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Interactive comment on "A fracture mechanics framework for optimising design and inspection of offshore Wind Turbine support structures against fatigue failure" *by* Peyman Amirafshari et al.

Anonymous Referee #2

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The manuscript presents a fracture mechanics strategy for defining the inspection intervals regarding fatigue crack growth in the supporting steel structures in offshore wind turbines (OWT). Even though the subject is highly relevant for the journal, some improvement needs to be made before it can be recommended for publication. The aim of many of the improvement is aimed for improving the readability of the manuscript.

1) The manuscript contains many abbreviations, and the use of them need to be somehow structured: a. Avoid using abbreviations in the manuscript b. Avoid using abbreviations for terms only used very limited in the manuscript c. Include a list of abbreviations and be careful to define the abbreviations the first time they are used and possible also

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Discussion paper

repeat them if it is a long time since they have been used last time

2) The fracture mechanical approach is presented as an alternative to fatigue damage accumulations approach, which in the manuscript is denoted an S-N method. Of the reviewer's opinion, they may more be considered as two complementary approaches. The fracture mechanical approach is well suited for describing fatigue crack growth, while the Fatigue damage accumulation approach is more suited for scattered fatigue damage evolution.

3) In line 107, it is stated that the compressive residual stress and shakedown phenomena can be addressed using fracture mechanics. They can also be addressed using the fatigue damage accumulation approach.

4) In line 170, it is stated that the criterion is particularly common for pipelines, pressure vessels, etc. But no-one of those cases is particularly relevant for OWT.

5) There is an inconsistency between equations 9, 10, and line 240: is Sig_UTS=Sig_U, I L_r,max=L_r.

6) Equations 11 and 12 can be written much shorter using a split equation with a curly bracket.

7) Equation 15, no definition of J'

8) There are issues with a number of figure and table references: E.g., line 269, 380, 383, 468, 497, 538, 552, 555, . . .?

9) Figure 9, it is unclear what is defining the length of I_1 and I_2, maybe add the safety factor on the predicted flaw growth curve. They should in someway be correlated with the tolerable flaw size.

10) In line 295, POD is not defined at this point.

11) Figure 10, the second axis in the first and third figure must be a frequency of occurrence and not a probability as it is the actual defect distribution. In addition, the

equation shown in figure 10, must be used the other way as it is the first figure, which contain the unknown.

12) Unclear correlation between figure 11 and table 1 and how is the largest flaw missed by the NDE method (line 327) defined as figure 11 is a continuous function only approaching 1.

13) Is the values are given in table 5 and 8 taken from the Gentils, 2017 reference or where are they coming from.

14) There are missing units on some of the values given in Tables 5 and 8.

15) Maybe the sub-section headline “Crack growth in Air” should be reformulated as a crack can not grow in air.

16) The colors of the lines in figure 21 should be made so it is clear what curves are related.

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