

# Dungavel Wind Farm CO<sub>2</sub> Analysis Report

April 2019

# Dungavel Wind Farm

## CO<sub>2</sub> 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 26MW wind farm located in South Lanarkshire, South West Scotland. This assessment considers the CO<sub>2</sub> savings made as a result of the wind farm’s energy production and export to the grid.

### Asset Introduction

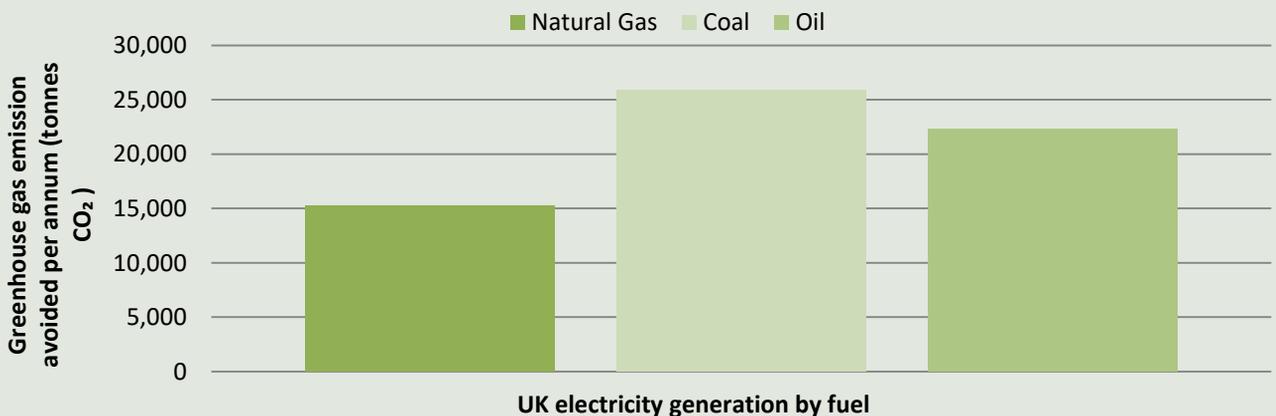
The Dungavel Wind Farm comprises of 13 Vestas v80 turbines each with a three-bladed rotor, active pitch control and variable speed operation with a rated power of 2,000kW each. Each turbine has a rotor diameter of 80m. Each year an average of 83,228MWh of renewable electricity is produced. Since commissioning in 2015 the wind farm has produced an estimated 285,615MWh of electricity. During the course of the installations remaining lifetime it is anticipated that up to 1,679,686MWh will be produced.

The renewable energy generated by the wind farm 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.



### CO<sub>2</sub> Savings

The preceding summary of energy generation from the wind farm enables illustration of the quantities of CO<sub>2</sub> that have been avoided had the Dungavel Wind Farm’s annual electricity production (83,228MWh) been produced by conventional fossil fuel sources.



### GHG Emissions Avoided

Fuel Type	Average Annual (tonnes CO <sub>2</sub> e)	Remaining Lifetime (tonnes CO <sub>2</sub> e)
Natural Gas	15,311	308,995
Coal	25,894	522,584
Oil	22,331	450,677

# Dungavel Wind Farm

## CO<sub>2</sub> Analysis Report

### 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 avoids 100% of the equivalent fossil fuel derived energy.

Total energy produced each year	UK Generated Electricity	Wind Generated Electricity
	<b>Conversion Factor</b>	0.28307
	<b>CO<sub>2</sub> Equivalent (kg CO<sub>2</sub>e)</b>	0.000
83,228,000 kWh	23,559,350	0.000
	<b>Annual CO<sub>2</sub> Difference (kg CO<sub>2</sub>e)</b>	23,559,350

### What do these savings mean?

The forecast CO<sub>2</sub> savings the New Albion Wind Farm will achieve over its lifetime is equivalent to:

- removing the combined emissions of 10,914 medium sized diesel cars over 20 years from UK roads.
- Power 22,319 residential properties based upon the national average electricity consumption statistics.
- Provide enough power to drive a Nissan Leaf 244,788,235 miles a year – equivalent to driving 9,830 times around the circumference of the earth
- Boil enough water for 14,565 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 8.8m/s, 4.5m/s greater then the UK average, allowing for an annual energy production of 83,228MWh.

Average Wind Speed m/s	Energy Production MWh/yr
8.8	83,228

### CO<sub>2</sub> Forecast

Based on the quantity of electricity the turbine produces each year, an average of 23,559 tonnes CO<sub>2</sub>e per annum will be avoided compared to the emissions associated with electricity produced for the UK Grid. It is expected that during the course of the turbines remaining 16.7 years of operational life 394,619 tonnes CO<sub>2</sub>e will be saved.

### Other Emissions to Air Avoided

In addition to avoiding CO<sub>2</sub> emissions, other greenhouse gas emissions are also avoided including CH<sub>4</sub> and N<sub>2</sub>O. 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 <sub>4</sub> emissions avoided kg/yr	N <sub>2</sub> O emissions avoided kg/yr
54,930	127,339

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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 CO<sub>2</sub> 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

This document contains information and may contain conclusions and recommendations. Every effort has been made to ensure that the information is accurate and that the opinions expressed are sound. However, Aardvark EM Limited cannot be made liable for any errors or omissions or for any losses or consequential losses resulting from decisions based on the information.



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