NOWITECH

Norwegian Research Centre for Offshore Wind Technology

Postdoc position within ”Balance Management with large scale offshore wind integration”

By 2020, more than 100 billion Euro are expected to be invested within the Europe for installation of 50 GW of offshore wind power.

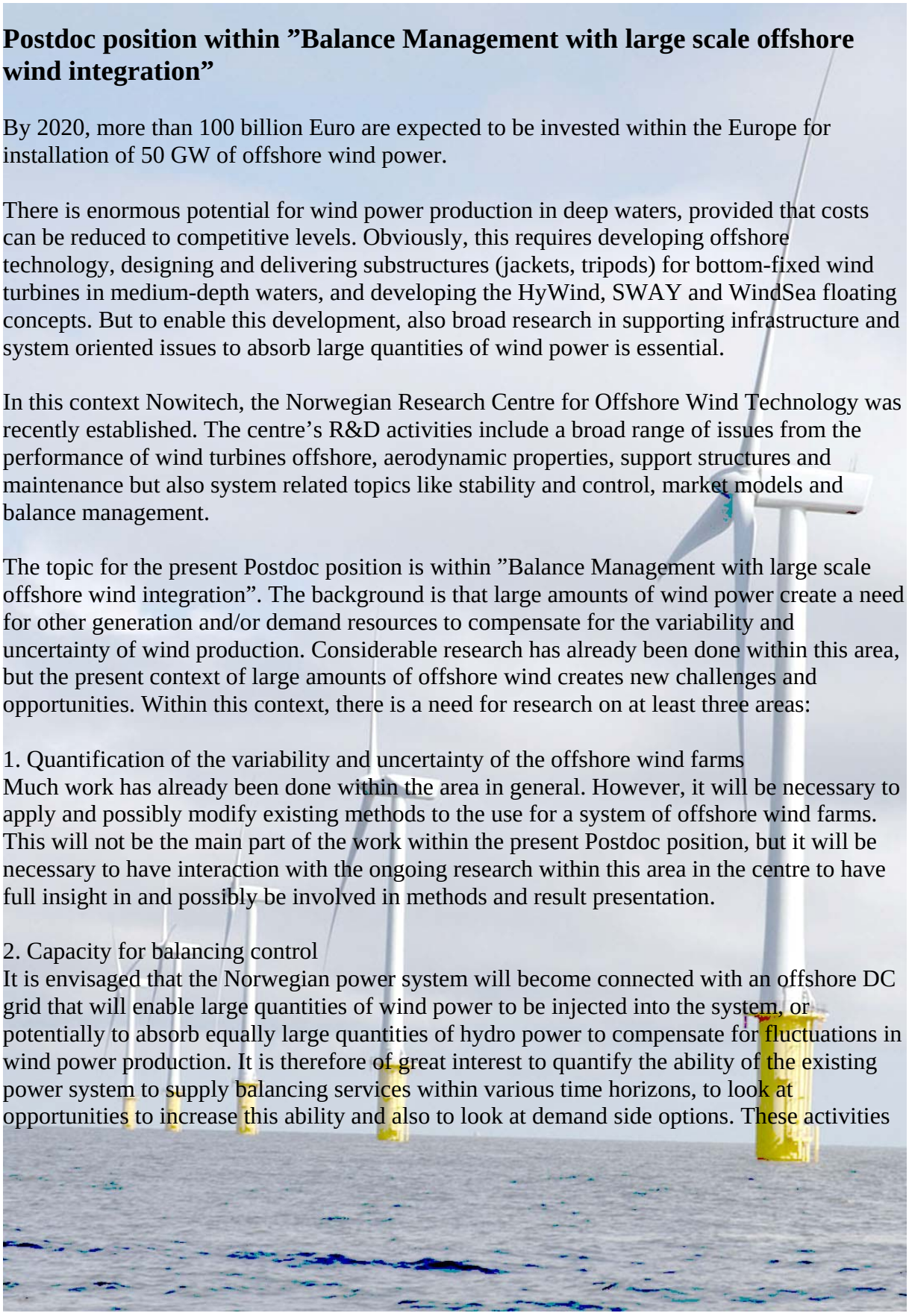
There is enormous potential for wind power production in deep waters, provided that costs can be reduced to competitive levels. Obviously, this requires developing offshore technology, designing and delivering substructures (jackets, tripods) for bottom-fixed wind turbines in medium-depth waters, and developing the HyWind, SWAY and WindSea floating concepts. But to enable this development, also broad research in supporting infrastructure and system oriented issues to absorb large quantities of wind power is essential.

In this context Nowitech, the Norwegian Research Centre for Offshore Wind Technology was recently established. The centre’s R&D activities include a broad range of issues from the performance of wind turbines offshore, aerodynamic properties, support structures and maintenance but also system related topics like stability and control, market models and balance management.

The topic for the present Postdoc position is within ”Balance Management with large scale offshore wind integration”. The background is that large amounts of wind power create a need for other generation and/or demand resources to compensate for the variability and uncertainty of wind production. Considerable research has already been done within this area, but the present context of large amounts of offshore wind creates new challenges and opportunities. Within this context, there is a need for research on at least three areas:

1. Quantification of the variability and uncertainty of the offshore wind farms
Much work has already been done within the area in general. However, it will be necessary to apply and possibly modify existing methods to the use for a system of offshore wind farms. This will not be the main part of the work within the present Postdoc position, but it will be necessary to have interaction with the ongoing research within this area in the centre to have full insight in and possibly be involved in methods and result presentation.

2. Capacity for balancing control
It is envisaged that the Norwegian power system will become connected with an offshore DC grid that will enable large quantities of wind power to be injected into the system, or potentially to absorb equally large quantities of hydro power to compensate for fluctuations in wind power production. It is therefore of great interest to quantify the ability of the existing power system to supply balancing services within various time horizons, to look at opportunities to increase this ability and also to look at demand side options. These activities



will be done in close cooperation with the CEDREN research centre (Centre for Environmental Design of Renewable Energy, SINTEF Energy Research, Norway, http://www.sintef.no/projectweb/CEDREN) and with ongoing research within the project Balance Management in International Power Markets (A cooperation project between SINTEF Energy Research, NTNU and TU Delft).

3. Grid effects
A specific challenge in the offshore wind context is that it will be connected with the Norwegian grid in a relatively limited area. Given the potentially large amounts of power, grid congestion will easily occur, creating challenges in the way the hydro power control capacity can be utilized. Grid extensions are possible and necessary, but it is probable that congestion will occur periodically in any case, both in the spot and in the balancing markets. A framework must be designed to optimally utilize both the grid and available generation resources. Besides the technical challenges, this must also take into account the existing and foreseen market framework, which also is the topic of a PhD study within the centre.

4. International power exchange
The offshore grid connecting the wind farms will presumably be connected with both the Norwegian and several other European national grids. The wind farms together establish a kind of “power production island” lying between several power systems with different characteristics. The offshore grid will use DC technology, which creates a large degree of freedom with respect to directing the power flows. An important research question is how to operate this grid under varying conditions, with the goal of optimizing total resource utilization, both in situations with small and large wind production.

The Postdoc position will be within the Department of Electric Power Engineering at NTNU. Some participation in teaching related activities and supervision of Master and PhD students will be required. The Department has strong cooperation with related activities at SINTEF Energy Research. The length of the engagement is 2 years, with a possibility for extension with another 2 years, provided available funding.

Contact persons:
Professor Gerard Doorman, Department of Electrical Power Engineering, NTNU
gerard.doorman@elkraft.ntnu.no, +47 99604235

Research Scientist Magnus Korpås, SINTEF Energy Research
magnus.korpas@sintef.no, +47 73597229