

Referee #2 Anonymous

REVIEWER's COMMENTS and Authors' responses

Review of “Grand Challenges in the Design, Manufacture, and Operation of Future Wind Turbine Systems”

Author: Paul Veers et al.

The manuscript is one of the most comprehensive reviews of wind turbine systems that the reviewer has come across. It provides detailed discussions about the range of topics from inflow wind; aerodynamics and aeroelasticity of wind turbines; turbine and wind farm controls; experimental capabilities, modelling, field measurements; offshore wind turbines and so on. The manuscript is well written and is easy to read. The reviewer however suggests the authors to reduce the repetition of the discussions as much as possible. Some discussions in the earlier sections are repeated in the later sections (probably unintentionally). Some minor comments which are listed below. Other than that, the reviewer strongly recommends publication of this manuscript.

***Authors' response** - Thank you for the recognition of the comprehensive nature of the effort. Some repetition is necessary as each section may be read independently; people may not read the whole document but may seek out topics of particular interest. However, we have tried to remove any unnecessary repetition.*

Specific comments:

1. Pg 11, line 282: “The accuracy . . . ”

This sentence is not clear

***Authors' response** - The sentence has been modified to say, “A new class of high-fidelity computational capabilities based on first principles and limited modeling assumptions offers a valuable means by which these tools can be made more accurate and validated for situations where measurements are impossible.”*

2. Pg. 20, line 519: “However, the size of modern-day turbines . . . ”

Are there studies which have investigated how existing inflow models may not be suitable for modern wind turbine size? If so please add them as references over here.

***Authors' response** - This is more of a commonly noted issue that is more or less obvious than a research outcome. There are references that touch on this topic, including: Hannesdottir, Á., Kelly, M., and Dimitrov, N.: Extreme wind fluctuations: joint statistics, extreme turbulence, and impact on wind turbine loads, Wind Energ. Sci., 4, 325–342, <https://doi.org/10.5194/wes-4-325-2019>, 2019.*

3. Having one sub-sub section 3.5.1 in sub-section 3.5 does not make sense.

***Authors' response** - Agreed. 3.5.1 has been changed to 3.6.*

4. Pg 31, line 855 to 863 This paragraph is not very clear. How will the measurement during the development stage pose challenge?

Authors' response - We have reworked the paragraph to clarify things as best we can.

5. Pg. 33, line 907: “. . . and damage of the turbine and its components.”

I do not think damage of the turbine and its components themselves are uncertainties, but they are the consequence of uncertainties.

Authors' response - Agreed. The sentence has been changed to remove that inconsistency.

6. Figure 6: From this figure, one may interpret that Hybrid RANS-LES is a lower fidelity model compared to LES. This may not be true. Hybrid RANS-LES is more like one of the LES methods. So you can either put the Hybrid RANS-LES figure at the same level as LES or remove it.

Authors' response - The figure has been modified, replacing “Hybrid RANS-LES” with “Hybrid methods”. Details about the various possible CFD approaches used in wind energy are given in the text.

7. Pg 58, line 1599: “The highly competitive . . . manufactured at costs less than \$20/kg . . .” Reference is needed.

Authors' response - The discussion has been expanded to indicate that this is an approximate target cost for wind turbine systems (which is well known in the turbine manufacturing world) and an order of magnitude lower than typical aerospace costs.

8. Pg 58, line 1608: Remove and

Authors' response - Done

9. Pg 62, line 1710 to 1719: Do you have reference(s) for this paragraph?

Authors' response - This paragraph has been significantly modified to recast the current challenges with carbon fiber as one of producing carbon fiber in a more cost-effective way specifically adapted to wind turbine blade current needs and potential future design applications.