WES-2023-156

Response to Reviewer 2:

Firstly, thank you to the reviewer for taking the time to review and provide comments for this manuscript we appreciate it. We will address the reviewer's comments which are in **black bold** font with our response in *italics*.

The manuscript entitled "Operations and Maintenance Cost Comparison Between 15MW Direct-Drive and Medium-Speed Offshore Wind Turbines" deals with a very interesting topic, which is very important for the near future development of wind turbine technologies.

In a nutshell, the authors analyze the O&M costs of 15 MW direct-drive and medium-speed offshore wind turbines. An O&M model named StrathOW (which I guess has been developed at the University of Strathclyde) is employed to simulate scenarios and the input of the model is given by reliability data for the various sub-components which are taken from the literature. A sensitivity analysis is conducted and extreme cases are contemplated as well.

Thank you, Davide, for taking the time to review this submission to Wind Energy Science. We appreciate the positive feedback you have given and will address any suggestions to improve the manuscript below.

The quality of the presentation is very good and my comments to the paper are minor.

1) I would appreciate some more details about the application of the O&M model. It would be interesting for me to understand more in deep how much representative the results are.

You are correct that the model was developed at the University of Strathclyde. The application of the model is seen with our industrial partners who utilise this model for operations and maintenance modelling at present. As with all operations and maintenance models, they are never 100% representative, as the nature of O&M is that results are variable dependent on their inputs and a model will always carry some uncertainties around the results. However, we feel that this model captures important aspects and importantly highlights the difference between the two configurations. The values of cost are not necessarily the most important but rather the cost difference between the configurations. For a more in-depth understanding of the model and how it was benchmarked, Dinwoodie et al. have a paper, 'Reference Cases for Verification of Operation and Maintenance Simulation Models for Offshore Wind Farms' that provides more information (https://doi.org/10.1260/0309-524X.39.1.1)

2) Summarizing drastically, the result of the paper is that the former or the latter technology is slight more advantageous depending on a series of factors, which the authors discuss. I think that the wind turbine practitioners community might appreciate some more concrete guidelines, or at least criteria. Thus, I recommend to make an effort on this point.

We agree that it would be extremely beneficial if there were a set of concrete guidelines for developers but as alluded to before, operations and maintenance is a multi-faceted and due to multiple variables, often conclusions have to be more nuanced than concrete criteria. However, we acknowledge the reviewers point to make this clearer in our conclusion and so we have rewritten a section to highlight what the key takeaway for developers is, 'The study's key takeaway was that, in situations where site accessibility is limited, direct drive turbines prove

more economically viable for next-generation 15 MW turbines. However, with good accessibility, the cost gap between direct drive and medium speed configurations is reduced. Moreover, medium speed turbines might have lower operational costs than direct drive turbines if failure rates fall below a specific threshold, as indicated by the 5th percentile estimates from Jenkins et al. These findings hold significance for developers planning future wind farms with larger turbines, aiding them in selecting the optimal drive train for specific sites.'