

Wind Energ. Sci. Discuss., referee comment RC2
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Comment on wes-2022-15

Anonymous Referee #2

Referee comment on "Probabilistic temporal extrapolation of fatigue damage of offshore wind turbine substructures based on strain measurements" by Clemens Hübler and Raimund Rolfes, Wind Energ. Sci. Discuss., <https://doi.org/10.5194/wes-2022-15-RC2>, 2022

This well-written paper refers to fatigue damage accumulation issues to predict/extend the future fatigue life of wind turbine substructures using monitoring data. The topic is very important and it is amazing that there is not more concern and scientific activity in this domain.

While the paper is focusing on fatigue action effects in WT towers due to wind action and issues of fatigue damage accumulation using the linear accumulation theory, the following items deserve at least some discussion in order to emphasize more the importance of fatigue damage calculations:

- The WT industry claims for a fatigue lifetime of substructures of only 20 years which is ridiculous from technical and environmental viewpoints. Private companies are obviously not interested in durable infrastructure; replacing WT every 20 years is very profitable for companies but has a very negative impact on the environment. The authors are invited to comment on the issue of useful service life to be expected from (environmentally friendly) WT.

- Measured strain (stress) values in WT towers show relatively small values but the number of stress cycles is very high. The fatigue issue related to WT towers is in the domain of Very High Cycle Fatigue. This should be discussed. F.ex., fracture mechanics based fatigue theories indicate a threshold of fatigue stress intensity at (welded) details for which stresses, beyond this threshold, do not contribute to fatigue damage. This item should be discussed in more detail and considered in the fatigue damage accumulation.

- Related to the previous comment, typical (welded) details in WT towers and their fatigue resistance should be discussed in more detail, because of the obvious link between linear fatigue damage accumulation and the assumed S-N curve of fatigue vulnerable details.

- A safety factor is introduced but it is not discussed on how a safety margin should be fixed for the present case of monitoring-based fatigue assessment approach.