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Interactive comment on "The effects of blade structural model fidelity on wind turbine load analysis and computation time" *by* Ozan Gozcu and David Robert Verelst

Anonymous Referee #2

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General comments: The paper deals with the influence of modelling fidelity of turbine blades on the computational time and the derived loads. This is an interesting topic and has increasingly higher attention due to the larger turbine and eventually larger deflections and thus non-linearity in the response. The paper is well written and clear. The overall purpose and approach is clearly described and easy to follow. Graphics, tables and equations are presented well and consistently. Specific comments and suggestions: The paper starts out with a good overview of previous work in the area, and among other analyses, it mentions earlier work on the influence of non-linearity on stability. This is, however, not treated further in the paper and this is an essential shortcoming. It would be interesting to use the models established in this study also

for investigating the impact on stability, e.g. blade vibrations during operation or even flutter in speed-up cases. The reference for the HAWC2 input files is not active (Page 5 line 18). In the description of the computational setup based on the IEC61400-1 standard, only the DLC1.2 is included (page 7 line 5ff). The additional effort to include all fatigue relevant cases (at least fault cases 2.4 + start-up and shut-down) would have been minor, and since these load cases often involve extreme loads and thus extreme deflections, the impact of non-linearity could be high in such cases. This is a part missing the current paper. A paragraph (page 7 line 9ff) describe how one must be careful when considering ultimate loads in cases where the statistical variation is high. The statements are correct, but what is the intension with these statements? The ultimate loads are not really covered in the analysis, apart from sparsely in Figures 8+10. Some considerations are included on the pitch activity and on the pitch power consumption. It is not mentioned or considered how the frictional moments are influencing the torsional moment and thus the power consumption of the pitch drives. This must be mentioned and if it in an easy way could be included, it will strengthen this part of the analysis. In a side remark (page 14 line 3) it is mentioned that the AEP is only influenced 1%. This does not seem consistent with the relatively large difference in effective rotor radius (page 9 line 18-19). A further detailed analysis of the power production/power curves could be included. In the analysis of the normalized maximum loads (e.g. page 10 line 6) it is unclear how the statistics are derived. Is it absolute max or average of all realizations? In the conclusion it is stated that the behavior of the yaw moment is different than other loads (fewer sub-bodies underestimate loads). What is the physics behind this? Could be correct, but it need an further analysis and an explanation should be given. It is recommended that users model blades with "as many sub-bodies as there are structural elements". How is that conclusion derived? And how many structural elements are recommended?

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