Answers to reports on wes-2022-109

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Answer to anonymous referee 1

1. Reviewer claims: "My earlier question on Figure 6 "Why does the mean ptfm pitch change, if we're just feeding back velocity, rather than position?" is not resolved. I did not compare against Figure 5 but only the lines within Figure 6. I don't understand why the mean value would change in closed-loop if the "plt" controller feeds back velocity rather than position."

   We are sorry that we didn't understand the question last time. Now it is clear. The change in the mean platform pitch value is motivated by the difference in the mean value of the blade pitch (see Figure 1 of this document). One can compare the high values in the peaks for $\zeta_p lt = 0.25$ with respect to the other curves. The minimum does not change with respect to the other cases. It results in a higher mean value for the blade pitch. Thus, the latter leads to a lower thrust force in average. This makes the platform pitch mean (the static part) value lower than $\zeta_p lt = 0.1$ and the reference.

   The reason of the peaks in the blade pitch can be motivated by the combination of high demanded damping ($\zeta_p lt = 0.25$), with the proximity to the rated wind speed (the controller is on the boundary of regions 2.5 and 3) and also the wave period. In fact, for case (2), where the wind speed is the same, the wave period is much higher and this phenomenon is not produced (the platform pitch mean value is the same for all the values of $\zeta_p lt$).

2. Remark accepted and integrated in the manuscript.

3. Remark accepted and integrated in the manuscript.

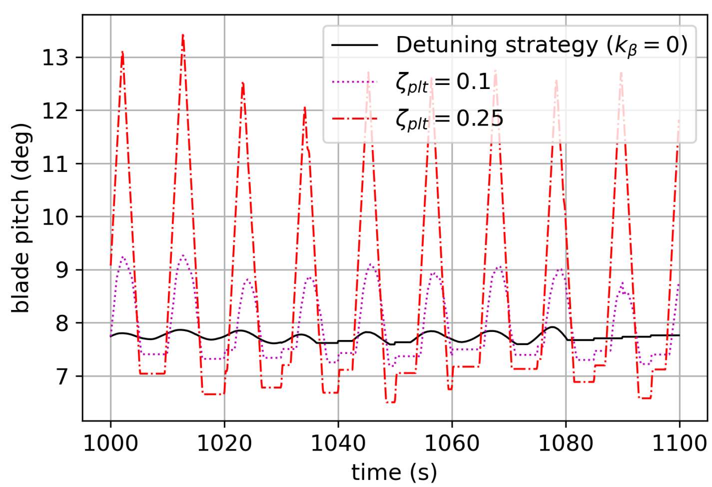

Figure 1: Blade pitch output for simulation reported in Figure 9 of manuscript (test case (1)). Mean value of the blade pitch for $\zeta_{plt} = 0.25$ is higher the other curves.

Answer to anonymous referee 2

1. Reviewer claims: "It is still difficult to understand the merits of this controller, compared to the standard ROSCO controller with a flipped sign k_β. The authors maintain that only a de-tuning method is used in ROSCO, but that is not the case as is openly defined here: https://github.com/NREL/ROSCO/blob/main/Test_Cases/IEA-15-240-RWT-UMaineSemi/DISCON-UMaineSemi.IN.

   This issue has been extensively addressed in the previous answer to the reviewers. In the manuscript, there is an entire Section (Section 2.5) dedicated to the the differences with respect to ROSCO controller. In this Section, equations (46) reports the explicit expression of k_β for our control strategy. equations (47) reports the explicit expression of k_β for ROSCO strategy. The two expressions are different because ROSCO calibrates the k_β in order to decouple the platform pitch dynamics and the rotor dynamics, while our strategy focuses on the platform damping. Moreover, The ROSCO controller, as downloaded by the github link, uses a unique k_β for a given simulation, even if the wind speed varies. In our strategy the k_β is explicitly defined and it is implemented to variate in the time series. With this paper, the reader is provided with an explicit formulation of the platform pitch compensation allowing to increase the platform damping and this explicit formulation has never been reported in literature. This is an important novelty (not present in ROSCO controller or papers related to ROSCO). Finally, it is to be underlined that we have never mentioned that only a de-tuning method is used in ROSCO. Perhaps the reviewer got confused because, for numerical tests, in Section 3, we have chosen a de-tuning strategy as reference for the comparison of results.

2. Thanks, it is corrected in the new version of the manuscript.