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On AEP prediction and wake modelling at Anholt

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The Anholt wind farm is not only one of the largest parks of the world but also has one of the highest capacity factors (CFs); in 2014 it was 45.85%¹. This is mainly due to the low wake effects within the wind farm. Using hub-height hourly simulated winds from the WRF model for the year 2014 at a position in the middle of the wind farm, without accounting for wake effects and assuming flow homogeneity within the wind farm, the CF is 45.07%. The difference between the model-estimated and the reported CFs are partly due to errors in the WRF model but it is also due to the gradients of wind speed and direction. We show that the WRF model is able to reproduce such gradients relatively well by comparison to the wind farm's SCADA. About 1.5 yr of such SCADA, further quality controlled and filtered, reveals an average wake loss of 3.87% only, whereas results from three wake models, Park, Larsen and FUGA, show average wake losses of 3.46%, 3.69%, and 3.38%, respectively. We employ a bootstrap method to estimate the uncertainty of the wake models. As this is performed with reference to the SCADA, the results provide an idea of the uncertainty of the AEP prediction². We find all wake models to underpredict the wake loss. The simpler models are as uncertain as the more sophisticated ones.

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¹ Danish Energy Agency, <https://ens.dk/service/statistik-data-noegletal-og-kort/data-oversigt-over-energisektoren>, access:14/02/2017

² Nygaard, *EWEA Offshore* (2015)