2020-83

Overall

- The subject matter of the paper is interesting but the article itself needs substantial work still
- I recommend a near full re-write of the abstract and introduction (see detailed comments below). The substantive elements are glossed over, too much vague language is used, and arguments as to the need for this approach are not sufficiently developed (see detailed notes below).
- Another major weak point is that the key results of the paper occupy a very small percentage of the overall text content of the paper – there is a lack of interpretation and explanation of the results versus describing.

Abstract

- Language in the abstract regarding the methods are somewhat vague. Overall the abstract is quite short. More specificity can be added so that the reader can have a better sense of the overall article content and impact
- Similarly for the results, the discussion of good quality / reasonable accuracy are vague terms. Falling short of real validation also vague. This can be improved quite a bit

Introduction

- Again, first sentence vague. First attempt of what? This particular sensing method? Any method using load harmonics? It is an odd way to start the paper. Usually you would start with the larger motivation and need, state of the art and then build to what this paper is going to do and its novelty at the end of the introduction.
- Again, discussion on wind sensing and rotor response with blade load sensing is a bit vague – what are the common sensor types? What blade load sensor types are you specifically referring to? How often are the actually available in standard practice at commercial farms? From what I understand, additional sensors for blade loading are not commonly applied in commercial practice. The most we typically have in a commercial park is the scada.
- "In a nutshell" is colloquial language, avoid such language in scientific writing – the explanation is weak of how the overall method works.
- I don't follow the logic of the bullets, or the argument here. What is the argument you are trying to make?
    - "Deterministic" is not the right terminology, what do you mean to say here?
    - Lower not slower sampling rates, or you can say less frequent sampling – but this is only important if 1P is a more important load to measure versus other harmonics
    - Explain the third bullet – why is this a good thing?
    - Yes, but if these harmonics and associated loads aren't the most critical design driving loads then none of this matters
- What do you mean polluted by turbulent eddies? Polluted is again colloquial verbiage and doesn't characterize scientifically what is going on – and is veer the only other characteristic we are interested in?

Overall for the first page and a half, there is a lack of a good argument as to what the different methods are that are out there, why going after the 1P makes sense and what you get/don't get by going after that measurement

- Pg. 2 line 8, Jumping to the load-harmonic method and data training without fully explaining what it is and how it compares to other methods
- Discussion about method applied in simulations or in datasets is odd. The use of it in a simulation environment would be to explore the physics and determine the feasibility of the method. The use of it in the field would be to show experimentally that the method works (i.e. validate)
- Explain why you can trust the method enough on its own without a met-mast in subsequent usage for other turbines.
- Aspects of implementation is better than implementational aspects
- Page 3 lines 1-3, the methods themselves are still not well explained and now a second is introduced without proper explanation
- Lines 10-17 – this is the first time this type of approach is used correct? How does it differ from what has been done in the past (be more explicit)
- Good discussion of limitations of the method. Make sure to circle back to it in future work
- Rather than using a "true validation" terminology, this should be seen as a field demonstration. Speak to what you do validate – what can you say from the results of the analysis that are novel and interesting? "interesting and very promising insight" is again vague – what do you get out of this study?
- Do not speak to your opinion in a scientific paper. Remove that statement.

Methods

- 2.1
    - First paragraph and Fig. 1 are very basic concepts it could be made smaller with all 4 images on one line. Put the vertical shear and uplow next to each other and then the yaw and horizontal next to each other. Why is there a slight tilt in the line for vertical shear? It looks slightly odd.
    - 10 minute averaging for wind energy applications is used often due to the characteristic frequency content in the wind itself
- 2.2
    - "in a nutshell" used again, review full paper to remove such casual language and phrases – replace that language with a more full and clear explanation.
    - Is it true that the the wind misalignment and vertical shear / horizontal shear affect loads in a symmetric fashion? There is evidence out there in a number of studies that this is not the case. It is okay to make a simplification for the sake a of study, but be caserful about what is claimed as "true." See for example: https://wes.copernicus.org/articles/3/173/2018/wes-3-173-2018.pdf
    - The whole discussion around shear and veer characteristics related to physical features and wind phenomena and the tie to rotational symmetry could be much stronger

- 2.3
    - As already mentioned, the whole argument around being able to generalize the observer design for turbines of the same type once developed for one is insufficiently explained / developed
    - How was robustness of the method shown? I assume model-based efforts were involved since this is the first field demo? And when you say method, which method are we talking about? Earlier you suggested you were using two methods together in this study
    - Here is the first mention on page 8 line 12 of the actual load sensors being used and how they are set up, there should have been some discussion on this much earlier
    - Can you speak to the limitations of the approach for averaging the loads for blade 2? When shifting the loads of blade 1/3 where there any significant deviations? – the next paragraph mentions this specifically
    - The scaling of the measurements is as specified with this factor s does not seem well-grounded since it essentially assumes that the two sensors are off by an equivalent but opposite bias. Since this is a demonstration of method, it is okay to do these sorts of things, but it needs to be explicit that this was done due to limitations of the experimental set up and is an area for future work – alternatively, the sensors could be inspected after the fact to assess their calibration status
    - The explanation for not using the wind vane is also not strong. There is indeed bias and uncertainty with win vane sensors. But saying they are off (without reference or qualification) is a weak argument. An easy excersise to correct for bias is to inspect the 0 to 360 wake profile of the turbine and see if the wake from the other turbine is where you expect it to be…
    - “in a nutshell used again, pag 8 line 31” remove hat and explain fully what you mean.
    - Bottom page 11 and top of page 12 – how much data did you have in the study overall? How long was the experimental campaign? It seems like there is something missing in terms of the overview of the campaign and how much data you have. I assume here that in the results in Fig 4, that you are using all the data you have and not accounting for different stability conditions etc that would affect the shear profile differently. You could bin the data by TI (low, moderate, high) if you have enough of it and see how well the shear profile matches under those conditions. In the right-hand side of figure 4, there seem to be significant outliers even though the overall R2 is still quite high
    - Again on the nacelle yaw sensor bias, inspection of the turbine wake location from the upstream turbine can help. Comparing two similar sensors requires assuming one is truth which is problematic unless direct calibration of one of the sensors is done before the experiment (which is always a good idea though costly)

Results

- The meat of the paper is in figures 10 through 12 with corresponding text beginning on page 17 line 6. Only 17 lines of text are dedicated to these results and the text is

descriptive (rather than interpretive). Too much attention is given to the site description and way to little attention to the actual analysis and interpretation of the results. Explain WHY the method does better under different conditions than others, what do you see as the main impact of the results? What are the key limitations? Some of the introduction discussion of limitations could be brought in here and discussed within the context of the results found.

- Tying the results back to the underlying physical phenomena, models, experimental set up and the triangulation of the 3 to explain what you understand and what the study tells you is critical to establishing the scientific value of the paper.

Conclusions

- Revisit the conclusions once the rest of the paper updates are made. A lot of the previous comments also apply here.
- Strengthen the overall closing statements