



CASE STUDY
13920

Fraisthorpe

Onshore Wind Farm Project - Renewable Energy



Fraisthorpe Wind Farm

Powersystems were responsible for the design, installation, testing and commissioning of the electrical infrastructure associated with this project. This consisted of a 66kV grid connection which was adopted by Northern Powergrid (NPG) as well as the electrical works for nine 3.3MW Vestas V112 wind turbines.

Fraisthorpe wind farm is a 29.7MW capacity wind farm situated in the East Riding of Yorkshire, England. Granted full planning permission in 2015, the wind power generation site began generating clean renewable energy in August 2016.

The completed site produces enough electricity to power over 22,500 homes and stops over 48,000 tonnes of carbon dioxide gas from entering the environment each year.

The wind turbines were initially shipped to Immingham Dock but safety concerns regarding the transportation of such large structures to site meant that they were unable to cross the Humber Bridge. Instead, the 197-foot (60m) blades took a circuitous 100-mile journey to avoid this route and arrive safely at Fraisthorpe.

The electrical work was undertaken in partnership with Jones Bros Civil Engineering on behalf of the client, BayWa r.e. GmbH.



Major design considerations:

Northern Powergrid set out strict connection requirements that needed to be met in order for the grid to accommodate the wind farm at 66kV. Powersystems design engineers used innovative design methods to meet these requirements and allow the customer to start selling energy to the electricity network.

The first of these was to design infrastructure which ensured Northern Powergrid's 66kV network would remain stable should faults occur on the windfarm. This was important in order to prevent any unnecessary outages on the grid. The inclusion of a high impedance 66/33kV transformer tackled this problem without compromising the overall performance of the customer's network.

Project facts and figures:

- ▶ Number of turbines: 9
- ▶ Wind turbine capacity: 3.3MW
- ▶ Totalled installed capacity: 29.7MW
- ▶ Length of 66kV underground cabling: 5km
- ▶ Length of onsite 33kV underground cabling: 18km
- ▶ Length of directional drilling under railway track: 100m
- ▶ 33kV capacitor bank: 3.5 MVAR
- ▶ 66/33kV high impedance transformer: 36MVA
- ▶ Powersystems have connected 24% of all onshore UK windfarms



66
kV

33
kV

11
kV

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How Powersystems helped:

As a Lloyds accredited contractor, Powersystems were appointed to design, supply, install, test and commission a new 66kV substation and 5km 66kV cable route for adoption by Northern Powergrid (NPG).

Powersystems installed a 5km 66kV ducted cable route in a mix of carriageway, footpath, verge, and agricultural land. This included a horizontal directional drill (HDD) under the Yorkshire Coast Railway Line. Powersystems liaised with Network Rail to ensure the 100m drill was compliant with their standards.

Due to the coastal location of the 66kV substation, we undertook a flood risk assessment. As a result, the substation compound was elevated 750mm above the surrounding land to ensure that it would be unaffected in the event of a flood.

The high impedance 66/33kV transformer gave rise to further design considerations. To overcome the reactive power losses in the transformer, we designed and installed a 3.5 MVar 33kV capacitor bank to guarantee that the wind farm would operate within Northern Powergrid's power factor limits for the connection.

Scope of works:

The major items of electrical plant that Powersystems designed, supplied, installed, and commissioned were:

- ▶ 36MVA 66/33kV transformer and ancillary plant
- ▶ 66kV circuit breaker and disconnectors
- ▶ 66kV voltage transformers (VTs) and current transformers (CTs)
- ▶ 66kV cable sealing ends
- ▶ 66kV protection panels including generation constraint scheme
- ▶ 33kV switchgear and associated protection equipment
- ▶ 33kV 50kVA auxiliary/earthing transformer and neutral earthing resistor (NER).
- ▶ Cable laying of 33kV, fibre optic and earth cables
- ▶ Earthing and lightning protection systems at the substation building and nine wind turbines
- ▶ 11kV pole-mounted transformer backup LV supply for the substation



The results:

- ▶ Fraisthorpe wind energy project was officially opened in August 2016

Economic benefits:

- ▶ The Fraisthorpe wind farm community benefit fund is being made available by Octopus Solutions, the owners of the Fraisthorpe wind farm, to support projects that improve the local quality of life and community resources for residents who live in the parish council areas of Barmston, Fraisthorpe, and Carnaby as well as part of the area served by Bridlington town council that sits south of the Spa. Grants are available of between £500 and £10,000
- ▶ Priority will be given to projects that:
 - ▶ Enhance quality of life for local residents
 - ▶ Contribute to vibrant, healthy, successful and sustainable communities
 - ▶ Promote community spirit and encourage community activity

The Fraisthorpe wind farm project was extremely successful and provided a meaningful economic boost to the local area. The wind farm is anticipated to generate electricity for 25 years which will support a community benefit fund.

Environmental benefits:

- ▶ The wind farm provides enough electricity to power over 22,500 homes and stops over 48,000 tonnes of carbon dioxide gas from entering the environment.



For more information

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