



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

CASE STUDY  
**161114**

# Lime Kiln Wind Farm

24 Wind Turbines with a connection capacity of 108MW capable of powering 100,000 Homes

## Introduction

Powersystems were appointed as the Electrical Balance of Plant (EBoP) contractor for the Limekiln 132 kV Substation and 33 kV Wind Farm, responsible for the design, build, testing, commissioning and energisation of the site's full electrical infrastructure.

Limekiln Wind Farm is the first UK project developed by Boralex, and consists of 24 turbines, delivering a total installed capacity of 108 MW. Once operational, the site will generate enough sustainable electricity to supply over 100,000 homes across the surrounding region.

Following planning consent from the Scottish Government, construction commenced in late 2023, with Powersystems leading the HV engineering and integration of the site's electrical systems.



GRID CONNECTION

33kV  
Grid Route

TOTAL CAPACITY

108 MW

24  
TURBINES

**BORALEX**

**RJ McLEOD**

## Project Facts and Figures

- ▶ 132 kV substations: 1
- ▶ Grid transformers: 1 (120 MVA, 33/132 kV)
- ▶ Dead Tank Circuit Breakers: 1
- ▶ Auxiliary transformers: 1
- ▶ Turbines: 24 x 4.5 MW
- ▶ Total installed capacity: 108 MW
- ▶ Connection voltage: 132 kV
- ▶ Altitude: Approx. 1,000 ft
- ▶ 33 kV cabling installed: 25 km
- ▶ NERS accredited ICP
- ▶ Energy for: ~100,000 homes



## Powersystems Partnerships

Situated in Caithness near the historic Dounreay Nuclear Facility, Limekiln Wind Farm was delivered in partnership with R.J. McLeod, on behalf of Boralex.

The site connects to the SSEN 132 kV transmission network, requiring careful coordination with the Transmission Network Operator throughout the design and commissioning stages.

As a leading connection provider, Powersystems brought extensive experience gained from working with all UK TNOs and DNOs, helping wind farm projects connect safely, efficiently and in line with national grid standards.



33 kV 132 kV

# Lime Kiln - Wind Farm delivering a connected capacity of 108MW

CASE STUDY 161114

## BORALEX

RJ McLEOD

### Wind Generation Development

The UK continues to transition towards a more sustainable energy system, and wind generation remains at the forefront of this shift. Limekiln contributes 108 MW of clean, renewable electricity and forms a key part of Boralex's growing UK portfolio.

The 24 turbines generate at 33 kV and are arranged across five turbine arrays, all feeding into the Limekiln wind farm substation. Here, voltage is stepped up to 132 kV for transmission directly onto the SSEN network.

The design approach prioritised resilience, environmental responsibility and long-term operational performance, ensuring the system will serve Scotland's energy needs for decades.

### Scope of Works and Major Design Considerations

Powersystems designed, supplied, installed and commissioned all major aspects of the electrical infrastructure, including:

#### 132 kV Substation Works

- ▶ 120 MVA 33/132 kV Grid Transformer
- ▶ Single-bay 132 kV structures and busbars
- ▶ 145 kV Dead Tank Circuit Breaker
- ▶ 132 kV Voltage Transformers
- ▶ 132 kV Disconnectors and Earth Switches
- ▶ 33/0.415 kV Auxiliary Earthing Transformer

#### 33 kV and Balance of Plant Systems

- ▶ 8 panel Schneider WS 33 kV switchboard
- ▶ 25 km of 33 kV cabling
- ▶ Earthing for substation and turbine locations
- ▶ LV, control, signal and communication cabling
- ▶ LV systems including compound lighting and control panels
- ▶ SCADA system interfacing with turbine supplier and client network
- ▶ 132/33 kV protection schemes

#### Key Design Studies

- ▶ Protection coordination
- ▶ Load flow analysis
- ▶ Fault level studies
- ▶ Harmonic analysis
- ▶ Cable loss calculations
- ▶ Transformer bund calculations

### Project Timings

Initial civil works commenced in early 2023, with Powersystems mobilising in late 2023. Despite a condensed delivery window and the complexity of the site, strong health and safety processes and collaborative planning ensured the project met all critical milestones.

A major achievement was the energisation of the main substation and first turbine array on 20 November 2024, enabling early generation. The full wind farm will be operational by April 2025.



### What the Client Wanted

Boralex are committed to expanding access to affordable renewable energy and supporting climate resilience across their global portfolio. For this project, their objectives included:

- ▶ High-quality, robust electrical infrastructure
- ▶ Safe, efficient delivery within a defined programme
- ▶ Long-term operational sustainability
- ▶ A system designed to support Scotland's decarbonised energy future

### How Powersystems Helped

As the appointed HV Balance of Plant contractor, Powersystems provided full life cycle delivery from early design through to energisation.

#### We ensured:

- ▶ Compliance with all technical and regulatory requirements
- ▶ A cost effective approach without compromising safety or quality
- ▶ Clear communication and coordination with SSEN
- ▶ Expert engineering support to resolve challenges quickly
- ▶ Prioritisation of tasks to meet grid energisation deadlines

Our team also implemented rigorous safety systems, consistent toolbox talks, and robust electrical testing procedures to ensure a safe and successful project.

#### Key Responsibilities Included:

- ▶ Electrical design, studies and interface management
- ▶ Technical support to Boralex
- ▶ HV and LV installation
- ▶ Point on wave commissioning
- ▶ Protection and control panel installation
- ▶ HV/LV testing and certification
- ▶ SAP provision for energisation activities



## Design Works

- ▶ Design was a critical phase to ensure cost efficiency, regulatory compliance and system safety. Works included:
- ▶ Full 132 kV substation and compound layout
- ▶ 132/33 kV protection scheme design
- ▶ Battery charger and LV design
- ▶ HV and LV network modelling
- ▶ Cable sizing and loss studies
- ▶ SCADA and communication network design
- ▶ Review of all client technical documentation
- ▶ Control and signal circuit design

## Installation Works

- ▶ Powersystems completed installation of:
- ▶ All substation and turbine earthing
- ▶ 132 kV compound infrastructure
- ▶ 25 km of 33 kV cabling
- ▶ LV and control cabling
- ▶ Schneider WS switchboard
- ▶ Protection and control panels
- ▶ 110 V DC battery chargers
- ▶ Compound lighting and control equipment
- ▶ 33 kV termination and jointing works



## Commissioning Works

Commissioning activities included:

- ▶ Hot and cold commissioning of switchboards, transformers and auxiliary equipment
- ▶ VLF pressure testing of HV cables
- ▶ Full protection scheme testing at 132 kV and 33 kV
- ▶ TNO interface testing
- ▶ LV installation certification
- ▶ Functional testing of all new systems

## Energisation Works

- ▶ Provision of SAPs for 132/33 kV energisation
- ▶ Pre energisation checks on all turbine arrays
- ▶ Safe energisation of arrays and substation infrastructure
- ▶ Issuance of safety documents to site operatives

## The Results

The Limekiln Wind Farm Balance of Plant works were completed on programme in April 2025, with the final turbine array energised and handed over on schedule and within budget.

Wind remains Scotland's largest electricity source, and Limekiln will meaningfully contribute to sustainable regional supply.

Powersystems are proud to have supported Boralex on their first UK project and look forward to future collaborations delivering shared sustainability goals.

## Environmental Benefits

- ▶ 108 MW of clean energy powering approx. 100,000 homes
- ▶ Supports Scotland's climate commitments
- ▶ Long-term sustainable land use
- ▶ Reduced reliance on fossil fuels throughout the region

## Economic and Social Value

Over its 25 year operational life, Limekiln will deliver:

- ▶ A long-term community benefit fund
- ▶ Around 720 jobs supported across Scotland during construction
- ▶ 270 jobs supported in the north of Scotland Significant contribution to the regional economy

