



A 100% Renewable Electricity Supply by 2050: Climate-friendly, Reliable, and Affordable

Prof. Dr. Miranda Schreurs

German Advisory Council on the Environment, Berlin

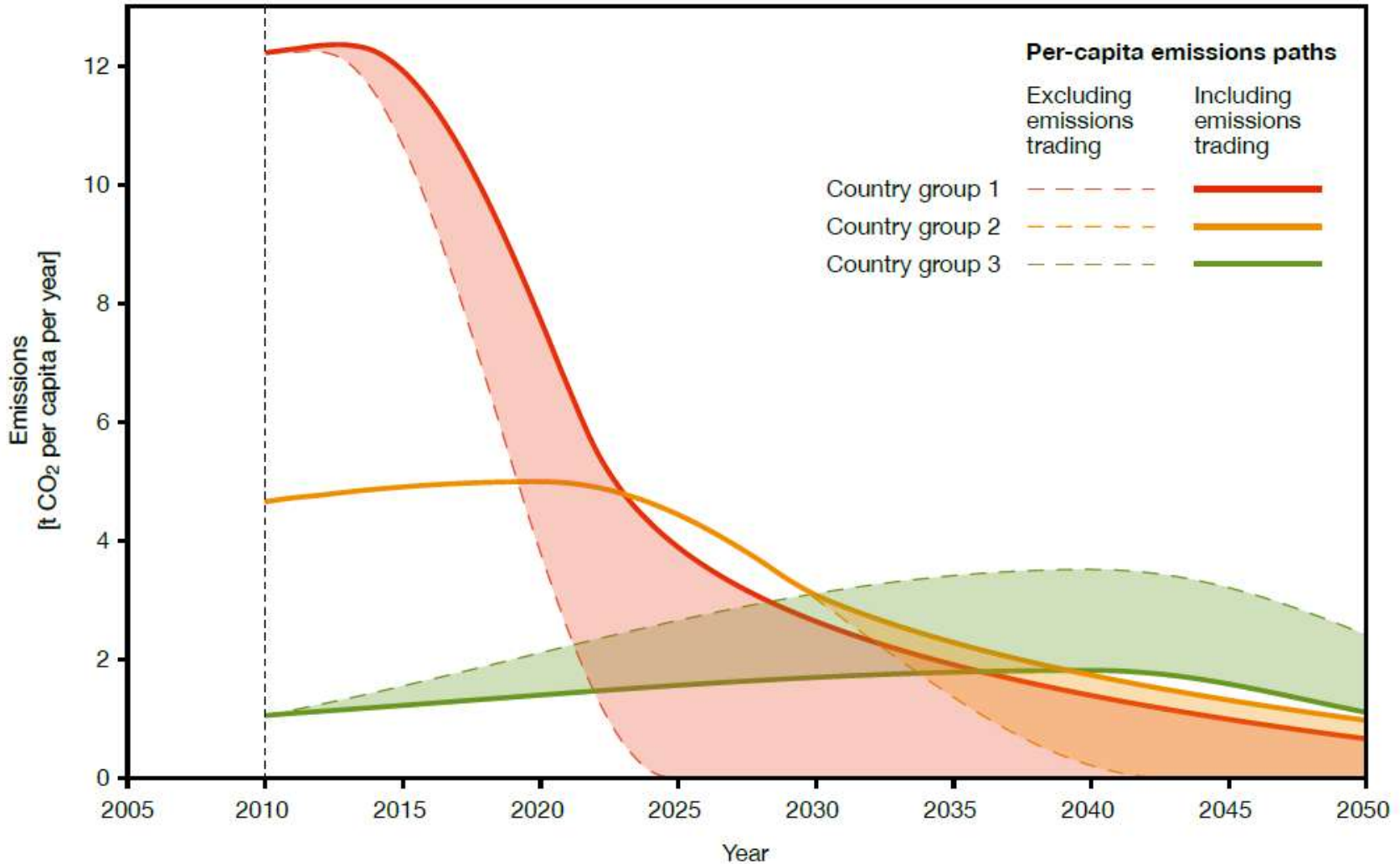
Director of the Environmental Policy Research Centre and Professor of
Comparative Politics at the Freie Universität Berlin

Providing scientific policy advice since 1971

- ❑ independent, inter-disciplinary scientific council nominated by the Federal Cabinet
- ❑ comprised of 7 professors (natural science, engineering, economics, law, political science)
- ❑ Broad mandate to provide early warning of negative trends and new ideas for furthering environmental policy and inform the wider public
- ❑ SRU is an active member of the European Environment Advisory Councils (EEAC)



The Challenge: Full Decarbonisation



WBGU, 2009: Solving the Climate Dilemma: the Budget Approach

Comparing Low Carbon Technologies



Conclusion: Renewable energy is the least controversial and most sustainable option for decarbonisation



Demand reduction



Requirement



Nuclear



Acceptance
Resources
Waste



Fossil with CCS



Cost
Capacity
Containment



Renewable Energies



Grid
Extension
Storage



Compatibility ?



Backcasting Approach

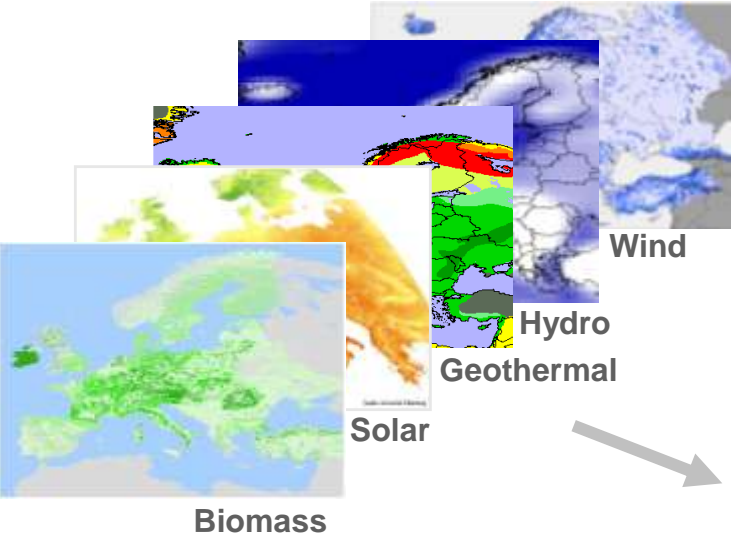
REMix-Europe (Renewable Energy Mix for Sustainable Electricity Supply in Europe)

Inventory of Ressources

GIS (Geographic information system), C

Power Needs and Load

GIS, C

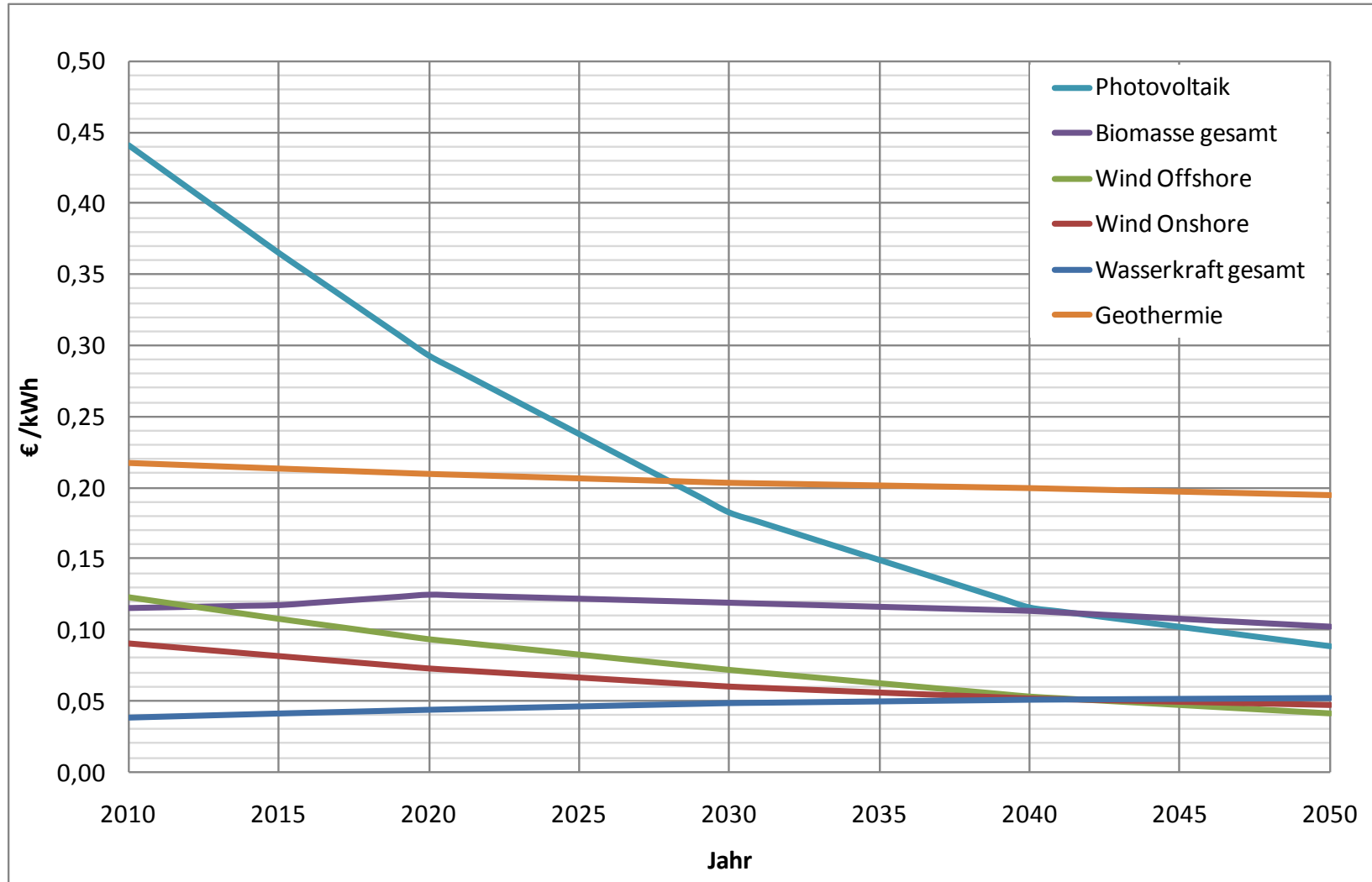


Linear Optimisation
GAMS (General Algebraic Modeling System)

Key model assumption: Learning Cost Curves



In the middle range of literature

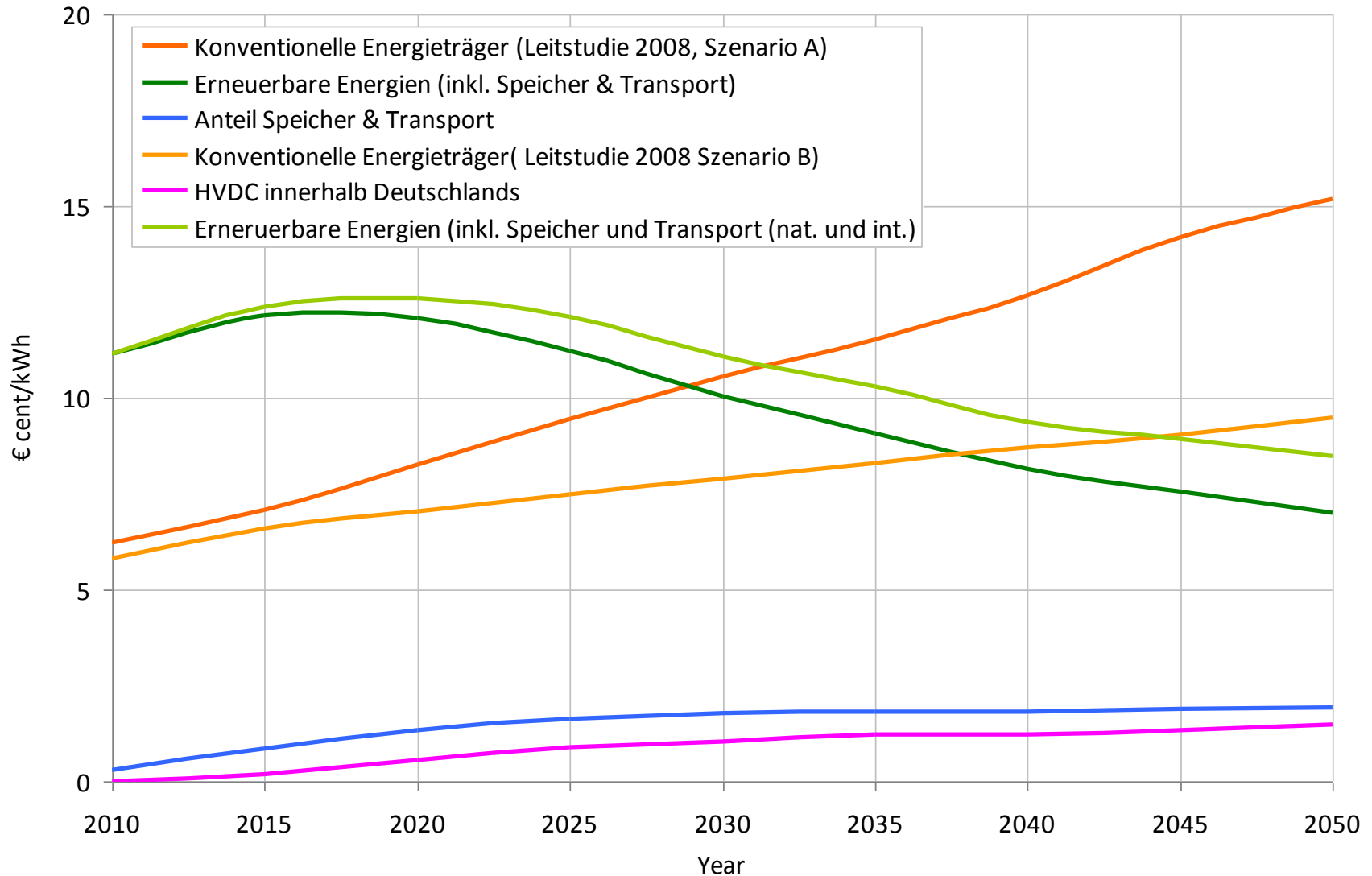


The cost development



Compared to a conventional supply scenario (Germany)

Specific electricity costs over time (Szenario 2.1.a)

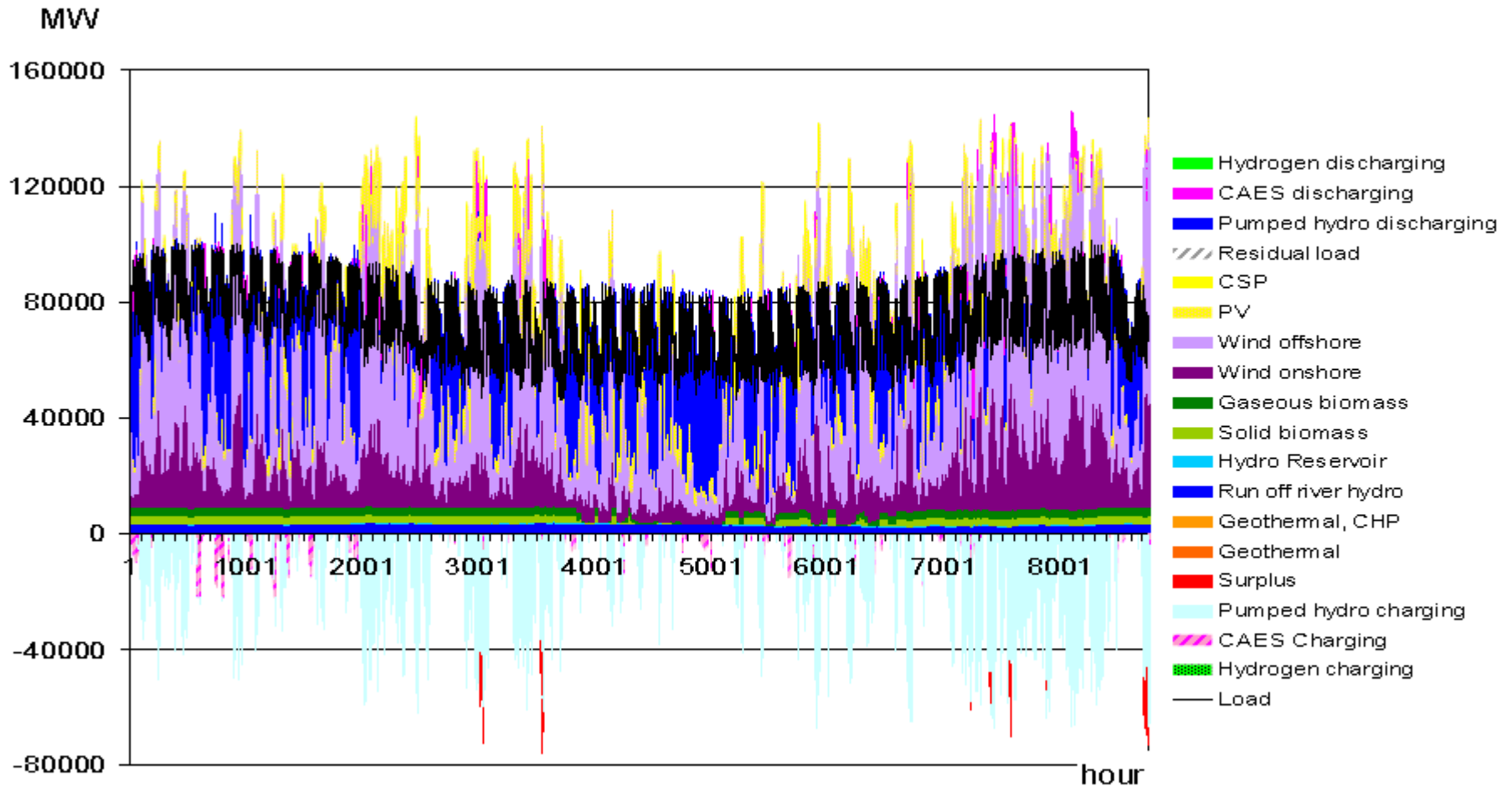


Hourly results 2050 DE-DK-N



100% national production, 15% exchange

Scenario 2.1.a: DE-DK-NO 100% EE / 100% SV, max. 15% exchange / 509 TWh



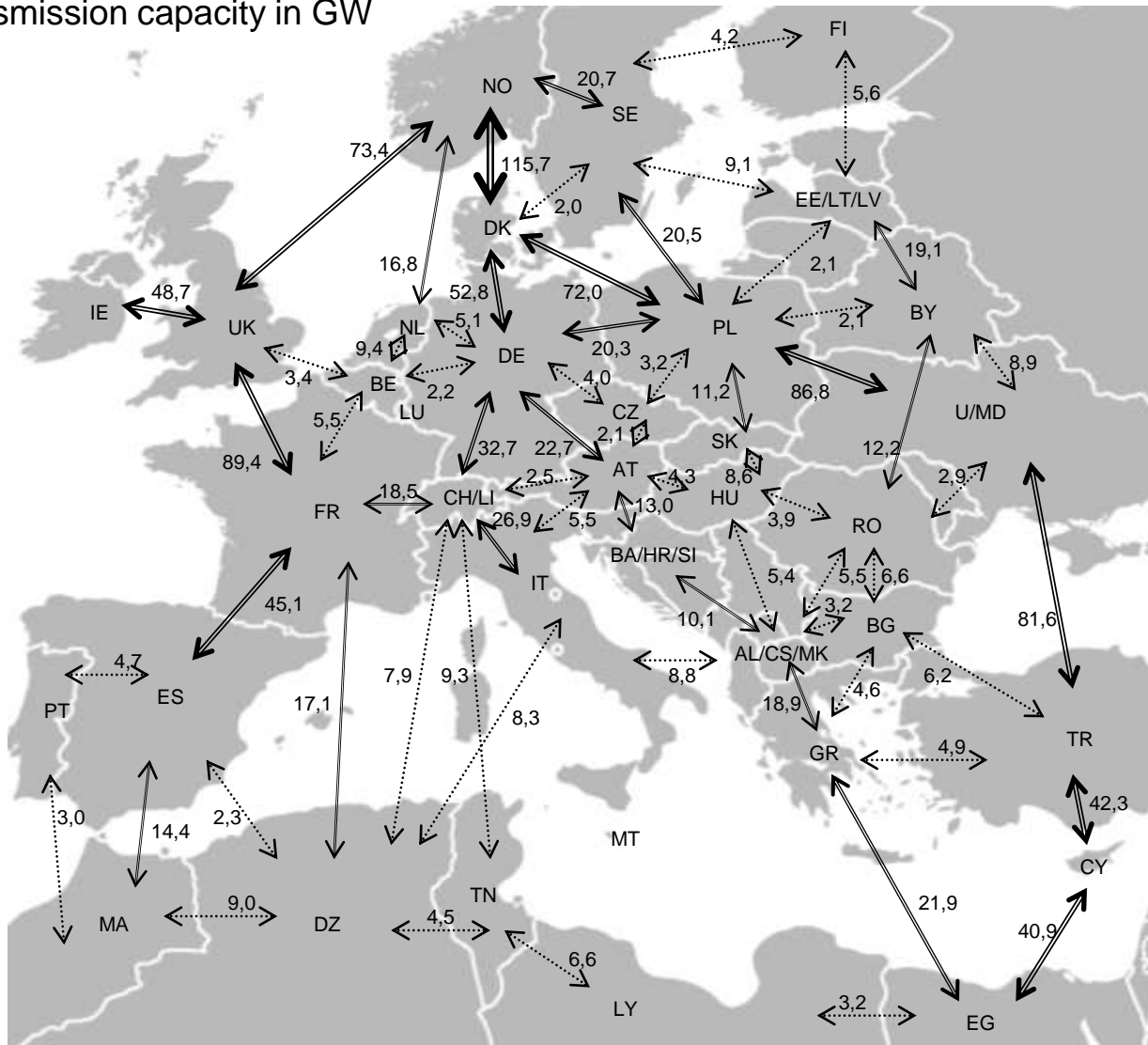
TEN-E Needs by 2050



and the key role of the nordic „power house“

Maximum transmission capacity in GW
(Scenario 3.a)

- > 2 GW
- > 10 GW
- > 20 GW
- > 40 GW
- > 100 GW

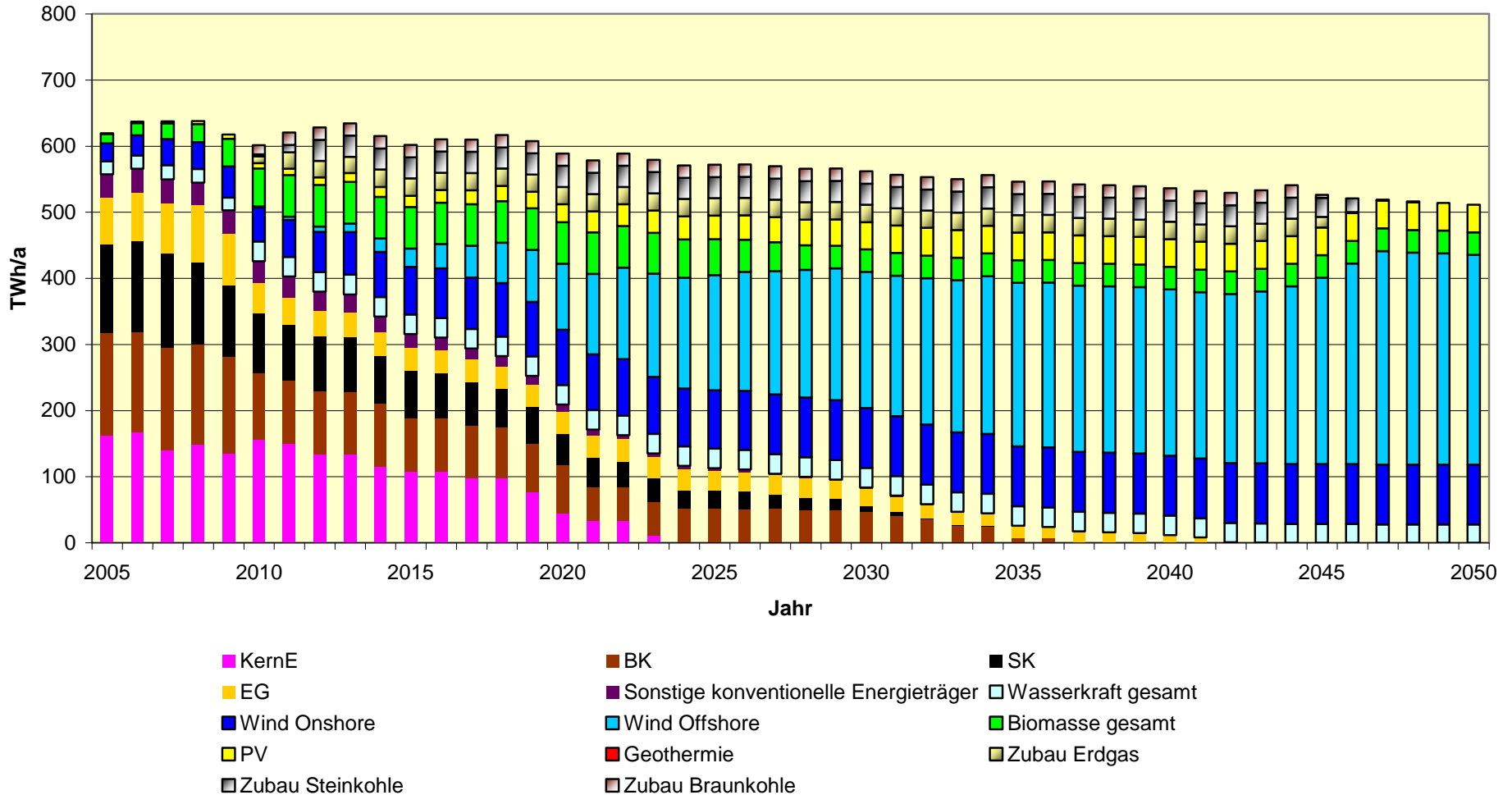


Development of renewable energy mix



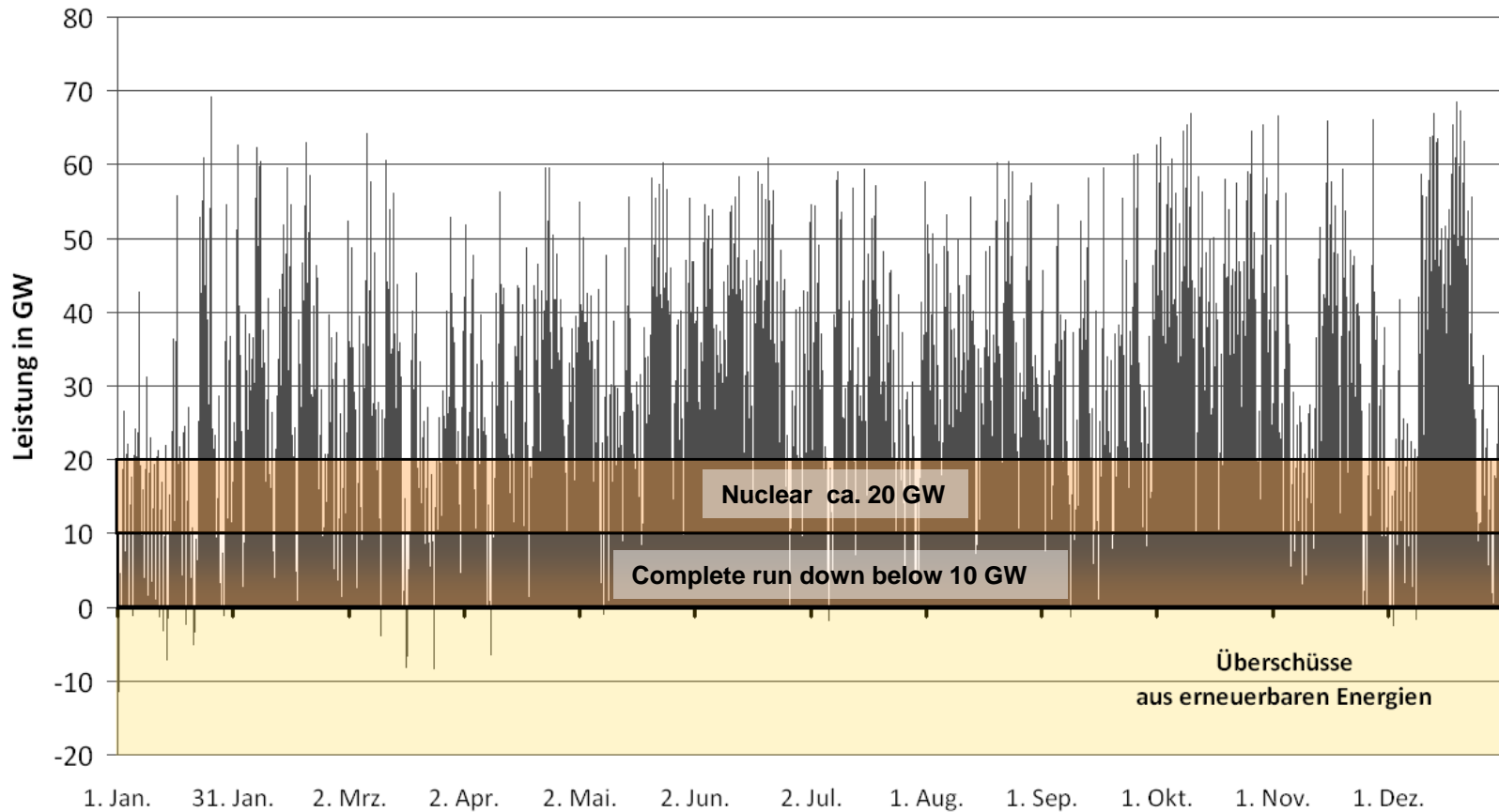
in Germany until 2050

Entwicklung der Bruttostromerzeugung 2005 bis 2050
konventionelle Erzeugung und regenerative Energiequellen (für 509 TWh/a in 2050)



Fluctuating supply

overstretches nuclear plant flexibility already in 2020



- Develop a binding climate and carbon neutral electricity target linked to emissions trading for 2050 (important for providing economic signals)
- Promote further measures for energy efficiency—the most important bridging “technology”
- Introduce measures at both the European and national levels to support the expansion of renewables, including continuation of a reformed feed-in-tariff and development of 2030 renewables targets
- Avoid the construction of new conventional power plants as they are neither consistent with a low carbon energy goal nor with the need for a flexible base load power supply
- Initiate planning for and develop incentives to foster the development of a new, expanded electricity grid
- Cooperate with Scandinavia in the development of hydro pump storage capacity