Reviewer comments

This is a very interesting paper presenting blind tests results for different wake models estimating the power gains through wind farm wake control (WFFC). The paper focuses on wake control by yawing the upstream rotors. Four different data sources are used for the blind comparisons: open field measurements form an onshore wind farm, wind tunnel measurements using model rotors, and two different high-fidelity simulation tools based on Large Eddy Simulation (LES).

The paper is in general very well written. Use of the English language is very good and only a few typos are present. The presented analysis is very comprehensive and the contribution to new knowledge is significant. However, it is believed that the paper is far too long to be published as a single journal paper. It is recommended to split the script in two separate papers, for example one dealing specifically on the modelling of large-scale rotors (Blind tests 1, 3 and 4), while the other focusing only on the blind test using the wind tunnel data.

The following is a summary of the main comments:

Major Comments

1. Page 2, Introduction: It is recommended to highlight in more detail literature sources documenting previous validation work of the wake models used in this blind comparison.

2. Page 9: Equation 1 – the paper should elaborate in more detail the limitations of this model for the range of time-averaged CT considered in the blind tests. References to relevant past works dealing with yawed rotor aerodynamics should be included. Consideration has to be given to the following: (1) n does depend on the tip speed ratio (& hence CT) acting on the rotor; (2) rotor yaw causes CP (and CT) to become a function of time and (3) the time-averaged CP does decreases with yaw angle.

3. Page 10, first paragraph: the statistics of the polynomial fits should be included (R squared, standard error).

4. Page 10: an important consideration where considering open field measurements is the influence of shear. Wind shear causes the wake to deflect upwards, thus also theoretically contributing to the wake losses reduction. Thus, apart from considering the impact of rotor yawing, the effects of shear should also be assessed. Have the effects of wind shear without rotor yawing been examined? This analysis is important inorder to properly quantify the real contribution of rotor yawing alone.

5. Page 13: Including data about the site topography is important for the reader to understand better the operating environment of the wind farm. Such data can be obtained through satellite data.

6. Page 13, line 5: the term “waked directions” is inappropriate.

7. Page 14, line 285: It is understood that, following the binning process, the average wind direction was computed - was a vector average used?

8. Page 15, first para: It is helpful to present the relation for estimating the wake skew angle here. How does the formula correct for the variation of the wake skew angle with CT? Past works have shown that this follows a quasi-linear relationship.

9. Page 15, line 326: Explain what these parameters stand for.

10. Page 17, line 373: To what extent has this transfer function been validated?

11. Page 17, line 380: The numerical technique applied for filtering has to be stated.

12. Page 22, Section 3.1: Details about the operating conditions of the rotor are lacking (e.g. tip speed ratio)

13. Page 22, Section 3.1: the Reynolds number matching is difficult to achieve in the wind tunnel tests given that the scale ratio is far too small. The paper should elaborate about this limitation.

14. Page 26, line 578: in yawed rotors, the disk-averaged induction at the rotor becomes a function of time. This violates the assumption for the simplistic wake losses models that are based on the linear momentum equation applied for stead flow conditions. A remark on this matter should be included.

15. Page 37: The paper should explain briefly the numerical verification work undertaken to ensure that numerical errors are negligible. It should be ensured that the uncertainty arising from numerical spatial and temporal discretization does not mask the differences in power estimated with and without WFFC.

Minor Comments

1. Page 1, line 11: “The majority of …”

2. Page 2, line 1: “In addition to the flow modelling, the sensitivity…..”

3. Page 3, line 1: Do not start new paragraph with “Also”

4. Page 3, line 60: “….power gain at the wind farm level by applying wake steering control strategy.”

5. Page 3, line 65: “induction control that were included in the majority”

6. Page 4, Line 1: “The results of the benchmark are classified based on the technology readiness level…”

7. Figure 10: The quality of this figure has to be improved.

8. Figure 11: enlarge font size of text in the figure (this applies to similar figures in the paper)

9. Figures 12 and 13: the figures are too small to make the colour scheme easy to distinguish between the different plots.