

Kirkthorpe Hydropower Project CO₂ Analysis Report

September 2019

Kirkthorpe Hydropower Project

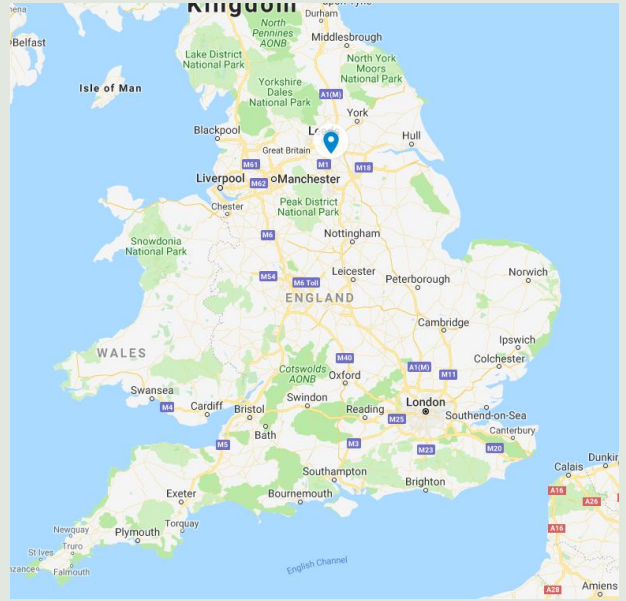
CO₂ Analysis Report

Executive Summary

Aardvark Certification Ltd (ACL) has been instructed by John Laing Environmental Assets Group (UK) Ltd to assess and report against the carbon savings achieved by their 500kW hydropower project located alongside the River Calder near Wakefield. This assessment considers the CO₂ savings made as a result of the hydro turbine's energy production and export to the grid.

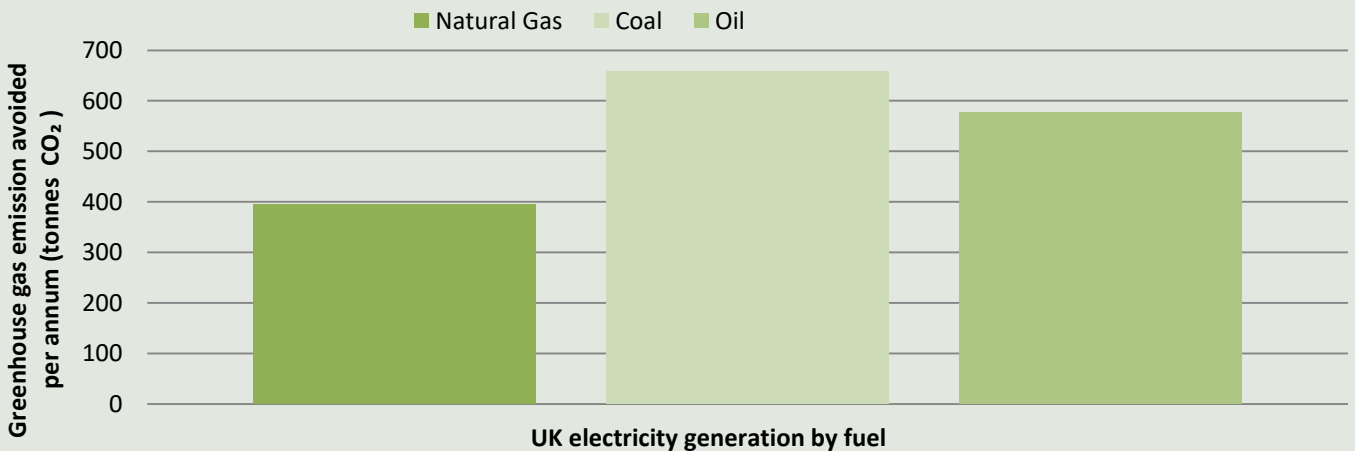
Asset Introduction

The Kirkthorpe Hydropower Project is a low head propeller type Kaplan turbine located alongside the Kirkthorpe weir. Adjustable inlet guide vanes allow it to maximise its energy yield to suit the flow rate. The turbine has a design capacity of 550kW which is limited to 500kW to sit within FiT bandings. Each year an average of 2,153MWh of renewable electricity has been produced. Since commissioning in November 2016, the turbine has produced 6,100MWh of electricity. During the course of the installations total lifetime it is anticipated that up to 129,180MWh will be produced. The renewable energy generated by the turbine is fed either directly into the grid or will be used to charge a planned onsite battery storage facility which will form part of the asset.



CO₂ Savings

The preceding summary of energy generation from the turbine enables illustration of the quantities of CO₂ that have been avoided had the Kirkthorpe Hydropower Projects annual electricity production (2,153MWh) been produced by conventional fossil fuel sources.



GHG Emissions Avoided

Fuel Type	Average Annual (tonnes CO ₂ e)	Lifetime Saving (tonnes CO ₂ e)
Natural Gas	396	20,072
Coal	658	29,275
Oil	577	33,946

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Energy Production

As there are no green house gas emissions associated with the operational phase of a hydro turbine, the renewable energy produced by the Kirkthorpe Hydropower Project offsets 100% of the equivalent fossil fuel derived energy.

Total Energy Produced			UK Generated Electricity	Solar PV Generated Electricity
			0.25560	0.00000
Electricity	2,153,000	kWh	550,307	0
		CO ₂ Equivalent (kg CO ₂ e)		
		CO ₂ Difference (kg CO ₂ e)		550,307

What do these savings mean?

The forecast CO₂ savings the Kirkthorpe Hydropower Project will achieve over its lifetime is equivalent to:

- removing the combined emissions of 253 medium sized diesel cars every year from UK roads for the lifetime of the asset.
- Power 577 residential properties every year based upon the national average electricity consumption statistics.
- Provide enough power to drive a Nissan Leaf 6,332,353 miles a year – equivalent to driving 254 times around the circumference of the earth
- Boil enough water for 377 million cups of tea

CO₂ Forecast

Based on the quantity of electricity the turbine produces each year, an average of 550 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 turbine's remaining 57.2 years of operational life, a further 31,459 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 Kirkthorpe Hydropower Project 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
1,421	3,294

Additional Benefits

As well as the various environmental benefits the Kirkthorpe Hydropower Project delivers, it has also been designed to mitigate any impact on local biodiversity in and along the river.

Yorkshire Hydropower has constructed a Larinier Fish Pass and Eel Pass which will aid the upstream movement of

- salmon and sea-trout (both Biodiversity Action Plan (BAP) species) towards their spawning gravels, passing the tallest obstacle to upstream migration on the major rivers of Yorkshire
- sea and river lamprey (BAP species) that migrate up from the North Sea to spawning gravels in the River Calder and Colne
- the European Eel, using a separate brush filled pass attached to the old sluice pier
- a wide variety of coarse fish (including barbel, dace, chub and grayling), allowing access to new habitat and spawning gravels.

The fish and eel pass that were built is a vital measure required to help secure sustainable fish populations in the river. It also assists in securing the future of fish eating predators such as otters (UK BAP), heron and kingfishers (RSPB Amber List) which depend on sustainable fish stocks in the river.

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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 2019.

Liability

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