POTSDAM INSTITUTE FOR CLIMATE IMPACT RESEARCH

A Great Transformation?

Possible Pathways Towards A Low Carbon Economy

Prof. Dr. Ottmar Edenhofer
Dr. Nico Bauer

Potsdam, 11th March 2010

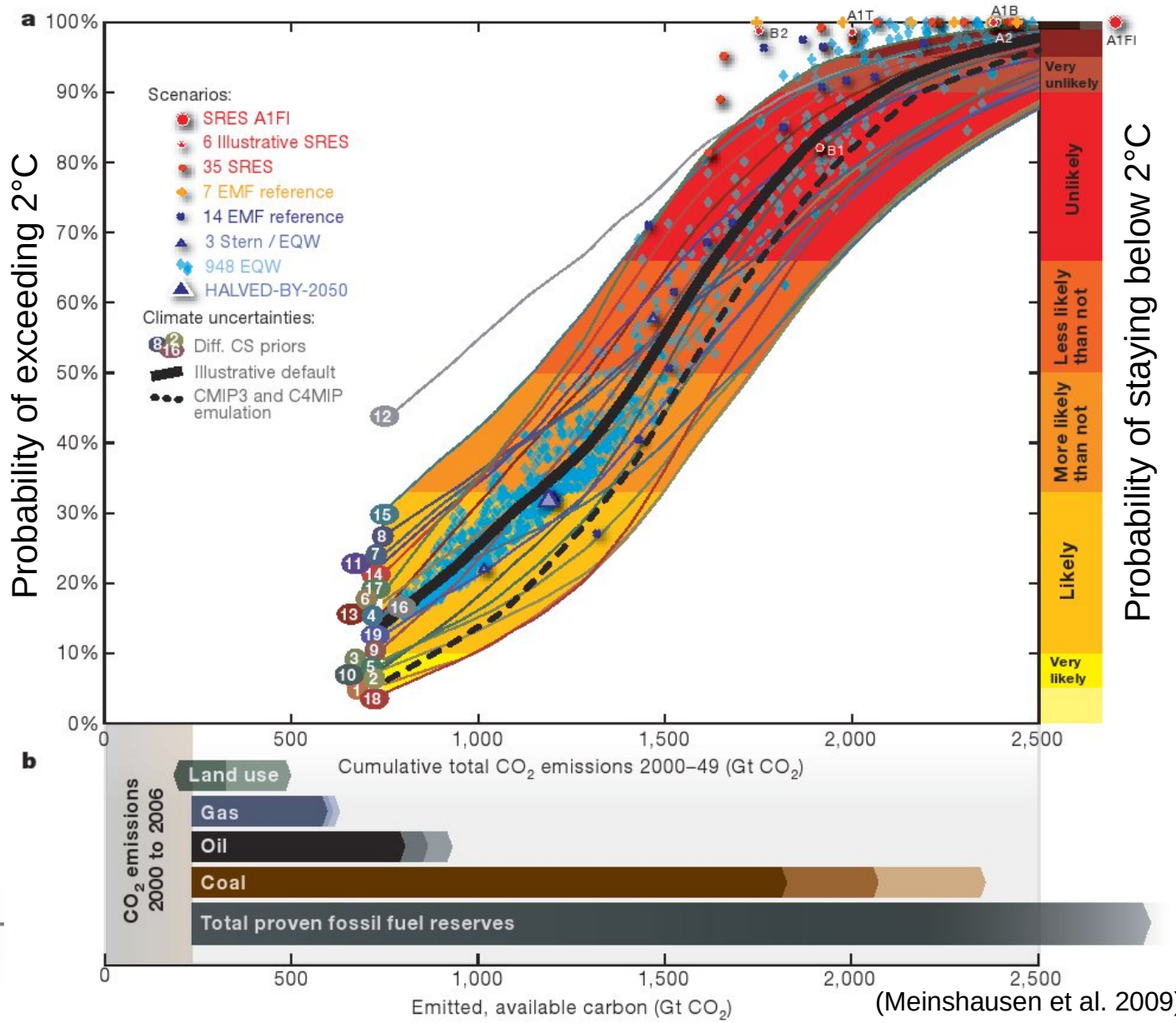
ALICE Symposium

PIK

ipcc
INTERGOVERNMENTAL PANEL ON climate change
Working Group III (WG III) – Mitigation of Climate Change

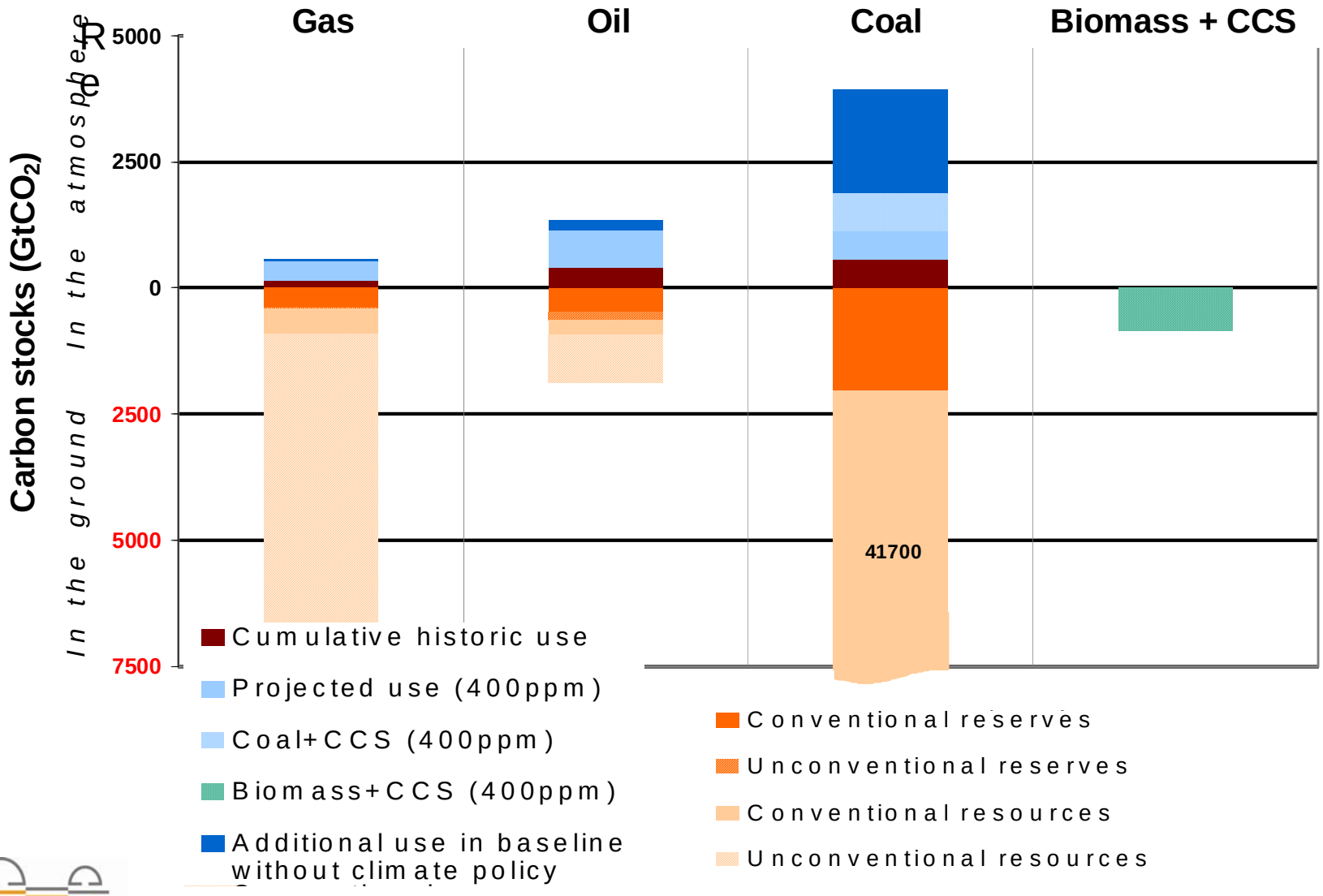
Technische Universität Berlin

Climate Protection Implies a Remaining Stock of Emissions



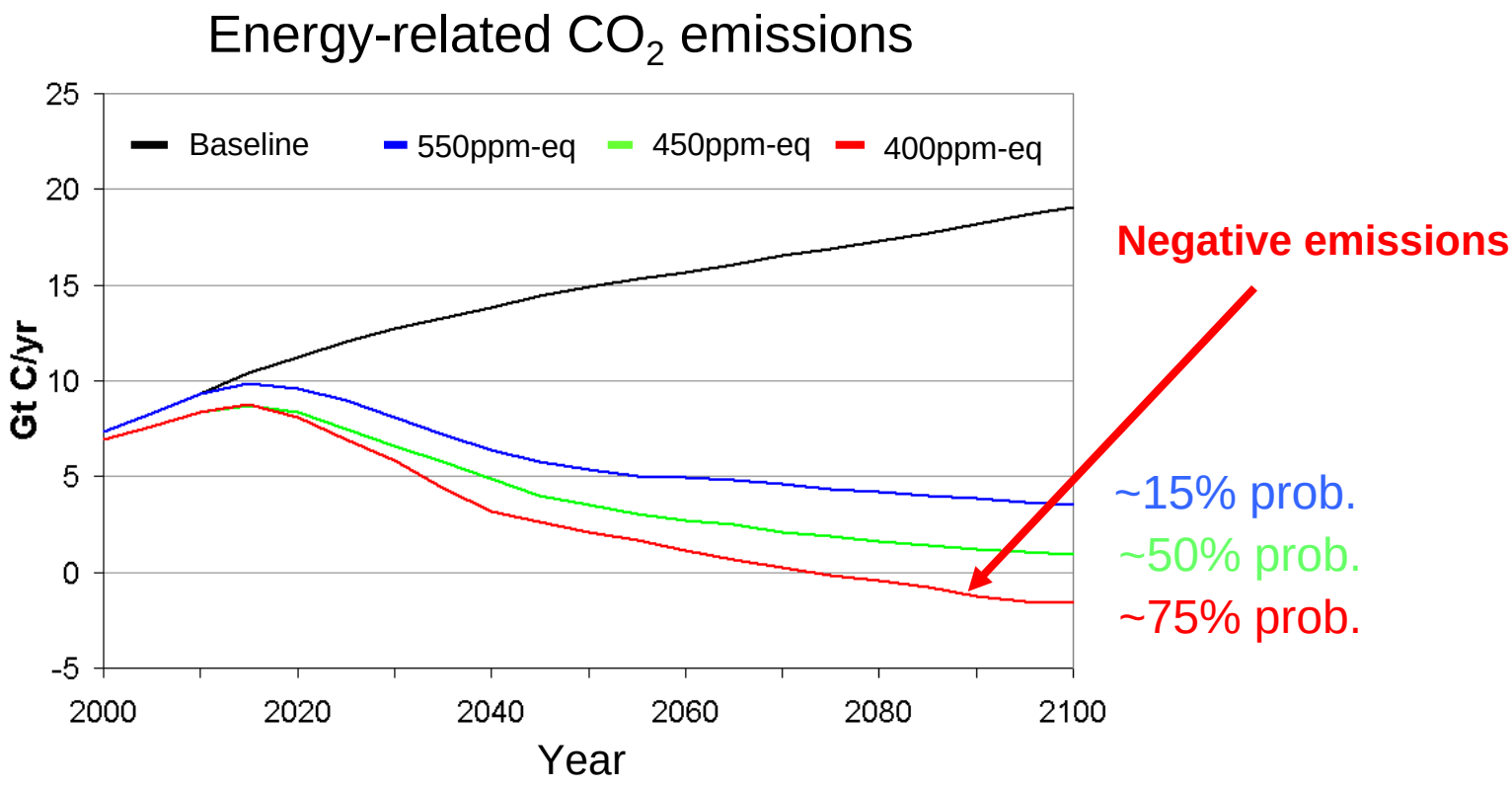
(Meinshausen et al. 2009)

Atmospheric Disposal Space vs. Fossil Resource



The Economics of Atmospheric Stabilisation

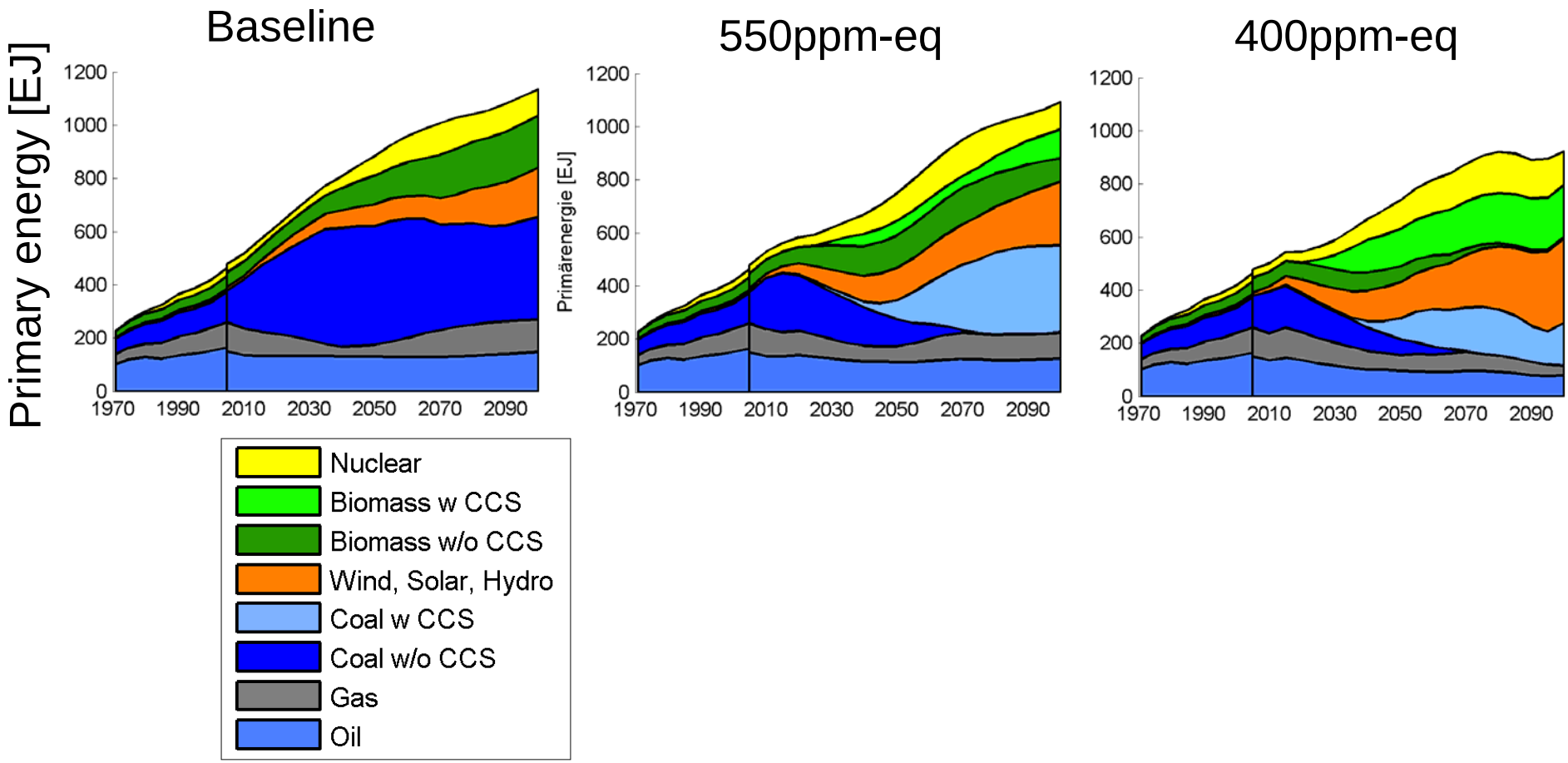
Analysis of 3 stabilisation targets with different probabilities to reach the 2° target: 550ppm-eq, 450ppm-eq, 400ppm-eq



Knopf, Edenhofer et al. (2009)

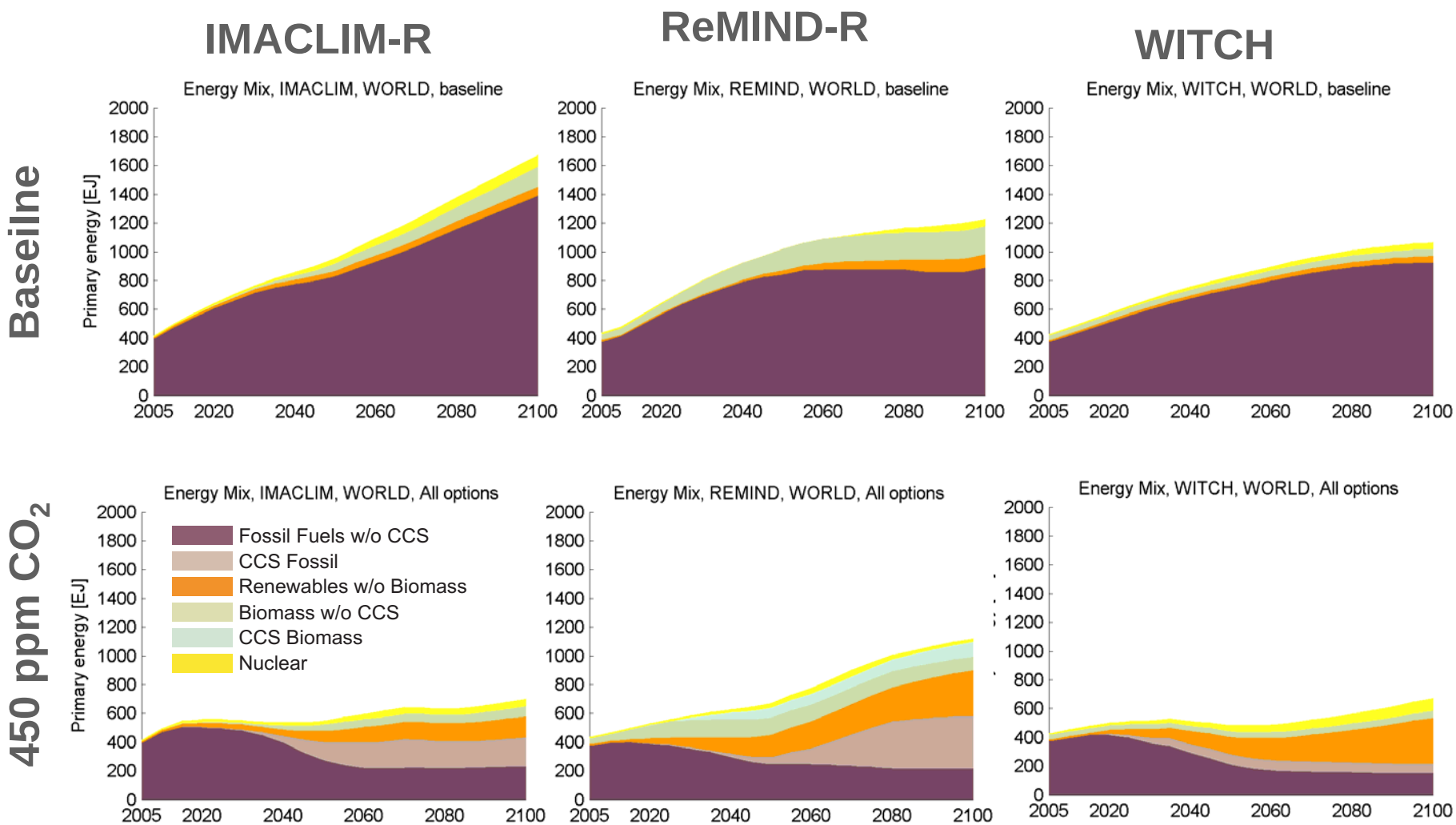
Transformation of the Energy System

The historical challenge



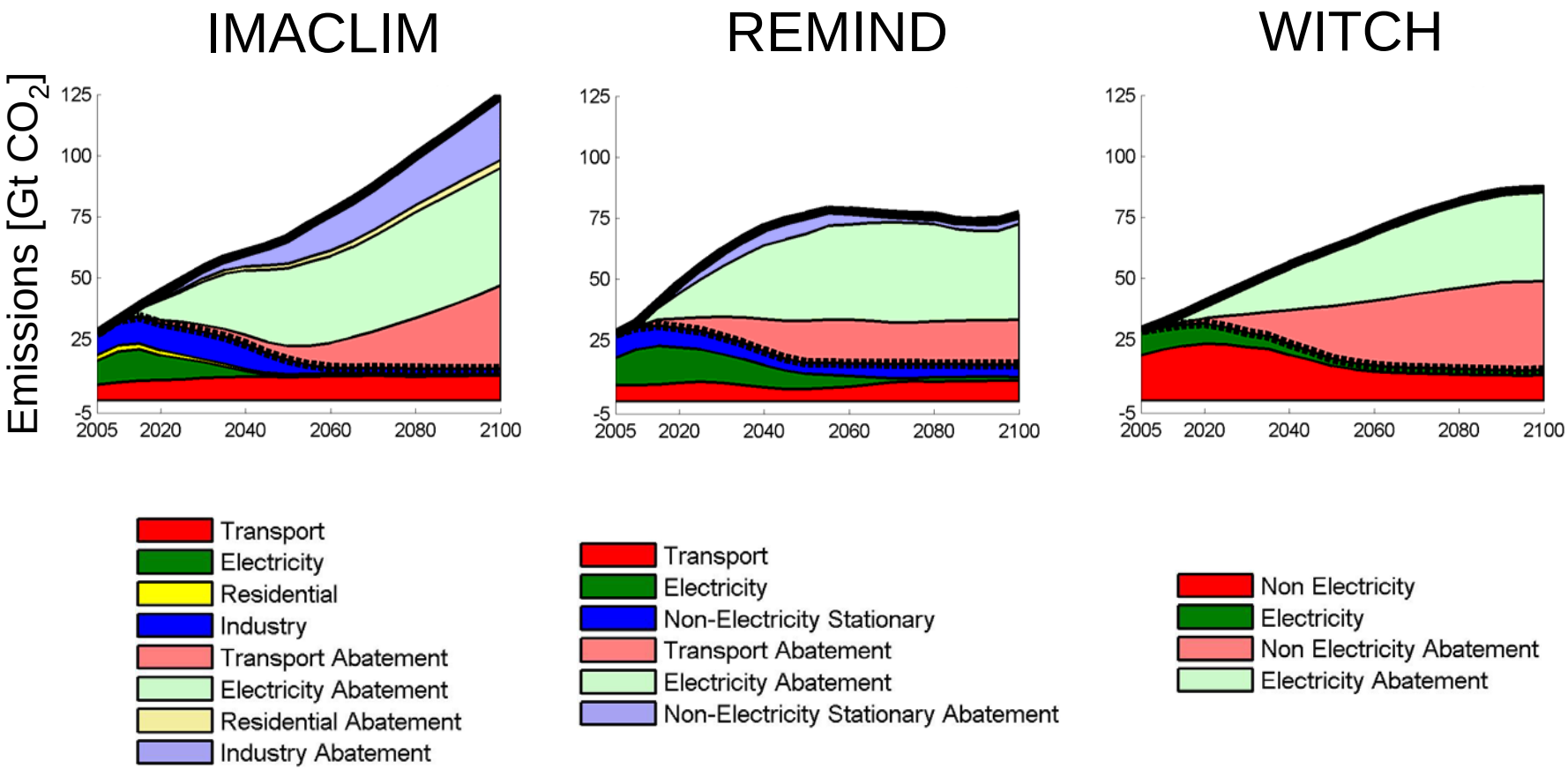
Knopf, Edenhofer et al. (2009)

The energy system transformation

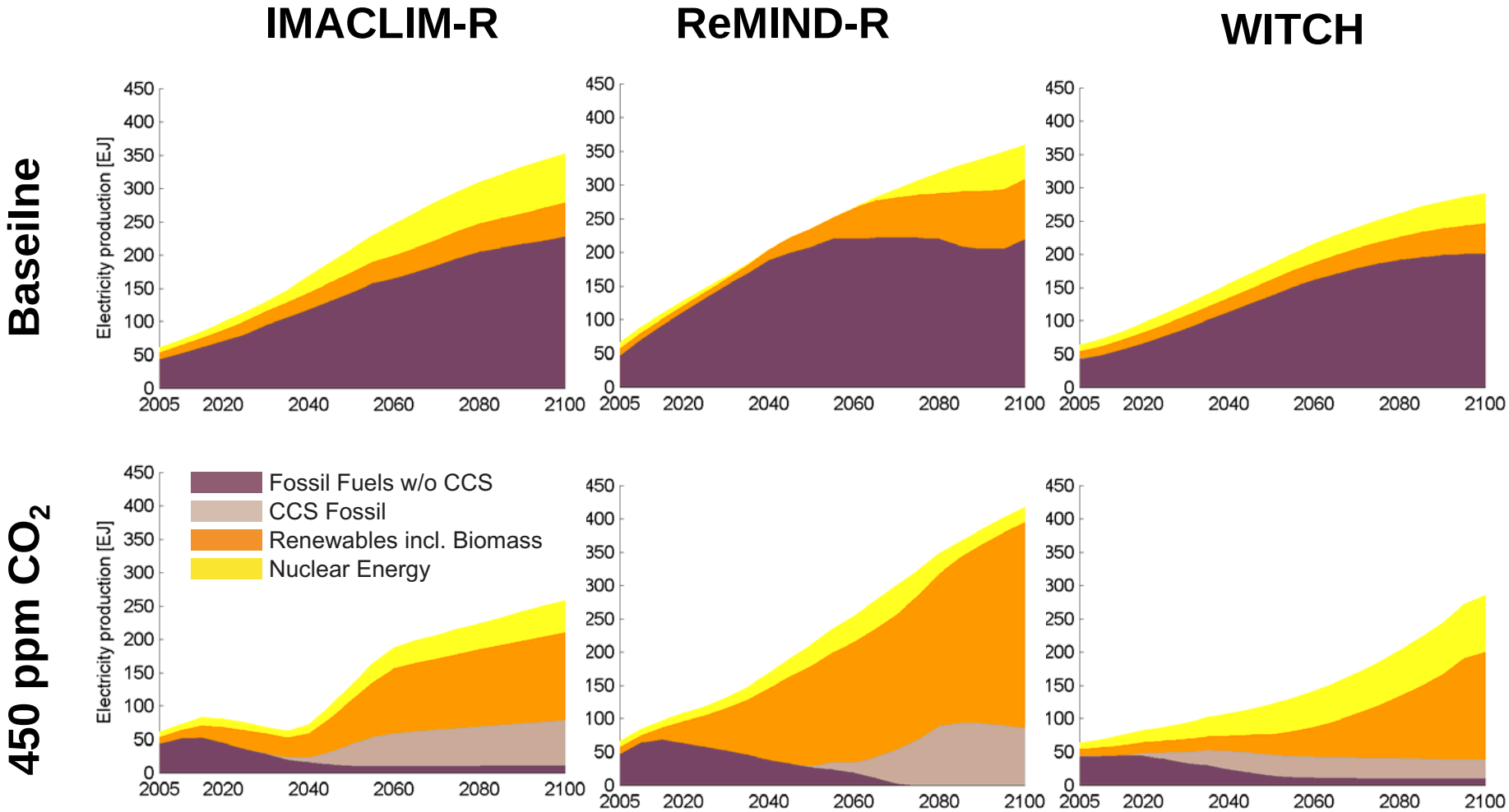


Mitigation Per Sector: “Dynamic Sectoral Wedges”

Sector emissions: Baseline vs. 450 ppm CO_2

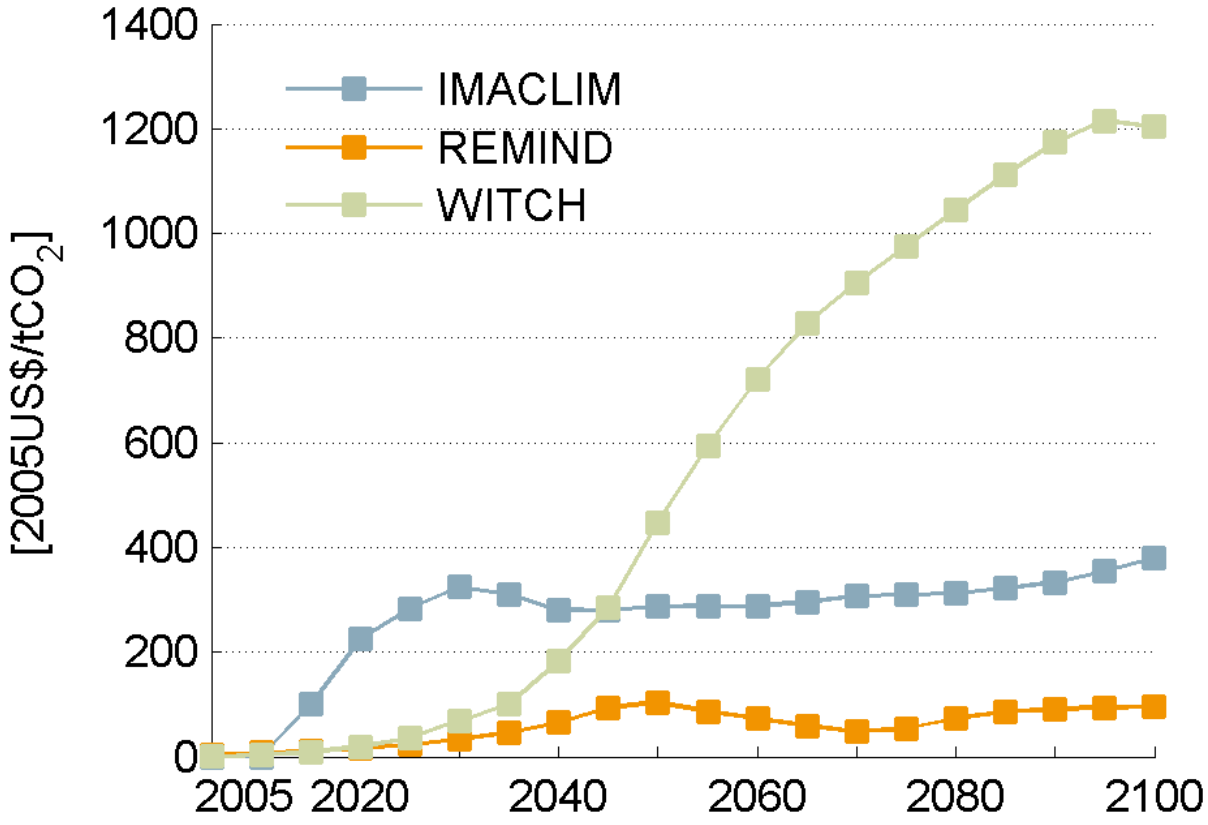


Sectoral results: Electricity production



Luderer et al., 2009

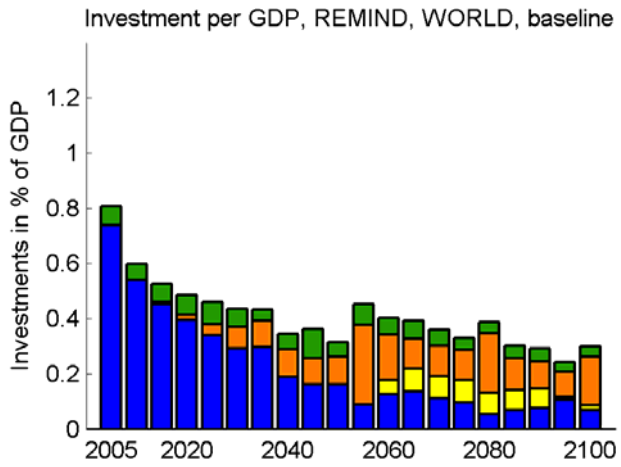
CO_2-prices (450 ppm)



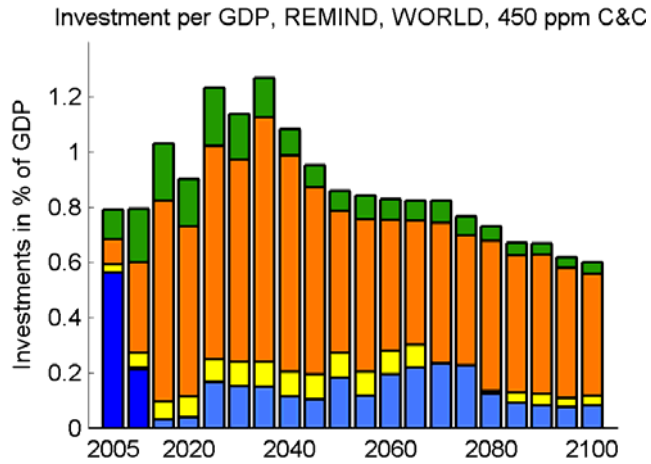
Luderer et al., 2009

Energy System Investments (REMIND)

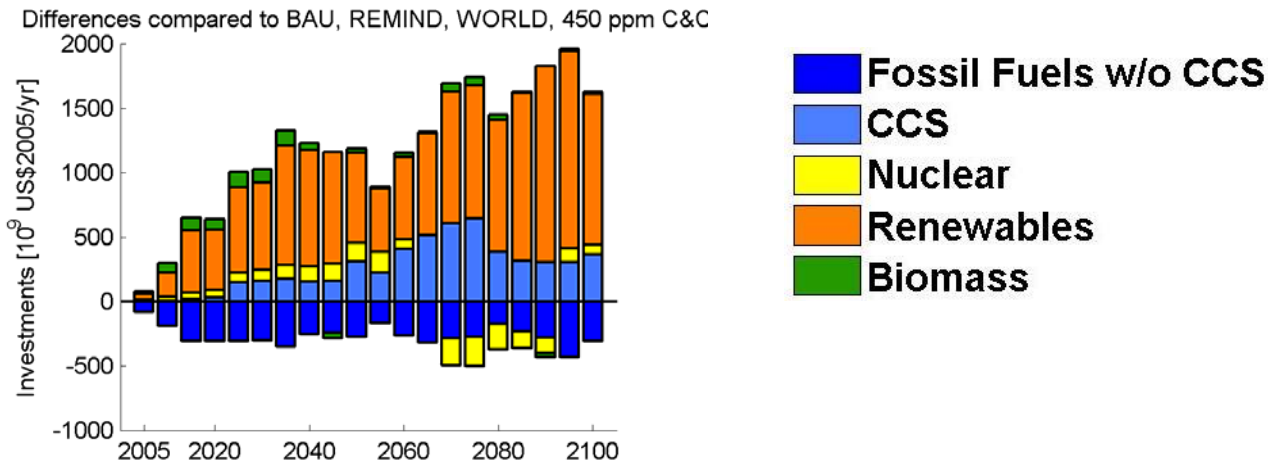
Baseline



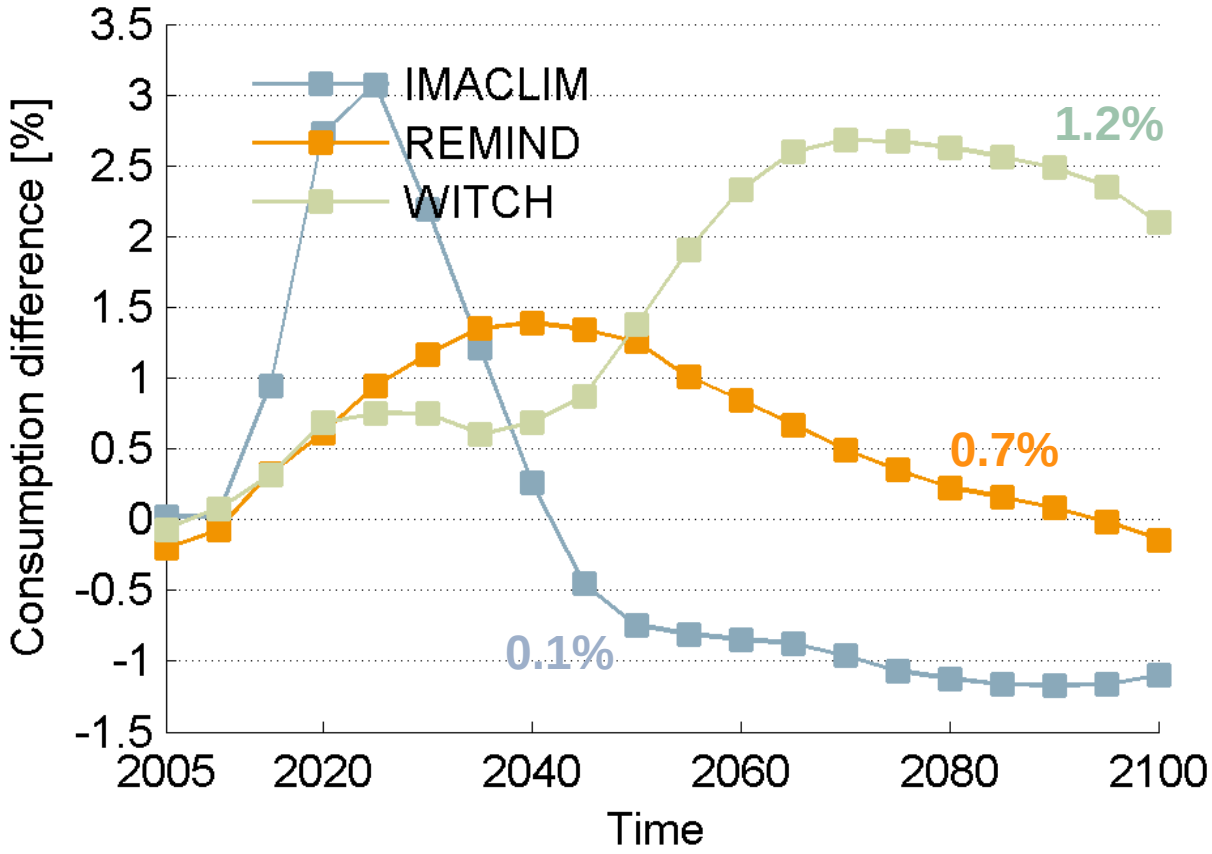
450 ppm CO_2



Difference



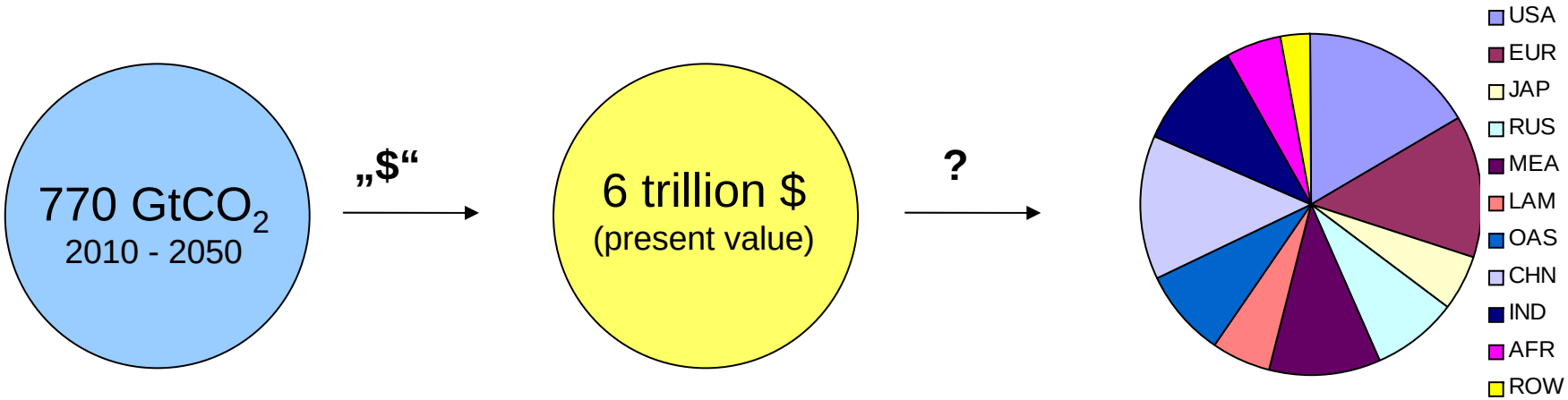
Mitigation costs



The Climate Rent

- Climate Policy: 2°C target requires to limit the budget of CO_2 emissions

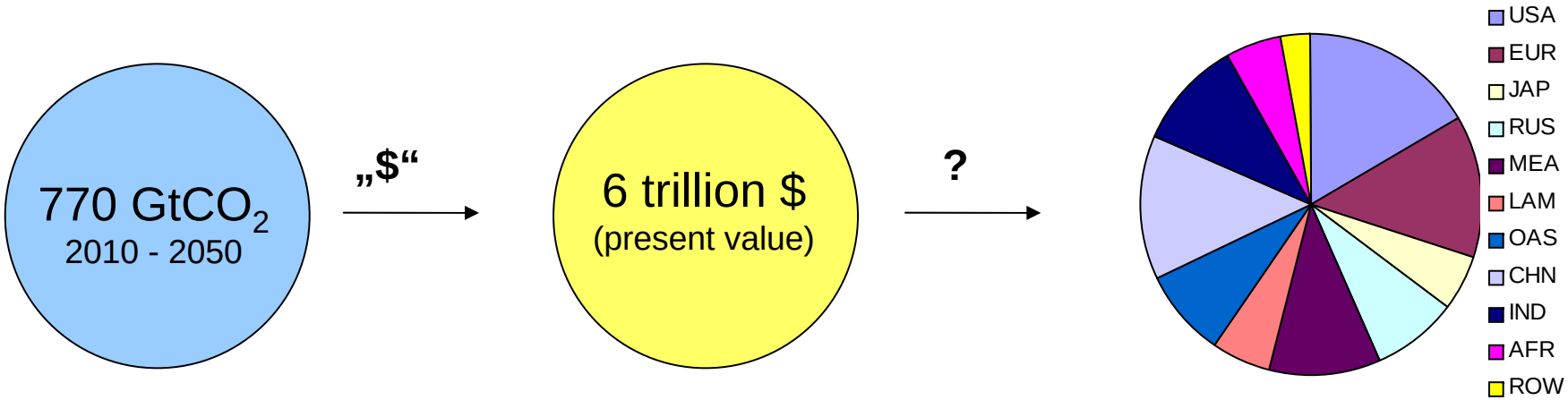
- Cap-and-Trade system signals scarcity and creates the „climate rent“



Lüken, Bauer, et al. (2009)

The Climate Rent and Technology Policy

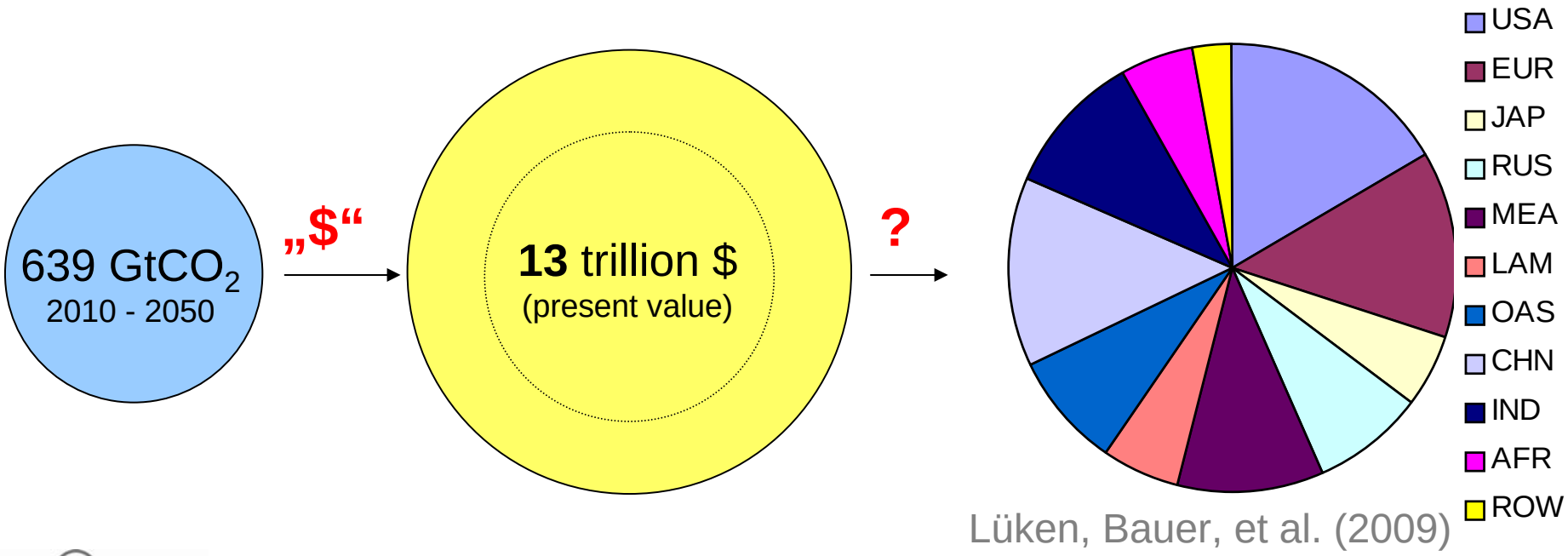
- With a limited availability of CCS the picture changes



Lüken, Bauer, et al. (2009)

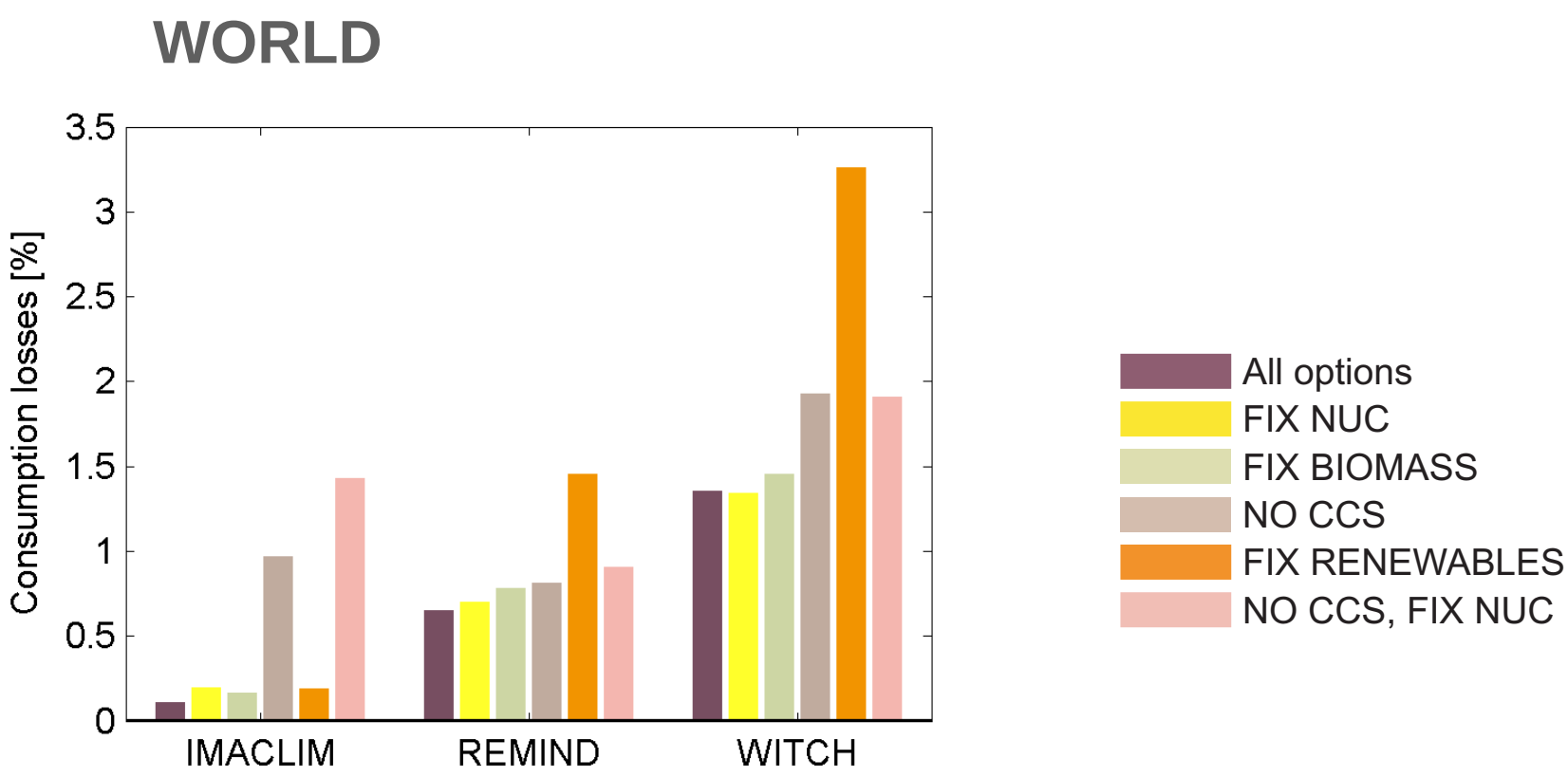
The Climate Rent and Technology Policy

- With a limited availability of CCS the picture changes
- The climate rent depends on the technology



Lüken, Bauer, et al. (2009)

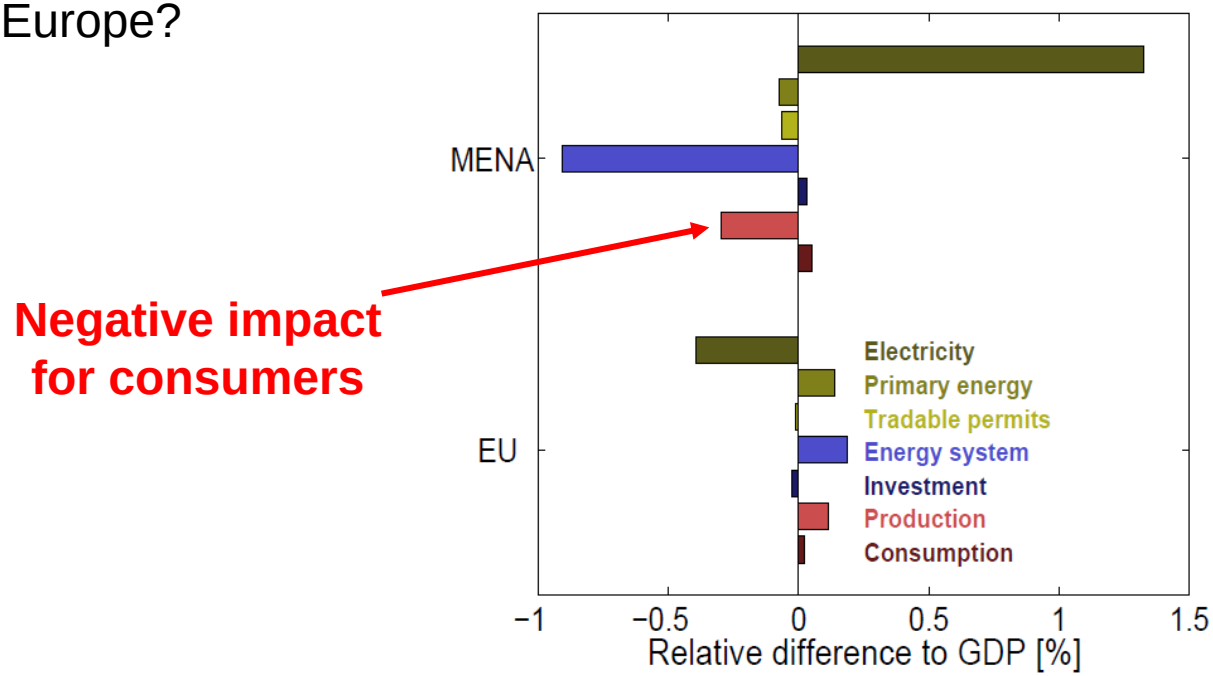
Technology option values



Large Scale Trade of Renewables

Are there potential losers of the energy transition who may veto policies?

What is the sectoral impact of trading renewables between MENA and Europe?



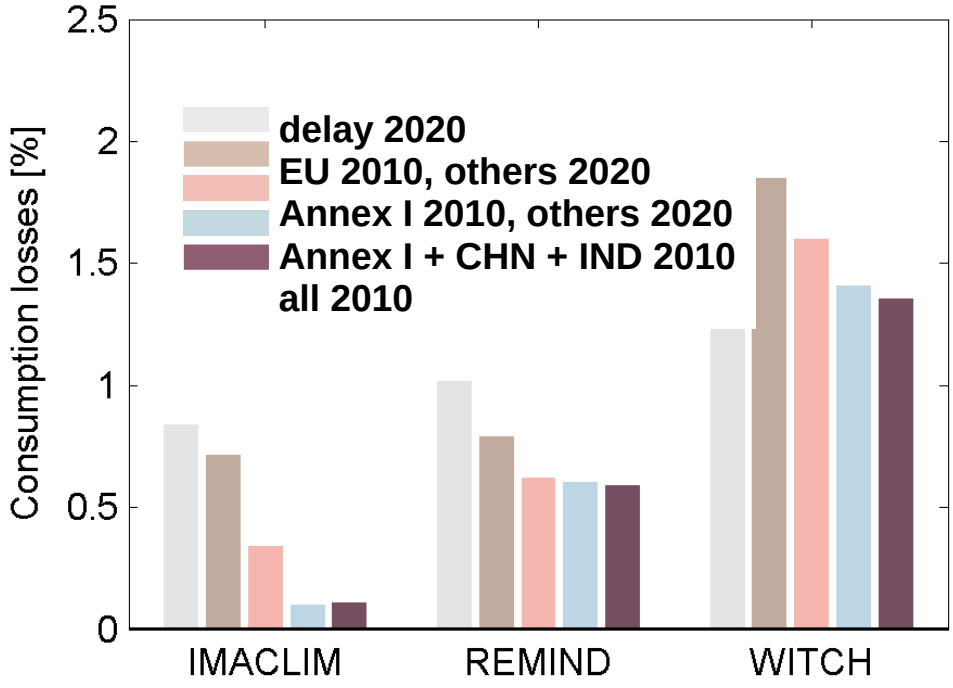
Bauer et al. (2009)

⇒ In MENA region the non-electric sector may experience losses from trade with Europe

⇒ Compensation policies or issue linkage (water)

The cost of delay

WORLD



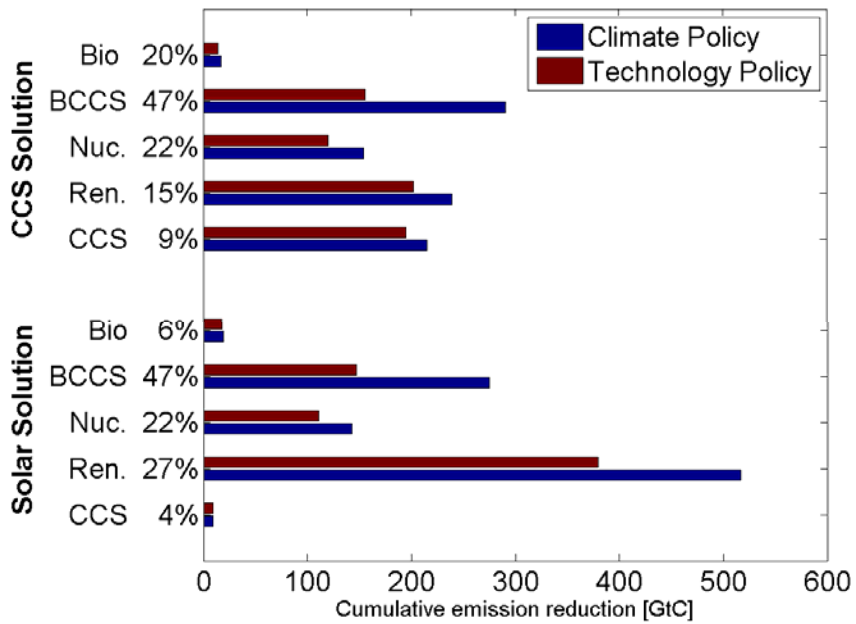
Luderer et al., 2009;
Jakob et al., in prep.

Can subsidies for low-carbon technologies substitute for the missing carbon price?

How strong is the rebound effect?

Climate vs. Technology Policy – The Rebound Effect

What emission reduction, if policy forces low-carbon technologies into the market but does not constrain emissions?

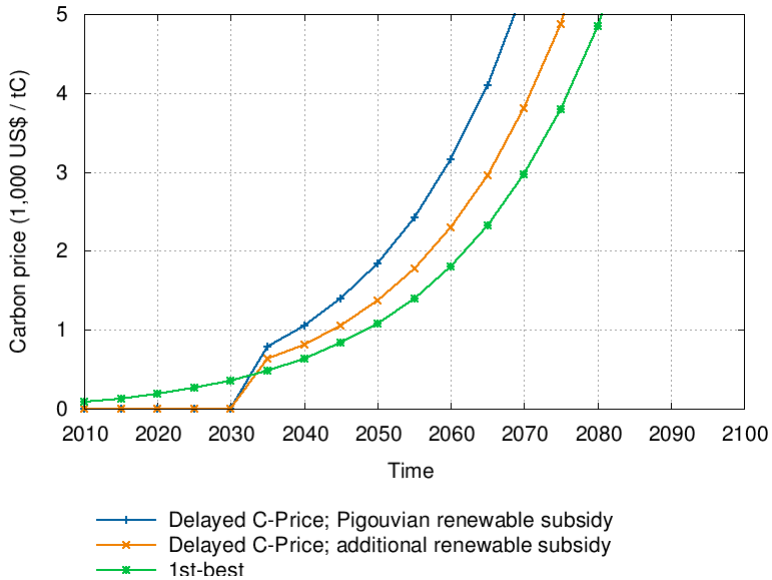


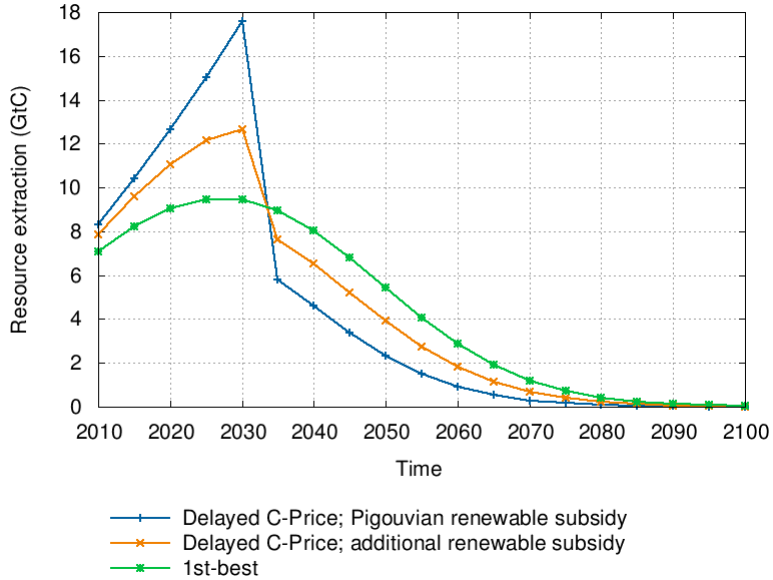
Bauer et al. (2010)

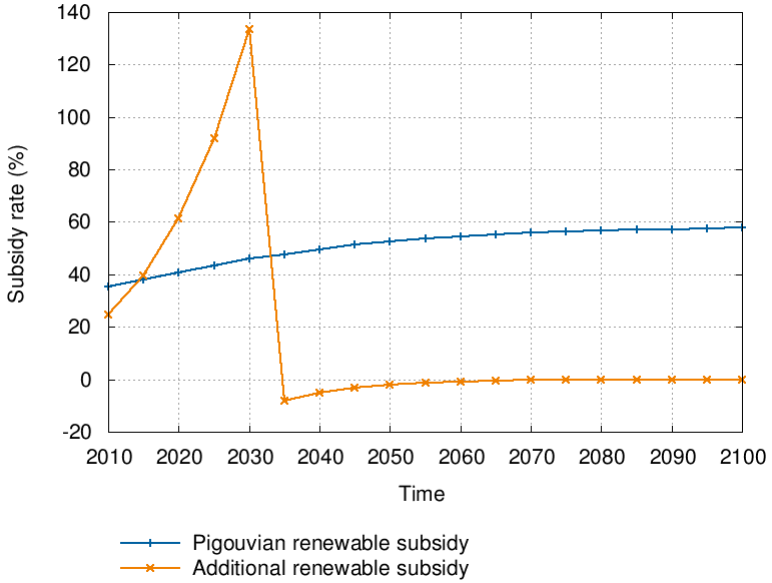
⇒ Technology policy only partly locks-out carbon-intensive technologies.

⇒ Institutional lock-out by emission caps is necessary.

Delayed Carbon Pricing and Subsidies for Renewables







Policy Instruments

- Is carbon pricing sufficient?

- What is the role of technology policy?
  - Proof of concept; reduce uncertainty
  - Keep climate rent limited
  - Enhancing international cooperation: Internalization of spill-overs (e.g. learning by doing)
  - Compensates partially delayed carbon pricing
  - But is not sufficient for climate protection: rebound effect

- What is the role of infrastructure?
  - Tradability of renewables
  - Balancing the fluctuations of renewables
  - Infrastructure investments improve utilization rate of RES

The Purpose of this Symposium

- Be specific! Think about barriers not only about requirements.
- Every business is special on its own
- The electricity sector
  - Faces particular business environment and regulations
  - Shares expectations about future prices and the role of climate policy
  - Develops particular technologies
- Three challenges of the electricity sector which will be faced by our workshop:
  - Small scale and municipal utilities investments
  - New coal issues, incl. CCS
  - Investment into large scale renewables