Wind Energ. Sci. Discuss.,
doi:10.5194/wes-2016-31-RC1, 2016

Interactive comment on "Blind test comparison of the performance and wake flow between two in-line wind turbines exposed to different atmospheric inflow conditions" *by* Jan Bartl and Lars Sætran

Anonymous Referee #1

Received and published: 26 September 2016

The manuscript deals with a blind test comparison between numerical results obtained with 5 different CFD codes and experimental results obtained in the closed-loop wind tunnel at NTNU in Trondheim. The test case is composed of 2 in-line model wind turbines exposed to different inflow conditions: homogeneous and low turbulent flow, homogeneous and high turbulent flow and, high turbulent shear flow. The comparison is based on the wind turbine performances (power and thrust) and on the flow field in the wake of the upstream wind turbine. This blind test comparison is in the continuity of several previous blind tests performed in the same facility and with the same wind turbines but with different inflow conditions and wind turbine arrangements. The main

objective is to provide database of increasing complexity in order to give the possibility to CFD developers to validate their codes on more and more challenging configurations.

Major comments:

This subject is of great interest and completely fulfills the needs expressed by numerical modelers to have access to comprehensive validation datasets with a progressive increase of complexity. It is therefore valuable to publish the outcomes of these benchmarks. On the other hand, the inherent weakness of these benchmarks is the difficulty to organize the comparison process in a synthetic way, with clearly stated outcomes based on metrics, and without losing the reader in details or technical digressions.

Consequently, I suggest to the authors to provide a table in §2.3, summarizing the properties of the different numerical tools (CFD methods, wind turbine model, mesh properties, blockage, etc).

And in order to make the discussions on results more straightforward, I suggest to use Metrics (as correlation coefficient (R), fractional bias (FB), normalized mean square error (NMSE), geometric mean (MG), geometric variance (GV), fraction with a factor of 2 (FAC 2)) to provide a synthetic comparison.

The inflow conditions are not representative of atmospheric flows. Indeed, the ratio between the integral length scale and the rotor diameter is not at all realistic. Consequently, do not mention "atmospheric" flows but "turbulent flows" in the title and in the body of text.

Minor comments:

- Remove Figs 1 and 3. Use Fig. 4(a) to describe the general set-up

- §2.2.3 change "measurement uncertainties" with "Statistical and measurement uncertainties"

- §2.4.2 : A single hot wire does not measure one velocity component but the velocity magnitude in the normal plane to the wire. Please be more precise when you explain the computations of k and the used approximations.

- How the TKE is computed for LDV measurements (at least, 2 velocity components are measured simultaneously) ? How does it compare with TKE assessed from hot wire measurement?

- §3.3: please show the velocity and turbulent profile for the inflow of test case C. Is it a linear shear?

- P18, line 10 (not shown in this report)...why do not use in this manuscript the equivalent wind speed as reference to compute the power coefficients if it gives better results? Please modify it

- §3.3 : the incoming flow is not isotropic anymore. How k is computed in the present case?

Interactive comment on Wind Energ. Sci. Discuss., doi:10.5194/wes-2016-31, 2016.