

Codford Biogas Plant CO₂ Analysis Report

May 2021

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CO₂ Analysis Report

Executive Summary

Aardvark Certification Ltd (ACL) has been instructed by JLEN Environmental Assets Group Ltd to assess and report against the carbon savings achieved by the 3.8MW Codford Biogas Plant located near Warminster in Wiltshire. This assessment considers the CO₂ savings made as a result of this biogas plant as well as the wider environmental benefits the project has delivered.

Asset Introduction

The Codford Biogas Plant is currently fed on approximately 90,000 tonnes per annum of food waste. The biogas plant has a designed export capacity of 3.8MW in the form of electricity which is directly to the national grid. Three CHP's (2no. 1.066 MW and 1no. 1.5 MW) provide heat and power to meet the energy requirements of the plant with surplus electricity exported to the grid and some of the available heat supplied for local use. The plant was originally commissioned in 2014 at 2.1 MW and has undergone expansion in 2016 with the addition of the 1.5 MW genset and 0.165 MW ORC. At current capacity, the plant produces circa 30,376 MWh of renewable electricity per annum.



CO₂ Savings from Renewable Electricity & Heat

Renewable energy such as electricity and heat derived from biogas avoids significant CO₂ emissions compared with fossil fuel derived energy. Standard conversion factors for fossil fuel derived electricity, natural gas and biomethane are shown below:

UK Generated Electricity: 0.23314 kg CO₂e per kWh

Natural Gas: 0.18387 kg CO₂e per kWh (gross CV)

Biomethane: 0.00518 kg CO₂e per kWh (gross CV)

The calculated CO₂ savings shown within this report are based on the actual savings achieved by the site.

Greenhouse Gas Emissions

The Codford Biogas Plant uses 100% waste materials as feedstock to produce energy. The anaerobic digestion process enables the diversion of this waste going to landfill where the decomposition of the material would release greenhouse gases directly to atmosphere. By treating the waste via anaerobic digestion, the energy from these gasses can be captured and substitute fossil fuel derived energy.

CO₂ Emissions Avoided

Based on the above data, it is possible to calculate the CO₂ savings the plant has achieved since commissioning had the equivalent quantity of energy been derived from fossil fuel sources. Total CO₂ emissions which would have come from an equivalent quantity of electricity or natural gas from fossil fuel sources in the UK is shown below along with CO₂ savings made through energy production from the biomethane plant. This shows a total of 7,075tCO₂e is being avoided per annum by the Codford Biogas Plant through it's electricity export.

Total Energy Produced		UK Generated Electricity	Biogas Generated Electricity
		0.23314	0.00021
	Conversion factors		
	CO ₂ Equivalent (kg CO ₂ e)	7,081,861	6,379
Electricity	30,376 MWh		
		7,075,482	
		CO ₂ Difference (kg CO ₂ e)	

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CO₂ Savings & Lifetime Forecast

With the preceding analysis, it is possible to calculate the CO₂ emissions which will be avoided in the future based on the expected operational phase of the plant. An anaerobic digestion plant is typically designed with a 20 year operational lifetime. In practice this may go on well beyond the planned 20 years. Based on the expected 20 year operational forecast, the Codford Biogas plant is expected to save a total of 135,304 tCO₂e. This forecast is based on the current GHG emissions associated with the processing of waste feedstocks and operation of the plant. In practice it is expected that improved technology and efficiencies over the remainder of the lifetime of the plant will enable it to reduce its own emissions thereby increasing the overall CO₂ savings it contributes. The plant is not currently utilising all available heat produced and may be able to avoid further emissions in future if additional local heat users can be identified.

What do these savings mean?

The CO₂ savings achieved by the project can be difficult to comprehend and relate to real world understanding. We therefore equate the savings to every day scenarios such as vehicles, and homes to assist readers in interpreting the data.

The Codford Biogas Plant has to date offset an estimated 43,323 tCO₂e since commissioning and is expected to offset at least a further 91,981 tCO₂e over its operational lifetime.

This equates to:

- Equivalent emissions produced by a mid-sized diesel car driving around Earth's equator 19,456 times over the lifetime of the plant
- Removing 62,114 mid-sized diesel cars from UK roads based on the lifetime CO₂ savings the plant will achieve whilst it has already offset equivalent emissions to 21,740 cars.
- Providing enough renewable electricity to power 6,467 average UK homes over the lifetime of the plant.

Other Environmental & Community Benefits

Digestate

The Codford Biogas plant delivers another important environmental benefit to the local farms around the plant through provision of a natural biofertiliser they are able to spread on their land. This offsets the need for fossil fuel derived fertilisers. The liquid fraction of the digestate has been particularly useful for establishment of wheat, barley and oilseed rape. Use of the digestate as a direct replacement for traditional fertilisers offsets an estimated 897 t CO₂e per annum.

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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 2020.

Energy usage statistics are taken from OfGEM - <https://www.ofgem.gov.uk/gas/retail-market/monitoring-data-and-statistics/typical-domestic-consumption-values>

Mileage travelled per vehicle in the UK was taken from the RAC Foundation.

Digestate NPK values sourced from Defra's Fertiliser Manual 2017 (RB209) 9th edition

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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