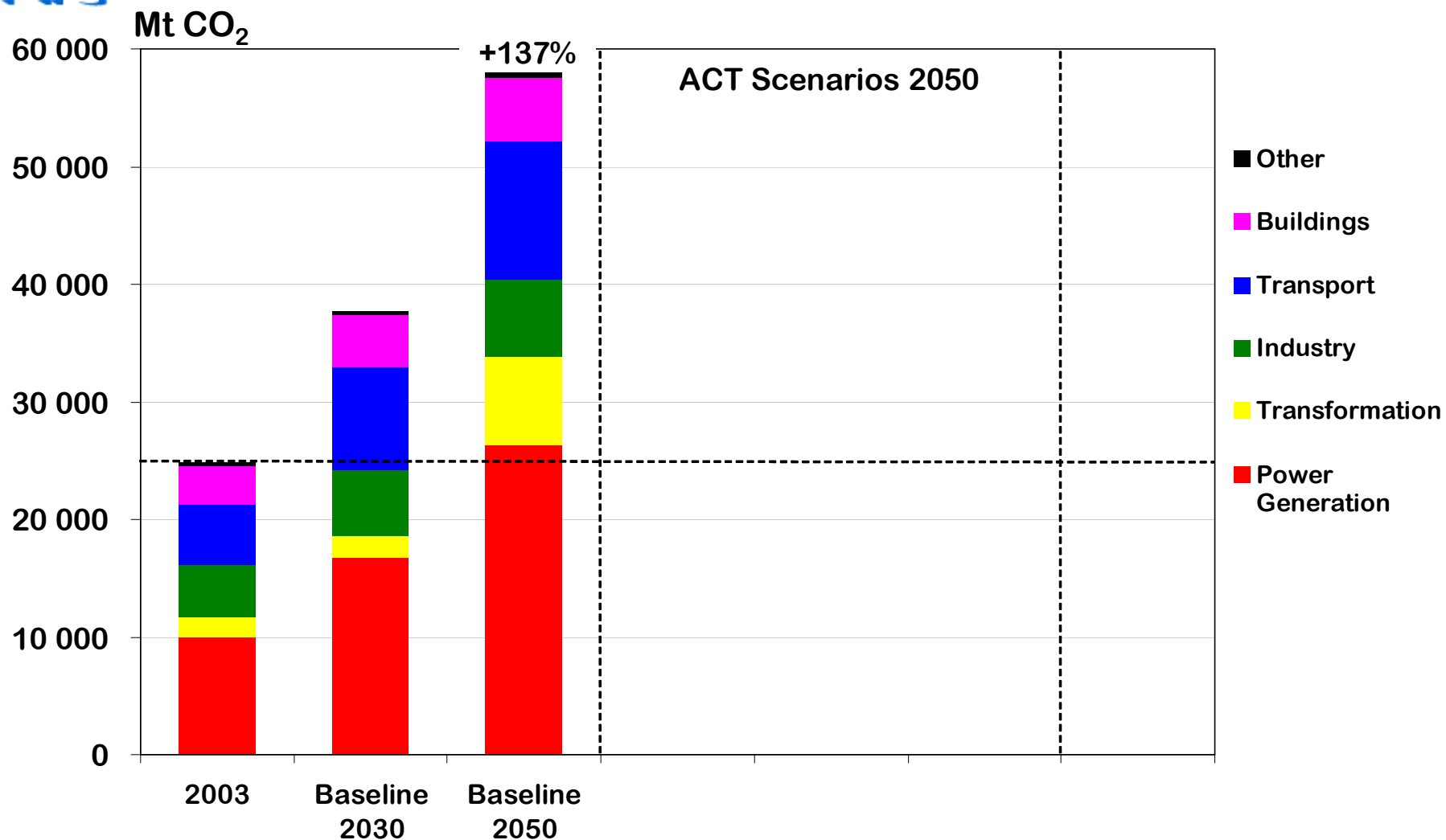
“We will act with resolve and urgency to meet our shared multiple objectives of reducing greenhouse gas emissions, improving the global environment, enhancing energy security and cutting air pollution in conjunction with our vigorous efforts to reduce poverty“

“The IEA will advise on alternative energy scenarios and strategies aimed at a clean, clever and competitive energy future”



Global CO₂ Emissions 2003-2050

Baseline Scenario



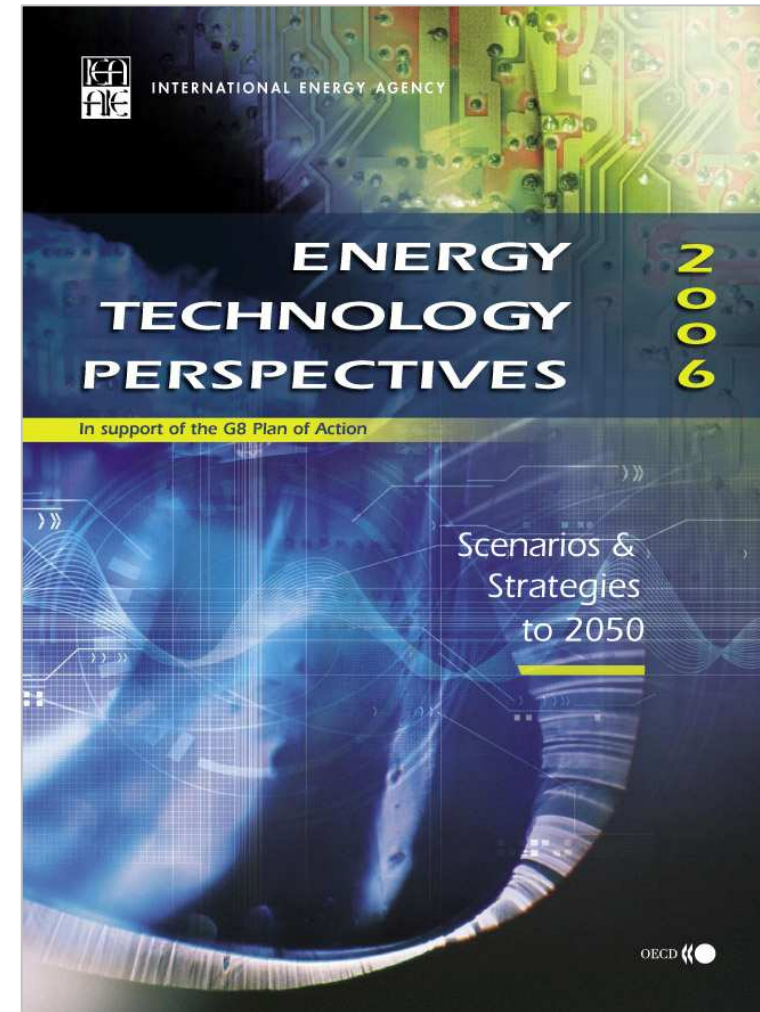
Emissions increase 137% from today's level



Energy Technology Perspectives 2006

ETP 2006 provides part of IEAs “advice on scenarios and strategies” at St. Petersburg

ETP 2006 presents a groundbreaking review of technologies across all sectors and assess how they together can make a difference



Key Findings

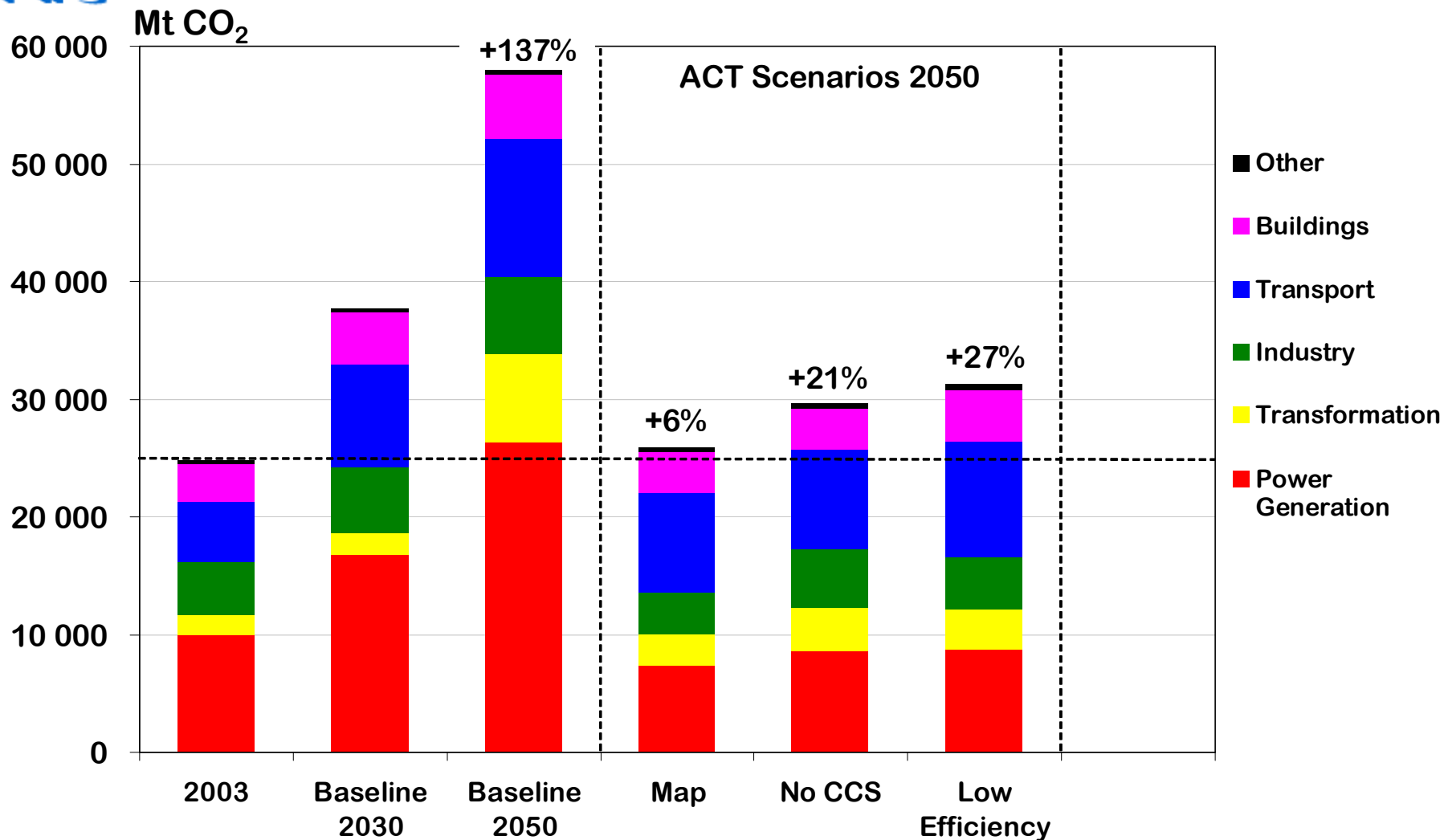
- Current policies will not bring us on a path towards a sustainable energy future
- A more sustainable energy future is possible with a portfolio of clean and efficient technologies
- Using technologies that have an additional cost of less than \$25/tonne CO₂ avoided:
 - Global CO₂ emissions can be returned to today's level by 2050
 - Expected growth in both oil and electricity demand can be halved
- Requires urgent action to promote, develop and deploy a full mix of energy technologies
- Collaboration between developing and developed nations will be essential





Global CO₂ Emissions 2003-2050

Baseline and ACT Scenarios

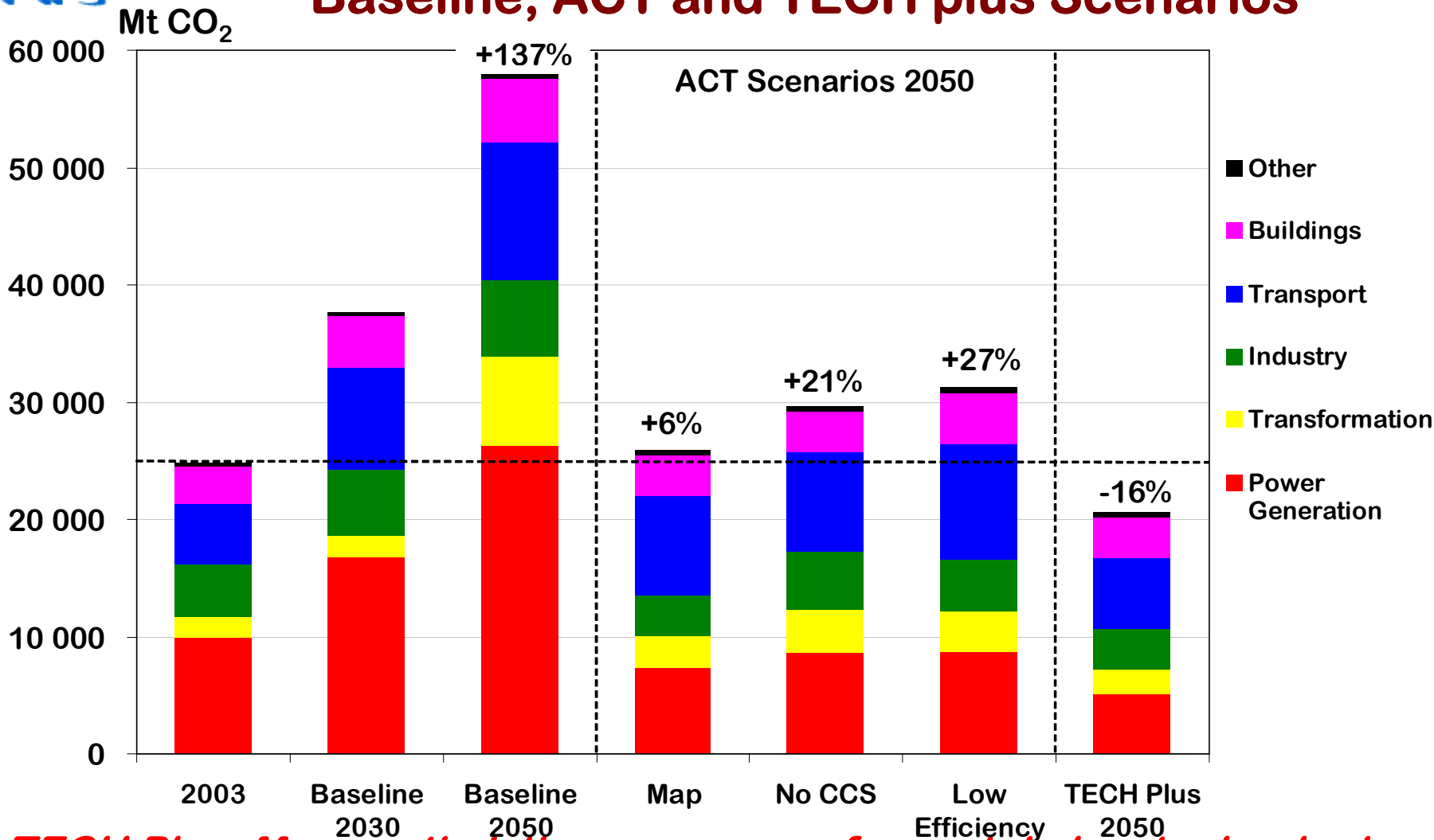


Impact of less efficiency progress



Global CO₂ Emissions 2003-2050

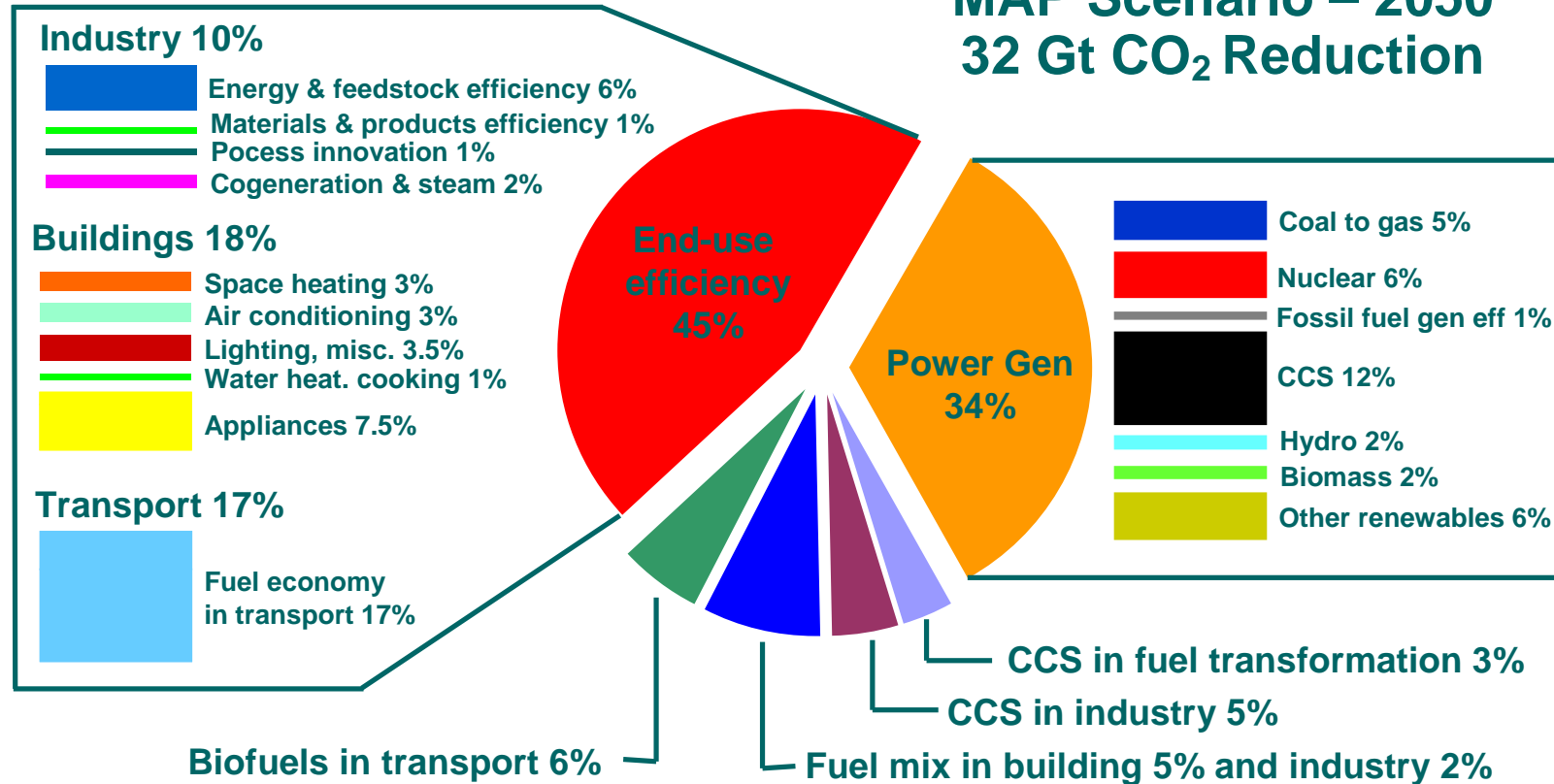
Baseline, ACT and TECH plus Scenarios



TECH Plus: More optimistic on progress for certain key technologies

Emission Reduction by Technology Area ACT Map Scenario

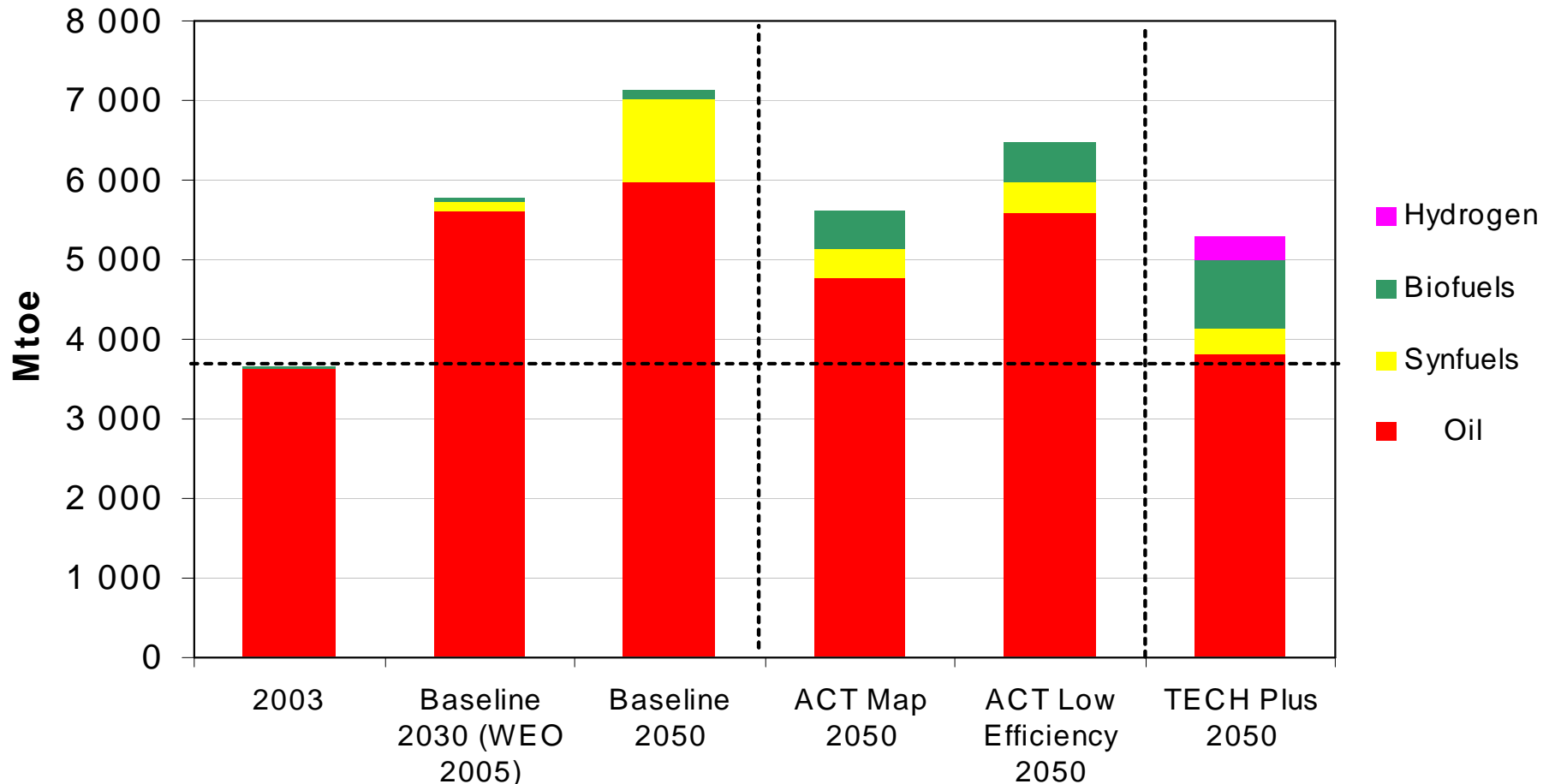
MAP Scenario – 2050
32 Gt CO₂ Reduction



Improved energy efficiency most important contributor to reduced emissions

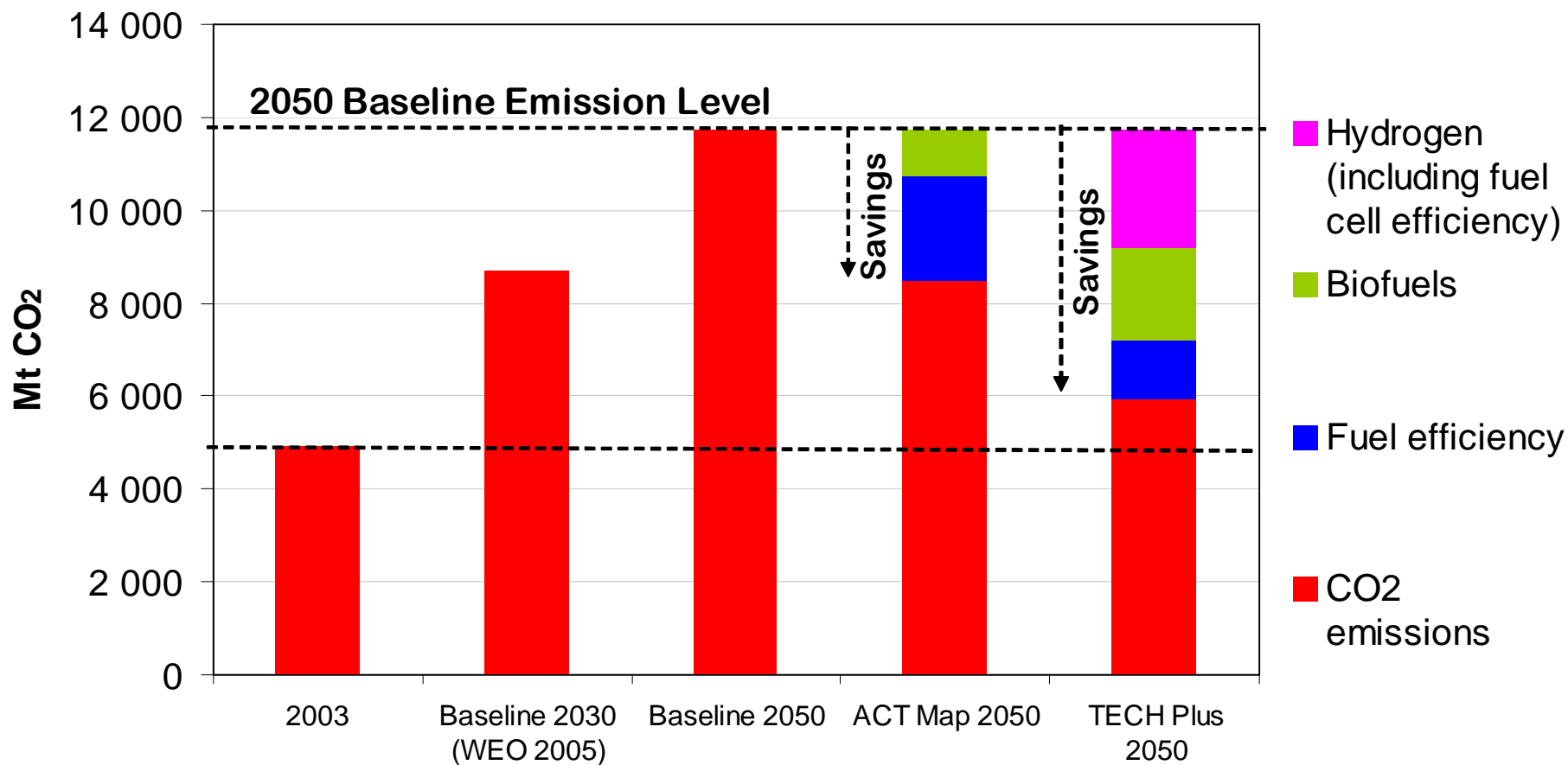


World Liquid Fuel Supply by Scenario 2003-2050



Primary oil demand is below 2030 baseline level, and is returned to about today's level in TECH Plus

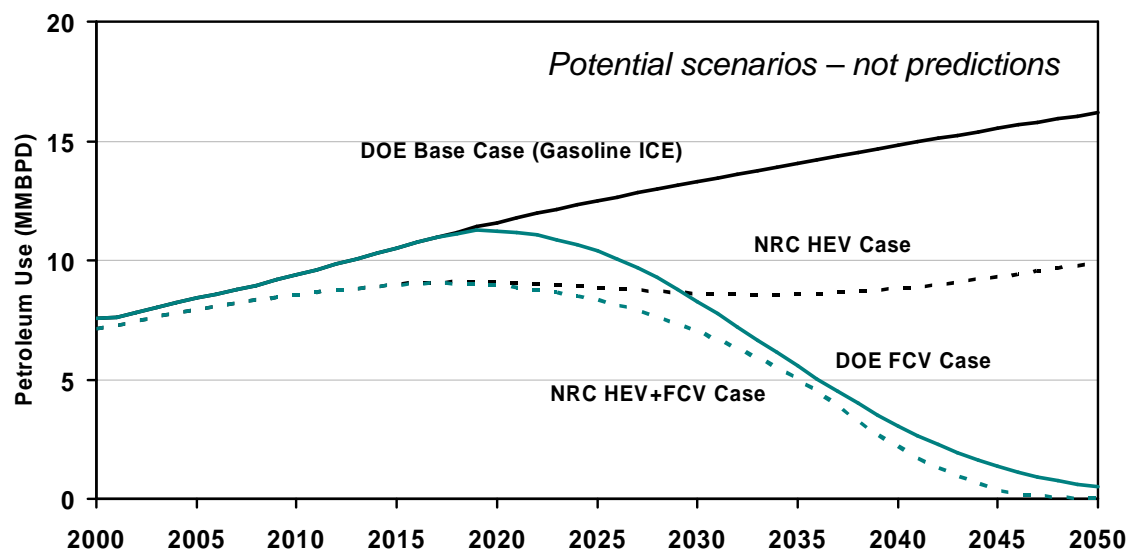
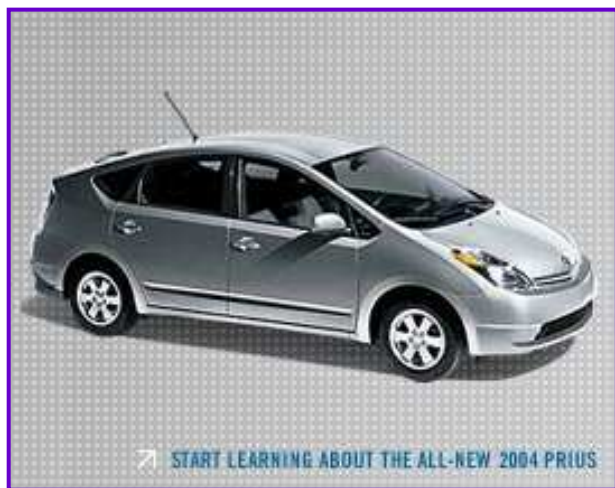
Transport CO₂ Emissions by Scenario



Map Scenario: Two-thirds of CO₂ emissions reduction is from improved fuel efficiency and one-third from biofuels

Hybrids are a Bridge

Hybrid vehicles are a bridge technology that can reduce pollution and our dependence on oil until long-term technologies like hydrogen fuel cells are market-ready.



Hybrid/Hydrogen FCV Strategy

- Near-term focus on hybrids
- Transition Phase to Hydrogen - decentralized H₂ production from distributed natural gas
- Long-term hydrogen fuel production from diverse domestic carbon-free sources such as renewables, nuclear, and coal with sequestration



Hydrogen is a Possible Key to a Secure and Clean Energy Future

Energy Security

Produced from a variety of domestic sources

Environmental


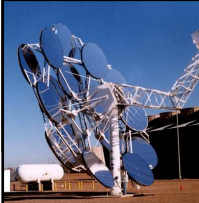

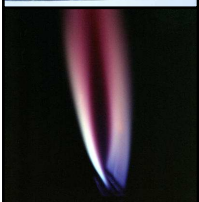


Criteria pollutants from mobile sources eliminated

Emissions from stationary H₂ production sites easier to control

Greenhouse gas emissions significantly reduced

Economic Competitiveness

Abundant, reliable, and affordable energy is an essential component in a healthy, global economy

	Biomass	
	Hydro Wind Solar Geothermal	
	Nuclear	
	Oil	With Carbon Sequestration
	Coal	
	Natural Gas	

HIGH EFFICIENCY & RELIABILITY



ZERO/NEAR ZERO EMISSIONS

Transportation

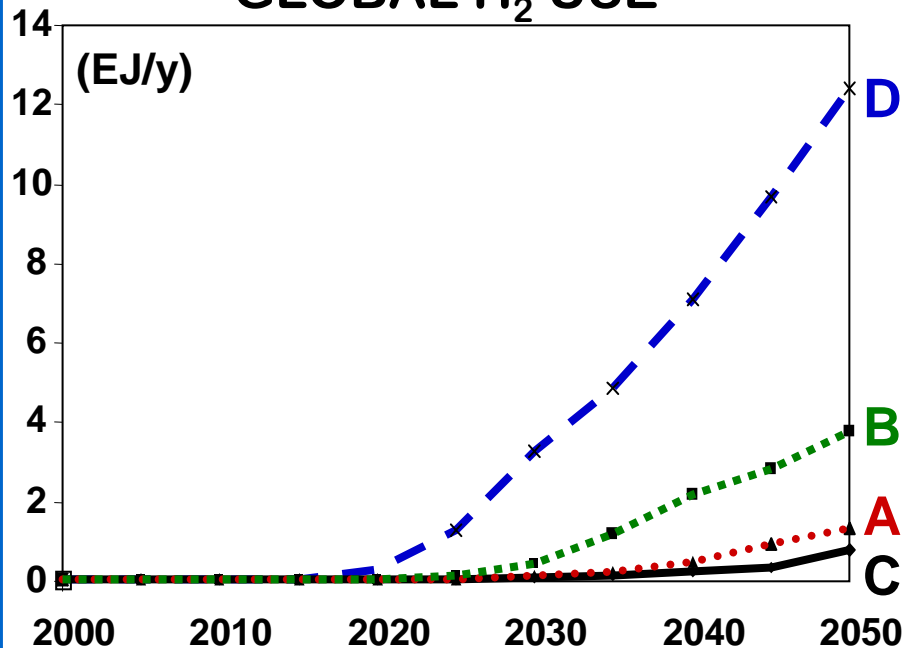


Distributed Generation

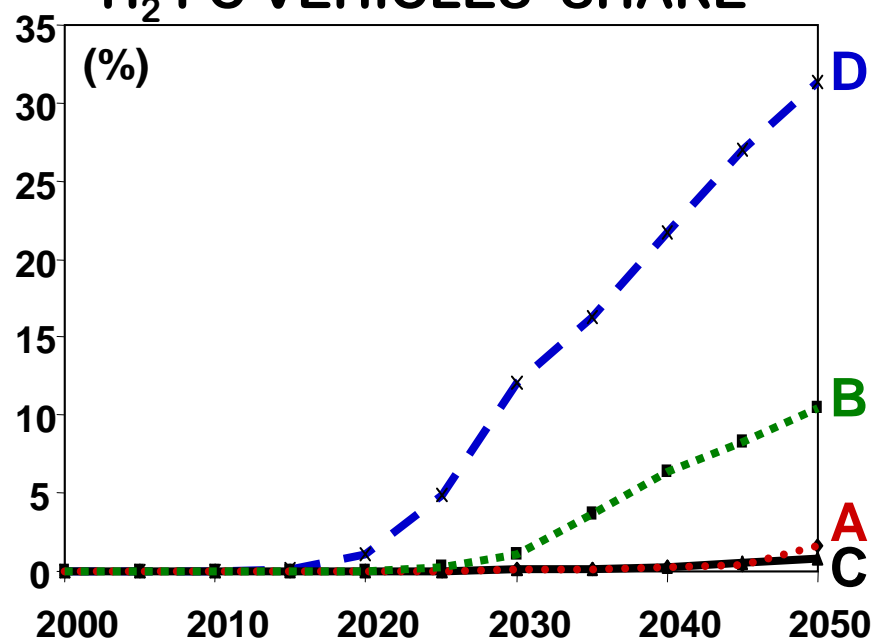


Market Scenarios

GLOBAL H₂ USE



H₂ FC VEHICLES SHARE

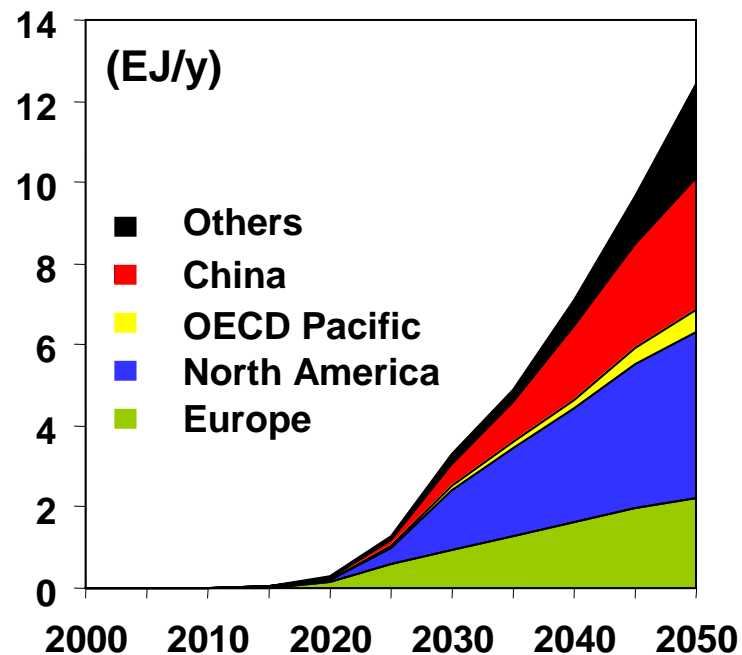


- A - Weak CO₂ policy and tech. development**
- B - Strong CO₂ policy in Kyoto countries and tech. development**
- C - Strong CO₂ policy in Kyoto countries and tech. lag**
- D - Strong CO₂ policy world wide and tech. development**

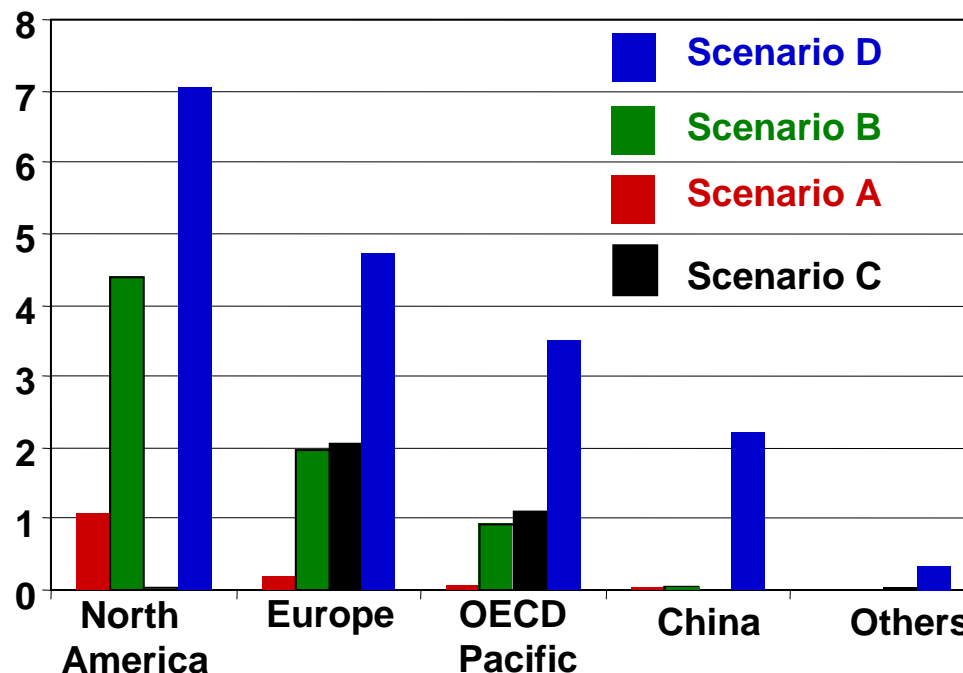
Up to 30% H₂ fuel cell vehicles by 2050

Regional Markets

H₂ Use - Scenario D



Per capita H₂ use in 2050 - (GJ H₂/pc)



Best scenario: 60% FC vehicles in China by 2050, 42% India and US, 36-48% Europe, 35% Canada, 22% Japan, 10% Australia

Differences across regions due to discount rate, fuel taxes, infrastructure, consumers' attitude for capital-intensive investment, mobility needs, car-mileage.



Transport

Is the Key to Reducing Growth in Oil Demand

- Share of biofuels by 2050 is 13% and average 2050 vehicle is almost 50% more efficient than today
 - Reduce expected growth in transport oil demand by almost 50%
- Transport accounts for 62% of the 42 mbpd total oil savings by 2050, which more than halves the expected growth in total oil demand
- Hydrogen and Fuel Cells can reduce transport oil demand and CO₂ emissions even further and can be crucial for long-term sustainability

Scenario Analysis Key Findings

- Most energy still comes from fossil fuels in 2050
- CO₂ emissions can be returned towards today's level by 2050
- Growth in oil and electricity demand can be halved
- Power generation can be substantially de-carbonised by 2050
- De-carbonising transport will take longer but must be achieved in the second half of the century





Conclusions: Technology is the Key

- Urgent action is needed in public and private sectors
- Collaboration between developed and developing countries essential
- A technology portfolio will be needed
- Improving energy efficiency is top priority
- CCS is key for a sustainable energy future
- Other important technologies:
 - Renewables, including biofuels
 - Nuclear
 - Efficient use of natural gas
 - In time and with effort, hydrogen and fuel cells



Thank you for your attention!

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