POWERSYSTEMS™
HIGH VOLTAGE SPECIALISTS
An Employee Owned Business

CASE STUDY 15931

South Kyle Wind Farm

50 Wind Turbines with a connection capacity of 240MW capable of powering 190,000 Homes

GRID TRANSFORMERS 2 X 120 MVA

PROJECT VALUE MILLIONS 14.5

TOTAL CAPACITY 240 MW

50 TURBINES

VATTENFALL

RJ McLEOD

Introduction

South Kyle Wind Farm is one of the largest onshore renewable energy developments built in Scotland in recent years. With 50 Nordex N133/4.8 MW turbines, the site delivers 240 MW of clean, sustainable power, enough to supply around 190,000 homes annually.

Powersystems was appointed as the Electrical Balance of Plant contractor, responsible for the full design, installation, testing, commissioning and energisation of the electrical infrastructure, including:

- Two 132 kV substations
- Two 120 MVA grid transformers
- A 4.2 km 132 kV grid connection route
- 72 km of 33 kV array cabling
- Sixteen panel 33 kV switchboard
- Full LV, controls, protection, SCADA and communications systems

Following government consent, construction commenced in 2020. As Vattenfall's largest UK onshore wind farm, South Kyle represents a major investment in Scotland's sustainable energy future.

Project Facts and Figures

- 132 kV substations: 2
- Grid transformers: 2 No. 120 MVA
- Auxiliary transformers: 3
- Wind turbines: 50 No. 4.8 MW
- Installed capacity: 240 MW
- Altitude: Approx. 600 ft
- 33 kV cabling: 72 km
- 132 kV cabling: 4.2 km
- NERS Accredited ICP
- Powers up to 190,000 homes and offsets around 300,000 tonnes of CO_2 annually

132 kV

Powering the Transition to a Sustainable Future

South Kyle - Wind Farm capable of powering 190,000 homes

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

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Powersystems Partnerships

South Kyle spans two Scottish regions: East Ayrshire and Dumfries & Galloway.
It lies adjacent to SP Transmission's New Cumnock Substation and was delivered in partnership with R.J. McLeod, the Principal Balance of Plant Contractor.

The project connects directly into the SPT 132kV network, requiring close interface management with the Transmission Network Operator.

Powersystems has delivered numerous major wind projects alongside R.J. McLeod and Vattenfall, bringing extensive HV experience across all UK TNOs. This expertise ensured safe, coordinated and efficient grid integration for a project of national significance.

Wind Generation Development

Wind generation continues to play a vital role in the UK's transition to sustainable, low carbon energy. South Kyle marks Vattenfall's largest onshore wind project in the UK, with:

- 8 wind turbine arrays
- Turbines generating at 33 kV
- Voltage step up to 132 kV at the main substation
- Export via a 4.2 km 132 kV cable route to the remote connection substation
- Final connection to the SPT 132 kV network

The engineering design focused on long-term reliability, environmental stewardship and resilience across a large geographic footprint.

Scope of Works and Major Design Considerations
Powersystems designed, supplied, installed and commissioned all major electrical infrastructure, including:

132 kV Connection Substation

- 132 kV outdoor sealing ends
- 145 kV GE Hypact hybrid circuit breaker
- Earthing systems
- Protection and control panels
- Auxiliary power equipment
- 11 kV DNO interface

Main 132 kV Wind Farm Substation

- 2 No. 120 MVA grid transformers
- 132 kV structures and twin bay busbars
- 132 kV dead tank circuit breakers
- Voltage transformers, disconnectors and earth switches
- 2 No. 33/0.415 kV auxiliary earthing transformers

33 kV and Balance of Plant Systems

- Sixteen panel Schneider WS 33 kV switchboard
- 72 km of 33 kV cabling
- 132 kV cable route (4.2 km fully ducted)
- Substation and WTG earthing systems
- LV, control, communications and signal cabling
- Compound lighting and custom control panels
- IEC 61850 SCADA system
- Full 132/33 kV protection schemes

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Design Studies Included

- Protection coordination
- Load flow and steady state modelling
- Fault level calculations
- Harmonics
- Cable loss calculations
- Transformer bund capacity
- Lightning and earthing analysis

Project Timings

- May 2020: Civil works commenced
- Late 2021: Powersystems mobilisation
- 12 May 2022: Connection substation energised
- 22 August 2022: Main substation and first WTG array energised
- April 2023: Full wind farm operational

Strong health and safety management, proactive planning and streamlined engineering processes ensured the project met all major milestones despite its scale and technical complexity.

What the Client Wanted

Vattenfall's strategic ambition to "Power Climate Smarter Living" relies on developing high quality, efficient renewable energy projects with long-term operational resilience.

Their objectives for South Kyle included:

- A robust and reliable HV system
- Comprehensive substation and network design
- Safe and efficient construction
- Strong environmental stewardship
- Integration of sustainable construction practices
- Delivery of a project benefiting local communities for decades

How Powersystems Helped?

Powersystems delivered full HV Balance of Plant capabilities, ensuring:

- Technically precise, compliant engineering
- Safe installation across a challenging, multi site landscape
- Close collaboration with Vattenfall, R.J. McLeod and SPT
- Efficient sequencing to meet energisation deadlines
- A "Safety First" culture, embedded throughout construction
- Engineering solutions that reduced cost and improved long term reliability

Our team played a vital role in maintaining programme continuity, overcoming engineering challenges, and enabling the client to meet key grid connection dates.

Key Responsibilities Included

- Electrical design and studies
- Technical support and client liaison
- TNO interface management
- HV and LV installation
- Point on wave commissioning
- Protection and control integration
- Cable design, supply and installation
- HV/LV testing
- SAP provision

Design Works

Powersystems completed:

- Full 132 kV connection substation design
- Main 132 kV substation layout and building design
- 132/33 kV protection schemes
- SCADA architecture (IEC 61850)
- Civil GA drawings
- HV and LV network studies
- Cable sizing and loss modelling
- Control & signal interfaces
- Design reviews and technical advisory support

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Installation Works

Key installations included:

- Substation and compound earthing
- Full 4.2 km ducted 132 kV cable route
- All 132 kV plant at connection and main substations
- 72 km of 33 kV array cabling
- LV and control cabling
- 16 panel WS switchboard
- 110 V DC battery chargers
- Compound lighting and controls
- All 33 kV jointing and terminations

Commissioning Works

- Hot and cold commissioning of switchboards and transformers
- VLF AC pressure testing of HV cables, including the 132 kV route
- Protection scheme testing at 132 kV and 33 kV
- SCADA and communication testing
- TNO interface testing
- LV certification
- Functional testing of all installed systems

Energisation Works

Powersystems provided:

- 132/33 kV SAPs for energisation
- Pre energisation checks on all turbine arrays
- Safe energisation sequencing
- Issue of safety documentation for all operatives

The Results

The South Kyle Electrical Balance of Plant works were completed on programme, with final handover in April 2023. All turbines are now generating and exporting power into the Scottish grid.

This was one of the largest projects Powersystems has delivered to date and a major milestone in our partnership with R.J. McLeod and Vattenfall.

Environmental Benefits

- 240 MW powering ~190,000 homes annually
- ~300,000 tonnes of CO_2 offset per year
- Significant peatland restoration
- Native woodland planting
- On site material sourcing reducing transport emissions
- Long-term sustainability integrated into construction and operational planning

Economic and Social Value

- £38 million Community Benefit Fund over project lifetime
- £2.4 million initial investment via Foundation Scotland
- 720 Scottish jobs supported, including 270 in Southwest Scotland
- £93.4 million contribution to Scottish economy
- £44 million retained in the Southwest region
- Strong supply chain engagement through Meet the Buyer events

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