

Moel Moelogan 2 Wind Farm

CO₂ Analysis Report

April 2019

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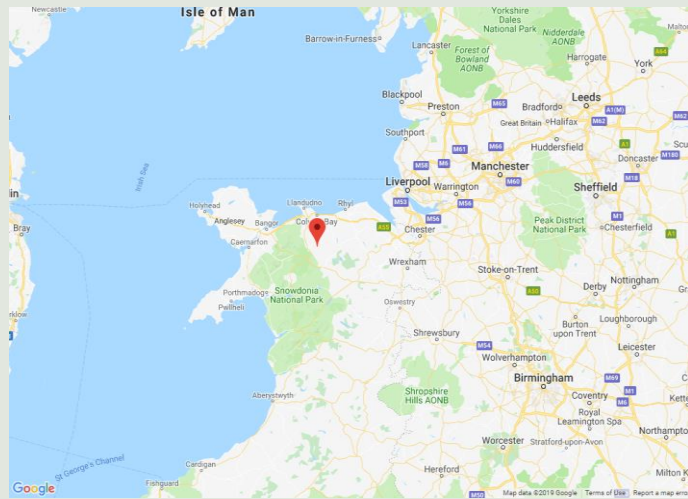
Executive Summary

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 11.7MW wind farm located in North Wales. This assessment considers the CO₂ savings made as a result of the wind farm's energy production and export to the grid.

Asset Introduction

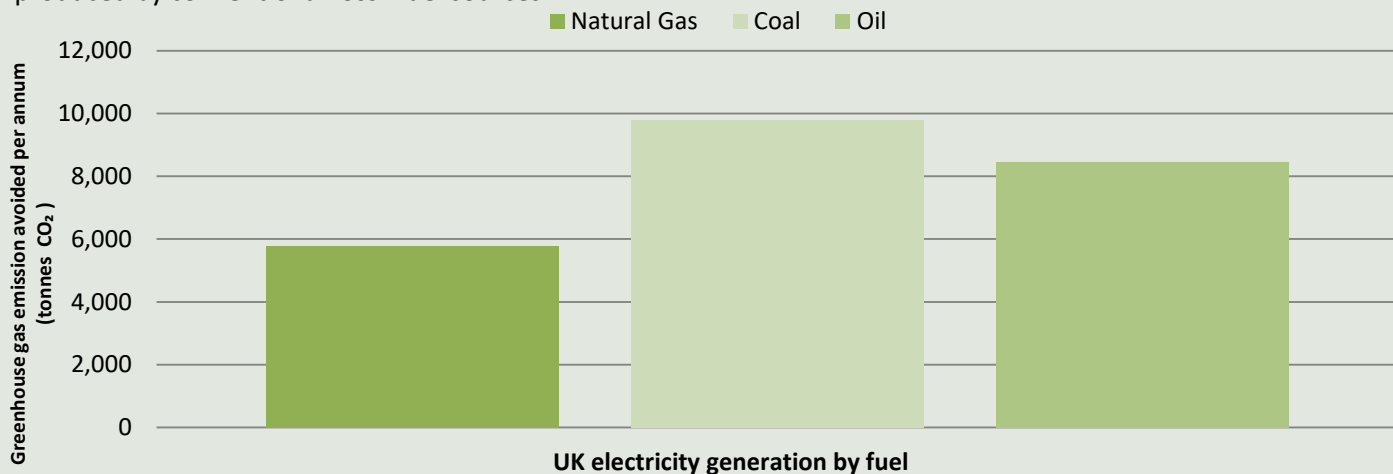
The Moel Moelogan 2 Wind Farm comprises of 9 Siemens SWT-1.3 turbines each with a three-bladed rotor, active pitch control and variable speed operation with a rated power of 1,300kW each. Each year an average of 31,502MWh of renewable electricity is produced. Since commissioning in 2013 the wind farm has produced an estimated 202,449MWh of electricity. During the course of the installations operational lifetime it is anticipated that up to 643,479MWh 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.



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 Moel Moelogan 2 Wind Farm's annual electricity production (31,502MWh) 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	5,795	118,374
Coal	9,801	200,199
Oil	8,452	172,652

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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 Moel Moelogan 2 Wind Farm avoids 100% of the equivalent fossil fuel derived energy.

Total energy produced each year	UK Generated Electricity	Wind Generated Electricity	
	Conversion Factor	0.28307	0.000
31,502,000 kWh	CO₂ Equivalent (kg CO₂e)	8,917,271	0.000
	Annual CO₂ Difference (kg CO₂e)		8,917,271

What do these savings mean?

The forecast CO₂ savings the Moel Moelogan 2 Wind Farm will achieve over its lifetime is equivalent to:

- removing the combined emissions of 4,181 medium sized diesel cars over 20 years from UK roads.
- Power 8,448 residential properties based upon the national average electricity consumption statistics.
- Provide enough power to drive a Nissan Leaf 92,652,941 miles a year – equivalent to driving 3,721 times around the circumference of the earth
- Boil enough water for 5,513 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 8.0m/s, 3.7m/s greater then the UK average, allowing for an annual energy production of 31,502MWh.

Average Wind Speed m/s	Energy Production MWh/yr
8.0	31,502

CO₂ Forecast

Based on the quantity of electricity the turbine produces each year, an average of 8,917 tonnes CO₂e 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 14 years of operational life 124,842 tonnes CO₂e will be saved.

Other Emissions to Air Avoided

In addition to avoiding CO₂ emissions, other greenhouse gas emissions are also avoided including CH₄ and N₂O. Based on the amount of electricity produced by the Moel Moelogan 2 Wind Farm per annum, emissions of these gasses which have been avoided have been calculated and shown below.

CO ₂ e of CH ₄ emissions avoided kg/yr	CO ₂ e of N ₂ O emissions avoided kg/yr
20,791	48,198

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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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