Please kindly address the following aspects.

From the methodological point of view:

- Could you please provide an explanation on why the load cases have been selected to have a 600 s duration referring to the IEC onshore standard taking into account this is a floating wind turbine?

- Section 5.1, from L350. Could you please clarify why the selection of optimal parameters is performed under nonlinear simulations with a specific implementation of the gain scheduling (mean wind speed) but the controller assessment is made with a different implementation (blade pitch angle)? This would represent a shortcoming from the methodological point of view, and would call into question the tuning process and, more particularly, its optimality. I'd strongly advise that the parameters selection and the controller assessment are performed in a coherent way with the same control implementation, taking into account that this seems to have an effect. Otherwise, it is very difficult to draw clear and solid conclusions from the results.

Other comments:

- Introduction, L56
  Could you please further emphasize the differences between your work and previous works in the optimization of parameters of multivariable feedback controller with non-linear aeroelastic simulations vs Zalkind et al.(2022), for instance?

  Also, in that paragraph, it would be interesting to better highlight which is the novelty and main contributions of the manuscript, since it remains a bit unclear: the controller structure? The parameter optimization process? Any controller implementation aspect? Any other aspects in the control design process?

- Please be aware that Table 1 exceeds the page limits.

- In section 3, it would be nice to separate the explanations about the ROSCO baseline controller and the modifications introduced with the multivariable feedback controller in section 3.1. For instance, the sentence at L151 would better fit when reference is made to ROSCO, not after commenting the modifications introduced by the authors.

- Figure1, please include the reference to Task 37 GitHub repository in the caption

- References. Please complete the references with works not belonging to the authors or their research groups. E.g. application of LACPF to floating turbines in the introduction.

- It would be nice in Figure 3 to better highlight (e.g. with a different color in the blocks) the additional part that the LACPF part adds to the MVFB controller scheme.

- Figure 3 – caption, “the real-time pitch angle” sounds a bit strange. Something like “measured blade pitch angle” would be clearer.

- L161, instead of “the speed control reference”, maybe “the generator speed control reference” would be clearer.

- L178, for the sake of clarity, could you please specify explicitly to which coupled frequencies do you make reference with “the motion is much more significant in the coupled-frequency ranges for floating turbines”?

- Please include the explanation of the complex frequency from equation (4) in equation (2) as it is the first time it appears.

- Equation (7) -> It could be a bit misleading to use the same Greek letter in this equation as the one used for the blade pitch angle.

- Figure 7, Figure 9 – caption: Could you please specify what do you exactly mean by “Only parts of the mean wind speed conditions are shown”? Maybe the sentence could be rephrased to make it clearer.

- Figure 9 – caption. For the sake of caption completeness, could you please specify the type of load case used in the simulation?

- L319 – Do you have any hypothesis on why the case of 14 m/s presents an increase in tower load and platform motion in Figure 9?

- Figure 9 – according to the figure, MVFB decreases loads more than LACPF+MVFB. Maybe this should be commented in the discussion.

- L316, L323 -> Please make clear reference to the figure you are discussing (Figure 9).

- L345. Please specify in the text that the figure and discussion refers to DLC 1.3 cases, not only in the figure caption.

- L357, the statement “which should be further improved by more advanced algorithms such as model predictive control (MPC)”. Should it be strictly improved by MPC? The statement seems to be a strong conclusion which cannot be directly derived from the results and their discussion, specially taking into account that the selection of parameters is performed with a different implementation of the gain scheduling than the one used for the controller assessment. I’d advise to present this comment as a

future work of interest for the authors rather than as a conclusion from the work performed.

- Figure 11 and L365. Since the cases with mean wind speeds higher than 12 m/s are not executed for stability 1 and 3, I'd advise not to plot any point for those speeds and stabilities since they could be misleading. Or is it really a typo and you meant 20 m/s in L365?

- Figure 11 – For the sake of caption completeness, please indicate which DLC cases are shown in the figure.

- When making reference to the obtained life extension in section 5.2, abstract and conclusions, a disclaimer should be introduced saying that this is based on the assumption that the fatigue life of the turbine is fully based on the DLC1.2 cases.

- L438: The sentence "However, a more detailed assessment can be further improved by more complicated modeling of the pitch actuator damage" sounds a bit strange. Do you mean rather a more complete modeling?

Language aspects & typos:

- L18, please correct the unfinished sentence "Under the same wind speed conditions"
- L55, please correct "to improving"
- Footnote 2: space between value and unit
- L165: openloop -> open loop
- L165: missing "and" in the sentence "both the blade pitch angles generator torque are kept"
- L318: As kp_float "increases"
- Figure 10 caption: interesting instead of interested?
- L429: space in between "%of"