

First Author: Nikhar J. Abbas

Manuscript Title: A Reference Open-Source Controller for Fixed and Floating Offshore Wind Turbines

MS No.: wes-2021-19

### Author's Response to Reviewers

We would like to thank the reviewer for taking the time to review our revised manuscript. We have carefully considered all of their suggestions, and have attempted to acknowledge all suggested modifications, clarifications, and overall updates to the paper. The tables below directly addresses each of the reviewer comments and how we have updated the manuscript accordingly. All equation references correspond to the revised manuscript.

In addition to the changes directly addressed in this document, a few minor updates have also been made to our manuscript to improve clarity of some ideas.

Further, a color-coded revised version is provided at the end of this document, which shows all of the changes that were made to the manuscript. All text in blue has been added to the manuscript, and the text in red has been removed. Figure 15 has also been added for this revision.

Comments from Referee #1	Authors' Response
Line 17: As stated in the revised manuscript, the proposed open-source controller reduces the maximum thrust by over 10%. It also reduces the maximum platform pitch angle by approximately 20% when using the platform feedback routine instead of a more traditional low-bandwidth controller. These numbers are shown to convince the reader of the merit of the implemented algorithms, and I agree they look promising. However, I am missing a comparative analysis of the wind turbine power output and in particular the annual energy production. If a reduction in the turbine thrust happens at the same time with a reduction of the annual energy production, then it is questionable if the proposed change has a positive overall impact. I suggest that the authors consider adding a simple calculation to evaluate the annual energy production for a given site of their choice and compare the results. If a reduction in the maximum thrust happens at the same time with an increase of annual energy production or at least the same	<u>Response</u> Thank you for this feedback. A more detailed analysis of the IEA-15MW wind turbine has been included to better highlight the tradeoffs of using different outputs of various controller implementations on the IEA-15MW wind turbine.
	<u>Changes</u> An AEP comparison is now provided in Figure 15 and is discussed in the surrounding text.

<p>annual energy production, then the authors can fairly conclude that the proposed open-source controller is effective and better than the existing controllers.</p>	
<p>It would be nice if the authors could provide a detailed view of the changes to the wind turbine loading for different DLCs, and at critical locations such as blade root, high and low speed shafts, and tower top and bottom.</p>	<p><u>Response</u> We appreciate this suggestion. Some more details of the DLC results are provided.</p> <p><u>Changes</u> An analysis of changes for the IEA-15MW with different controller configurations is provided in Section 6.2. Figure 15 has also been added to show the changes graphically.</p>
<p>Section 2.1 and conclusion: The controller design process of industrial wind turbines is more detailed than the simplified design process explained in this paper. I suggest that the authors clearly explain that their approach is suitable for an automated design of mainly region 2 and 3 based on fundamental control design principles available in the public literature. Having statements like line 606 (<i>“The controller structure is similar to many controllers that are seen on industry turbines that function in the field.”</i>) is not realistic and does not add any value to the paper. Real wind turbines operating in the field are more sophisticated in structure and algorithm than the proposed controller, and what is known to the public research community.</p>	<p><u>Response</u> Thank you for offering this feedback, it is well received. We have removed some statements and clauses that suggest that this controller might be very representative of an industry controller.</p> <p><u>Changes</u> The statement in like 606 has been removed, and the abstract and Section 2 have been updated for clarity.</p>