

Supporting Technology Development with REMix: Identifying Key Properties for Future Energy System Relevance

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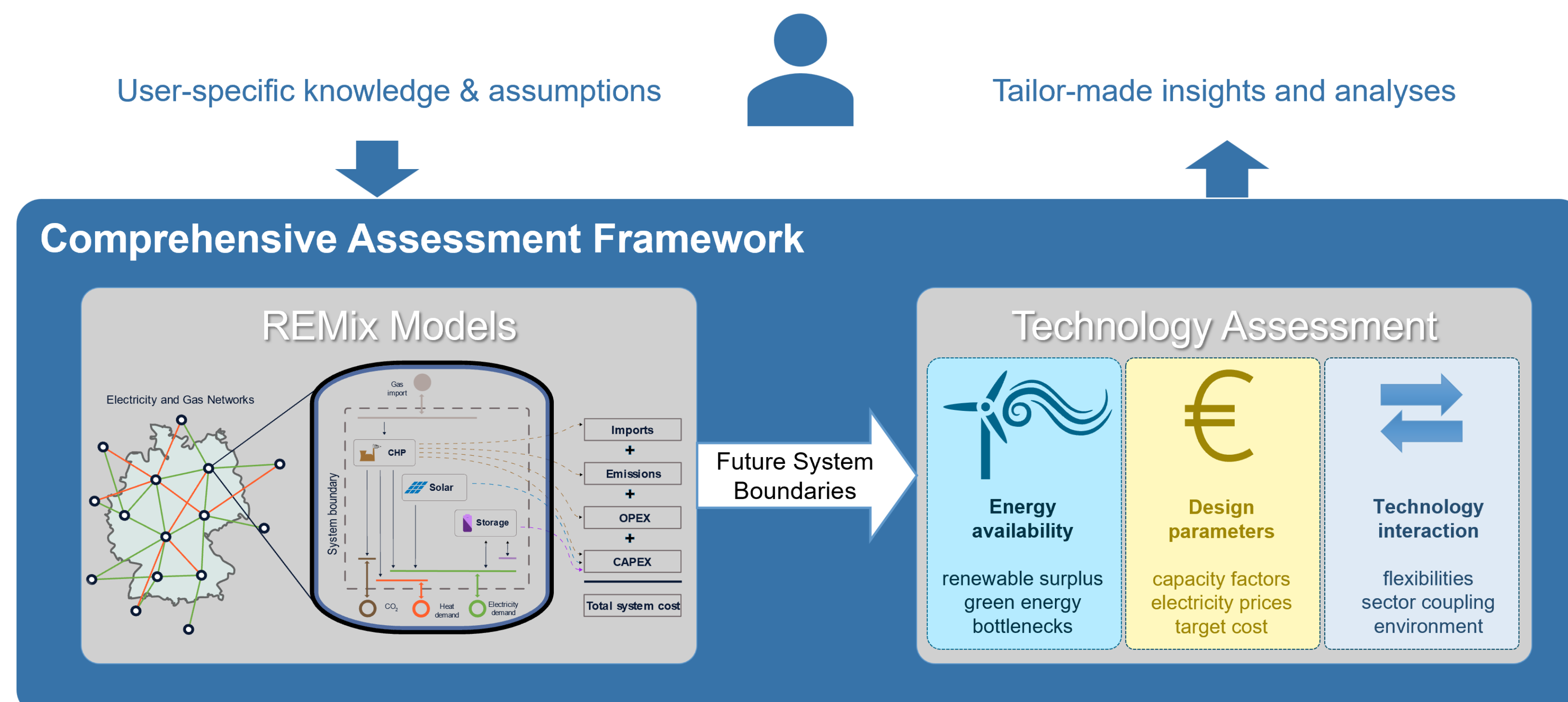


Fig. 1: Using the REMix Modeling Framework¹ as key component for scenario-based technology assessment

Stakeholders can **identify the most suitable sites for specific infrastructure** projects considering competition in the technology mix and forecast realistic operational patterns through data-driven modeling.

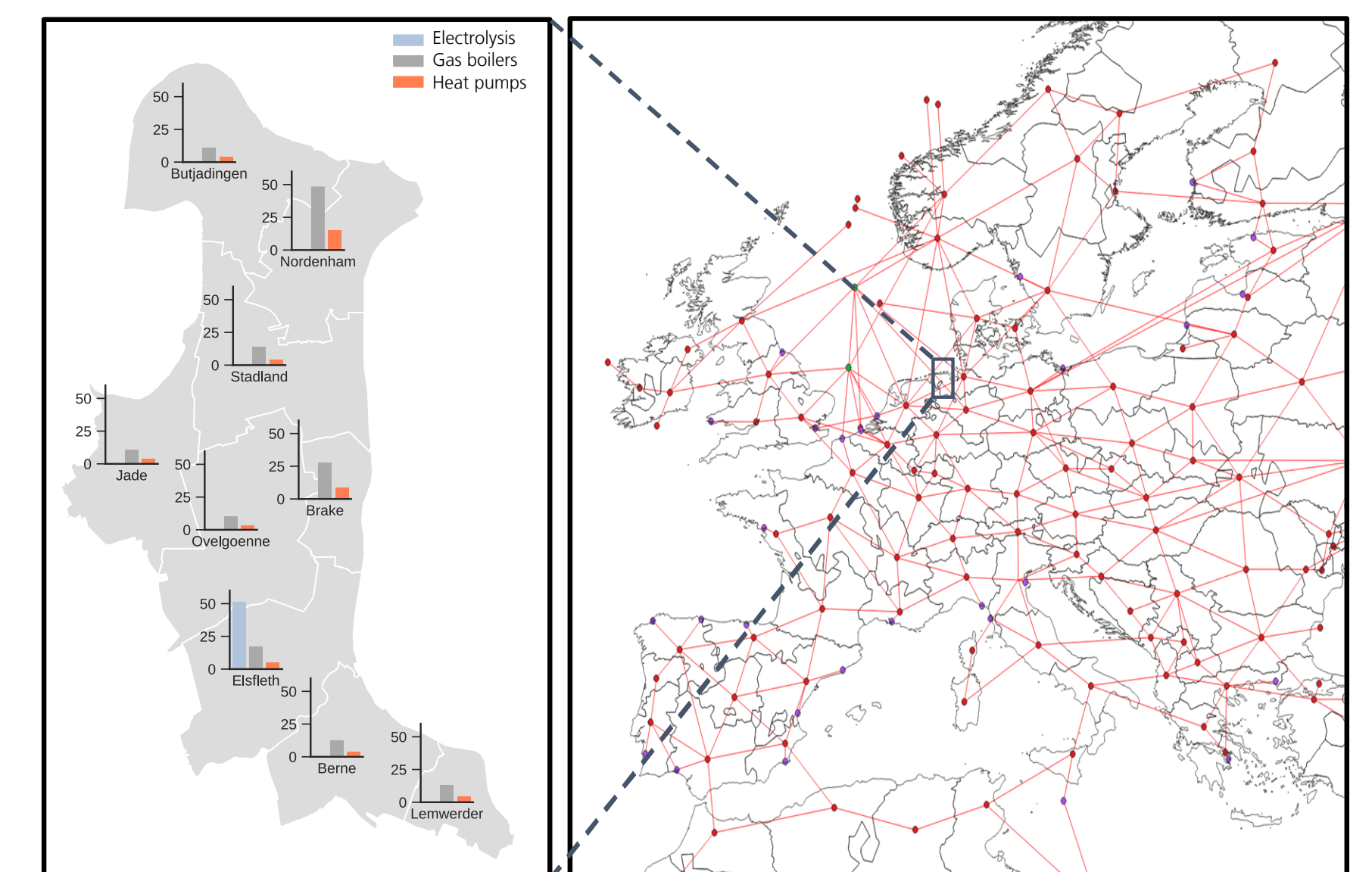


Fig. 4: Spatially resolved capacities of different technologies considered in sector-integrated scenario analyses of the German county Wesermarsch

Show case 1 Electricity prices vs. CO₂

We combined energy system planning (REMix) and electricity market simulation (AMIRIS) to obtain energy system indicators for thousands of scenarios².

Capturing uncertainties

- The modeling comprised sampling of
- techno-economic data such as CAPEX and OPEX of power generation, storage, and grid transfer,
 - CO₂ and fuel costs
 - technology-specific efficiencies

Additionally, renewable power feed-in was simulated using 25 years of historic weather data to capture variability and ensure **robust performance assessment** across different conditions.

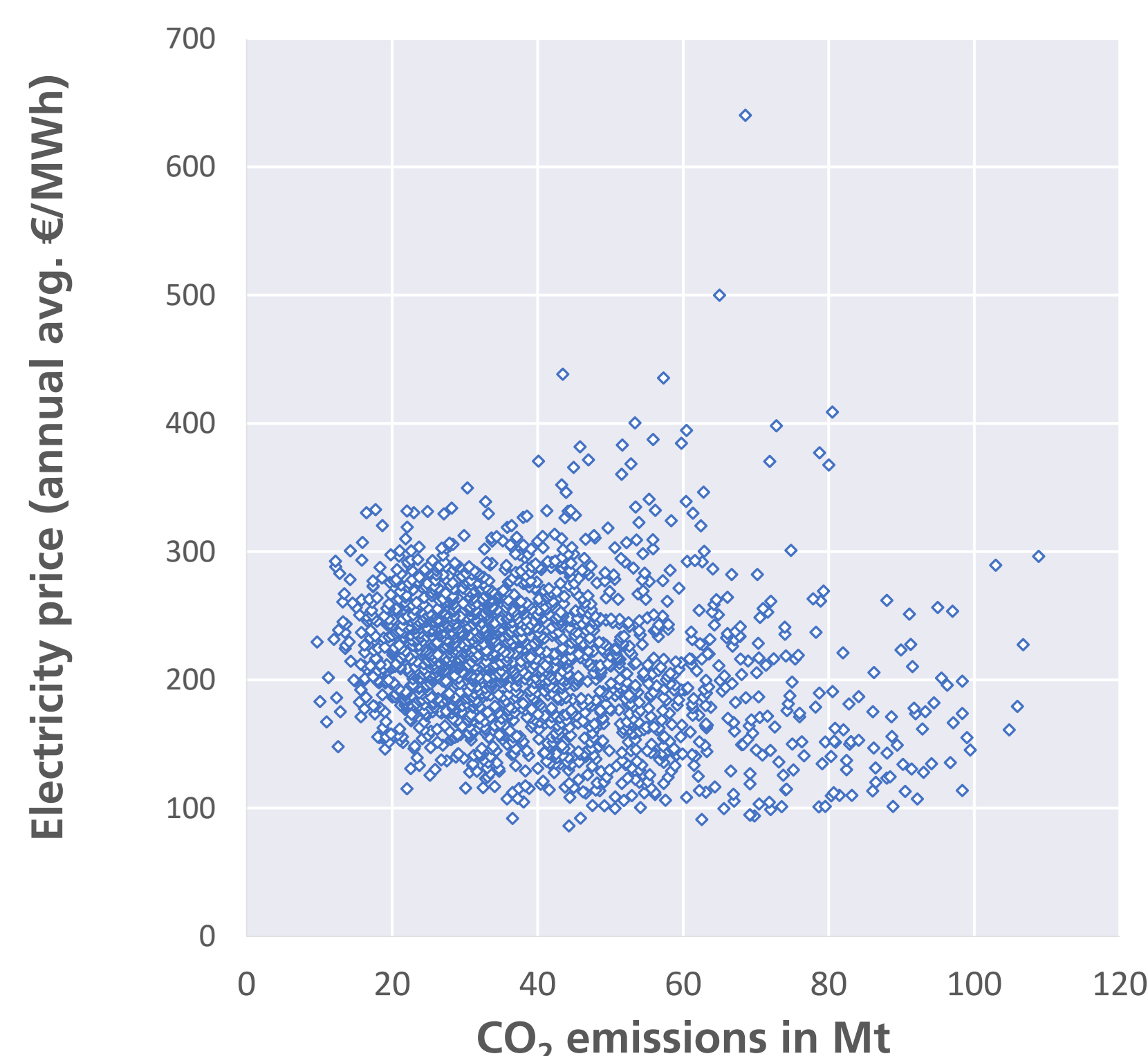


Fig. 2: Exemplary scenario results of the German power system usable as parameters for technology assessment studies.

Show case 2 Techno-economic targets

Which cost range needs to be reached so that Carnot batteries become a competitive storage option?

This question has been subject to the REMix application in the research project CarnoBat³. We found, that from today's perspective a **low-cost storage** medium is key for being beneficial in a least-cost German energy system.

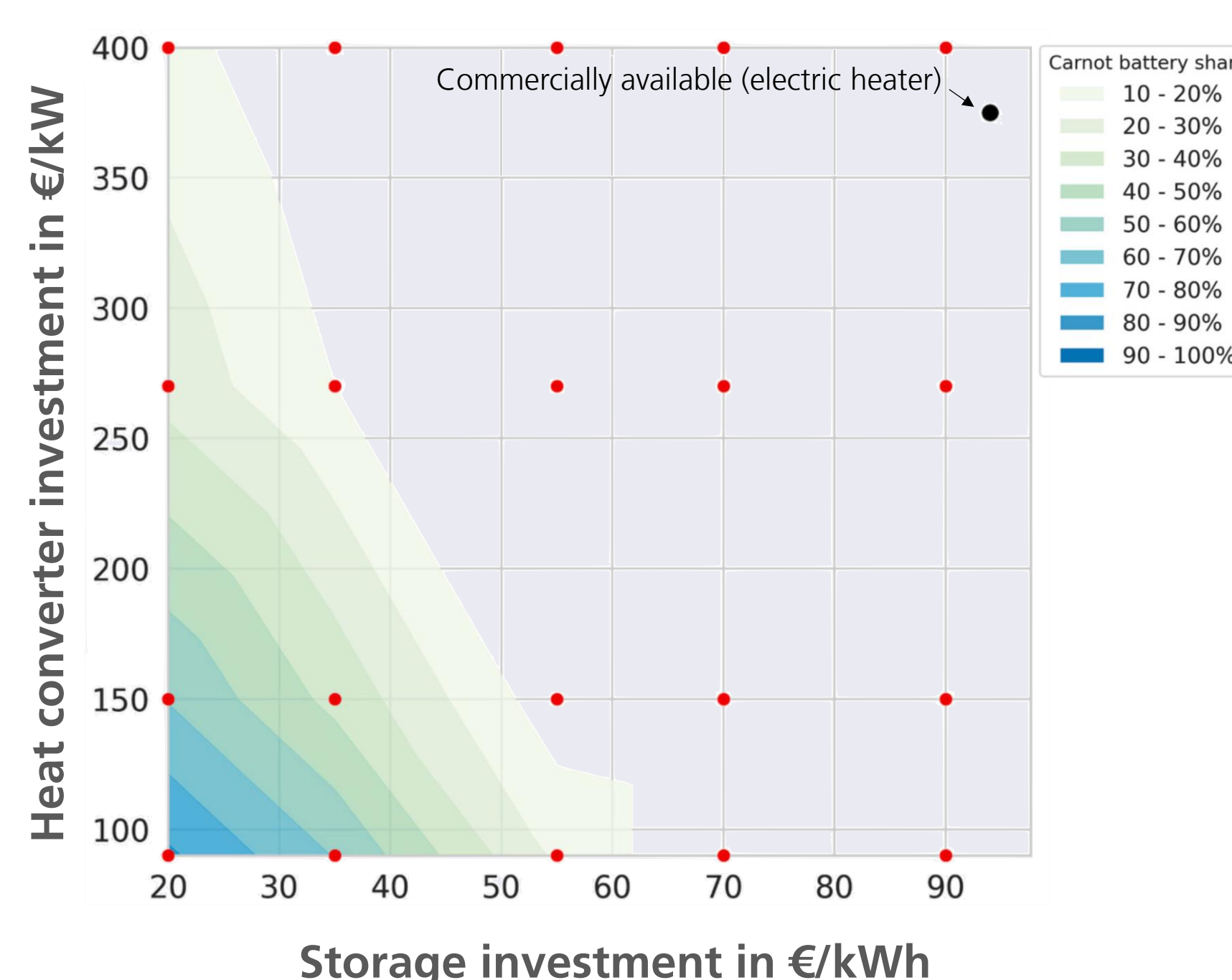


Fig. 3: Distribution of sampling of investment costs for gas-fired power plants used as input for scenario analyses with REMix.

Show case 3 Multi-vector infrastructure needs

REMix empowers technology developers to explore how energy technologies fit into tomorrow's **multi-energy systems**.

Beyond technology assessment

Incorporating user-specific aspects — such as **ancillary service** provision, stress case **resilience** or **critical raw material** requirements⁴ — enables the derivation of additional performance indicators to support techno-economic assessments and inform technical guideline development. This facilitates a **data-based prioritization of R&D activities**.

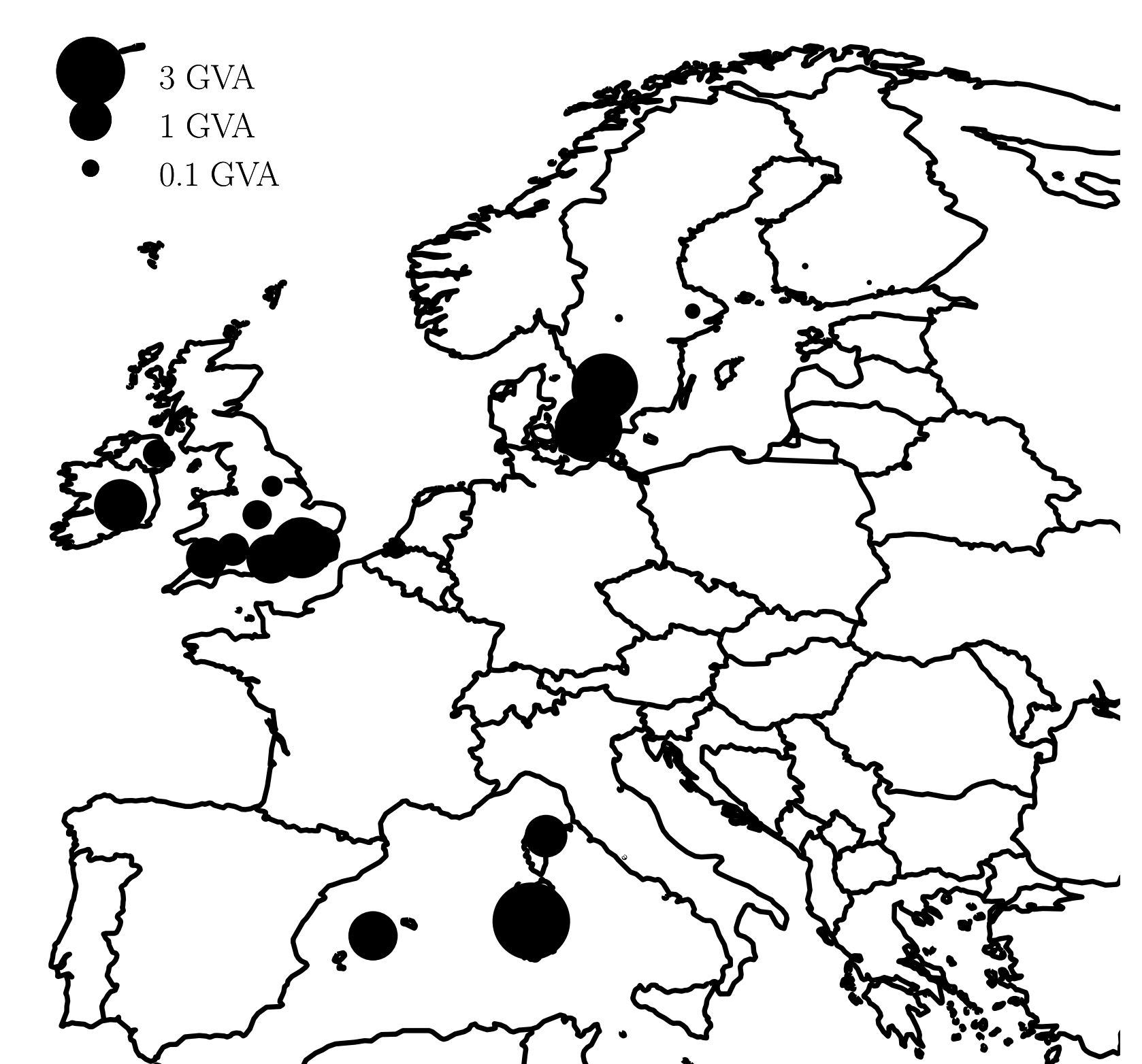
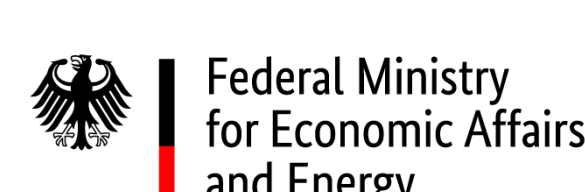


Fig. 5: Suitable sites for battery energy storage systems with grid-forming inverters to ensure a sufficient total system inertia in a scenario with inverter-dominated power generation.⁴

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- Cao et al. (2023): Evaluation of Uncertainties in Linear-Optimizing Energy System Models - Compendium. DLR-FB-2023-15. 95 S. doi: 10.57676/w2rq-bj85
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