POWERSYSTEMS
HIGH VOLTAGE SPECIALISTS
An Employee Owned Business

CASE STUDY 13983

Aikengall II

Wind Farm Project - Renewable Energy

The wind farm development:

Powersystems designed, supplied, installed, tested and commissioned a 132kV outdoor open-terminal substation for a new 60.8MW wind farm including;

A 90 MVA 132/33kV grid transformer and associated 132kV circuit breaker, disconnectors, VTs, protection panels and substation SCADA system

Also inclusive of a 6-panel 33kV indoor switchboard, and the associated wind farm 33kV cabling to 19 wind turbines

The works included design and layout of the 132kV primary plant to allow for a future expansion to the substation of up to 140MW. Design, installation & commissioning of the interface protection with Scottish Power Transmission and provision of operational metering & control signals for Grid Code compliance.

Powersystems also undertook the electrical compliance studies and preparation of the UDFS to achieve Grid Code compliance and assisted with on-site Grid Code compliance testing.

Powersystems designed, installed and commissioned one of the first point-on-wave circuit breaker controllers to be used in the UK for controlled energisation of a 132kV grid transformer to ensure voltage dips were kept within National Grid limits when energising the transformer.

Aikengall II Community Wind Farm became operational in November 2017.

Scope of work & major design considerations:

Aikengall II Community Wind Farm is located in East Lothian, 6 km south of Innerwick and 11 km southeast of Dunbar. The wind farm forms an extension of Community Windpower's operational Aikengall Community Wind Farm. Aikengall II Community Wind Farm comprises of 19 Siemens Direct Drive wind turbines. These wind turbines have a tip height of 145 metres and a generating capacity of 3.2 MW.

Project Facts and Figures:

- Number of turbines: 19
- Wind turbine capacity: 3.2 MW
- Totalled Installed capacity: 60.8 MW
- Connection Voltage: 132kV
- Connection to Grid:
- Size of site: 3km^2
- Energy for 40,000 households
- Length of onsite access tracks: 10 km
- Length of onsite 33kV cabling: 55km

Wind Farm Project Timings:

Aikengall II Community Wind Farm was given planning consent by the Scottish Government on Friday 1 March 2013. The wind farm has an installed capacity of 60.8 MW to generate clean, green electricity.

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Community Windpower

What the client wanted:

Community Windpower is at the forefront of wind energy development in the UK with over 800MW built, under construction and in development. As renewable energy specialists, they are fully experienced in the identification, design, development, construction and operation of onshore wind energy projects.

Community Windpower wanted a 140MW connection to Scottish Power Transmission's 132kV network in Dunbar, this was required for the new 60.8 MW wind farm Aikengall II. This also provided sufficient capacity for a future expansion to the wind farm, known as Aikengall IIA.

The Aikengall II wind farm consisted of 19 3.2MW Siemens direct-drive wind turbines located on one of the windiest and consequently most productive sites in the UK, the Lammermuir Hills.

The client required a 33kV cable layout which minimised electrical losses between the turbines and also allowed for future cables to Aikengall IIA wind farm to be installed along the same wind farm tracks.

The 132kV substation, being a direct connection to National Grid, and having a registered capacity of 140MW needed to be Grid Code compliant.

Community Windpower wanted Powersystems to provide the full suite of electrical compliance studies to demonstrate Grid Code compliance and design the electrical infrastructure to ensure satisfaction of National Grid and Scottish Power's interface requirements.

How Powersystems helped:

Powersystems lead the high-level design of the electrical infrastructure right from the start of the project, determining that it was more cost effective to have the Aikengall II and Aikengall IIA wind farms supplied from a single substation, rather than having two separate substations located closer to the centre of each wind farm.

We designed the 132kV substation layout and 33kV cable system in such a way that the future equipment for Aikengall IIA wind farm can be installed with minimum interruption to the Aikengall II wind farm. This ensures that Aikengall II will continue to generate throughout the construction period for Aikengall IIA.

Our simulation studies of the grid transformer energisation indicated that it would fail to stay within the voltage dip limits set by National Grid. We therefore proposed a point-on-wave controller and a 132kV circuit breaker with segregated-phase switching to limit the transformer inrush current and corresponding voltage dip during energisation.

The results:

The completed Aikengall II wind farm become operational in November 2017. The site being set on a very windy location has a high utilisation factor.

Environmental Benefits

Aikengall II Community Wind Farm will generate enough electricity to power approximately 40,000 homes and will displace around 68,700 tonnes of Carbon Dioxide per annum.

Economic Benefits

Aikengall II Community Wind Farm will provide annual community benefit funding equivalent to £5,000 per MW of installed capacity for the planning permission of the wind farm. Based on an installed capacity of 60.8 MW, this equates to £304,000 per annum, totalling around £7.6 million during the 25-year operational period, for the local host communities.

The wind farm is a sound demonstration that onshore wind is the cheapest form of new-build electricity generation available in the UK today.

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