



Vortrag im Rahmen des Seminars

Forschungskolloquium | Research Seminar

Autor:

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Titel:

Optimal mixes for dispatchable net-zero electricity generation: insights from screening curves

Abstract:

"Driven by the ambition to reduce greenhouse gas emissions, many countries aim to achieve a net-zero energy system in the future. While variable renewable energy sources (VRES), such as wind and solar power, play a vital role in achieving a net-zero energy system, it is clear that net-zero energy systems must also balance the intermittent nature of VRES generation with net-zero dispatchable power plants, such as hydrogen-fired or nuclear power stations. However, due to the uncertainty surrounding future power plant and fuel costs, it is unclear which combination of net-zero dispatchable technologies will be cost-optimal for which energy system. In this article, we employ the screening curve model in a Monte Carlo simulation with varying cost assumptions for 27 different energy system configurations, investigating which net-zero technology emerges as cost-optimal under which circumstances. To perform the Monte Carlo simulation, we compile a comprehensive cost database and methodically enhance the Screening Curve model to include inter-annual weather variability and battery storage. Preliminary results suggest that the firm capacity of the investigated net-zero energy systems is cost-optimally provided by a combination of batteries, blue hydrogen-fired power plants, and nuclear power plants. With rising shares of VRES, the firm capacity of nuclear power plants decreases, while the firm capacity of batteries and blue hydrogen-fired power plants increases. A sensitivity analysis will be conducted to investigate the effect of specific cost parameters on the results, and the findings will be presented in the research seminar."