Offshore wind
A safe investment!

PO105 Validated best practice for offshore wind farm yield prediction
Maria Cahill, Matthew Colls, Thomas Grey, Joel Manning Prevailing Ltd

Abstract

We have compared the latest ‘pre-construction’ offshore energy yield assessment techniques to the actual performance of the operational UK fleet. The UK is fortunate to have an abundance of freely available wind measurements on the Crown Estate’s Marine Data Exchange, as well as production statistics published by OFGEM.

Using these datasets we have estimated 100% available, long-term wind farm yield at the metering point, using both pre-construction and operational techniques.

These two approaches are compared at 23 wind farms, totalling 5GW of operational projects in UK territorial waters.

Results

Prevailing found that, on average, the pre-construction assessments over-predict the energy yield of the UK fleet by 0.7%. No wind farm was observed to under-perform by more than 6.3%.

This is significantly more accurate than similar comparisons onshore1 -8 where the mean bias tends to be larger and there is a greater spread of results, with most onshore validations ranging down to -30% for individual wind farms. This finding should increase investor confidence that offshore wind farms will perform near expected levels (if best practice methodology is followed).

Discussion

WAKES : Prevailing has used a range of wake models in this work, so it was possible to compare individual modeling results. It is clear that some models perform better than others. Investigation of the range of results for each model indicates an ensemble of the top performers provides the lowest risk prediction.

AVAILABILITY : In the absence of project specific data, a very simple assumption of 5% has been made for project availability. It is likely that some of the net bias is due to wind farms not performing to this assumed availability level.

TURBINE PERFORMANCE : There is a perception in the wind industry that wind flow offshore is benign and therefore turbines operate as per their warranted power curve all the time. However it is key to remember that average conditions do not generate the same energy as the average of the conditions.

Conclusions

- A major validation study was completed, applying current best practice ‘pre-construction’ energy yield assessment methods to the UK offshore fleet.
- An average performance bias of -0.7% was observed, although this may be reduced if project specific availability loss factors were available.
- The pre-construction estimates were within 6.3% energy yield for all considered offshore wind farms. From an energy yield perspective at least, offshore wind is significantly lower risk than onshore wind.
- Using a range of validated wake models is key to reducing uncertainty in energy predictions.

References

3. DMG GI “Moving Beyond Unverified Wake Models” EWEA Resource Assessment Technology Workshop 2015
4. AME Turbines “Gaining the Edge on Plant underperformance” 2009

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