"Impact of Wake Impingement on the Fatigue Loads in the Main Bearings and Blades of Offshore Wind Turbines" (https://doi.org/10.5194/wes-2026-13)

In this work, the impact of wake effects on the fatigue loads of offshore wind turbines is investigated. Two different loads are considered, the main bearing and the blade root bending moments. Loads are determined using openFAST in combination with FAST.Farm. Analyses are conducted for a two-turbine configuration as well as a real farm layout.

Analyzing the wake effects on fatigue loads in wind farms is a topic of high relevance for industry but also in research. The presented work addresses several smaller research gaps. Although no fundamentally new ideas are presented, the work is definitely of interest for the readers of WES. However, some issues must be resolved before I can recommend publication in WES.

Major comments:

1) Section 2.1.1: In my opinion, the explanations in this section are not sufficient. Surely, you do not have to describe the turbine model in detail again. However, important aspects should be mentioned. For example,
   a. You use a monopile, correct?
   b. Do you model waves? If yes, how?
   c. What simulation length do you use and do you remove initial transients at the beginning of each simulation?

2) If I am not mistaken, Eq. (5) to (9) do not fit the force/moment definitions in Fig. 1. For example, Fig. 1a shows that $F_{x,s} = -F_{x,MBs}$ (both arrows point in the same direction so that $\sum F_x = F_{x,s} + F_{x,MBs} = 0$). However, Eq. (9) states that $F_{x,s} = F_{x,MBs}$.

3) L. 178 (and others): You frequently write "blade root DEL". However, you do not specify which one. I assume that you mean the flapwise moment. However, it is not clear.
   This becomes even more problematic, as you use the "out-of-plane (OoP)" moment in Fig. 7. Flapwise and OoP are not the same, e.g., if the turbine starts to pitch the blades. Hence, be very clear in which DEL you use/show.
   When you use the flapwise DEL, this might have an influence on your results above rated wind speed. Due to reduced wind speeds in wake conditions, the turbine will pitch the blades less. Therefore, the flapwise moment remains "close to the OoP moment". This is something you might need to discuss/consider.

4) Eq. (11): At least for the DEL, this weighting is not correct. A correct weighting is given for example by Dimitrov et al. (https://doi.org/10.5194/wes-3-767-2018). You should use such a weighting: $WFL = \left(\sum w\, FL^m\right)^{\frac{1}{m}}$. Otherwise, low DELs are weighted too much, especially for high exponents m.
   I am not sure whether this is relevant for the bearing load as well. Please, check this carefully.

Minor comments:

5) In my opinion, the innovation of the paper could be stated even more clearly in the introduction. In line 34-37, the differences between this study and prior studies remain a bit unclear. In line 56-58, the novelty is stated explicitly. However, the statement in these lines is not self-explanatory.

6) L. 49: You state that one goal of your work is to deliver "an exemplary damage map". However, how generally valid can such a map be if it is just based on a single wind farm layout? If it is not generally valid, for what purposes is it still useful?

7) Section 2.2.1: You should briefly discuss whether linear damage accumulation is suitable for blades. You can do this in Section 2.2.1 or in the "Conclusions" where you already mention the composite material of blades.

8) Eq. (1): Did you apply a Goodman correction or something similar to account for time series with a non-zero mean value?

9) Eq. (2) and (3): Make clear where these equations come from.

10) L. 119: I think Fx, Fy and Fz have not been explained so far.

11) L. 130-140: Do you know or at least have an idea of how relevant the simplification of the selected (in contrast to the real) bearings is?

12) Table 2: Make clear, where this data comes from. In the text, it is somehow (but not clearly) mentioned, but here, it is missing.

13) L. 155-159: You nicely discuss that the metrics are not perfect. However, you do not state why you use them if they are not perfect.

14) Fig. 3: In my opinion, it would be very nice to see how wind speeds and turbulence intensity change at T1 for different crossflow offsets and turbine spacings (could be shown in an appendix using a similar plot as Fig. 3). This would help the reader to understand the connection between reduced wind speed and change in DEL, while the changed turbulence intensity seems to have no significant effect.

15) Fig. 3: The different colour bars in Fig. 3a and 3b are quite misleading. It seems as if the change for wind speeds above rated is much smaller in Fig. 3b, although it should be more or less the same, as the produced energy above rated remains (nearly) the same.

16) Fig. 3: How is the interpolation done?

17) Fig. 4: Perhaps, you can briefly explain "Case 1" and "Case 2" in the caption so that the figure is self-explanatory.

18) Conclusion: You might discuss the limitations of your work in more detail, e.g., just one type of turbine, just one farm layout, simplified shaft models, just one turbulent wind field (random seed) per load case, no/simplified consideration of wave loads, …

Typos, etc.:

19) Table 3: You forgot 16m/s.

20) Fig. 5: In the figure titles, it must be "$= 0.7D$" and "$= -0.7D$"