

Dungavel Wind Farm CO₂ Analysis Report

August 2018

Dungavel Wind Farm

CO₂ Analysis Report

Executive Summary

Aardvark Certification Ltd (ACL) has been instructed by John Laing Environmental Assets Group Ltd to assess and report against the carbon savings achieved by the 24MW wind farm located in South Lanarkshire, South West Scotland. This assessment considers the CO₂ savings made as a result of the wind farm’s energy production and export to the grid.

Asset Introduction

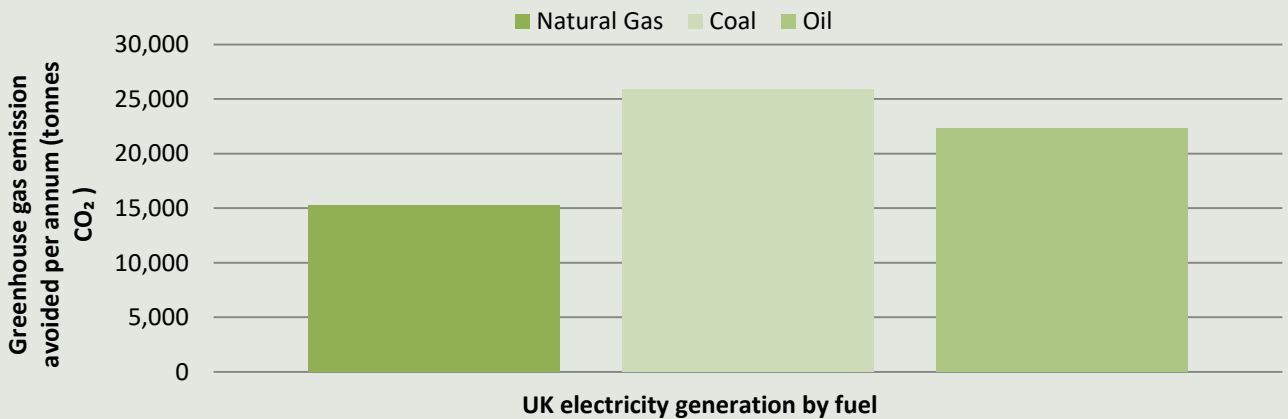
The Dungavel Wind Farm comprises of 12 Vestas turbines each with a three-bladed rotor, active pitch control and variable speed operation with a rated power of 2,000kW each. Each turbine has a rotor diameter of 80m. Each year an average of 83,233MWh of renewable electricity is produced. Since commissioning in 2014 the turbine has produced an estimated 374,548MWh of electricity. During the course of the installations remaining lifetime it is anticipated that up to 1,706,277MWh will be produced.

The renewable energy generated by turbine is fed directly into the grid via the transformer. The grid management system converts the current generated by the generator into an AC current according the requirements and standards given by the local utilities operator.



CO₂ Savings

The preceding summary of energy generation from the wind farm enables illustration of the quantities of CO₂ that have been avoided had the Dungavel Wind Farms annual electricity production (83,233MWh) been produced by conventional fossil fuel sources.



GHG Emissions Avoided

Fuel Type	Average Annual (tonnes CO ₂ e)	Remaining Lifetime (tonnes CO ₂ e)
Natural Gas	15,283	479,259
Coal	25,895	530,857
Oil	22,332	457,811

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Energy Production

As there are no green house gas emissions associated with the operational phase of a wind farm, the renewable energy produced by the Dungavel Wind Farm offsets 100% of the equivalent fossil fuel derived energy.

Total energy produced each year	UK Generated Electricity	Wind Generated Electricity
	Conversion Factor	0.28088
	CO₂ Equivalent (kg CO₂e)	23,378,485
83,233,000 kWh	Annual CO₂ Difference (kg CO₂e)	23,378,485

What do these savings mean?

The forecast CO₂ savings the Dungavel Wind Farm will achieve over its lifetime is equivalent to:

- removing the combined emissions of 506 medium sized diesel cars over 25 years from UK roads.
- Power 17,175 residential properties based upon the national average electricity consumption statistics.
- Provide enough power to drive a Nissan Leaf 244,802,941 million miles a year – equivalent to driving 9,831 times around the circumference of the earth
- Boil enough water for 14,566 million cups of tea

Site Location

The turbines location is carefully chosen to optimise the conversion of available energy from the wind to into electricity. The site's average wind speed is 6.8m/s, 2.5m/s greater then the UK average, allowing for an annual energy production of 83,233MWh.

Average Wind Speed m/s	Energy Production MWh/yr
6.8	479,249

CO₂ Forecast

Based on the quantity of electricity the turbine produces each year, an average of 23,378 tonnes CO₂e per annum will be offset compared to the emissions associated with electricity produced for the UK Grid. It is expected that during the course of the turbines remaining 20.5 years of operational life 479,259 tonnes CO₂e will be saved.

Other Emissions to Air Avoided

In addition to offsetting CO₂ emissions, other greenhouse gas emissions are also avoided including CH₄ and N₂O. Based on the amount of electricity produced by the Dungavel Wind Farm per annum, emissions of these gasses which have been avoided have been calculated and shown below.

CH ₄ emissions avoided kg/yr	N ₂ O emissions avoided kg/yr
54,933	127,346

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Methodology

This report has been prepared in good faith by Aardvark Certification Ltd based on data obtained from the owner/operator of the asset reviewed. Our calculations of CO₂ savings are based on IFI Approach to GHG Accounting for Renewable Energy Projects. Baseline Emission Factors used in this analysis are taken directly from the Department for Business, Energy & Industrial Strategy Greenhouse gas reporting: conversion factors 2018.

Liability

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