Sectoral Approaches for Greenhouse Gas Mitigation in the Power Sector

IEA-ENEL workshop
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Perspectives on Electricity and Climate Change

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G8 GLENEAGLES 2005

G8 SUMMIT 2006 Saint-Petersburg

"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"

-- from "G8 Gleneagles Communiqué"

"We will move forward with timely implementation of the Gleneagles Plan of Action. We have instructed our relevant ministers to continue the Dialogue on Climate Change, Clean Energy and Sustainable Development and report its outcomes to the G8 Summit in 2008"

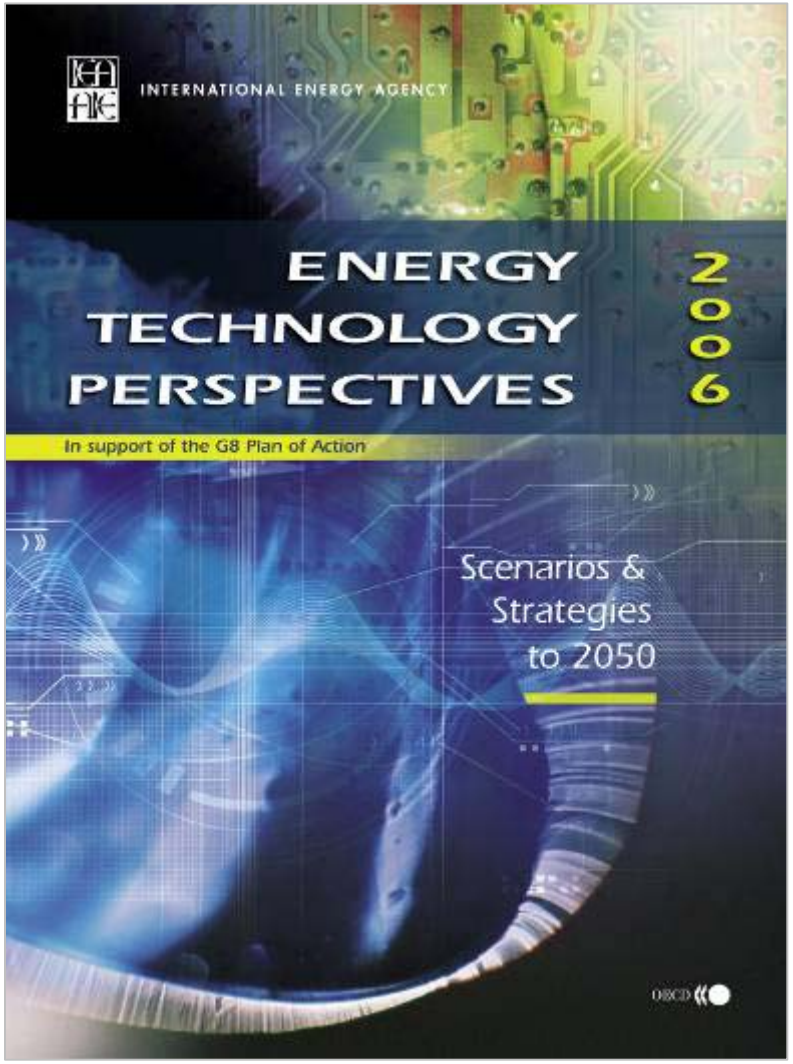
-- from "G8 St. Petersburg Communiqué"

IEA's G8 Programme

- Alternative energy scenarios and strategies
- "Best practice" in policies promoting energy efficiency in buildings, appliances, transport and industry
- Cleaner fossil fuels
- CO_2 capture and storage
- Renewable energy
- Enhanced international co-operation

Energy Technology Perspectives
Scenarios & Strategies to 2050

A sustainable energy future is achievable



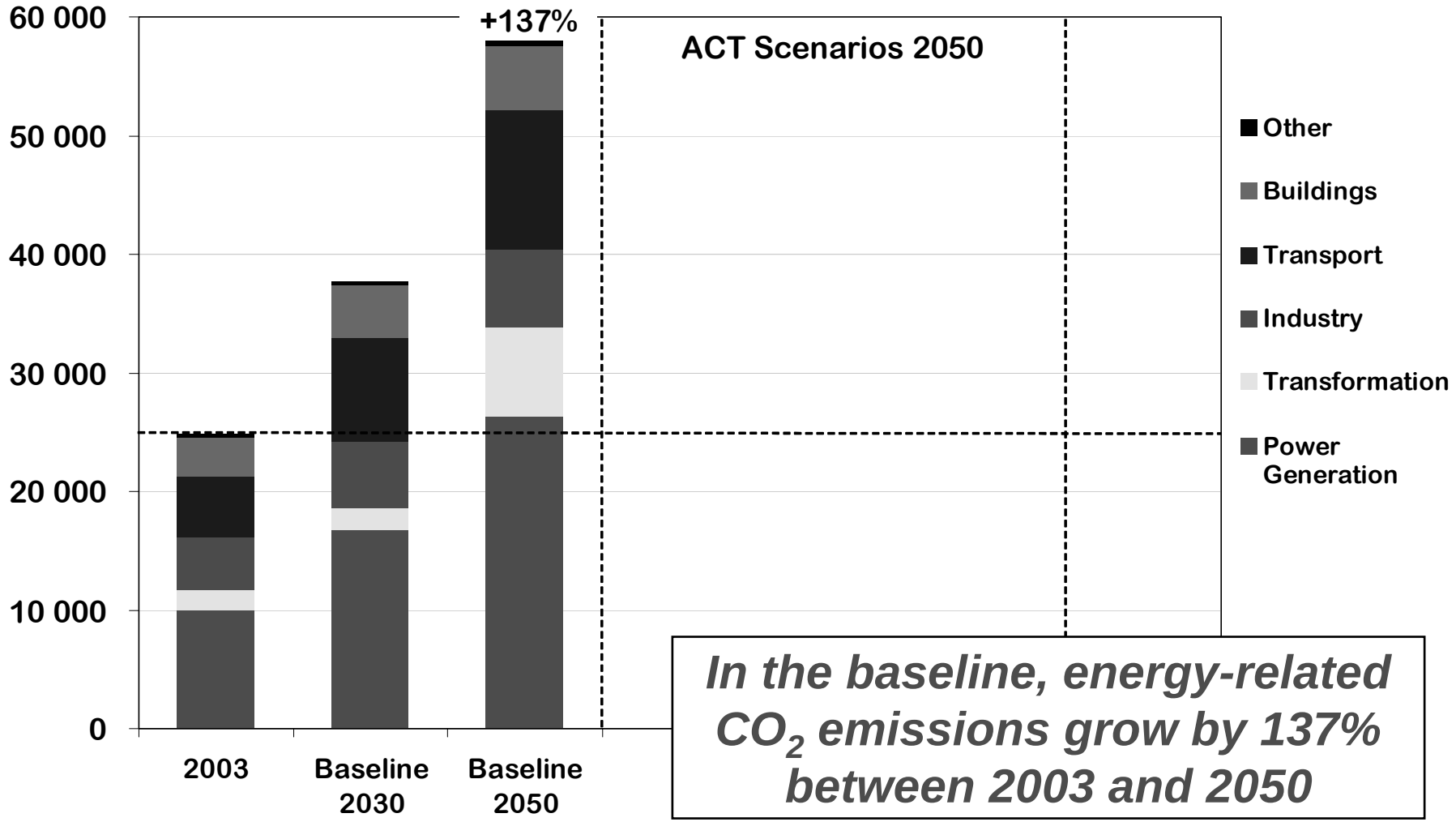
Energy Technology Perspectives Presents

- Status and perspectives for key energy technologies in:
  - Power Generation
  - Transport
  - Buildings and Appliances
  - Industry
- Global scenarios to illustrate potentials for different technologies under accelerated policies
- Strategies for helping key technologies make a difference

Key Findings

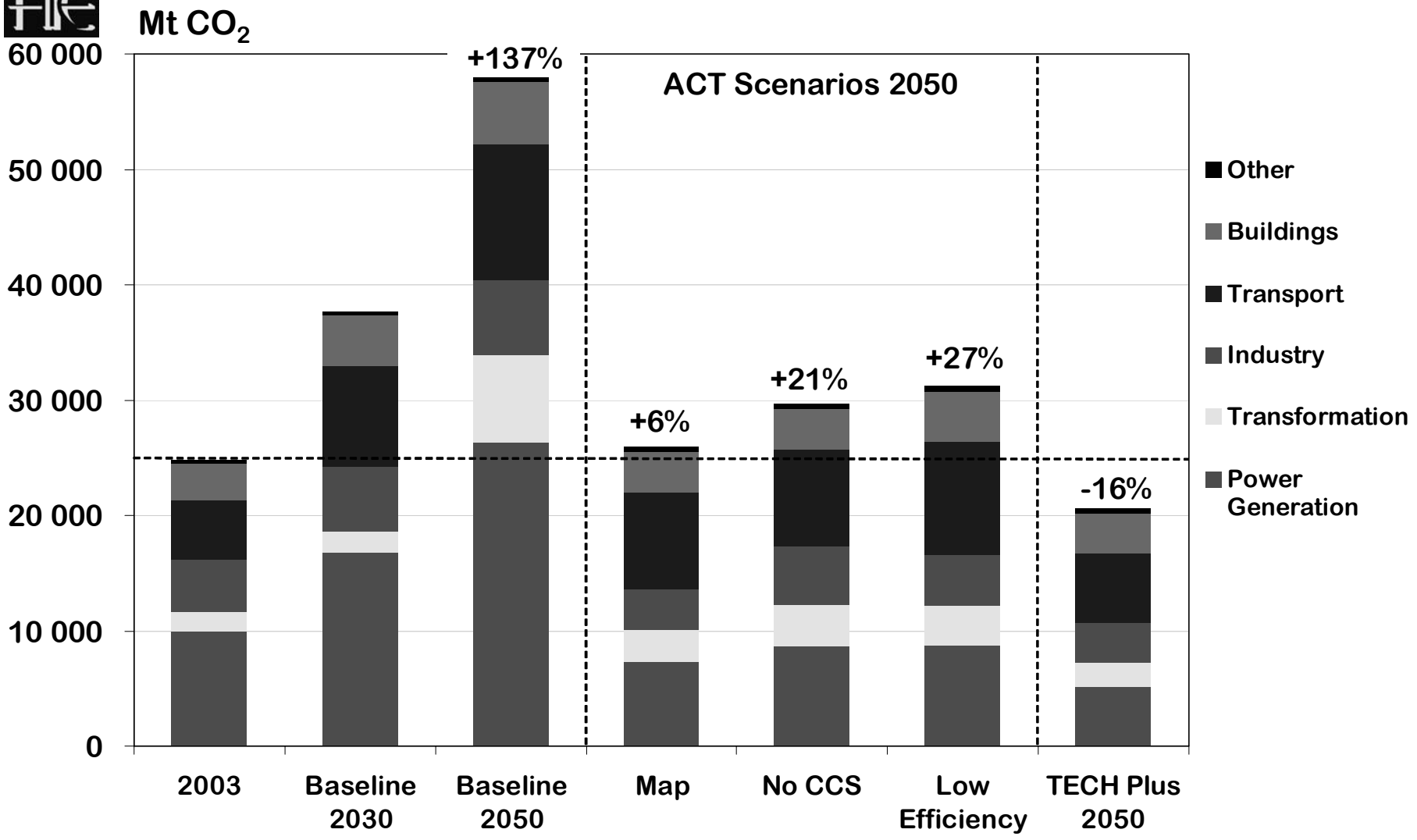
- **Current policies will not bring us on a path towards a sustainable energy future**
- **A more sustainable energy future is possible with a portfolio of clean and efficient technologies**
- **Using technologies that have an additional cost of less than USD25 /tCO_2 avoided:**
  - **Global CO_2 emissions 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 CO_2 Emissions 2003-2050
Baseline Scenario

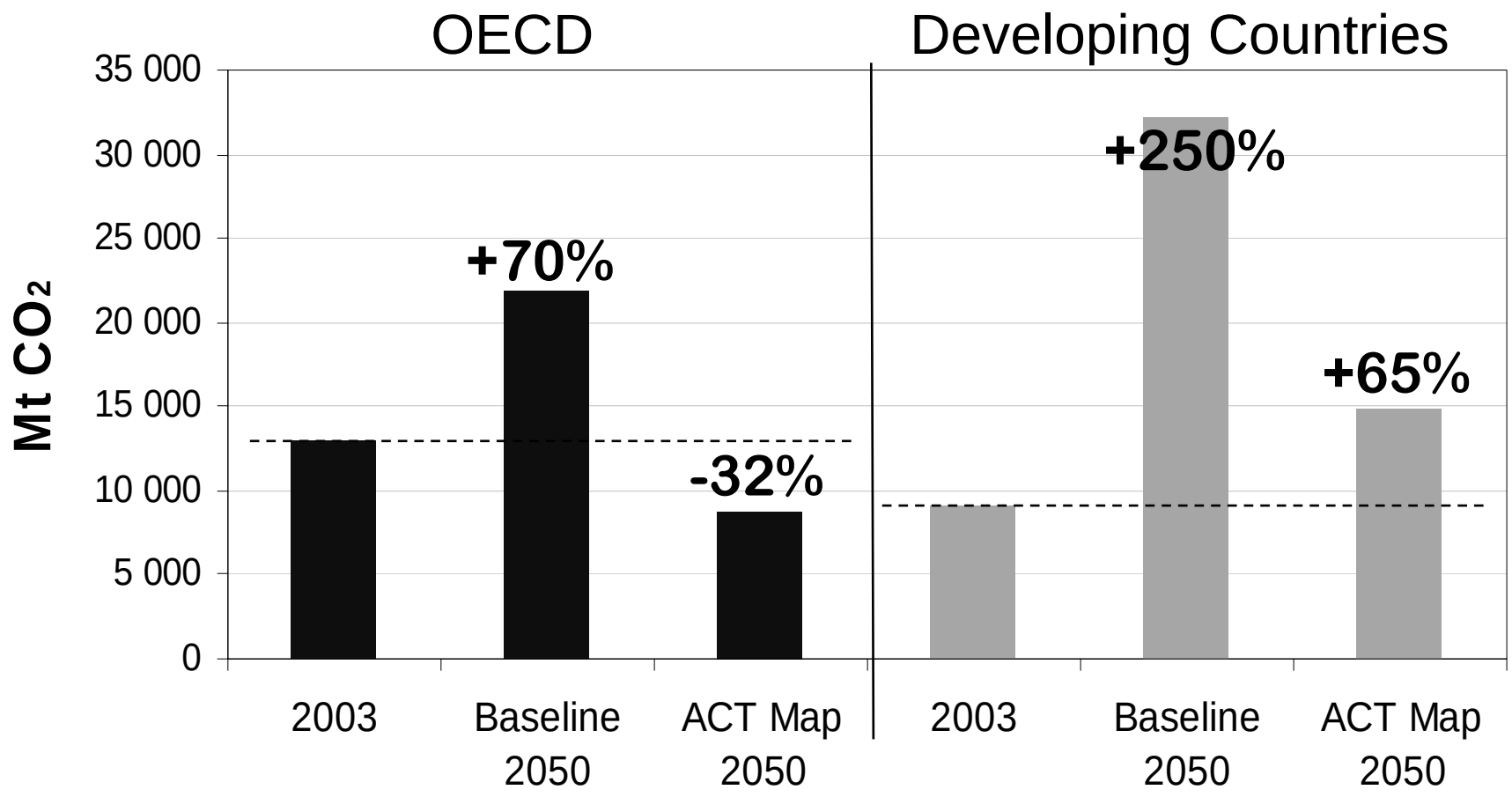


In the baseline, energy-related CO_2 emissions grow by 137% between 2003 and 2050

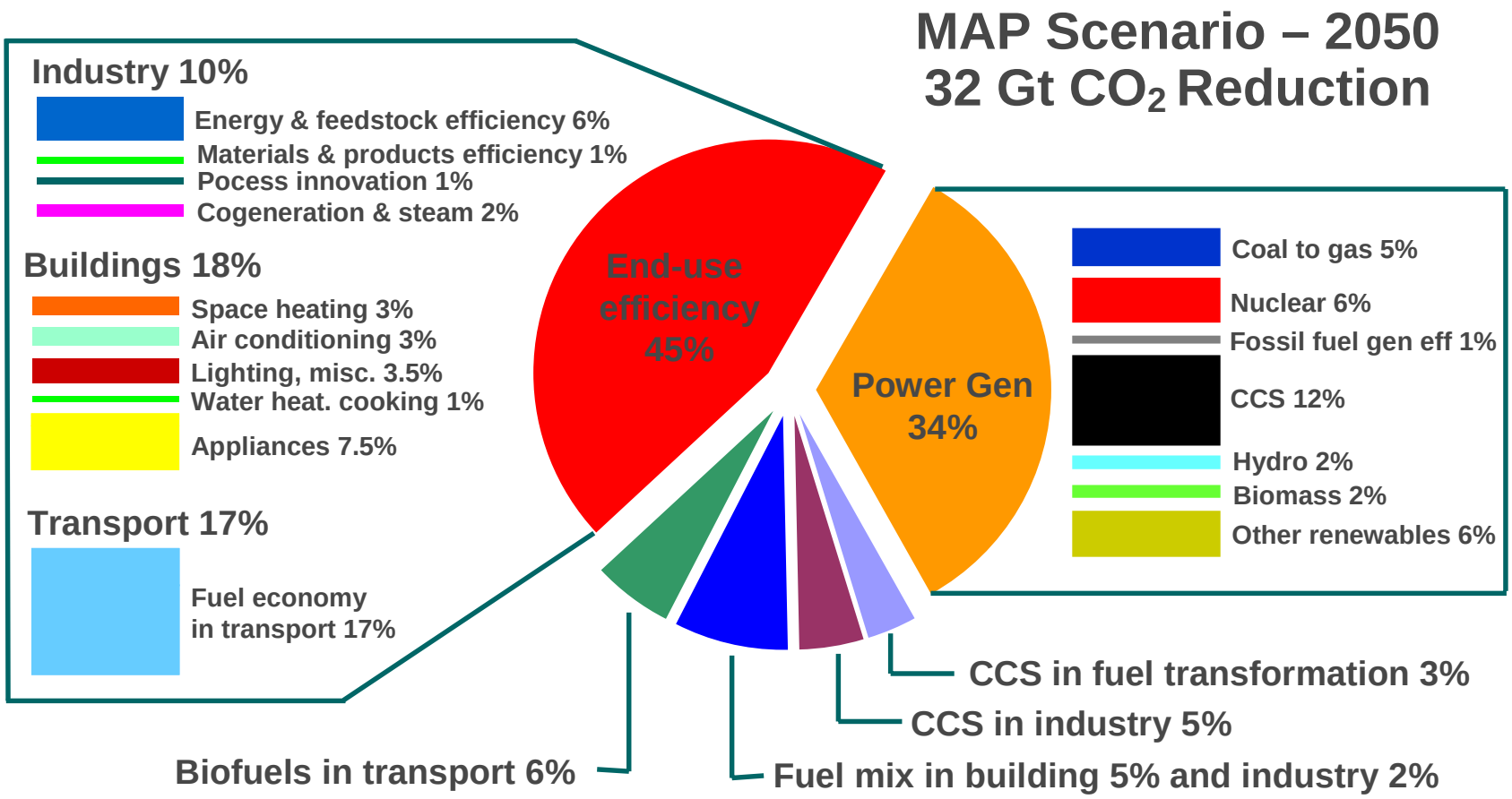
Global CO_2 Emissions 2003-2050



Regional CO_2 emissions

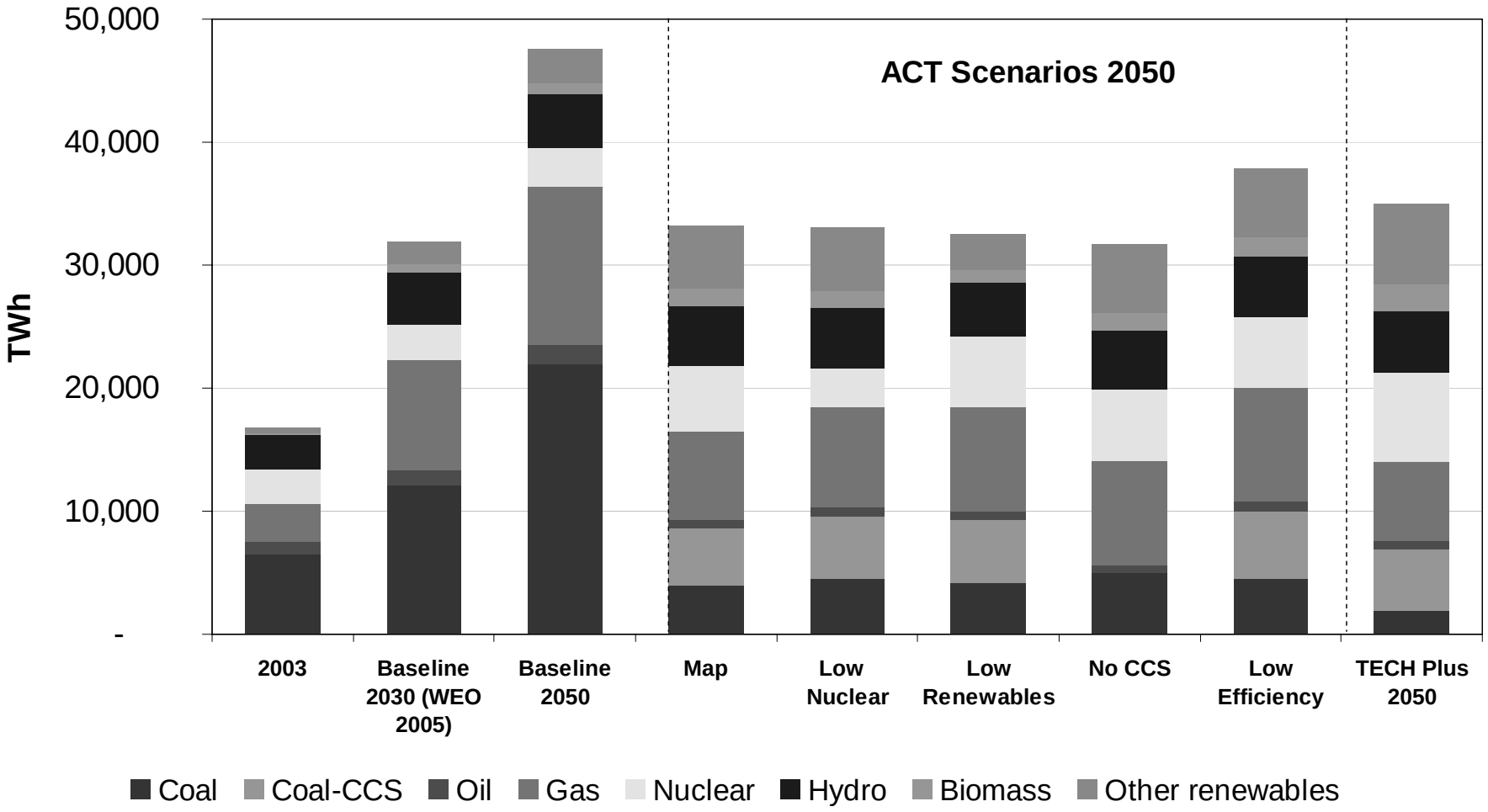


Emission Reductions by Technology Area

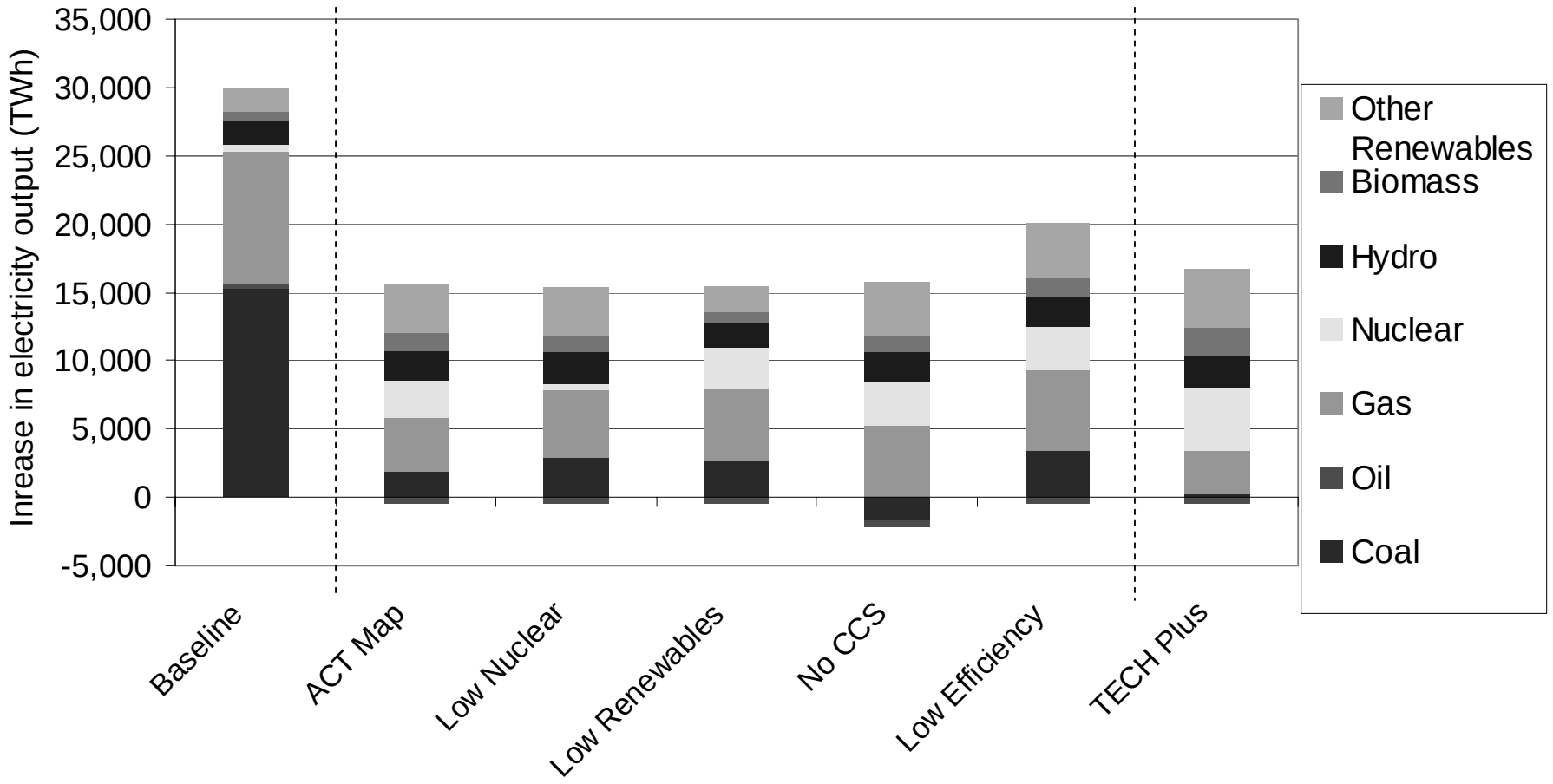


Improved end-use energy efficiency is critical

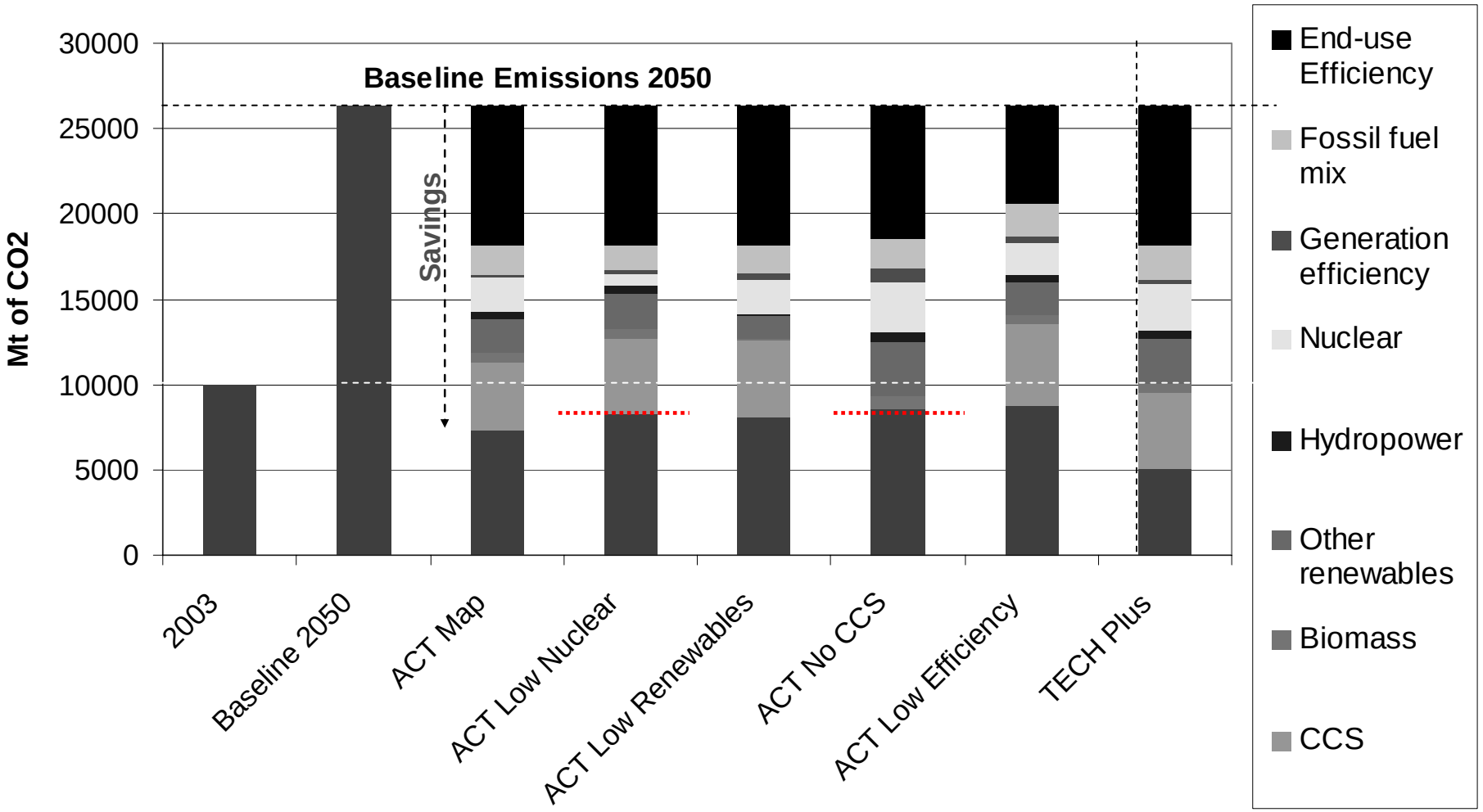
Power Generation



Power Generation Growth



CO_2 Emission Reductions in Power Generation



Electricity Generation

- **CCS is crucial for the role coal can play in a CO_2 constrained world – without CCS coal-fired generation in 2050 drops below today's level**
  - **By 2050 some 5000 TWh of electricity can be produced by coal-plants equipped with CCS**
  - **There is an urgent need for more R&D and for full-scale CCS demonstration plants**
- **Renewable generation can quadruple by 2050**
- **Nuclear can gain a much more important role in countries where it is acceptable**

Energy Efficiency - A Top Priority

- **The above electricity mix may be unaffordable without ambitious energy efficiency**
- **Improved efficiency halves expected growth in electricity demand and reduces the need for generation capacity by a third**
- **Improved energy efficiency saves 15 $GtCO_2$ by 2050 – 60% of current emissions**
- **Lower efficiency progress increases supply-side investments and costs of reducing CO_2 emissions**

Investment Needs 2005-2050

This is a big challenge

CCS (20%)	1 000 500 MW coal fired plants with CCS 100 ammonia plants, 300 blast furnaces, 500 cement kilns with CCS
Renewables (14%)	New plantations the size of South Africa 200,000 3 MW wind turbines 175 X growth solar-PV/CSP 22 X growth geothermal
Nuclear (6%)	An additional 250 1 GW nuclear plants
Industrial energy efficiency (10%)	All motor systems 25% more efficient Maximum coal injection in blast furnaces
Efficiency in buildings (18%)	80% fluorescent lighting and CFL Electric appliances 50% more efficient
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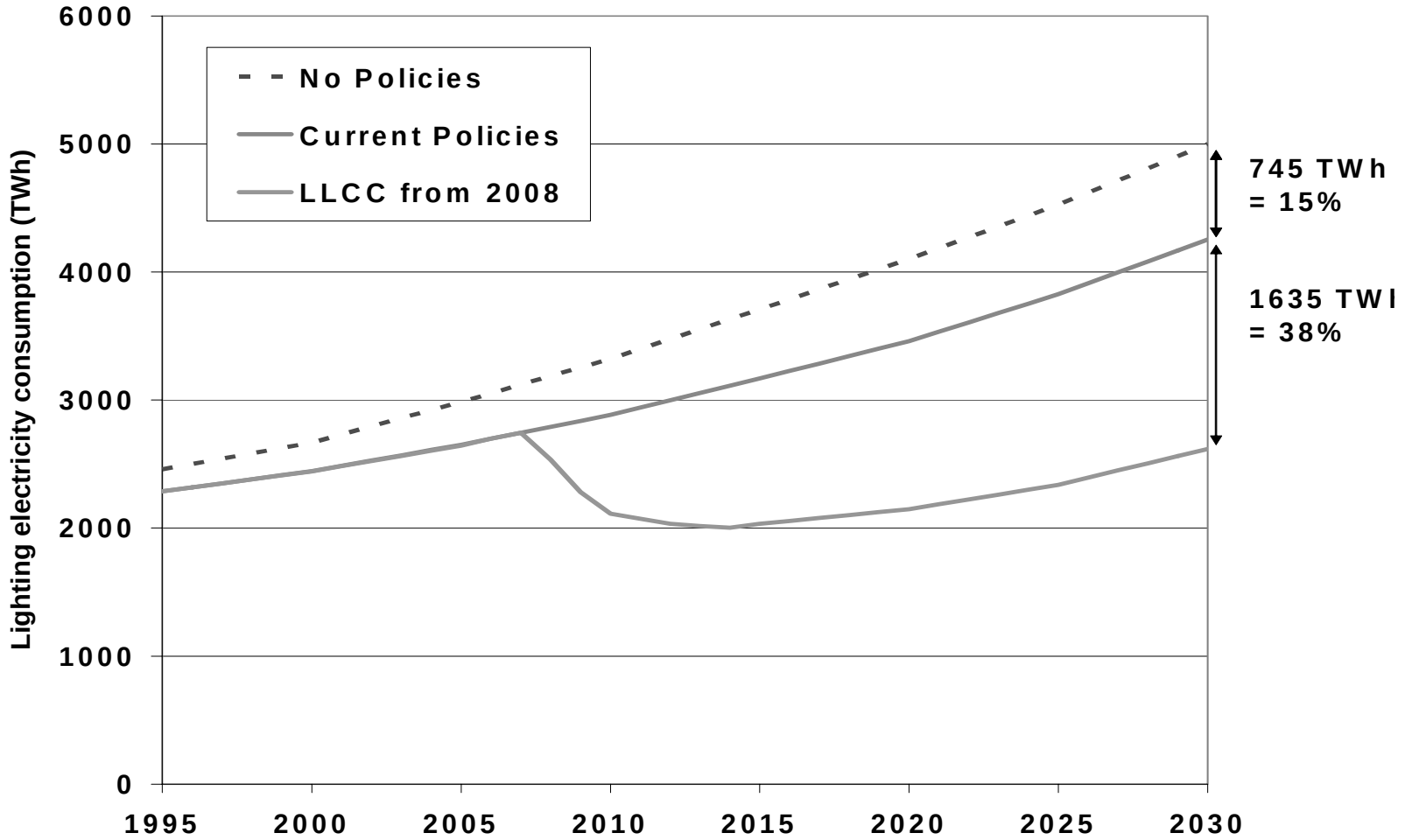
Lighting: Cost-Effective Savings
(From IEA's Light's Labour's Lost)



Global lighting cost could be reduced by US$ 2.6 trillion and 16 $GtCO_2$ could be saved (2008-2030)

Challenges

- **A carbon price signal (one form or another) is needed for some important technologies to come to market**
- **Significant RD&D efforts – i.e. costs – needed**
- **Energy efficiency should lead the way in the near term: action is lagging behind**
  - **Win-win options may not require international coordination**
  - **But can international cooperation help?**

Question for this meeting: what forms of international approaches could achieve progress on these fronts?

Thank you

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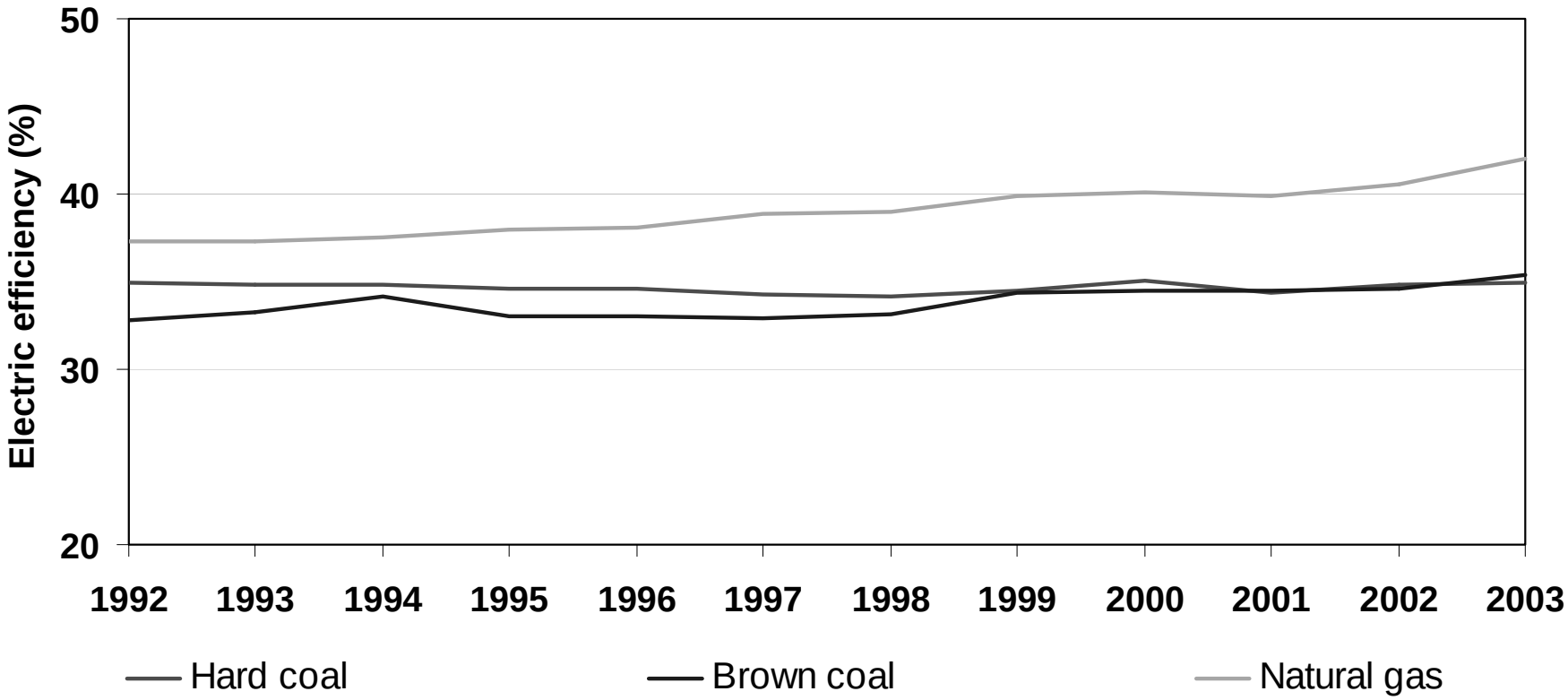
Back-up slides

Global Average Power Generation Efficiency Trends

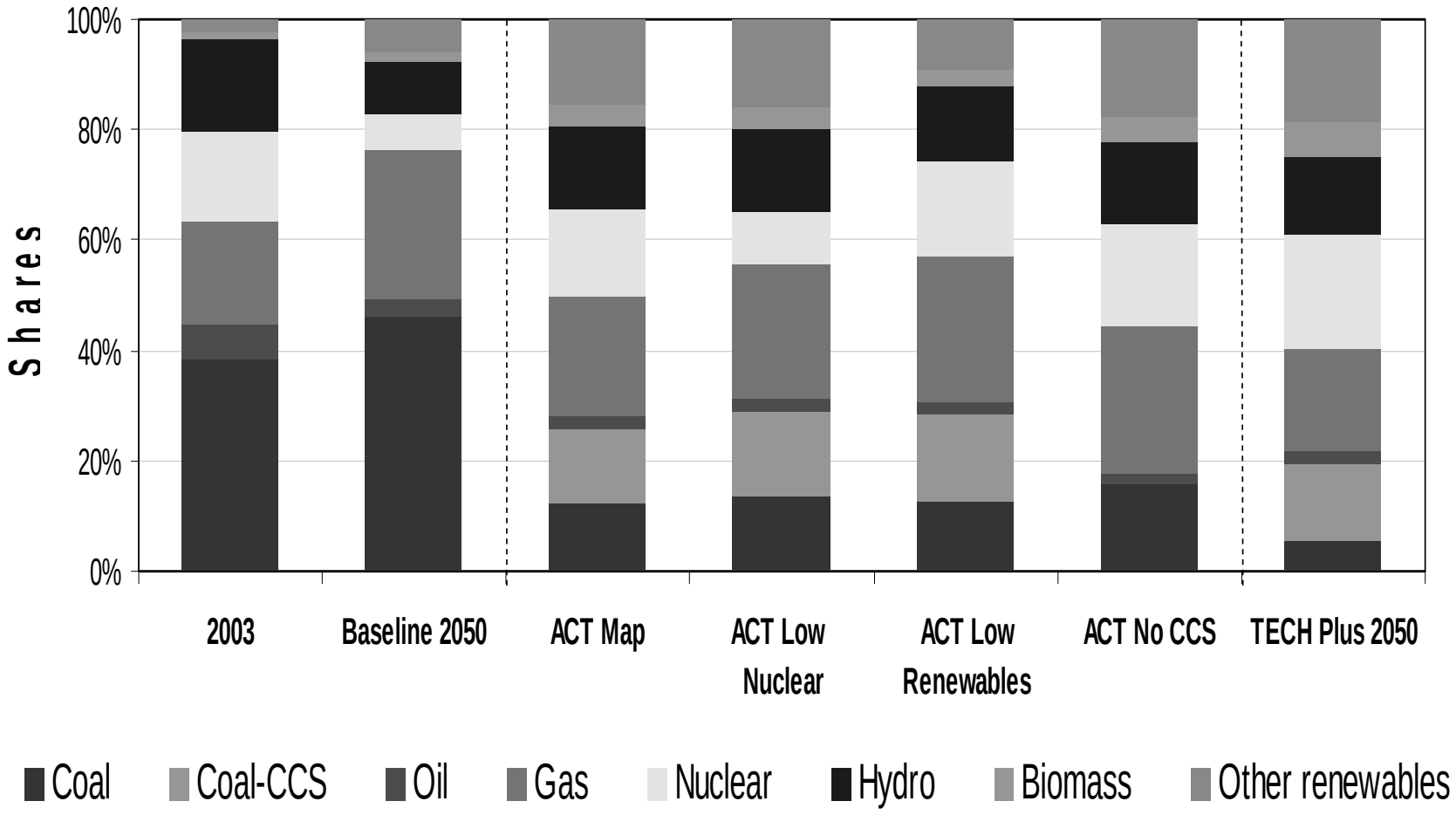


Best coal technology 48%, best gas technology 60%

Regional Power Generation Mix 2003

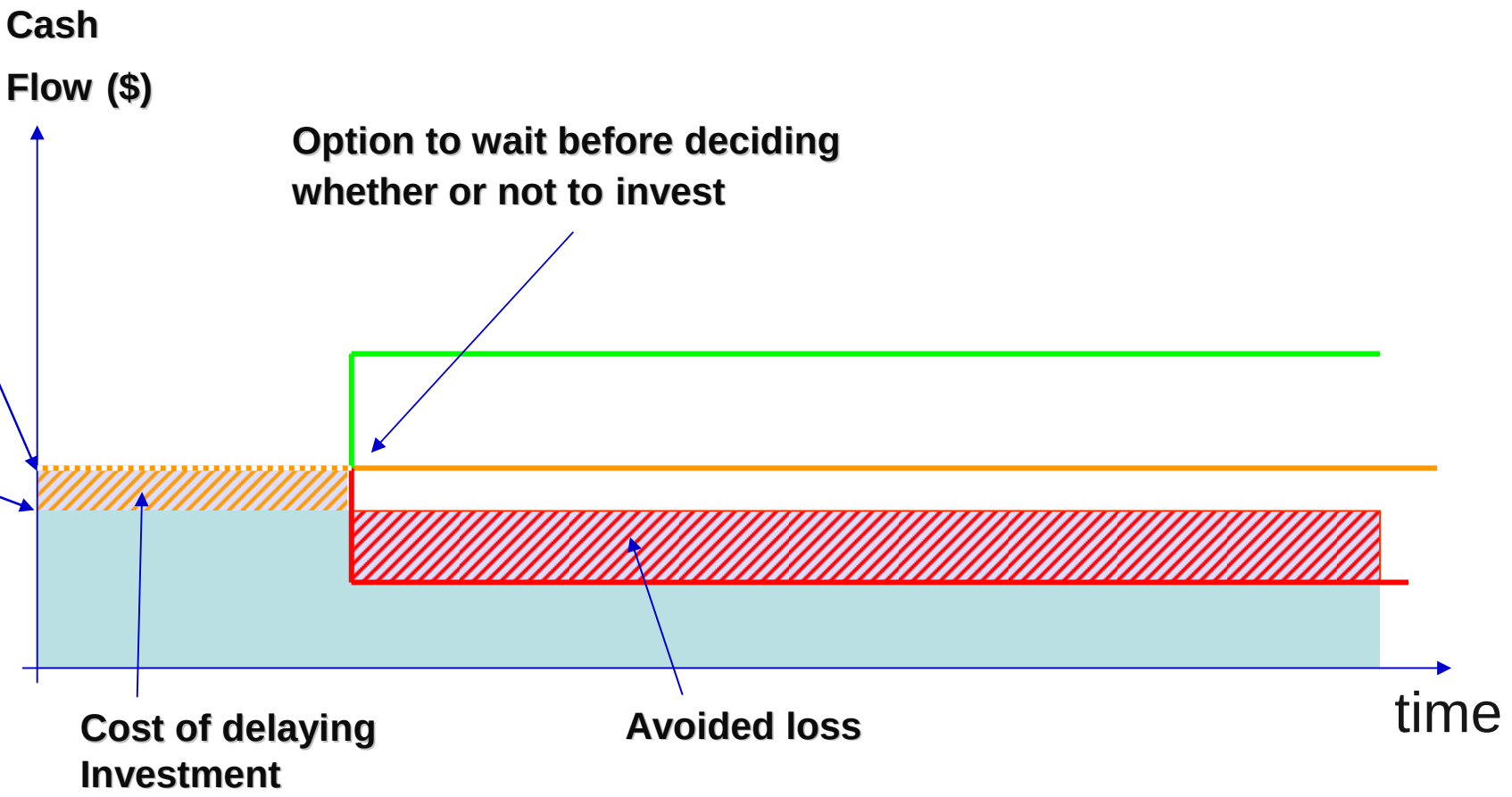
[%]	OECD	Developing Countries	Transition Economies
Coal	39	47	23
Oil	6	10	4
Gas	18	17	38
Nuclear	23	3	18
Hydro	13	22	18
Other Renewables	3	1	0.2

Global Electricity Generation by Fuel (2050)



Important role of CCS; strong growth in renewables and nuclear power

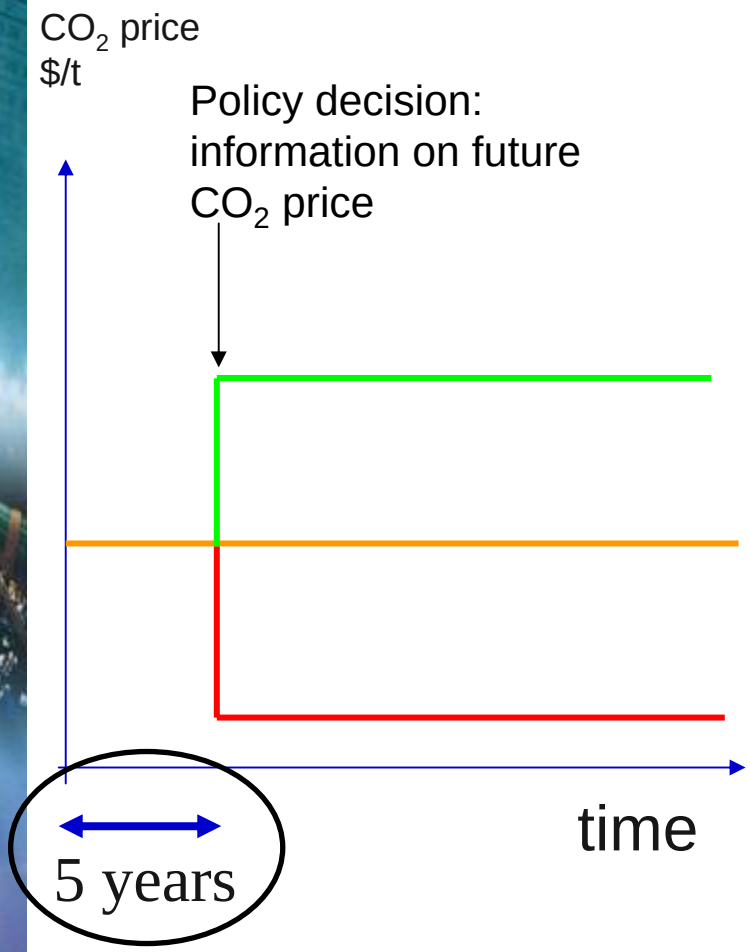
Analysing Investment Decision under Uncertainty the 'Real Option' Method

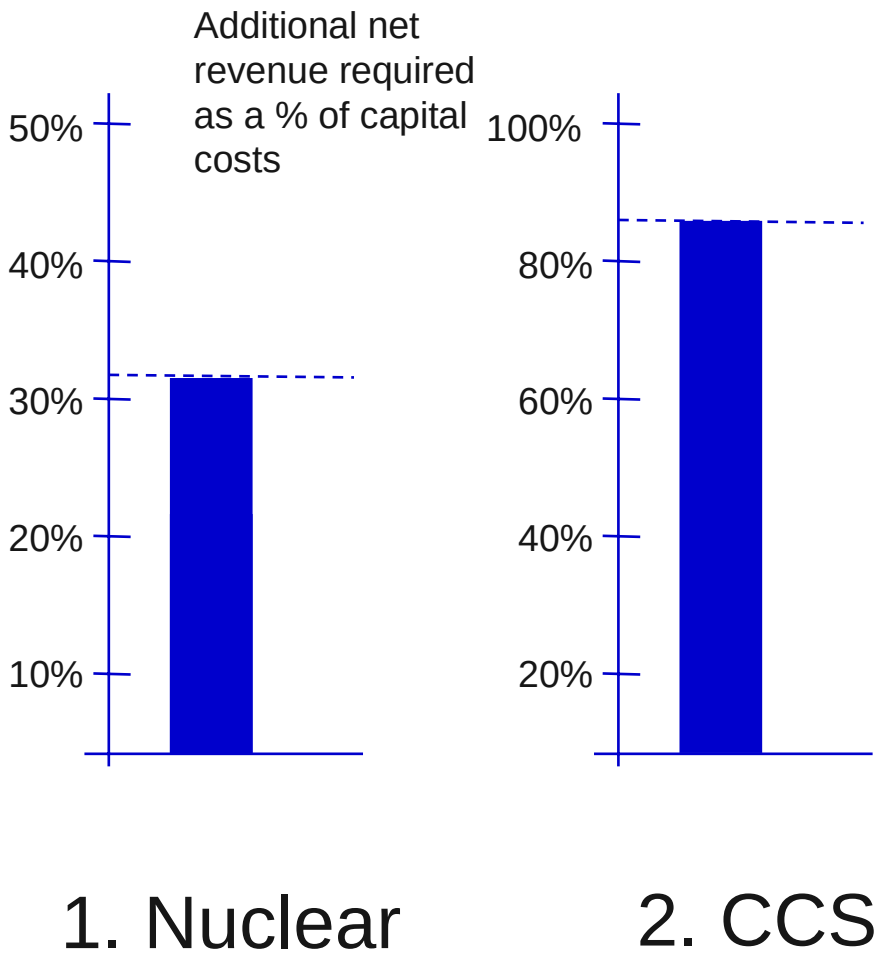


Invest *NOW* if
cost of delaying > value of delaying

Effect of CO_2 price uncertainty on investment threshold

Case 1: a 5-year commitment period

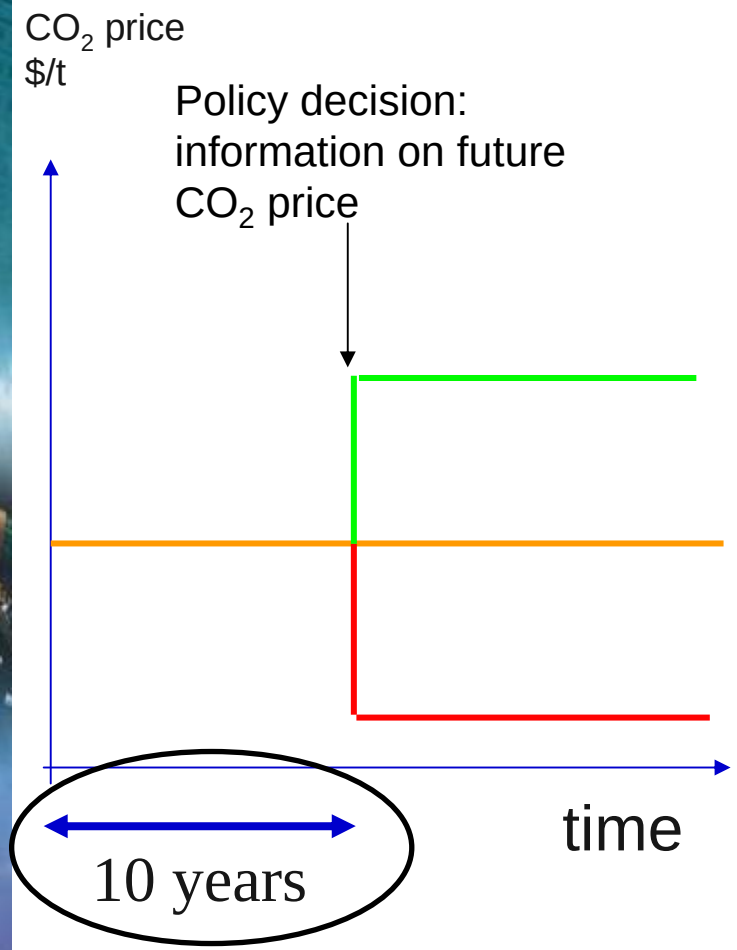


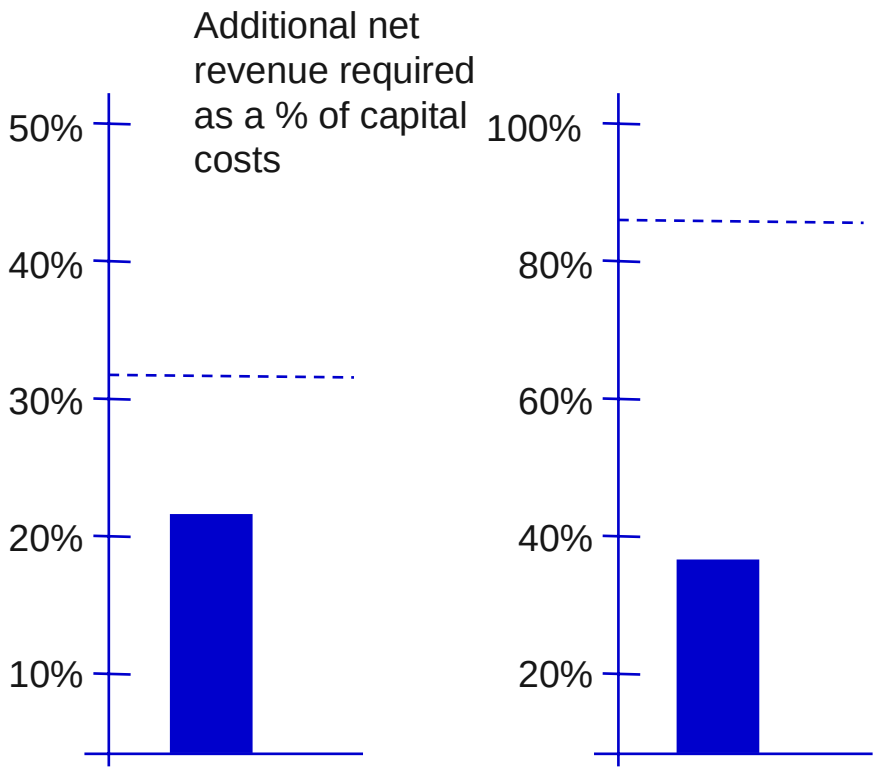


Source: Blyth and Yang (IEA, 2006)

Effect of CO_2 price uncertainty on investment threshold

Case 2: a 10-year commitment period





1. Nuclear

2. CCS

World Liquid Fuel Supply by Scenario