

Thrybergh Hydropower Project CO₂ Analysis Report

September 2019

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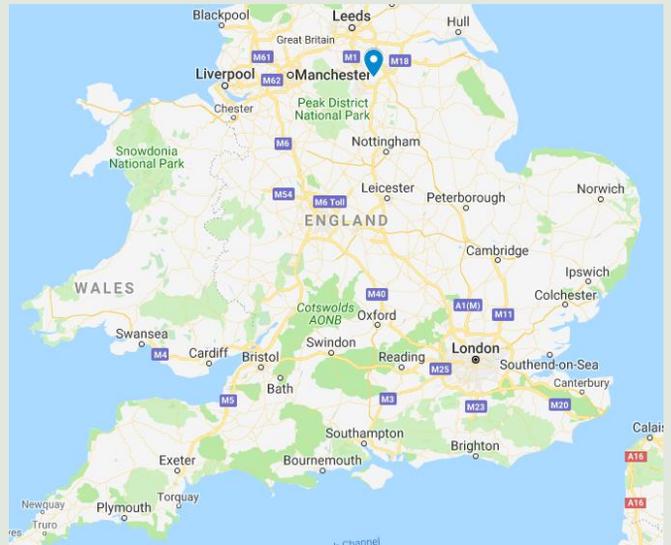
Executive Summary

Aardvark Certification Ltd (ACL) has been instructed by John Laing Environmental Assets Group (UK) Limited to assess and report against the carbon savings achieved by their 260kW hydropower project located alongside the River Don near Rotherham. This assessment considers the CO₂ savings made as a result of the hydro turbine's energy production and export to the grid.

Asset Introduction

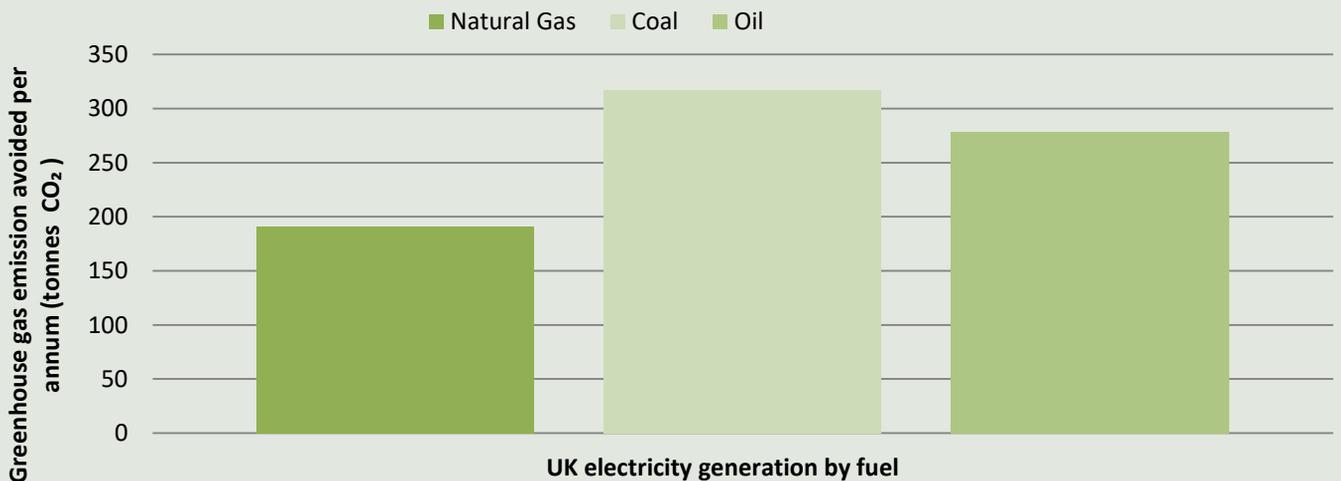
The Thrybergh Hydropower Project is a low head Archimedes Screw Spaans Babcock turbine located alongside the Thrybergh weir. The Archimedes Screw, originally developed to pump water, is run in reverse to drive a turbine. The turbine has a design capacity of 260kW and an expected operational life in excess of 60 years. Each year an average of 1,039MWh of renewable electricity has been produced. Since commissioning in October 2015, the turbine has produced 4,069MWh of electricity. During the course of the installations total lifetime it is anticipated that up to 62,340MWh will be produced.

The renewable energy generated by the turbine is fed either directly into the grid or used to charge an onsite battery storage facility which forms 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 Thrybergh Hydropower Projects annual electricity production (960MWh) 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	191	20,072
Coal	318	29,275
Oil	278	33,946

Thrybergh Hydropower Project

CO₂ Analysis Report

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 Thrybergh 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	1,039,000	kWh	265,568	0
		CO ₂ Equivalent (kg CO ₂ e)		
		CO ₂ Difference (kg CO ₂ e)		265,568

What do these savings mean?

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

- Removing the combined emissions of 122 medium sized diesel cars every year from UK roads for the lifetime of the asset.
- Powering 279 residential properties every year based upon the national average electricity consumption statistics.
- Providing enough power to drive a Nissan Leaf 3,055,882 miles a year – equivalent to driving 123 times around the circumference of the earth
- Boiling enough water for 182 million cups of tea

CO₂ Forecast

Based on the quantity of electricity the turbine produces each year, an average of 266 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 56.1 years of operational life, a further 14,894 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 Thrybergh 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
686	1,590

Additional Benefits

As well as the various environmental benefits the Thrybergh Hydropower Project delivers, it also contributes to the overall transition of the UK's energy network to one of multiple smaller generating stations through providing crucial balancing services to the national grid via its integrated battery storage system. The battery discharges stored renewable electricity to the grid at times of high demand or when other intermittent forms of renewable generation are not available. The project therefore plays an important role in enabling the network to accommodate other renewable energy generating station whilst contributing renewable energy itself.

In order to overcome any disturbance to the local aquatic wildlife, a fish and eel pass was installed. This enables fish and eels to find safe passage along the river unhindered by the turbine. Additionally kingfisher boxes have been installed to further encourage biodiversity along the river.

Since the project was commissioned, Atlantic Salmon have been viewed in the upper section of the River Don for the first time in over one hundred years showing that the installed fish pass is effective and enabling natural cycles to continue with minimal impact.

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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 2019.

Liability

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