

# Tay Waste Water Treatment Plant

## CO<sub>2</sub> Analysis Report

May 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 Tay Waste Water Treatment Plant. This assessment considers the CO<sub>2</sub> savings made as a result of activities undertaken by the waste water treatment operation.

### Asset Introduction

The Tay Waste Water Treatment Plant comprises of a 35km sewer network main and seven pumping stations each with storm overflow storage facilities. The facility treats up to 150,000m<sup>3</sup> of waste water per day and is estimated to serve approximately 250,000 people from homes and industry in the Dundee and Arbroath areas of Scotland.

The waste water treatment operation generates enough electricity to power 60% of its overall energy requirement. The site employs 30 people in direct employment and supports many more through indirect contracting. As well as producing clean water and renewable energy, the plant also produces a valuable biomass fertiliser that can be used for a variety of land uses and is independently certified as being suitable for use as a land based fertiliser.



### CO<sub>2</sub> Savings

The Tay Waste Water Treatment Plant achieves CO<sub>2</sub> savings through the production of electricity from the sludge removed as part of the waste water treatment process. The sludge is utilised in an on-site anaerobic digestion plant which produces biogas. The biogas is used as fuel for a combined heat and power plant which produces electricity and heat. The electricity generated is used to power the on-site operations which reduces the imported energy demand of the site by approximately 60%.

### Tay Energy Use

The Tay Waste Water Treatment Plant uses electricity and heat in the waste water treatment process. Heat use and generation at the facility is currently unmetered. Electricity consumption is metered at sub-meter level across the facility which enables quantification of the total energy demand of the facility.

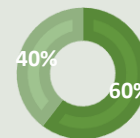
Analysis of the annual energy data for 2018 shows that the Tay plant uses a total of 4,589 MWh of electricity per annum across the total facility. Of this, some 1,818 MWh was imported from the grid with the balance of 2,771 being generated by the on-site CHP.

### CO<sub>2</sub> Emissions Avoided

Based on the above data it is possible to quantify the CO<sub>2</sub> emissions which are avoided through the generation of electricity through the on-site anaerobic digestion of sludge.

#### TAY ELECTRICITY SOURCES

■ Electricity from AD ■ Imported Electricity



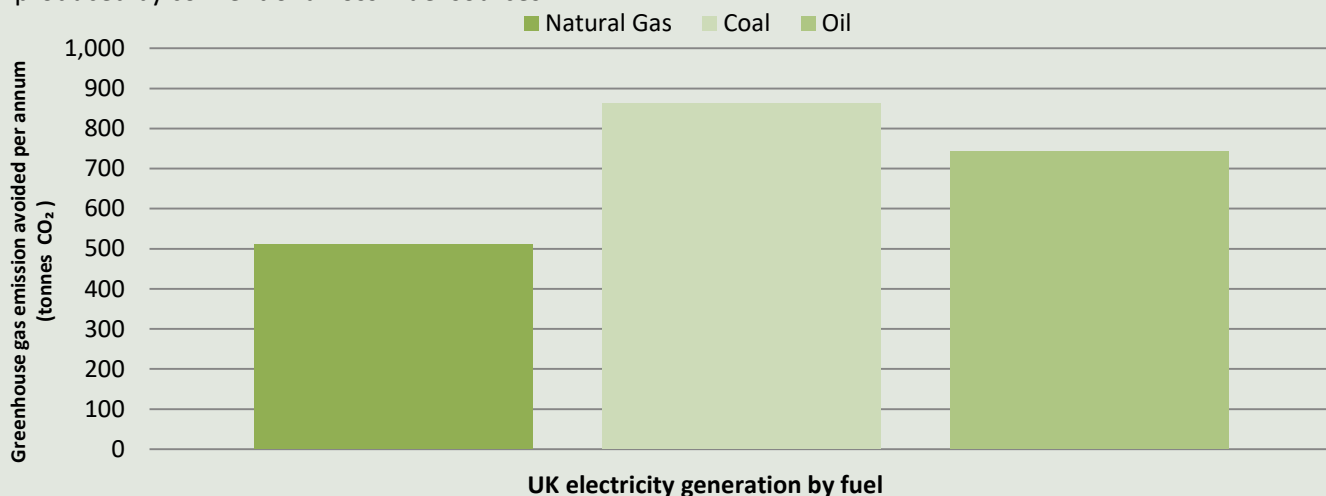
Supply Type	Emissions Factor	Total Energy Use/Supply (kWh)	CO <sub>2</sub> Emissions (tonnes CO <sub>2</sub> e)
UK Grid Supplied Electricity	0.28307	4588647	1299
AD Supplied Electricity	0	2771073	0
Balance of Grid Supplied Electricity	0.28307	1817574	515
<b>Emissions Avoided</b>			<b>784</b>

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### CO<sub>2</sub> Savings

The preceding summary of energy generation from the Tay treatment plant enables illustration of the quantities of CO<sub>2</sub> that have been avoided had the treatment plants total annual electricity production (2,771MWh) been produced by conventional fossil fuel sources.



### GHG Emissions Avoided

Fuel Type	Average Annual (tonnes CO <sub>2</sub> e)	Lifetime Saving (tonnes CO <sub>2</sub> e)
Natural Gas	510	18,349
Coal	862	26,763
Oil	744	31,033

### CO<sub>2</sub> Forecast

For consistency across the JLEN asset CO<sub>2</sub> reports, we have based our CO<sub>2</sub> forecast on a 25 year operational lifetime. In practice, it is expected that the treatment plant will operate in excess of this timeframe. Based on the 25 year operational lifetime, Tay would continue to achieve CO<sub>2</sub> savings for a further 7.5 years. Based on current annual electricity generation of 2,771MWh, it is estimated that a further 5,883 t CO<sub>2</sub>e will be avoided. Over the entire operational phase (25 years) of the Tay plant, an estimated 19,610 t CO<sub>2</sub>e will be avoided through replacement of grid imported electricity with renewable electricity generated via the on site AD plant.

### What do these savings mean?

The forecast CO<sub>2</sub> savings the Tay Treatment Plant will achieve over its lifetime is equivalent to:

- removing the combined emissions of 360 medium sized diesel cars every year from UK roads for the lifetime of the asset.
- power 743 residential properties based upon the national average electricity consumption statistics.
- provide enough power to drive a Nissan Leaf 8,150,215 million miles a year – equivalent to driving 327 times around the circumference of the earth
- boil enough water for 485 million cups of tea

### Other Emissions to Air Avoided

In addition to offsetting CO<sub>2</sub> emissions, other greenhouse gas emissions are also avoided including CH<sub>4</sub> and N<sub>2</sub>O. Based on the amount of electricity produced by the Tay Treatment Plant per annum, emissions of these gasses which have been avoided have been calculated and shown below. These are included in the total CO<sub>2</sub> equivalent values used within this report.

CO<sub>2</sub>e of CH<sub>4</sub> emissions avoided kg/yr

1,829

CO<sub>2</sub>e of N<sub>2</sub>O emissions avoided kg/yr

4,240

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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 CO<sub>2</sub> 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.



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Certification Ltd.