GWS SPECIALISTS IN EMPIRICAL ECONOMIC RESEARCH

izes gGmbH Institut für ZukunftsEnergie- und Stoffstromsysteme

SOCIO-ECONOMIC IMPACTS OF AMBITIOUS GHG REDUCTION TARGETS WITH EXPLICIT GREEN TECHNOLOGY INFORMATION

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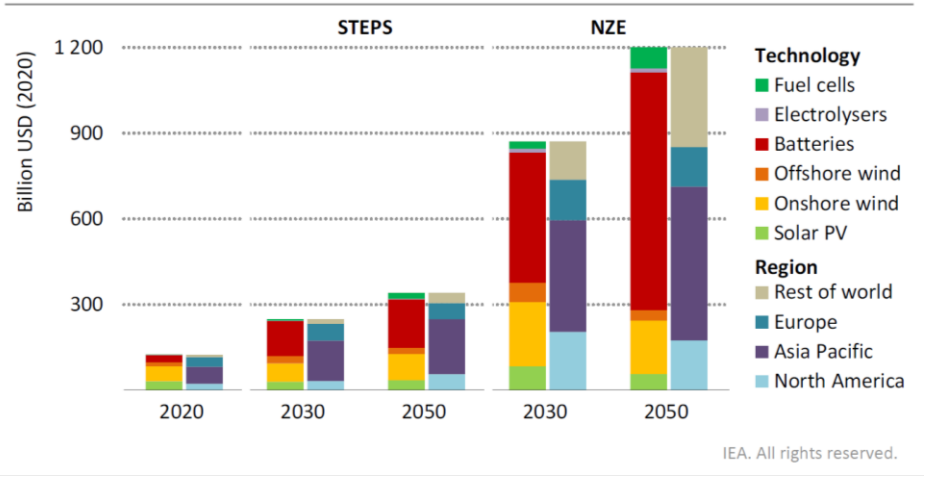
Background

- The new emerging energy economy: IEA sees an annual 1200 billion USD market in the NZE scenario in 2050
- 3-year BMWi funded project “Low carbon Leakage”, 2020-2023
  - ⇨ How can the relocation of clean energy technologies (CET) be prevented?
    - Pros and cons of first mover strategy
  - ⇨ Where will the new goods be produced?
    - Improved understanding and modelling of global low carbon value chains
    - Socio-economic impacts (GDP, value added, jobs)
  - ⇨ How can these technologies be quantified (often not in statistical classifications)?

Figure 1.3 ▷ Estimated market size for selected clean energy technologies by technology and region, 2020-2050

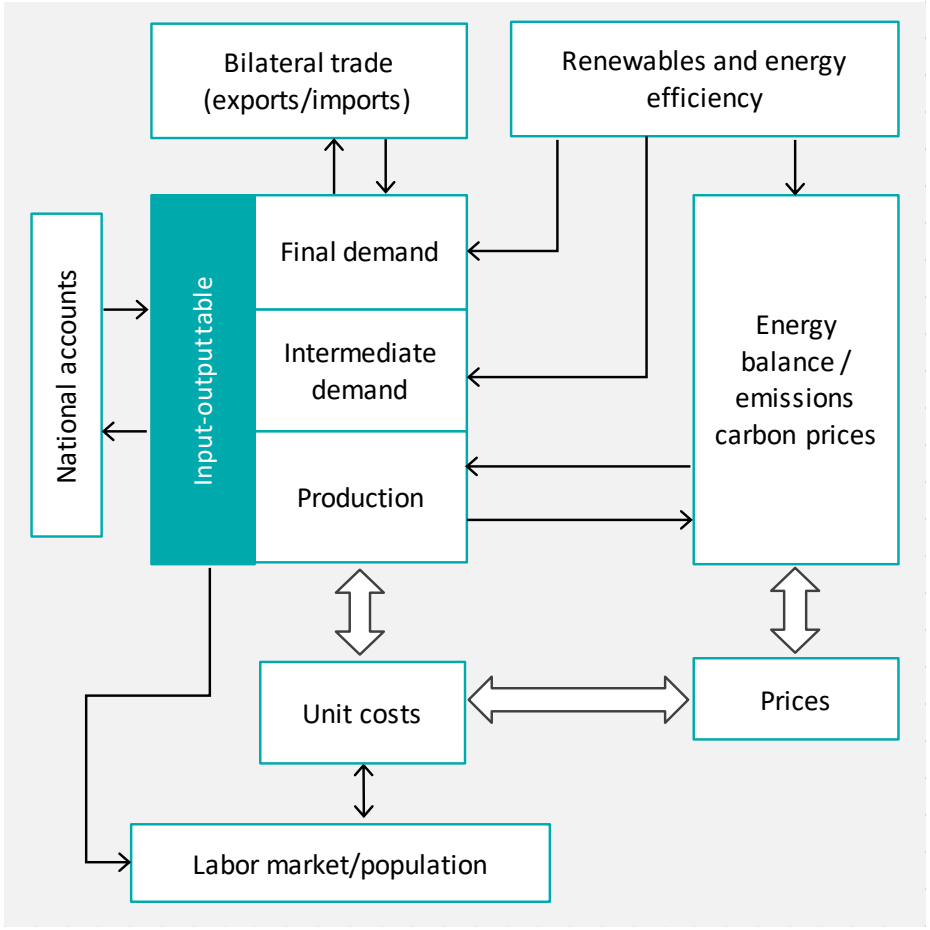


Source: IEA (2021)

	Technology		Technology
1	Wind Energy	8	Hydropower
2	Solar energy / PV	9	Heat storage
3	Batteries	10	Fuel cell vehicles
4	CCUS and CO_2 infrastructure	11	Heat pumps
5	Biomass	12	Efficiency in industry
6	E-mobility	13	Transmission and grid
7	Hydrogen	14	Building technologies

The model: GINFORS-E

- Macroeconometric model of the world economy, combining consistently production, international trade, energy use and emissions: https://web.jrc.ec.europa.eu/policy-model-inventory/explore/models/model-ginfors-e
- Economic structures: Harmonized OECD input-output tables for 64 countries, 36 industries and one region Rest of the World from 2005 to 2015
- Macro models and bilateral trade from TINFORGE (Mönnig/Wolter 2020)
- Bilateral trade shares for 33 goods und 154 countries econometrically estimated:
  - ⇨ Explaining variables: Relative prices, trends
- Changes in the cost situation at the level of 36 industries are transmitted to world trade, change sectoral production, value added, and prices as well as GDP
- Input-output relations by 36 (homogeneous) industries
- Explicit modeling of carbon prices (ETS and non-ETS)
- Myopic agents, non-equilibrium

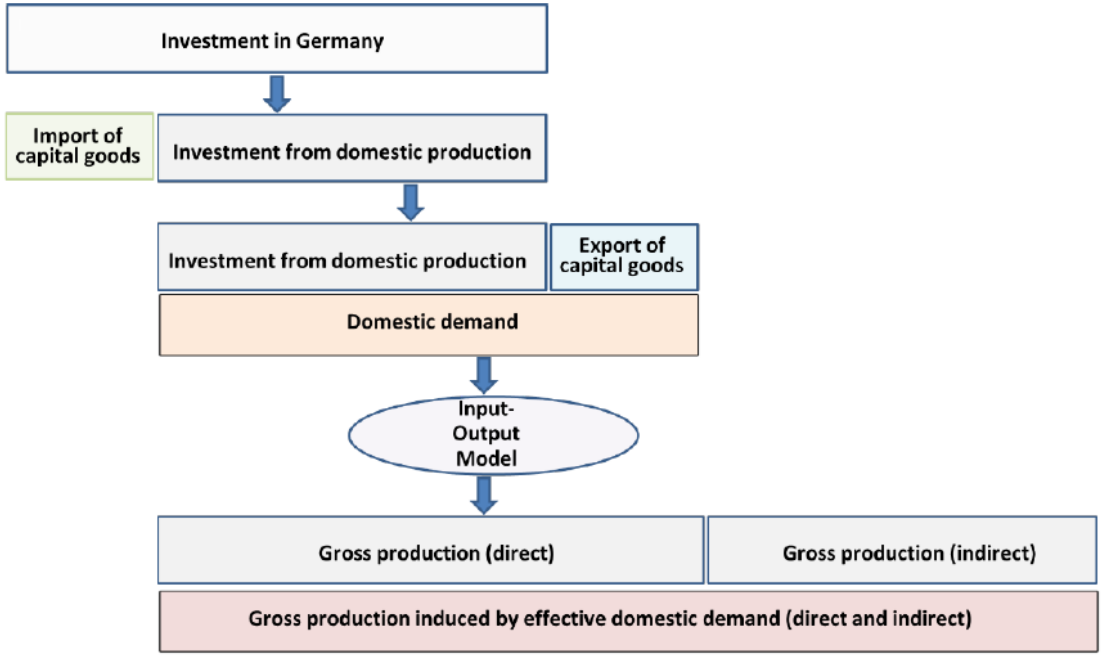


Concept

- CET and their value chain need to be identified in the existing IO classification of 36 production categories in order to implement them
- Information about the value chain enters over input coefficients in the IO table
- CET are not only produced domestically but also traded on a global scale
- Trade in CET goods is reported in a classification other than IO
  - ⇨ **How to match the classifications and separate different parts of the value chains?**

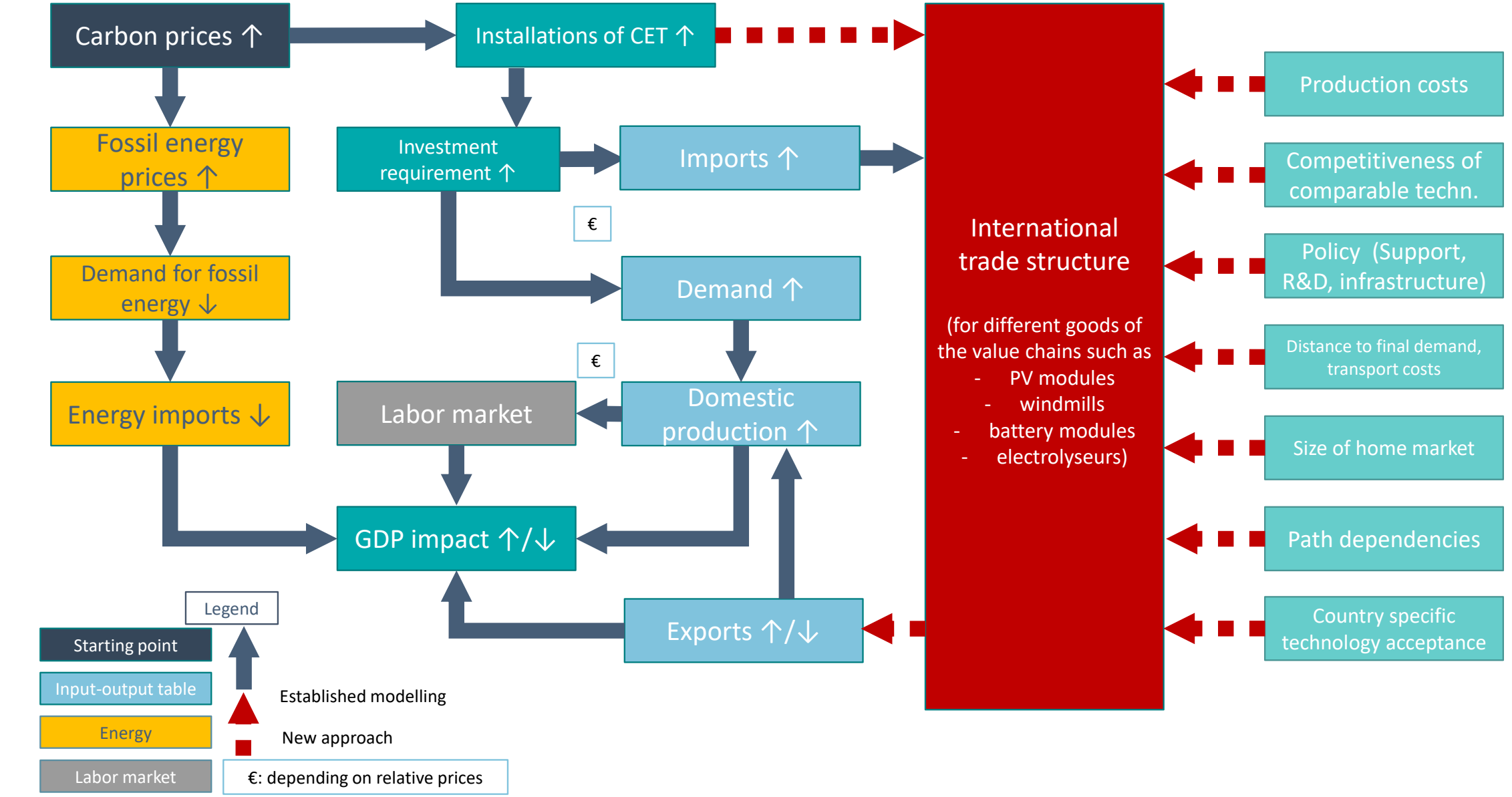
- Input vectors for 11 renewable energy technologies exist for (O'Sullivan/Edler 2020)
- Previous studies estimated the employment linked to RE in Germany using an input-output model

Schematic representation of the calculation steps for deriving effective domestic demand and gross production



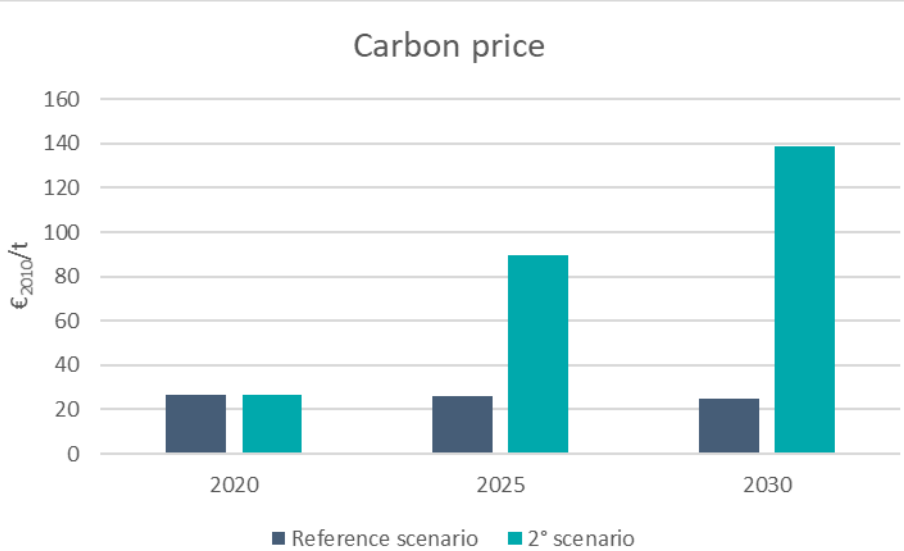
Source: O'Sullivan/Edler (2020)

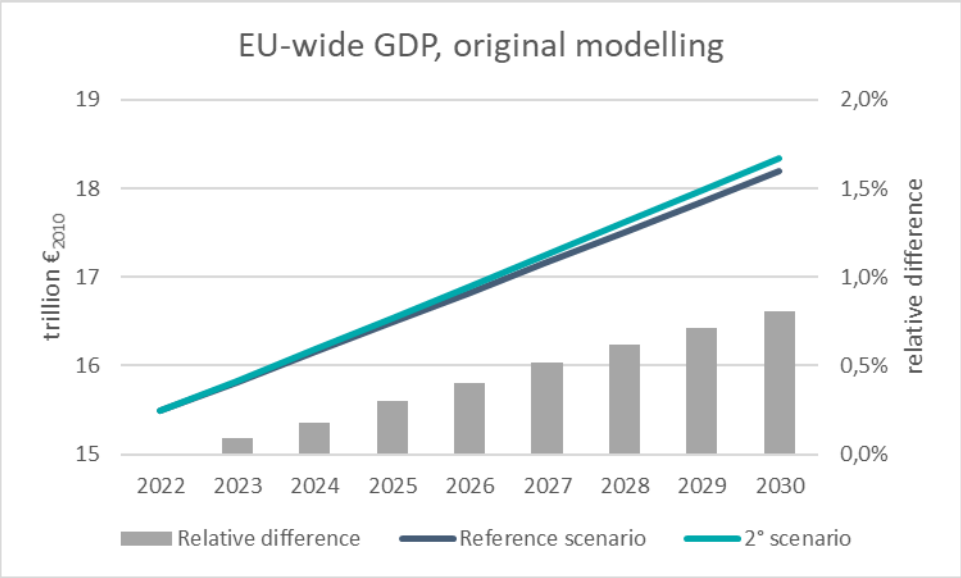
Modelling approach

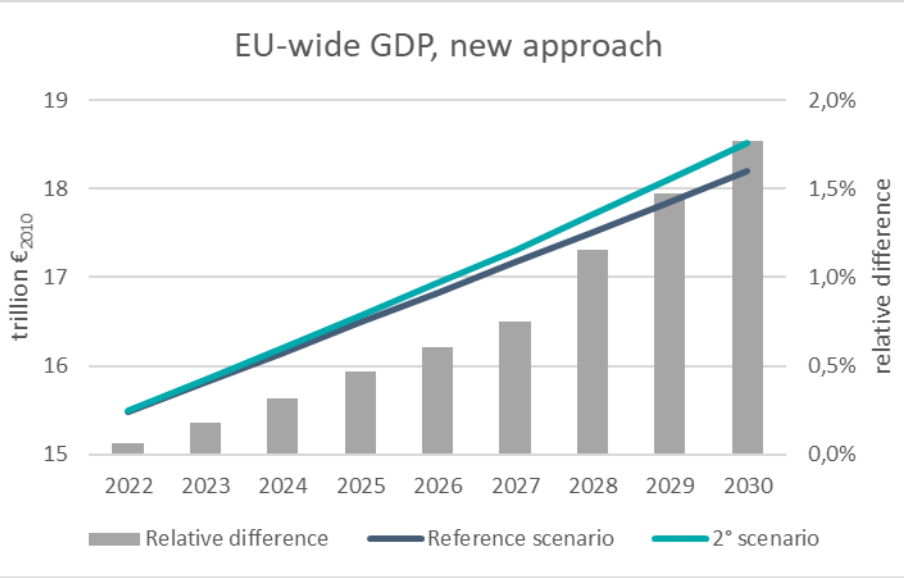


First results

- **Reference scenario** without further mitigation
- **2° scenario** (EU targets for 2030/2050 reached, also similar carbon prices in Rest of World)
- Higher positive GDP effect of mitigation (2° scenario) in EU in new approach







Outlook

- Integration of value chains of 14 CET in a global model with IO bilateral trade, energy and emissions

- Explaining shifts in production and trade flows of CET goods (trade patterns)
  - ⇨ What can be quantified?
  - ⇨ Where will lead markets be created?

- What is the role of policies and other country specific factors?
  - ⇨ Project partners from IZES will provide a socio-technical assessment based on regime (deficits and barriers) and landscape analyses for leading producer countries
  - ⇨ Incorporation of information into scenarios or use in modeling (endogenization)?

- Quantify impacts of ambitious mitigation targets under the new approach, evaluate the impact of different transition speed for individual countries

Thank you for your attention!

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- Mönnig, A. & Wolter, M. I. (2020): TINFORGE – Trade in INFORGE. Methoden-Update 2020. GWS Discussion Paper 2020/4, Osnabrück.
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