Report: Thermal Electrification Feasibility Assessment (Non-Technical Summary)

Company: GA Pet Food

Site: Plocks Farm, Leyland

Report To: David Colgan

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Contents

1 Executive Summary & QA Approval

1.1 Executive Summary

Report Title	**Thermal Electrification Feasibility Assessment (Non-Technical Summary)**
Report Summary	This report provides a non-technical summary of the previously conducted Thermal Electrification Audit carried out at GA Pet Food's Plocks Farm site, Leyland, UK. GA has proposed the installation of a 4.2 MW wind turbine and 13 MW of solar generation at the neighbouring Asland Walks Energy Park site. Cotopaxi & Spirax Sarco studied the use of the excess power generated to decarbonise the site's thermal energy demand. Currently, the site uses natural gas to generate steam – electrification and thermal storage systems can make use of the excess renewable electricity generated to generate steam, reducing the site's carbon emissions.
Project Ref No.	**CTX9325**
Client / Customer	GA Pet Food
Site Name(s)	Plocks Farm, Leyland
Report Issued To	David Colgan
Cotopaxi Project Director	Rob Lane (Robert.lane@cotopaxienergy.com)

1.2 Report QA and Approval

Report Authors	Christie Tierney
Project Director	Robert Lane
Approved by	Robert Lane
Approval Signature	
Approval & Issue Date	12th December 2025

2 Purpose of this Document

This non-technical summary explains the feasibility study undertaken by Cotopaxi, in collaboration with Spirax Sarco, to determine how locally generated renewable electricity at the proposed Asland Walks site can be used to provide heat at GA Pet Food's Plocks Farm manufacturing site. It is written for planning purposes and reduces engineering detail while confirming the intent, options considered and expected outcomes of the original study.

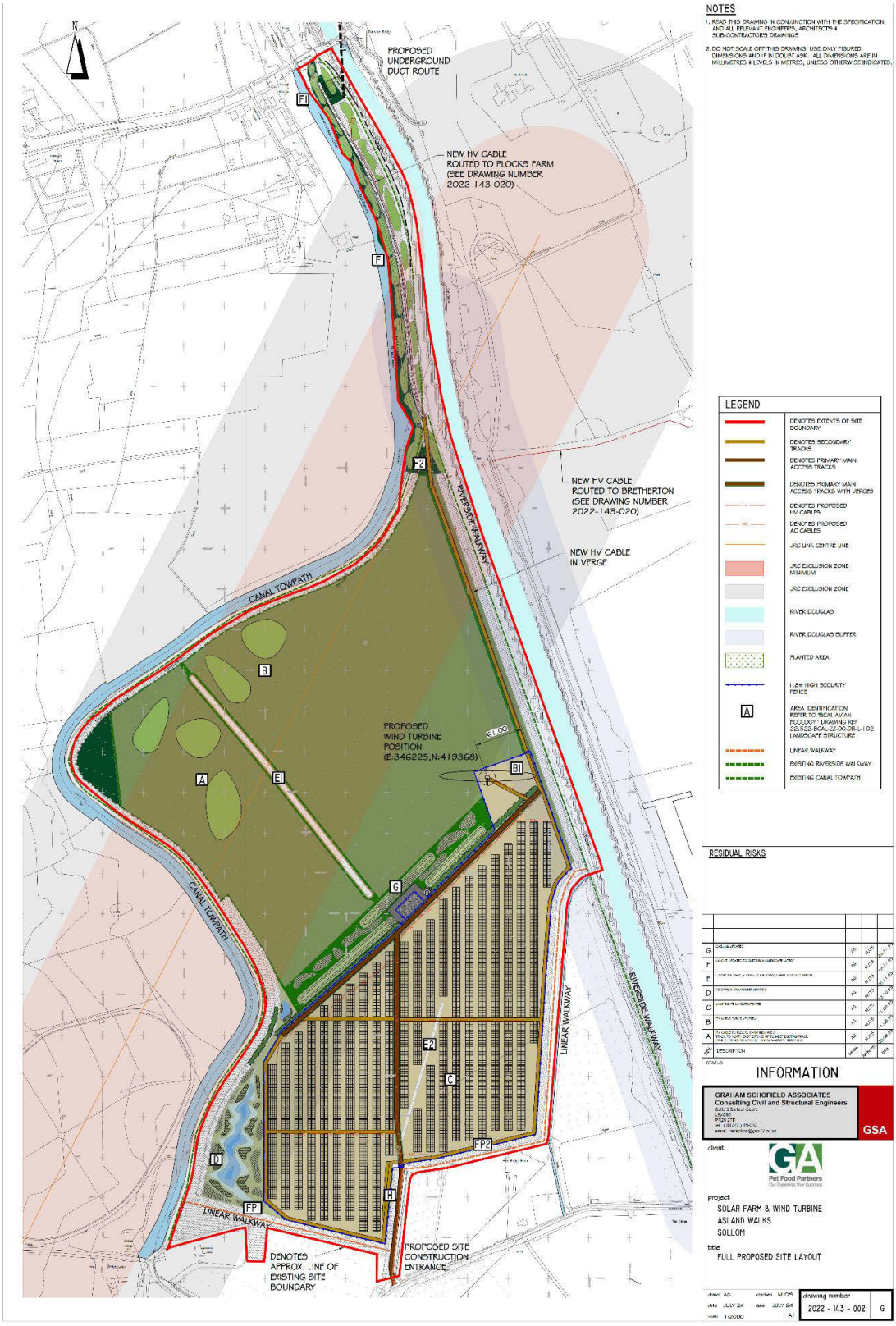
3 Site and Project Context

GA Pet Food Partners operates a large manufacturing facility at Plocks Farm, which currently relies heavily on natural gas for steam and hot water generation, consuming 31 GWh of fossil fuel natural gas from the grid annually. To reduce environmental impact and improve energy resilience, GA plans to install a 4.2 MW wind turbine and phased solar generation ((initially 6 MW, with a maximum modelled case of 13 MW) at the proposed Asland Walks Energy Park, located about one mile south of the factory.

At full development, the renewable energy park is designed to operate with maximum self-sufficiency. Any electricity generated that exceeds the site's immediate demand will be fully utilised on-site through the proposed process of **thermal electrification and storage**, converting the surplus renewable power into usable heat — specifically **steam and hot water** — thereby ensuring **zero electricity export** to the national grid. This innovative approach to managing surplus electricity simultaneously addresses the decarbonisation of GA's gas consumption, which holds parity with the required decarbonisation of the site's electricity load.

Using renewable electricity for heat instead of exporting improves environmental performance and can reduce running costs because the value of displacing purchased gas and imported electricity is greater than the price received for exported power.

The figure below presents the comprehensive site layout for the planned implementation of a solar farm and a wind turbine at Asland Walks. The design optimises land use to maximise renewable energy generation while minimising environmental impact. Key features include the designated solar array area, the wind turbine location positioned to leverage prevailing wind conditions, and associated infrastructure. This layout ensures operational efficiency, compliance with planning requirements, and integration with the surrounding landscape.


PROPOSED UNDERGROUND DUCT ROUTE
NEW HV CABLE ROUTED TO PLOCKS FARM (SEE DRAWING NUMBER 2022-143-020)
NEW HV CABLE ROUTED TO BRETHERTON (SEE DRAWING NUMBER 2022-143-020)
NEW HV CABLE IN VERGE
RIVERSIDE WALKWAY
CANAL TOWPATH
PROPOSED WIND TURBINE POSITION (E:346225,N:419368)
LINEAR WALKWAY
PROPOSED SITE CONSTRUCTION ENTRANCE
DENOTES APPROX. LINE OF EXISTING SITE BOUNDARY
NOTES
1. READ THIS DRAWING IN CONJUNCTION WITH THE SPECIFICATION, AND ALL RELEVANT ENGINEERS, ARCHITECTS & SUB-CONTRACTORS DRAWINGS
2. DO NOT SCALE OFF THIS DRAWING. USE ONLY FIGURED DIMENSIONS AND IF IN DOUBT ASK. ALL DIMENSIONS ARE IN MILLIMETRES & LEVELS IN METRES, UNLESS OTHERWISE INDICATED.
LEGEND
DENOTES EXTENTS OF SITE BOUNDARY
DENOTES SECONDARY TRACKS
DENOTES PRIMARY MAIN ACCESS TRACKS
DENOTES PRIMARY MAIN ACCESS TRACKS WITH VERGES
DENOTES PROPOSED HV CABLES
DENOTES PROPOSED AC CABLES
JRC LINK CENTRE LINE
JRC EXCLUSION ZONE MINIMUM
JRC EXCLUSION ZONE
RIVER DOUGLAS
RIVER DOUGLAS BUFFER
PLANTED AREA
1.8m HIGH SECURITY FENCE
AREA IDENTIFICATION REFER TO TSCAL AVIAN ECOLOGY DRAWING REF 22.522-BCAL-ZZ-00-DR-L-102 LANDSCAPE STRUCTURE
LINEAR WALKWAY
EXISTING RIVERSIDE WALKWAY
EXISTING CANAL TOWPATH
RESIDUAL RISKS
INFORMATION
GRAHAM SCHOFIELD ASSOCIATES
Consulting Civil and Structural Engineers
GSA
client
Pet Food Partners
project
SOLAR FARM & WIND TURBINE
ASLAND WALKS
SOLLOM
title
FULL PROPOSED SITE LAYOUT
drawing number
2022 - 143 - 002
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4 How the Study Was Conducted

The study was carried out using Cotopaxi's **Sustainability Master Plan (SMP)** approach, which is designed to identify the most cost-effective way for industrial sites to reduce carbon emissions. This method combines an on-site audit with detailed energy modelling.

- **On-site audit**: Cotopaxi and Spirax Sarco visited GA's Plocks Farm site to review energy use, steam systems, and infrastructure. They assessed how heat is currently produced and where improvements could be made.
- **Technology screening**: A longlist of potential technologies was reviewed, then narrowed down to those most suitable for GA's operations. This included electric boilers and thermal storage systems.
- **Energy modelling**: Using real site data and predicted renewable generation from wind and solar, Cotopaxi built an hourly energy model covering a calendar year. This model tested different scenarios, including a phased renewable rollout and various technology combinations, to understand their impact on costs and carbon emissions over a 20-year period.

5 Technologies Reviewed

Technologies considered as part of thermal electrification study include:

Electric Steam Boilers: These replace gas-fired boilers and generate steam using electrical heating elements. They are clean, efficient and have no combustion process and can run on renewable electricity when available, or grid electricity.

Spirax Sarco SteamBattery: A thermal storage system that uses electricity to heat and pressurise water. When heat is needed, the stored energy is released as steam, acting like a rechargeable heat source that can be charged when renewable energy is abundant and discharged when it is not.

Kyoto Heatcube: A modular thermal storage system using molten salt. It can charge and discharge at the same time, effectively acting as a steam generator while also storing excess renewable electricity for later use.

Other options considered: Heat pumps and several solid-media storage systems were also reviewed but not taken forward for detailed modelling. These were ruled out mainly due to temperature limitations, installation challenges, lack of data, or similarity to more proven alternatives.

6 Audit Key Findings

Over 60% of the factory's energy demand is for heat, and where high temperatures are required, steam is the most practical solution. The site layout, available space, and electrical capacity favour technologies that can either generate steam directly using electricity, or store heat and release steam when needed. After site visits and screening, three technologies were selected for detailed modelling: electric steam boilers, Spirax Sarco SteamBattery, and Kyoto Heatcube.

The table below summarises the scenarios modelled in Cotopaxi's SMP tool, which combines different renewable generation options with these heat technologies to assess their impact on costs, carbon emissions, and energy performance over a 20-year period.

Scenario	*Technology Option*	*1*	*2*	*3*	*4*	*5*	*6*	*7*
A	4.2 MW Wind	No electricity storage, export only	Electric boiler No storage	Steam Battery 12 MWh	Steam Battery 20 MWh	Electric Boiler Steam Battery 12 MWh	Electric Boiler Steam Battery 20 MWh	Kyoto HeatCube 40 MWh
B	4.2 MW Wind 6 MW Solar							
C	4.2 MW Wind 13 MW Solar							
D	4.2 MW Wind 20 MW Solar							

7 Modelling Outcomes and Results

Using renewables on site substantially lowers annual operating costs compared to the current position, even without storage. Adding storage further increases the share of renewable electricity that is used on site and reduces reliance on natural gas during periods of low renewable electricity generation.

For the wind turbine plus 6 MW solar case, exporting excess electricity is already financially attractive, with addition of thermal storage reducing carbon emissions without necessarily improving the overall business case. However, as solar capacity rises to 13 MW, thermal storage becomes more financially beneficial, because there are more hours with surplus generation that can be shifted to meet heat demand later.

The scenarios with a large, flexible store (Kyoto Heatcube at 40 MWh) delivered the lowest long-term cost of energy among the options modelled, with high renewable electricity utilisation and significant carbon reductions. SteamBattery also improves utilisation of renewable power and reduces emissions compared with export-only, with lower capital cost than Heatcube.

Fully converting all steam production to electricity without storage increases operating costs when grid electricity is needed. Pairing electric steam generation with storage improves this, but the most cost-effective results were achieved when storage was used primarily to displace gas at times of low renewable output, rather than running electric boilers continuously.

8 Implications for the Asland Walks Planning Application

The proposed energy park directly enables on-site heat decarbonisation and supports GA's pathway to net zero. The ability to store heat (SteamBattery or Heatcube) means exported electricity is minimised and the environmental benefits are maximised at the factory. The study demonstrates that there are credible, established technologies available that operate at the required steam conditions for food manufacturing and can connect to the planned 11 kV supply.

A phased approach is practical: the wind turbine can operate first, followed by 6 MW solar (base case). Thermal storage can be introduced early and scaled with solar capacity. This staged roll-out matches energy generation to factory needs, controls capital spending, and provides measurable carbon and cost benefits at each phase while advancing GA toward net zero.

9 Environmental and Community Benefits

Lower Factory Emissions: Replacing part of the gas-fired heat with renewable heat significantly reduces annual carbon emissions. In the higher-generation scenarios modelled, total site emissions reduce by around 50% compared to today, supporting GA's pathway to net zero.

Efficient Use of Local Renewable Power: By storing heat, more of the electricity generated at Asland Walks is used on site rather than being exported to the grid. This maximises the environmental benefit locally and supports the area's energy self-sufficiency.

Improved Reliance and Cost Stability: Using self-generated renewable energy and stored heat reduces exposure to volatile energy prices, which improves cost predictability for a major local employer.

10 Summary Recommendations

GA Pet Food Partners should proceed with the development of the Asland Walks Energy Park to enable on-site heat decarbonisation and support its pathway to net zero.

A phased approach is recommended, starting with the wind turbine installation, followed by the addition of 6 MW of solar capacity as the base case. Thermal storage should be introduced early and scaled as solar capacity expands, ensuring that surplus renewable electricity can be captured and used for heat rather than exported.

Initially, a SteamBattery sized for the first phase of renewable generation offers a cost-effective and proven solution, with the option to migrate to or complement this with Kyoto Heatcube modules as solar capacity grows toward 13 MW. This strategy maximises renewable utilisation, minimises exports, and delivers measurable reductions in operating costs and carbon emissions.

Existing gas boilers should be retained for peak and backup use to maintain operational flexibility while the share of renewable heat increases over time. Full electrification of steam without storage should be avoided, as it would increase operating costs when grid electricity is required.