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Scenario-Based Open-Source Data for Offshore Wind Energy in the North Sea: Facilitating Energy Research and Modeling

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Extended Abstract

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Abstract Summary

To meet Germany's climate goals, offshore wind energy in the North Sea is planned to expand from 9 GW to 70 GW by 2045, with EU targets reaching 300 GW by 2050. Current uncertainties in planning and implementation highlight the need for comprehensive, scenario-based data to conduct energy research in the North sea and assess trade-offs in resilience, sustainability, and economic efficiency, especially in long-term horizons.

This study addresses the lack of high-resolution, scenario-based datasets for offshore wind modeling. Existing datasets cover current infrastructure and short-term plans but lack long-term projections with offshore detail. A two-fold methodology is employed. First a review of existing datasets, assessing quality, licensing, and interoperability is performed. Based on the results, an open-source dataset across three time horizons, current status, 2030 expansions, and 2050 scenarios, is constructed.

Preliminary findings confirm gaps in long-term, high-resolution offshore data. The proposed dataset will include wind farms, market dynamics, and grid infrastructure, enabling robust modeling for market design and system integration. This work provides a foundation for evidence-based decision-making, supporting Europe's transition to a climate-neutral energy system.

Presenting Author Biography

Philipp Menge is a research associate at the Working Group of Economic and Infrastructure Policy at the Technical University of Berlin. His research focuses on the integration of offshore wind energy, operations research methods in energy systems, and innovative renewable energy technologies.

He holds an M.Sc. from TU Munich and a B.Sc. from the University of Mannheim, where he was part of the IBEA program. Prior to joining TU Berlin, he attended the Graduate School of Economic and Social Sciences at the University of Mannheim and contributed as a research assistant at the Mannheim Institute for Sustainable Energy Studies.