

Associate editor decision: Reconsider after major revisions

We acknowledge that you have incorporated the reviewers' feedback to some extent. However, the paper does not yet meet the standards required for WES in its current form. Further revision is necessary, particularly in how the methodology, and results are presented. There is a general consensus that the research demonstrates potential, and we encourage you to refine the manuscript accordingly.

Additional private note (visible to authors and reviewers only):

- While your work demonstrates potential, the reviewers were generally not impressed by the revisions made thus far. However, they still recognize some promise in your paper. One reviewer has recommended rejection, while the other has suggested an additional review round.
- To provide you with a final opportunity to convince the editorial board and reviewers that your paper meets the standards of WES, I encourage you to thoroughly revise your manuscript. Please address the feedback provided in both the original and the new reviews comprehensively
- If you choose to submit a revised version, it is imperative that the manuscript undergoes substantial revision prior to being forwarded by the AE for further evaluation by the reviewers.

Dear Editor,

Thank you for your feedback and for the opportunity to revise our manuscript. We have carefully considered the reviewers' comments and made the necessary revisions to improve the presentation of the methodology and results. While we recognize that further refinement is needed, we believe these changes address the key concerns raised. Below, we outline the revisions made in response to the feedback.

Besides addressing the more nuanced comments from the reviewers and introducing some small improvements, our main effort during the review process has been making our contribution clear: we do not present a controller design method nor a fatigue prediction method; we present a **specification design method**. With that in mind, we have made the following substantial changes in the text:

- A new title "Design of fatigue-based specifications for the design of controllers in wind turbines"
- A thorough review of the abstract, so that the main contribution is clear.
- A simplification of the introduction. We have eliminated some information that might cause confusion about the main topic.
- Section 3 has been entirely re-written. The technical work is still the same, but we have presented it in a more deductive way. We hope it is clearer now.
- The first paragraph of the conclusions has been modified from

"This work has presented a method for the estimation of mechanical fatigue based on the use of the linear model of a wind turbine and its controllers and a numerical calculation of the variation of the damage with the load spectrum. Then, this method has been used for the design of control specifications"

to

"This article presents a method for designing control specifications based on mechanical fatigue. By having a priori information about the expected fatigue, the number of design

iterations and the time spent on aeroelastic simulations are reduced, making the control design workflow smoother.”

Thank you for your time and consideration.

The authors.

Reviewer 1

I would like to thank the authors for their efforts to improve the manuscript. While I see considerable potential in this work, I find the changes insufficient to resolve the concerns raised previously. Consequently, I am inclined to recommend rejection at this stage.

The primary reason for this recommendation is that the paper still lacks sufficient coherence in its presented objective and method, making it difficult to follow and occasionally confusing. Unfortunately, the changes made by the authors have not adequately addressed this issue.

Dear Reviewer,

thank you for the time and effort you have put into evaluating our work. After another revision of our work, our main effort during the review process has been improving coherence and making our contribution clear: we do not present a controller design method nor a fatigue prediction method; we present a **specification design method**. With that in mind, we have made the following substantial changes in the text:

- A new title “Design of fatigue-based specifications for the design of controllers in wind turbines”
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“This article presents a method for designing control specifications based on mechanical fatigue. By having a priori information about the expected fatigue, the number of design iterations and the time spent on aeroelastic simulations are reduced, making the control design workflow smoother.”

We have made our best effort to stress the main contribution of our work (the design of fatigue-based specification for control) and have tried to get rid of other expression that might be confusing for the reader (fatigue prediction / fatigue evaluation).

In addition, there are two smaller points:

- The comparison to the baseline controller still appears unfair, and this concern was not sufficiently addressed.

We have tried to emphasize that our work focuses on specification design and its correspondence with simulation data. We have included some changes in that direction:

- We have eliminated the explicit mention to fatigue indicator from the abstract and have focused on specification validation “The specification design leads to a fatigue reduction that has been validated via simulation with a mean error 1.07%.”

- The description of the baseline controller has been modified. We have added a paragraph to explain the absence of ATD in the baseline controller and strengthen the idea that control performance is not the key issue in our work: “Additionally, ROSCO includes switching, filtering and load reduction strategies, such as the Active Tower Damping (ATD). The ATD strategy reduces tower base fatigue by actively damping the first fore-aft natural frequency at the tower base. The ATD has been deactivated in the baseline control version in order to test the proposed method for the design of specifications, more specifically its accuracy when predicting the quantitative impact of the new specification. As a result, a significant reduction in fatigue is expected regardless of the chosen controller design method.”

The conclusions have been modified to stress the addition of ATD: “More specifically, the feedback pitch controller has been redesigned and the active tower damping have been introduced to improve the performance of the ROSCO PI controller.”

- The author's tracked changes document did not fully reflect the revisions in the latest manuscript, which complicated the review process.

We sincerely apologize for the oversight. Thank you for bringing it to our attention. We understand that the discrepancies between the tracked changes document and the latest manuscript may have complicated the review process, and we appreciate your time and effort in evaluating the submission despite this. We will ensure that future revisions are clearly and accurately reflected to facilitate a smoother review.

Despite these issues, I believe this work has significant potential as its technical contribution could be a valuable addition to our community. I strongly encourage the authors to revise the paper thoroughly and resubmit it to Wind Energy Science at a later time.

Reviewer 2

The authors have addressed the comments from the reviewer which makes the paper more stronger.

Dear Reviewer,

Thank you for your kind feedback. We are glad to hear that the revisions have improved the paper and addressed the reviewer's concerns effectively.

But there are still few points need to be corrected.

1. For completeness, in Figure 3, please also add the generator torque control loop.
The torque input has been added to Figure 3 (now Figure 2).
2. There is still typo mistake addressed by the reviewer, which is not corrected in the revision.eg. In the caption of Fig.4, "sorrounding" should be changed to "surrounding"
The caption has been modified in Figure 4 (now Figure 3).
3. Line 216, change "gain in dB agains phase in degrees" to "gain in dB against phase in degrees)".
The change has been made.