



CASE STUDY  
**14549**

# Goole Fields II

## Onshore Wind Farm Project - Renewable Energy



### Major design considerations:

Initial design studies for the substation highlighted that the 39MVA 66/33kV grid transformer would produce significant voltage dips when energised. The design studies indicated that the 66kV voltage would dip by 14.9% when the transformer was switched on, well in excess of the Engineering Recommendation P28 limit of 3%.

To overcome this, Powersystems engineers installed and commissioned a point-on-wave controller with the 66kV circuit breaker in order to limit the transformer inrush current and ensure the voltage dips complied with the P28 standard.

Powersystems also designed, installed and commissioned 17 external 33kV package substations for the wind turbine transformers. The package substations were designed to meet the high security and anti-vandalism requirements of the client, and provide remote control and monitoring of the 33kV switchgear and transformers.

### Goole Fields II 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 17 Senvion 2.05MW MM92 wind turbines.

Goole Fields II wind farm is a 35MW capacity wind farm situated in the East Riding of Yorkshire, England. Granted full planning permission in 2016, the wind power generation site began generating clean renewable energy in June 2017.

The wind farm site extended to the existing Goole Fields wind farm, which was constructed in 2014, from 16 to 33 turbines, with a total rated output of over 67 MW. The average annual generation expected at Goole Fields and Goole Fields II would be equivalent to the domestic needs of around 38,000 average UK homes.

The electrical work was undertaken in partnership with Farrans Construction on behalf of the client Innogy.

### Project facts and figures:

- ▶ Number of turbines: 17
- ▶ Wind turbine capacity: 2.05MW
- ▶ Totalled installed capacity: 35MW
- ▶ 66kV circuit breaker with integral disconnectors & earth switches (ABB Pass Unit)
- ▶ 39MVA 66/33kV grid transformer
- ▶ Length of onsite 33kV underground cabling: 32km



**66**  
kV

**33**  
kV

# Goole Fields II - Onshore Wind Farm Project - Renewable Energy

CASE STUDY 14549



## How Powersystems helped:

Powersystems were appointed by Innogy to design, supply, install, test and commission a 66kV outdoor open-terminal substation and also carry out the electrical works infrastructure for 17 Senvion MM92 wind turbines.

The major items of electrical infrastructure were as follows:

- ▶ 39MVA 66/33kV transformer and ancillary plant
- ▶ 66kV cable sealing ends
- ▶ 33kV neutral earthing resistor (NER)
- ▶ 33kV cable connecting turbines and switchgear building
- ▶ Cable laying of 33kV, fibre optic communications and earth cables
- ▶ 66kV circuit breaker with integral disconnectors, VT's, and earth switches (ABB Pass Unit).
- ▶ 66kV control and protection panels for the transformer including point-on-wave controller and auto-voltage regulator (AVR) relay.
- ▶ Building
  - ▶ 33kV switchgear, protection and control
  - ▶ Auxiliary transformer circuit breaker
  - ▶ 110V DC battery charger
  - ▶ 33kV terminations
- ▶ Domestic supplies, including heating, lights and small power
- ▶ 50kVA 33/0.415kV auxiliary supply transformer
- ▶ Signal control and multicore wiring to SCADA system
- ▶ Electrical design and grid compliance studies
  - ▶ Insulation co-ordination study
  - ▶ Lightning protection study
  - ▶ Earthing study
- ▶ Earth system
  - ▶ Turbine earth electrodes
  - ▶ Switchgear/metering building earth electrodes
  - ▶ Outdoor open terminal substation earth electrode
- ▶ 17 No. 33kV external turbine transformer package substations
  - ▶ 2.5MVA 33/0.69kV transformers
  - ▶ Distance local control panel
  - ▶ 33kV switchgear, protection and ancillary services



## The results:

- ▶ Goole Fields wind energy project was officially opened in 2016
- ▶ The £12.7m Goole Fields II was a successful extension to the £5.5M Goole Fields wind farm

## Economic benefits:

- ▶ The community fund will invest in the region of £1.61 million over the operational lifetime of the wind farm.
- ▶ £250,000 community fund is available each year

## Environmental benefits:

- ▶ With a total installed generating capacity of 35 MW, the Goole Fields II development has the potential to make an important contribution towards helping tackle climate change, and to securing the U.K.'s energy supply.
- ▶ Goole Fields II wind farm could also meet the demands of the equivalent of up to 22,100 average U.K. households each year.
- ▶ Goole Fields I and II have a total rated output of 67MW and would meet the domestic needs of 38,000 average UK homes.



For more information

**T** 01454 318000

[www.powersystemsuk.com](http://www.powersystemsuk.com)