

Energy System Modelling of the Baltic Sea Region: Offshore Wind Farms, Hydrogen Systems, and Grid Infrastructure

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In collaboration with TU Delft and Witteveen + Bos, the research project aims to develop an energy system model that provides valuable insights into the optimal configurations of offshore wind farms, hydrogen systems, and grid infrastructure in the Baltic Sea Region. The project builds upon previous research by Witteveen + Bos and is intended to assist the firm in the decision-making process for future renewable energy project development in the region.

Previous research by Witteveen + Bos involved the development of an energy system model for the North Sea Region. The firm envisions opportunities for renewable energy project development in the Baltic Sea Region, specifically from its office in Riga, Latvia. To achieve this, the energy system model needs to be adapted to the region's unique characteristics, including meteorological, seabed, and ice formation conditions for optimal offshore wind farm placement. Furthermore, it necessitates an investigation of the region's existing grid infrastructure to model the optimal transmission and interconnection of future offshore wind farms. Lastly, the adapted energy system model aims to determine optimal hydrogen system configurations. Overall, adapting the energy system to the Baltic Sea Region is a technical endeavour carried out through Python. The research project concludes with a case study, sensitivity analysis, and recommendations.



Figure 1 Bathymetric map of the Baltic Sea
(David Sandwell, Satellite Geodesy, IGPP, SIO, University of California San Diego., n.d.).
Bathymetric conditions are a determining factor in optimal wind farm placement
within the energy system model.