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Interactive comment on "North Sea region energy system towards 2050: integrated offshore grid and sector coupling drive offshore wind installations" *by* Matti Koivisto et al.

Anonymous Referee #1

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This paper looks at three different scenarios for the development of offshore wind in the North Sea region until 2050:

i) Regular electricity and district heating demand and offshore parks connected to country hubs on a project-by-project basis;

ii) Regular electricity and district heating demand and hubs in the North Sea for a meshed grid connecting offshore parks to the mainland;

iii) Adding to the demand industry demand, partial electrification of transport, but no individual heating for buildings.

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Discussion paper

The paper compares i) and ii) with regards to wind generation and curtailment, then examines these metrics in scenario iii).

The topic is very interesting and the authors have done impactful work in this area in the past, but this paper feels thin and disjointed.

The comparison of i) and ii) repeats results from a previous publication, as the authors admit, adding only the curtailment results, which I don't think is high added value. As they are presented here, the results miss a lot of important information like the total costs, which are presumably in the other paper.

The addition of scenario iii) is an important further development of the model, but I'm not sure why it's bundled together with the comparison of i) and ii) in this paper. Also the results are rather minimal and presented in only 1.5 pages. Surely there is more to say here?

There is so much more that could be considered:

- What is the role of hydrogen? We're seeing a lot of new projects pairing offshore with electrolyzers, which is relevant for industry demand (steel, heat, ammonia, etc.). - Why no heat pumps for individual building heating in France / Germany / UK? Only Scandinavia has significant shares of district heating. - Building renovations? - Wake effects for offshore? DTU has led the field in this analysis. - Dependence of offshore build-out on recent cost developments and low acceptance for onshore wind.

More specific comments:

- The literature review is minimal and mostly contains self-cites. - Figure 1 has low information content. - The year for the reference Gea-Bermudez, Koivisto, & Münster oscillates between 2019 and 2020 or are there 2 publications? - What were the values of the CO2 tax? - Biofuels: what potentials in particular were considered here?

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