Case study: Novel offshore vertical axis wind turbines

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- Sector: Energy
- Project Type: Research & development

As part of the transition to a ‘low carbon economy’, renewable technologies are expected to play an increasing role in reducing dependence on fossil fuels for energy and electricity. Wind power in particular is likely to become a much larger contributor to the UK’s energy mix. The current dominant design for large, grid- connected wind turbines is a three blade rotor with a horizontal rotating axis. The concept of a vertical axis wind turbine (VAWT) is relatively new, but has several advantages over horizontal axis alternatives. It is able to capture the wind from any direction, and the vertical axis is such that the rotor equipment is located at base level, making it is simpler and less costly to install and maintain.

The Energy Technologies Institute (ETI) is a UK-based company formed from global industries and the UK government. One of three projects looking at new turbine design and concepts for offshore wind is the Novel Offshore Vertical Axis (NOVA) project, a UK-based consortium launched in January 2009 to look at the feasibility of a NOVA turbine.

This case study considered the potential reduction in greenhouse gases (GHGs) that could be achieved through the installation of NOVA wind turbines, in comparison to conventional horizontal axis wind turbines (HAWTs) for offshore power generation. The increased power rating of the NOVA turbines compared to current HAWTs is expected to provide considerable reductions in lifetime greenhouse gas emissions. It compared the emissions from 1 GW installations over 20 years, based on a life cycle analysis of construction, operation and disposal. The comparison used the popular Vestas V90 3 MW model and the proposed NOVA 10 MW units.

The estimated lifetime emissions were 521 kt CO2e for the conventional design and 419 kt CO2e for NOVA. Using budget share to attribute the reductions to the project partners, Cranfield’s brainprint was 34 kt CO2e. As there are no current NOVA units in operation, there were high uncertainties associated with the estimates. A Monte-Carlo simulation resulted in a 95% confidence interval for Cranfield’s brainprint for a 1 GW installation of -37–105 kt CO2e