BaltHub:
Offshore energy hubs in the Baltic Sea

Background

BaltHub analyses the cost-effectiveness of Baltic Sea energy hubs using integrated energy system analysis of the Baltic-Nordic region and beyond. Such hubs have offshore wind power connected far in the sea where wind speeds are high. The hubs can also be used to interconnect the onshore energy systems of the Baltic Sea countries, allowing efficient flow of energy and a more interconnected overall energy system. Offshore energy hubs can also provide for the expected increase in electricity demand due to sector coupling, driven by electrification of the heating and transport sectors.

The impacts of key parameters, such the level of electrification and sector coupling, on the offshore hubs' cost-effectiveness are investigated via scenario and sensitivity analyses. The results help decision makers in identifying the key parameters affecting offshore hub buildout in the Baltic Sea region.

Key research questions

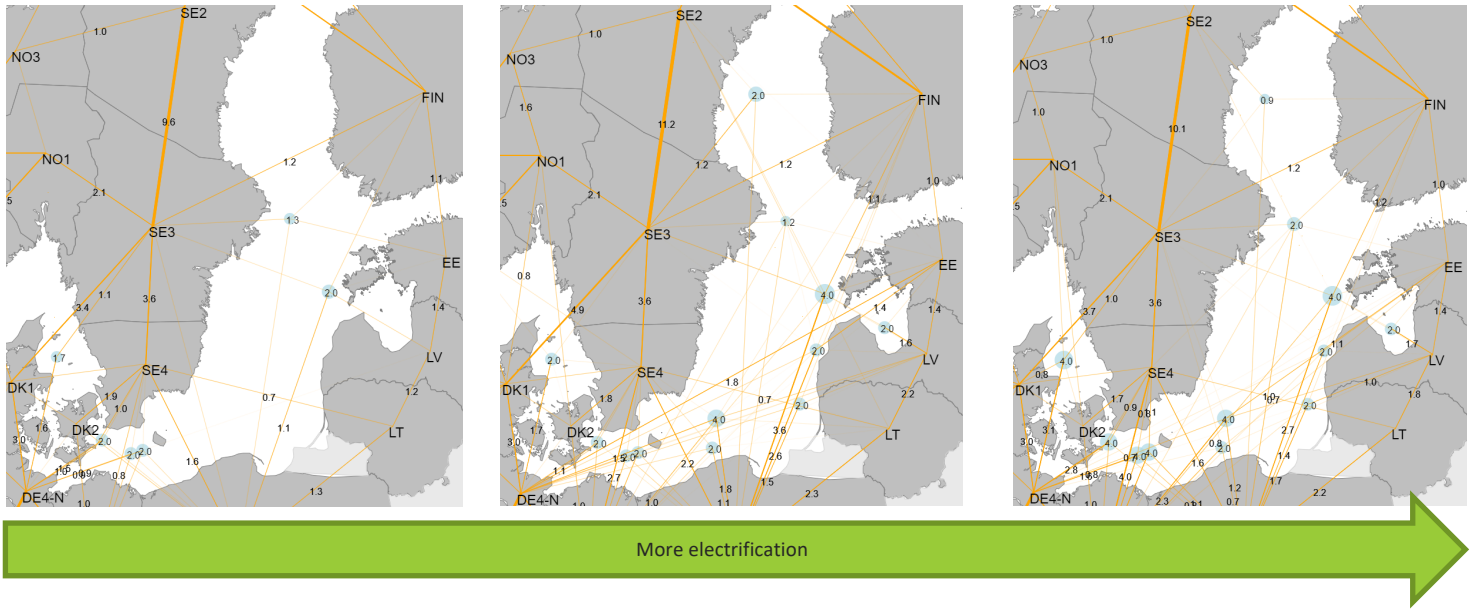
BaltHub studies the cost-effectiveness of Baltic Sea offshore energy hubs for driving the green transition in the Baltic Sea countries

- Are Baltic Sea energy hubs a cost-effective solution for driving green transition in Baltic Sea countries? How is this impacted by key input parameters?
- Do large-scale wake losses jeopardize the cost-effective buildout of offshore energy hubs in the Baltic Sea?
- Are the hubs beneficial in interconnecting the Baltic Sea region's countries?

Key findings:

1. **Baltic sea energy hubs are cost-effective**
   - Especially in highly sector coupled scenarios towards 2050
   - Although they see somewhat lower relative penetration than in the North Sea
   - Offshore wind hubs are in competition with onshore wind, and solar PV in the south
2. **Large-scale wakes do not prevent the cost-effective buildout of the hubs**
   - But somewhat smaller hubs in the Baltic Sea compared to the North Sea are expected
   - Northern-most locations in the Baltic Sea may be infeasible for energy hubs
3. **Hubs are integrated as part of the transmission system**
   - But more detailed studies required to find the exact cable sizes

Baltic Sea energy hubs (blue circles, in GW) and transmission lines in different scenarios by 2050



Scientific publications:

- M. Koivisto, et al., "Offshore energy hubs: Cost-effectiveness in the Baltic Sea energy system towards 2050", *Wind Integration Workshop*, Berlin, Germany, 2022
- J. Gea-Bermúdez, et al., "The Value of Sector Coupling for the Development of Offshore Power Grids", *Energies*, 2022 (https://doi.org/10.3390/en15030747)
- R. Bramstoft, et al., "The role of offshore energy hubs in future integrated energy systems", journal paper being written

About the project

- Funded by Nordic Energy Research
- Active from 2021 to 2022
- Budget: 1.7 million NOK (162,000 EUR)
- Partners: Technical University of Denmark, SINTEF, Tallinn University of Technology, Kaunas University of Technology
- Observers: Energinet, LITGRID, Fingrid and Elering

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