

Llynfi Afan Wind Farm

CO₂ Analysis Report

April 2019

Llynfi Afan 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 near Abergwynfi in South Wales. This assessment considers the CO₂ savings made as a result of the wind farm’s energy production and export to the grid.

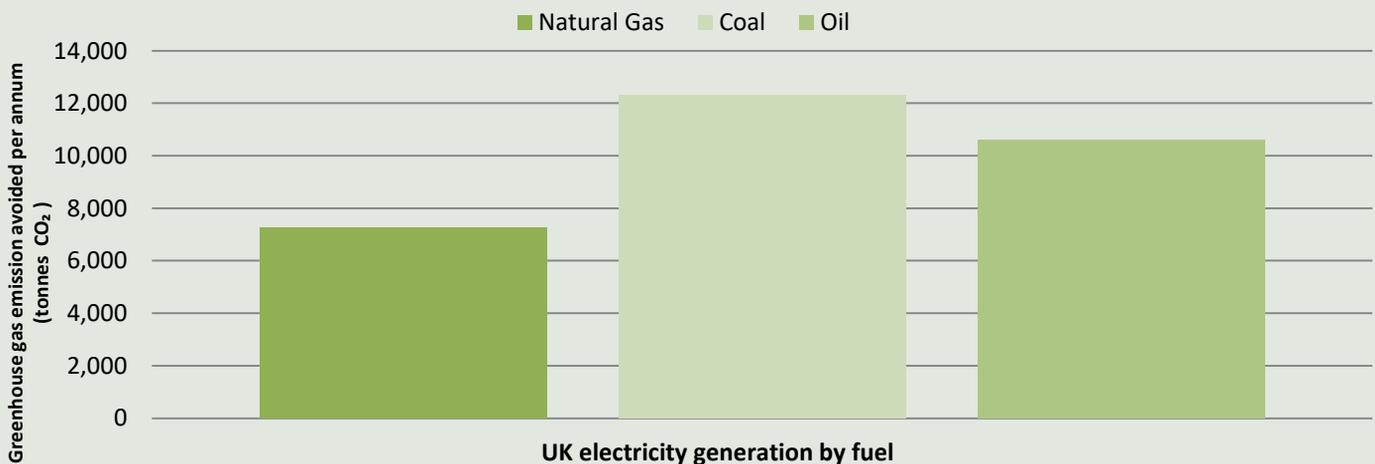
Asset Introduction

The Llynfi Afan Wind Farm comprises of 12 Gamesa G80 turbines each with a three-bladed rotor, active pitch control and variable speed operation with a rated power of 2,000kW each. Each year an average of 39,556MWh of renewable electricity is produced. Since commissioning in 2017 the wind farm has produced an estimated 127,566MWh of electricity. During the course of the installations operational lifetime it is anticipated that up to 846,164MWh 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 Llynfi Afan Wind Farm’s annual electricity production (39,556MWh) 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	7,277	155,660
Coal	12,307	263,259
Oil	10,613	227,034

Llynfi Afan Wind Farm

CO₂ 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 Llynfi Afan 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
	CO₂ Equivalent (kg CO₂e)	0.000
39,556,000 kWh	11,197,117	0.000
	Annual CO₂ Difference (kg CO₂e)	11,197,117

What do these savings mean?

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

- removing the combined emissions of 5,498 medium sized diesel cars over 20 years from UK roads.
- Power 10,608 residential properties based upon the national average electricity consumption statistics.
- Provide enough power to drive a Nissan Leaf 116,341,176 miles a year – equivalent to driving 4,672 times around the circumference of the earth
- Boil enough water for 6,922 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 8.1m/s, 3.8m/s greater then the UK average, allowing for an annual energy production of 39,556MWh.

Average Wind Speed m/s	Energy Production MWh/yr
8.1	39,556

CO₂ Forecast

Based on the quantity of electricity the turbine produces each year, an average of 11,197 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 18.2 years of operational life 203,413 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 Llynfi Afan 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
26,107	60,521

Llynfi Afan Wind Farm

CO₂ Analysis Report

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

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.



AARDVARK

Certification Ltd.