

ENERGY

A review of wind speed inter-annual variability for the UK offshore wind climate

DNV GL (published by The Crown Estate)

09 February 2018



Reduce LCoE for future offshore wind projects by improving financing conditions through the provision of an improved characterisation of the long-term UK wind resource.

What is inter-annual variability and how does it impact project finance?

Source of uncertainty / variability

Measurement accuracy

Long-term measurement height
wind regime

Vertical extrapolation

Loss factors

Inter-annual variability

Overall net energy uncertainty

Variabilities

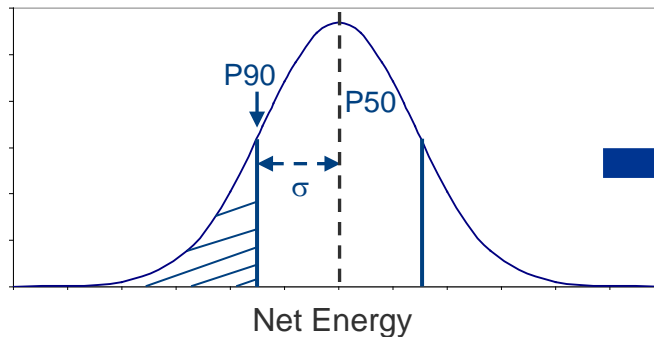
Future wind frequency distribution

Inter-annual variability of the wind

Usually the largest uncertainty in an energy yield assessment.

“Industry standard” 6% typically applied:

Raftery, P., Tindal, A.J., Garrad, A.D., “Understanding the risks of financing windfarms”, Proc. EWEA Wind Energy Conference, Dublin, 1997.



Higher P90/P50 ratio typically lead to better finance arrangement and reduced LCoE

Overview of main conclusions

Strong evidence to reduce IAV for UK offshore region

Reduction in LCoE between 0.3% to 0.7%



Agenda

1. Methodology for IAV assessment

1. Input data
2. Calculation
3. Validation

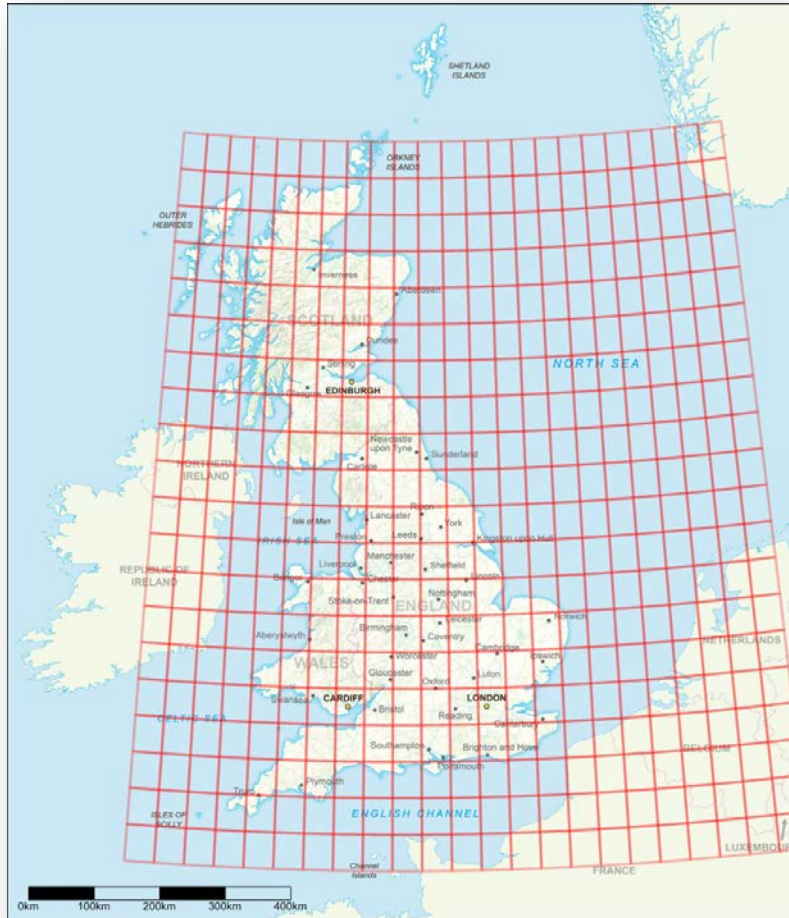
2. Key results from Levelised Cost of Energy (LCoE) modelling



Methodology for IAV assessment: Inputs datasets

Input data

MERRA-2 Reanalysis data



Validation data

- + Offshore masts/Lidars
- ◆ Coastal UKMO stations
- KNMI stations
- ▲ Ofgem data



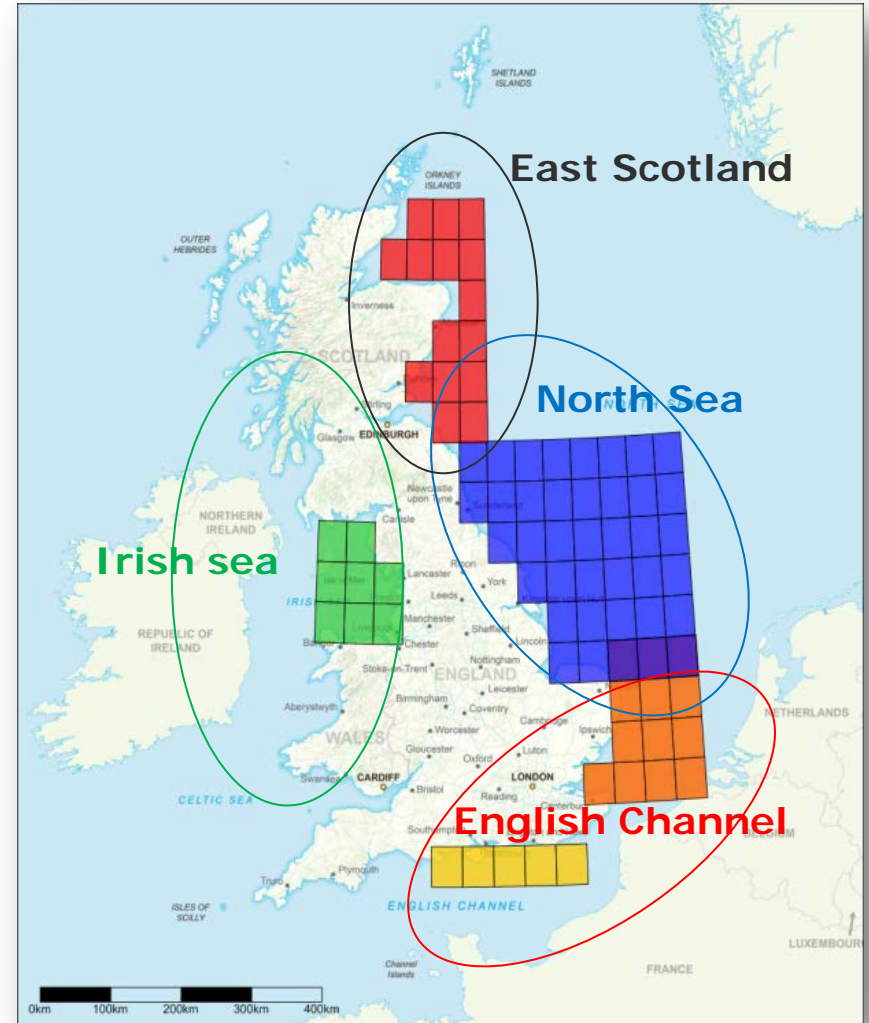
Methodology for IAV assessment: Calculation

5 regional indices derived using MERRA-2 (1996-2015)

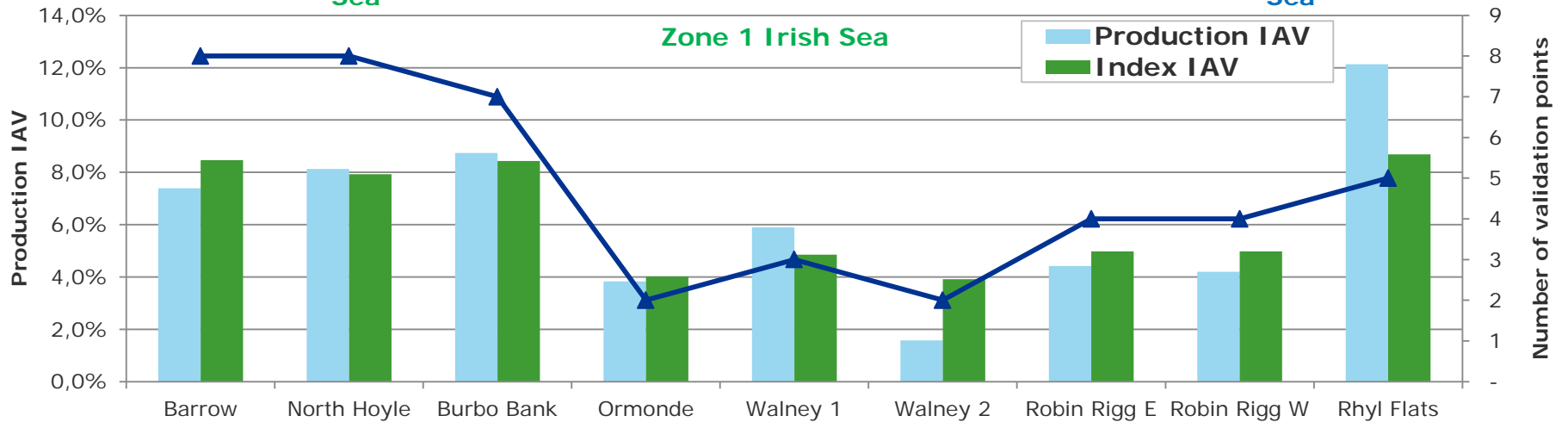
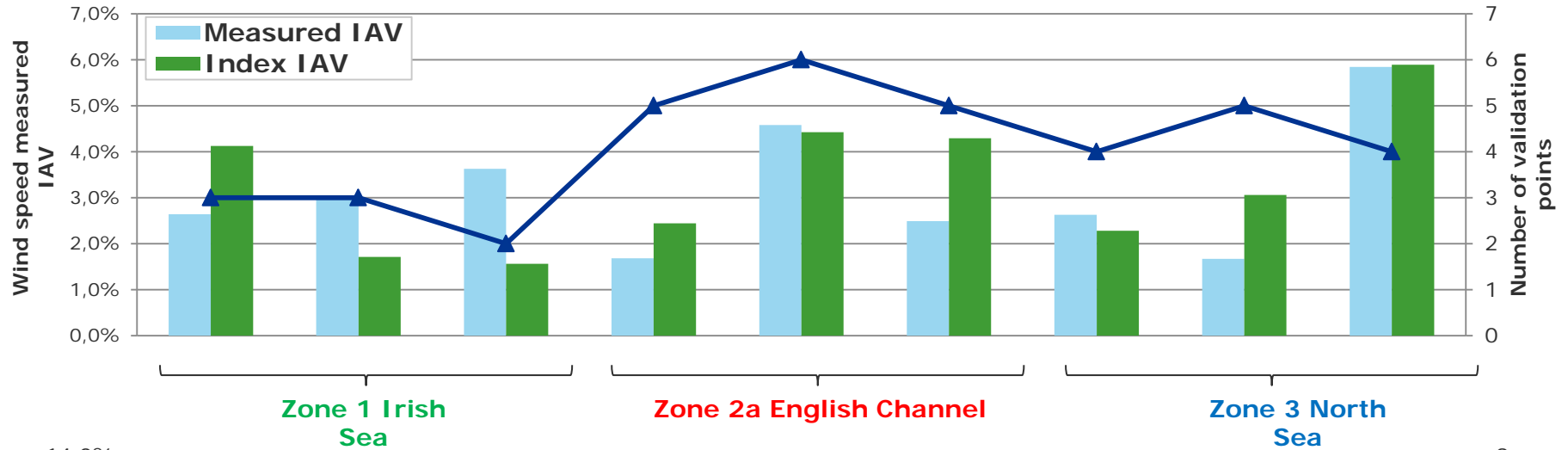
IAV derived from MERRA-2 regional indices

• Regional variation in IAV observed

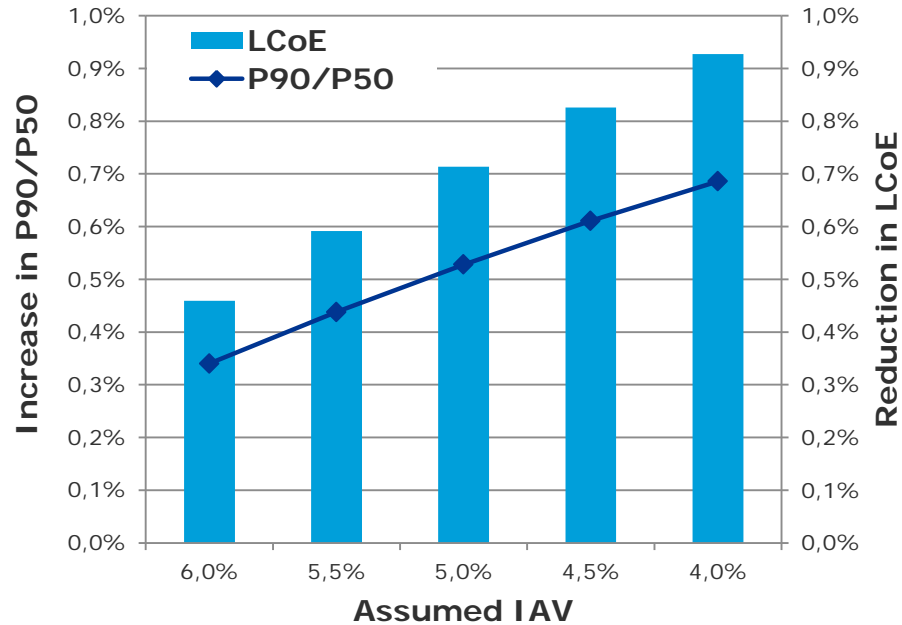
Validations against offshore measurements/production data



Methodology for IAV assessment: Validation



Key results from LCoE modelling



Reduction in LCoE estimated to be between 0.3% to 0.7% compared to “industry standard” base case.

Conclusions

Strong evidence to reduce IAV for UK Offshore region

Reduction in LCoE between 0.3% to 0.7%



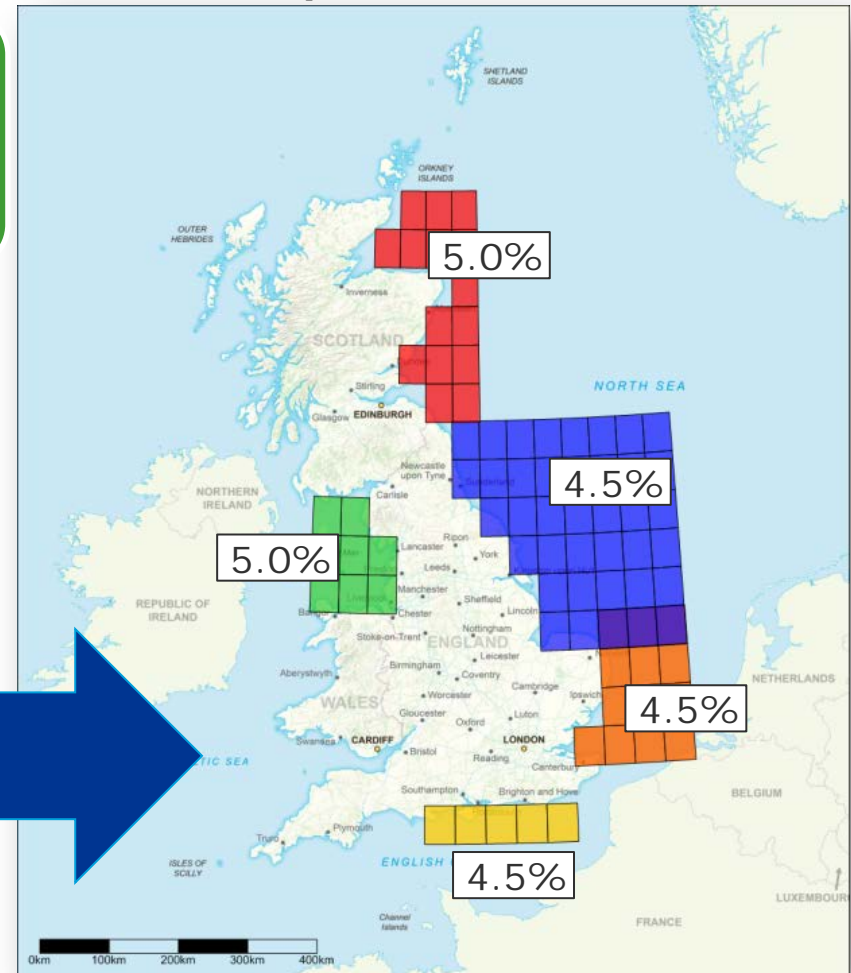
<https://www.thecrownestate.co.uk/media/1043271/uk-offshore-wind-variability.pdf>

DNV GL current best practice resulting from this work

Adjust the IAV predicted by the 20 year indices to...

- Account for longer historical period
- Account for sources of uncertainty in analysis:
- Quality of validation in each region (wind speed vs production)
- Definition of a year

DNV GL adopted values



With special thanks to:
Gemma Daron, Circe Trivino (DNV GL)
The Crown Estate

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