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

DNV GL (published by The Crown Estate)
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?

<table>
<thead>
<tr>
<th>Source of uncertainty / variability</th>
<th>Variabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement accuracy</td>
<td>Future wind frequency distribution</td>
</tr>
<tr>
<td>Long-term measurement height wind regime</td>
<td>Inter-annual variability of the wind</td>
</tr>
<tr>
<td>Vertical extrapolation</td>
<td>Usually the largest uncertainty in an energy yield assessment.</td>
</tr>
<tr>
<td>Loss factors</td>
<td>“Industry standard” 6% typically applied:</td>
</tr>
</tbody>
</table>

Overall net energy uncertainty

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

![Graph showing Net Energy distribution with P90 and P50 points](image-url)
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

- IAV derived from MERRA-2 regional indices
- Regional variation in IAV observed
- Validations against offshore measurements/production data

Map showing regions of interest: East Scotland, North Sea, Irish sea, English Channel.
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
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 current best practice resulting from this work
With special thanks to:
Gemma Daron, Circe Trivino (DNV GL)
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