



66kV 275kV 33kV 11kV 132kV 400kV

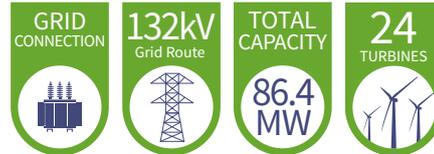
CASE STUDY
15975

Sandy Knowe Wind Farm

24 Wind Turbines with a connection capacity of 86.4 MW capable of powering 55,000 Homes

Project Facts and Figures

- ▶ Number of Wind Turbine Generators: 24
- ▶ Generator capacity: 3.6 MW
- ▶ Total Installed capacity: 86.4 MW
- ▶ Connection Voltage: 132 kV
- ▶ Altitudes of site: 505 ft
- ▶ Length of onsite 33 kV cabling: 22.3 km
- ▶ Energy for 55,000 houses



Introduction

The Sandy Knowe 86.4 MW Wind Farm is a state-of-the-art renewable energy project located in the scenic hills near Kirkconnel in Dumfries and Galloway, Scotland. This wind farm is a testament to Scotland's commitment to sustainable energy and reducing carbon emissions. With 24 wind turbines towering over the landscape, Sandy Knowe harnesses the region's robust and consistent wind resources to generate clean electricity for thousands of homes.

Developed by ERG, the Sandy Knowe Wind Farm was commissioned to meet the growing demand for renewable energy in the UK. The site was selected after comprehensive environmental and feasibility studies ensured minimal impact on local wildlife and habitats. Each turbine has been strategically placed to optimise wind capture while maintaining harmony with the natural surroundings.

Since its completion, the wind farm has played a crucial role in the local economy, creating jobs and supporting community initiatives. The project includes a community benefit fund that invests in local projects and infrastructure, promoting education, environmental conservation, and social development in the area.

Sandy Knowe Wind Farm is not just a source of renewable energy; it is a symbol of progress and sustainability, demonstrating the positive impact that renewable projects can have on communities and the environment. As part of Scotland's broader renewable energy strategy, this wind farm contributes significantly to the national grid, helping the country inch closer to its ambitious net-zero targets.



132
kV

Sandy Knowe - Wind Farm delivering a connected capacity of 86.4 MW

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Sandy Knowe 132 kV Substation and 33 kV Wind Farm Generation (Electrical Balance of Plant EBoP):

Powersystems high voltage (HV) specialist electrical engineering were appointed as the 86.4 MW Sandy Knowe Wind Farm Electrical Balance of Plant (EBoP) contractor. Powersystems were responsible for the design, build, testing, commissioning, and energisation of the entire electrical infrastructure associated with the construction of the 86.4 MW windfarm generation site.

The wind generation site received planning permission in 2016 from Dumfries and Galloway council. With the anticipated annual output of 250 gigawatt hours, the aim is to provide carbon free energy to over 55,000 homes in the surrounding areas.



Powersystems partnerships

The site is located near the A76 in Kirkconnel Dumfries and Galloway, and was constructed in partnership with Jones Brothers Civil Engineering Ltd on behalf of the client, ERG Power Generation SpA.

The site connects onto the Scottish Power Transmission Network (SPT) 132 kV network. Powersystems are the leading connection provider for wind farms in the UK and have connected over 30% of wind generation sites to the grid over the years, this project being one of a few projects undertaken for our client ERG. Powersystems engineers have the much-needed experience of working with every Distribution Network Operator (DNO) across the UK on this type of project, helping customers connect this type of project up and down the country.

Sandy Knowe Wind Farm scope of work and major design considerations:

The major items of electrical Infrastructure that Powersystems designed, supplied, installed, and commissioned were.

- ▶ Design and construction of the 132 kV Substation and compound – Including:-
 - ▶ 2 No. off Grid Transformers 132 kV Structures and Busbars
 - ▶ 132 kV Dead Tank Circuit breakers
 - ▶ 2 no off 132 kV Voltage Transformers
 - ▶ 132 kV Disconnectors and Earth Switches
 - ▶ 33 kV Capacitor Bank
 - ▶ 2 No. off 33/0.415 kV Auxiliary Earthing Transformers
- ▶ Installation and commissioning of the ten panel 33 kV Schneider WS Switch Board
- ▶ Installation of the 33 kV wind farm cabling works
- ▶ Earthing installation works
- ▶ Installation of low voltage, control, signal, and communications cabling works
- ▶ Design installation of the LV infrastructure
- ▶ Design and installation of the compound lighting and control panels
- ▶ Carry out various design studies, such as cable losses calculations, transformer bund calculations etc

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Sandy Knowe Wind Farm development:

As the UK energy production is changing by becoming greener and relying more on renewable energy to become net zero by 2050. Wind generation is the leading technology in this sector and the completion of this project will only aid in the UK achieving its carbon free goals.

The 24 x 3.6 MW turbines generate at 33 kV and are arranged of 5 arrays. These arrays then connect to the SPT network at 132 kV via the wind farm 132 kV Substation, where the 33 kV is increased to 132 kV by the 2 No. off 60 MVA 33/132 kV Grid Transformers.

Sandy Knowe Wind Farm project timings:

Construction of the Sandy Knowe Wind Farm site initially began in May 2021. Unfortunately, there was a delay to the project due to the original Principal Contractor going into administration, but despite the severe obstacles and with the right health and safety approach and procedures implemented, the project re-commenced and Powersystems continued at a steady and efficient pace. Powersystems re-mobilised on site in April 2022 which involved picking up and continuing with construction activities, Plant, and material deliveries, with key dates such as energisation on 5 October 2022.

The wind farm site became fully operational from February 2023 with all wind turbine generators (WTG's) producing and exporting power.

What the client wanted:

Climate change is the biggest challenge of our time, so the energy landscape is rapidly evolving. The UK's power network requires smart solutions to keep the lights on.

ERG have a growing wind generation portfolio that provides power to several thousands of homes within the UK, ERG are in fact the leading wind energy operator in Italy and have projects across seven different countries. ERG have set up a division with the UK and this is where they are most active in developing new wind assets. ERG's activities within the UK fit in to the UK Governments drive to reduce CO₂ emissions to zero by 2050.

How Powersystems helped:

Powersystems were appointed as the Balance of Plant High Voltage contractor for the project, involved with the design, installation, and commissioning of the electrical infrastructure for the wind generation project. Powersystems aim was to provide a high-quality service throughout this project, Powersystems achieved this by setting out objectives such as ensuring technical correctness, ensuring the client was getting exactly what they asked for whilst adding cost-effectiveness and finally by adhering to the number one Powersystems moto of "Safety First".

During the project there were a number of challenges that presented themselves and Powersystems engineers were at hand to provide full support to the client to help overcome any challenges through our excellent engineering knowledge and experience, which enabled the client to smoothly and successfully complete the project.

Powersystems worked closely with the project partners in order for the client to meet their deadlines that included arranged G99 testing. To achieve this, Powersystems engineers worked with the customer to prioritise the work tasks which resulted in the customer being able to generate power at the set target date to avoid costly penalties.

The list of responsibilities tasked to Powersystems can be summarised by the below;

- ▶ Electrical design and studies
- ▶ Client technical support
- ▶ Interface with SPT to co-ordinate any DNO requirements
- ▶ HV and LV infrastructure installation and commissioning
- ▶ Point on Wave Commissioning
- ▶ Protection and Control Panel installation and commissioning
- ▶ Cables & containment design, supply & installation
- ▶ HV/LV testing
- ▶ Senior Authorised Person (SAP) provision



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Design works

Design work is a vitally important part of any Powersystems project, at this stage we ensure the project will meet the clients regulatory, economic and most importantly safety requirements. The design works included in this project are listed below;

- ▶ Design of the 132 kV Substation compound and building
- ▶ Battery Charger Unit design
- ▶ Civil GA designs for the Substation and compound
- ▶ Design of the clients HV network
- ▶ Design of the LV network
- ▶ HV/LV cable calculations and cable sizing appropriate to the project loads and losses
- ▶ Review and advise on technical reports provided by the client
- ▶ Control & signal cable - this included the design of all small power and equipment control wiring

Installation works

Following the design stage, the installation work listed below was undertaken and completed;

- ▶ Installation of the Substation and compound earthing systems
- ▶ Installation of the Wind Turbine Generator (WTG) Earthing systems
- ▶ Installation of all associated 132 kV infrastructure within the 132 kV Substation compound
- ▶ Installation of all 33 kV cables
- ▶ Installation of LV and control cables
- ▶ Installation of the ten panel 33 kV Schneider WS SWB
- ▶ Installation of the 110V DC Battery charger unit
- ▶ Installation of the compound lighting including bespoke lighting contactor panel
- ▶ Installation of the 33 kV Capacitor Bank
- ▶ Undertook 33 kV jointing and termination works

Commissioning works

- ▶ Hot and Cold commissioning of the 33 kV SWB
- ▶ Hot and Cold commissioning of the Grid and Earthing Transformers
- ▶ AC Pressure (VLF) testing of newly installed HV cables
- ▶ Protection testing of 132 kV and 33 kV protection scheme
- ▶ Interface testing between the client's network and Transmission Network Operator (TNO)
- ▶ Electrical Installation certificate completed on newly installed LV circuits
- ▶ Insulation Resistance testing of all control and signal cables
- ▶ Functional testing of all newly installed equipment



Energisation works

- ▶ Provision of a 132/33 kV SAP to take energise the Substation and 132 kV compound
- ▶ Provision of a 33 kV SAP to attend site to provide supervision, undertake pre-energisation checks of WTG's, energise Wind farm arrays and issue safety documents to Powersystems operatives

The results:

The completed Sandy Knowe Wind Farm became operational in February 2023.

Environmental Benefit

- ▶ The 86.4 MW Sandy Knowe Wind Farm will aim to have an annual output of 250 gigawatt hours, providing carbon free energy to over 55,000 homes in the surrounding areas
- ▶ The site will help the Scottish Government to achieve its climate change legislation for Net zero emissions of all greenhouse gases by 2045

Economic Benefit

- ▶ This project will provide local community benefit fund, that will share up to £5,000 per MW of installed capacity with the local communities, in line with the Scottish Government policies and this will be over the life span of the project

In Conclusion:

The Sandy Knowe Wind Farm Balance of Plant contract work was completed within budget. This project is the first to be completed by Powersystems in 2023 for our new client but hopefully not the last as we hope to build a strong and supporting partnership between Powersystems and ERG as we work towards our common goal of making the UK greener.



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