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Interactive comment on "Monitoring offshore wind farm power performance with SCADA data and advanced wake model" *by* N. Mittelmeier et al.

Anonymous Referee #2

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Paper: wes-2016-16 Title: Monitoring offshore wind farm power performance with SCADA data and advanced wake model Authors: Niko Mittelmeier et al.

It is an interesting paper, introducing a new validation method for identifying wind farm underproduction. Such methods are highly needed with the large amount of wind turbines are installed in wind farms. The precondition for my review is that the method should also be applicable for implementation and not only be an theoretical exercise.

The method, which seems to be a spin-off from an EERA project named ClusterDesign, refers to an ideal determination of the inflow conditions. The proposed method uses wake models estimates as reference, which seems to make a robust estimate of the underproduction. The accumulated uncertainty for the inflow conditions has been estimated to 7% and this number seems realistic when using recent calibrated instru-

ments (cup and vane). This number is not realistic when using derived inflow conditions based on nacelle anemometry, electric power and wind turbine yaw position for periods longer than 1 year according to my experience. Problem: The determination of the wind farm inflow (environmental) conditions (wind speed and wind direction) seems not to be aligned with the state-of-art wind farm signals.

In section 2.1.1 the wind direction is derived, but without any reference to how this is done. The wind direction measured on the nacelle is only used for yaw control, where the strategy is the keep the rotor aligned with the wind direction to minimize the yaw-misalignment. This signal can also identify a "forced" yaw misalignment used to determine the "wake drift"? The optimal readings from this instrument is 0, and will not reveal anything about the actual flow direction, which only can be identified from the wind turbine yaw position. The wind turbine yaw position not used by the controller, only when wind farm has sector management (proposed but never seen). The yaw position is usually not calibrated or has a wrong offset, which need to be identified.

Section 2.1.2 states to use nacelle anemometry to determine the wind speed; correct this is the only accessible wind speed measured on a wind turbine. This is measured with either a cup anemometer or sonic, located on the nacelle (behind the rotor). The signal is recorded through the controller and stored in SCADA system, but lacks documentation and uncertainty estimation. A correlation check between a number of identical wind turbines reveals a large scatter in the binned power curves. The scatter increases when the turbine operates in a wake compared to free inflow. Conclusion: the nacelle wind speed signal is biased. Furthermore the nacelle anemometer changes over years e.g. due to degradation. Even a NTF based wind speed (IEC 61400-12-2) is only applicable for free, undisturbed inflow.

Conclusion on inflow conditions: the stated uncertainty, for wind speed and wind direction does not meet the requirements given in IEC 61400-12-1 and this need to be addressed both in the method and in the example. Comments to the figures: all figures should include proper captions readable out of context. The caption of the figures are not sufficient e.g. while Figure 2b is not a addressed in the caption.

The description of the method seems to be adequate, but the "wake drift" in section 2.2 is not well defined, I assume this refers to periods with active wake control, which I do not expect has been implemented yet?

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