

Wind Energ. Sci. Discuss., referee comment RC2  
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## **Comment on wes-2021-55**

Anonymous Referee #2

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Referee comment on "Wind Turbine Ice Detection Using AEP Loss Method – A Case Study" by Jia Yi Jin et al., Wind Energ. Sci. Discuss., <https://doi.org/10.5194/wes-2021-55-RC2>, 2021

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This paper used two approaches to estimate the AEP loss of a wind park in Norway due to icing. The first approach used a statistical investigation of the SCADA data, while the second approach compared the observed AEP with the results from a CFD study. The paper also tried to optimize the wind farm using the CFD tool, but this didn't seem to take into account the impact of icing, so it wasn't clear how that related to the main theme of the paper.

The main goal of the paper, to evaluate different approaches to estimating AEP loss is interesting, but the paper was quite challenging to follow and it isn't really clear to me what the main outcome of the study was.

### Major comments

- The paper as a whole was challenging to read, there were many typos, and the grammar was not very good. The structure also was not laid out for the reader making it hard to follow what the recipe was to get to the end results.
- Several topics were only vaguely discussed and were difficult to understand. For example, there were several places where it was stated that the T19Method would be compared to the SCADA data, but the T19Method uses the SCADA data to get its results. I kept expecting there to be an ice detector or some other method to determine the icing periods or loss, but they weren't found.
- None of the methods are clearly described in such a way to allow the reader to be able to replicate the study. The T19IceLossMethod is probably the best described as it is the simplest method, but it is not totally clear how stops were detected, or if duration was used at all for determining icing periods. The Numerical model section (3.2) does not describe any of the input data, what was used to build the 3D terrain model, where did

the roughness data come from, what was used for the inflow wind profile? In section 2, it is mentioned that a Weibull fit is carried out, but nothing about the method for fitting was described. While in all subsections in section 4 there were various methods applied that aren't described (4.1: how were the values of 57.1, 54.6, and 55.5% reached?; What is the % loss of total hour volume in table 6?; 4.2: Where can we see the vortex motion in figure 6 that you describe in this section?; 4.3 What is the T19IceLossMethod using in table and figure 7, so far all descriptions of that method produce results as % of ice loss, how do you then get an AEP?

- The data in the tables and figures was often hard to interpret and the reader was not guided to help understand it, rather than having discussion of the results, they were often just summarize in the text.

Minor comments:

Here I will mostly focus on the figures, tables, and references

- Shouldn't the reference to the cold climate market either be Timo's presentation at winterwind 2017 ([https://winterwind.se/wp-content/uploads/2015/08/9\\_1\\_24\\_Karlsson\\_IEA\\_Task\\_19\\_-\\_Cold\\_climate\\_wind\\_power\\_market\\_study\\_2015-2020\\_Pub\\_v1.pdf](https://winterwind.se/wp-content/uploads/2015/08/9_1_24_Karlsson_IEA_Task_19_-_Cold_climate_wind_power_market_study_2015-2020_Pub_v1.pdf)), or the Wind Power Monthly article (<https://www.windpowermonthly.com/article/1403504/emerging-cold>)?
- On line 38, you start of the paragraph as Gravidahl et al (Davis et al., 2016) it is unclear what the reference you were going for was, and the Gravidahl reference doesn't show up in the references.
- Table 1: it was unclear to me at first what was being show. I am now pretty confident that it contains the mean values for the 14 turbines, but it isn't clear what the reader should get from this table.
- Table 4: perhaps this information could be better portrayed through histograms of the different cell sizes, for example (<https://link.springer.com/article/10.1007/s10546-020-00591-0/figures/3>)
- Table 5: Is this the percentage of AEP loss? Something else?
- Table 6: If table 5 is correct, was there really 29.6% loss of AEP at turbine 13 with only 19.6 hours of down time, that seems quite extreme.
- Table 6: As mentioned above, there doesn't seem to be any description of that the % loss of total hour is, it seems like it might be the sum of the other columns by year, but should c be subtracted, and not all of the values sum correctly so I am a bit lost.
- Figure 5 is really hard to review, also it is known that there are a lot of points in certain parts of the power curve, consider instead using a hexbin plot like done in Figure 2 from (<https://onlinelibrary.wiley.com/doi/10.1002/we.1878>), for specific parts of the power curve you want to highlight. I was surprised to not see this paper referenced as it seems to be one of the closer papers to your work.
- Table 7: This seems a bit counterintuitive to me perhaps because in table 5 you were showing the percent loss, while here are showing the percent of the potential. It might be easier for the reader to keep using the same approach to describing the loss.
- Figure 7: What should be a better CFD result? I guess the closer the value is to the T19LossMethod? Since the SCADA data include icing effects that don't model in your CFD results.
- Figure 7: What does this figure add that you don't get from the table above?