Answers to editor on wes-2022-109

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Answer to the editor

The paper is modified according to the suggestions of the editor (details in the next of this document). Moreover, the paper is generally improved and in particular the section 3. An error is corrected in the computing of the fatigue of the pitch bearing (Figure and comments are corrected).

The editor remarked:

1. "Thank you for the revisions. I would still request one last round of revision related to Section 3. The results added to Section 3 generally strengthen the paper, but Section 3 has become rather difficult to follow. It is suggested that a table should be added to more clearly define all of the different control strategies that are compared, and the strategies should be referred to with names that are easy to relate back to such a table".

   Answer: Thank you for the remarks and corrections. The suggestion is accepted and a table is added resuming the controller strategies compared with the respective parameters $k_P, k_I and k_\beta$. The names used for the strategies in the text are the same employed in this table, helping the reader to have a reference of the strategies compared.

2. "Line 49: Note that the blade pitch control responds to an increase in rotor speed, not directly to the increase in the relative wind speed."

   Answer: the link between wind speed increase, aerodynamic torque increase and rotor acceleration was implied for brevity. A longer sentence is now in the manuscript to clarify this mechanism.

3. "Line 151: operative or operational?"

   Answer: "operational" seems more adapted in this sentence to express the idea that the compensation is used to obtain the same performance of a bottom-fixed wind turbine. Hence "operational" replaces "operative" in the manuscript.

4. "Line 158: typo "ot", and "it translates to" rather than "in""

   Answer: both corrected, thanks.

5. "Line 190: The sentence beginning "every component" is not a grammatically complete sentence."

   Answer: Sentence corrected with the following one: "Every component of ~~which~~ G(s) can be written as the quotient of a polynomial in s and $\chi_a(s)$".

6. "Figures 6 and 7 should be include axis labels and Figure 7 should be explicitly named in the text."

   Answer: Figure 7 is now explicitly named in the text. Values in Figure 6 and 7 are poles and zeros of the transfer function of the system in the complex domain. The labels for the real and imaginary part of the complex domain are now added in the manuscript.

7. "The explanation for the change in mean platform pitch in Figure 9 should be included in the paper."

   Answer: The answer given to the reviewer n.1 is now added in the manuscript with the associated Figure.

8. ”Why not include the ROSCO controller in these results with regular waves and constant wind as well? ”

   Answer: The test case with constant wind and monochromatic waves aims at verifying the analytical developments of the previous section. For this test, it is not recommended to compare performances of different control: it has not an added value in the comparison of the different controller strategy because those are ideal environmental conditions, they are not realistic and any comparison would not conclude on the pertinence of the controller strategy. In fact a controller performing well in this case could perform badly perform in a more realistic environment. The test has a sense when an analytical form of the controller is given and the comparison with the analytical results can be given. The idea is to show that a numerical model evolving in the same conditions of the analytical analysis reproduces the expected behaviour.

9. ”And are detuned coefficients used with the ROSCO controller? This seems unrealistic, as the aim should be to avoid detuning.”

   Answer: Concerning the coefficients ν_{rot} and ζ_{rot}, many tests have been performed to select the ones giving the best results for this floating wind turbine. Once tuned, they are kept constant for the three strategies. It is to be underlined that in ROSCO controller the tuning of k_β is not correlated to the tuning of ν_{rot} and ζ_{rot}. In fact, those coefficients are tuned separately from the floating feedback coefficient, as done in this article. Moreover ”detuning” is actually the adaptation of the coefficient to the specific floating system (see Hu, et al. (2021), Implementation and evaluation of control strategies based on an open controller for a 10 MW floating wind turbine. Renewable Energy. 179. 10.1016/j.renene.2021.07.117.).

   As the editor underlined previously, it is worth to show the benefit of considering an explicit definition of k_β adapting to the operating point and evolving in time with respect to a single time-constant and not adapting k_β. It doesn't depend on the choice of ν_{rot} and ζ_{rot}. What is important is that the same ν_{rot} and ζ_{rot} are considered for the different strategies, in order to underline the benefit of the choice of k_β. A comparison considering too many parameters changing from one term of comparison to another one is difficult to be understood.

10. Line 588: “it reduces fatigue damage” by, not for

    Answer: corrected