1548-05

ROYAL HASKONING

Airtricity
The Natural Progression

Bijlage 12

Windenergieberekeningen

ENERGY PRODUCTION ESTIMATES FOR WESTRIJN

Indicative Electricity Production Estimates have been produced for the proposed Westrijn Offshore Wind Farm. The following is a summary of the methodology used in this estimate:

- In the absence of data measured on the site, the wind speed at a hub height of 100 m was estimated based on experience with offshore measurements in the North Sea, including the 80 m Greater Gabbard mast. Other sources of offshore data were also consulted, including data from the KNMI Europlatform and K13 stations, and West Hinda.

- Wind speed variations across the site area were assumed to be negligible.

- WindFarmer was used to estimate array efficiency for the various turbine models and layouts under consideration. The array efficiency estimates are included in the figures following this description. The wake model utilised has been adapted for use on large offshore projects to include deep array losses. Validation of this adapted model has been conducted using data from the Horns Rev Offshore Wind Farm.

- The following additional sources of loss were assumed in the estimate. These have not been validated at this stage:

  - Electrical losses 3 %
  - Availability 8 %
  - Blade fouling and icing 0.5 %
  - High wind hysteresis 0.2 %
  - Substation maintenance 0.2 %

- The following net electricity production estimates were obtained:

Option	Model	Number	Wind Farm Capacity [MW]	P50 energy estimate [GWh/annum]	P90 energy estimate [GWh/annum]
1	Repower 5M	46	230	793	627
2	GE 3.6SL	57	205	730	576
3	GE 3.6SL	79	284	979	774

- It is noted that the uncertainties in these estimates are high, and the results are therefore indicative only. Uncertainties have been estimated and utilised to produce a 90 % probability of exceedance estimate, as detailed above.

- Options 1 and 2 above assume a regular array layout with elliptical exclusion zones of 10x8 diameters, aligned southwest. This spacing complies with current internal Airtricity guidelines.

- Option 3 above assumes a regular array with spacing of 8 diameters between rows and 6 diameters within rows, rows facing southwest. This is a tighter spacing than current internal Airtricity guidelines, and there is therefore an increased risk of more significant deep array losses with Option 3.

It is noted that details of these estimates are confidential and should not be released outside of the recipients organisation.