Project Design Phase-I

Proposed Solution Template

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Project Name : Predicting the energy output of wind turbine based on weather conditions

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1. 1,000% wind energy

A strong wind blows across the north-western part of the Jutland peninsula, and many wind turbines, solar cells and local CHP plants cover the equivalent of several hundred per cent of the annual electricity consumption. Jysk Energi operates the distribution company NOE Net and is co-owner of the supply network company Vestjyske Net 60 kV. Together, they supply approx. 430 GWh of electricity to their customers. Local electricity production is around 935 GWh. During windy weekends, the distributor sends off more than ten times the local consumption to other parts of the country. At NOE Net, wind turbines, CHP plants and solar cells cover more than 1,000% of the local electricity consumption over shorter periods. Wind turbine capacity alone is close to 400 MW, and with 7-8 large wind turbine and solar cell projects in 2017 and 2018 – including Vesterhav Nord at 170 MW in the North Sea – capacity will increase to 700 MW (Courtesy: Jysk Energi)

2. Energy park harvests energy from wind and sun

In Nørhede-Hjortmose, close to the North Sea, 22 3.3 MW Vestas turbines and 69,000 solar cell panels produce plenty of electricity for the grid. Private investors have installed 72 MW of wind energy and 15.2 MW of solar cells, contributing to the local municipality's goal to become 100% self-sufficient in green heating and electricity by 2020. Thanks in part to the wind turbines and solar cells, the residents and businesses of the municipality have already reached an estimated coverage of 60%."Yes, it is a truly spectacular park. The solar cells are installed between the wind turbines and do not bother anyone", says technical manager Per Nielsen of RAH, who is responsible for the combined network and connection of the solar cells to the 10 kV grid.

3. Test scheme in Nissum Bredning

The global wind market players continuously seek opportunities to develop offshore test projects, which potentially reduce production costs of electricity from offshore wind farms and keep offshore wind energy costs competitive. In July 2015, the Danish Energy Agency published a call for applications for tests of new technologies to establish and operate wind energy production offshore. Turbines in the test scheme receive a Contract For Differences of approx. EUR 0.09/kWh (DKK 0.7/kWh) for approx. 11 years and then market price until decommissioning.

4. Giant wind turbine blade captures more energy from the wind

Offshore wind energy is envisioned to play a significant role in the delivery of clean, renewable energy in the future and the cost is constantly reduced. Offshore wind projects coming online today are already delivering power at almost half the price of those finished in 2012 due to increased competition and larger turbines and components. A good example of that is the 88.4-metre blade for offshore application, introduced by LM Wind Power in June 2016. The giant blade is based on a newly developed carbon-glass hybrid technology and has been designed, manufactured and tested to last for 25 years of life offshore, in the harshest weather conditions and roughest seas.

5. Historically low bid for offshore wind farm

In November 2016, Vattenfall won the tender to build Kriegers Flak, which at 600 MW will become Denmark's largest offshore wind farm. The tender price of EUR 49.9/MWh (DKK 372/MWh) also makes Kriegers Flak the cheapest offshore wind project to date. The low price reflects a more mature market for offshore wind energy, with an increasing number of players entering the market, enhancing competition. Furthermore, flexibility and a simple, proven process in the tender procedure handled by the Danish Energy Agency contributed to the success of the low-priced winning bid.

6. The world's most powerful turbine

With an aim to drive down the cost of offshore wind while increasing the energy output per turbine, MHI Vestas Offshore Wind has brought its V164-8.0 MW to market. The nacelle is 20 metres long, 8 metres wide and 8 metres high. Each blade is 80 metres long and weighs more than 35 tonnes. The prototype, located at the Østerild National Test Centre for Large Wind Turbines, broke the energy generation record for a commercially available offshore wind turbine in December 2016 by producing 216,000 kWh over a 24-hour period. MHI Vestas has now uprated the 8 MW wind turbine, enabling it to reach 9 MW at specific site conditions. The increased production will add value to projects and save on Capital Expenditure (CAPEX) costs, as fewer turbines are needed to meet park capacity. In April 2016, the first two commercial 8 MW turbines were commissioned in an onshore project at Made in Denmark.