



Portland
energy recovery
facility

Achieving carbon neutrality
September 2020



Achieving Carbon Neutrality

Report for Powerfuel

September 2020

Executive Summary

Achieving net zero for the UK economy requires a transformational change to many aspects of life and the economy - including its infrastructure – at all scales.

The proposed Powerfuel Energy Recovery Facility (ERF) in Portland, Dorset is one potential piece of future infrastructure and therefore needs to consider how it will contribute to the UK's net zero goals in the short and long term.

Fichtner Consulting Engineers Ltd (Fichtner) has prepared a Carbon Assessment for Powerfuel which forms part of their Planning Application. Some key elements of that are quoted in this report for context, but the full report should be referred to. The methodology in that report guides assessments of the scale of emissions to be balanced in order to achieve net zero. As the report states,

"If the results of this methodology show that the plant has released more greenhouse gas emissions than have been displaced through export of electricity and heat and avoidance of landfill, then the Applicant would commit to offsetting the additional greenhouse gas emissions"

This report, *Achieving Carbon Neutrality*, operates with reference to the Carbon Assessment in that it communicates the process by which Powerfuel Portland will deliver on its 'Net Zero Emissions in Operation' objective, based on the actual emissions of the site.

Powerfuel expects that by creating a cost of carbon for the project, forcing the internalisation of that cost into the project financial management processes and creating an enhanced reporting mechanism this net-zero mechanism will help ensure a long term focus on finding ways to improve efficiency, capture carbon and generally seek out more sustainable practices and procedures.

This report, moves from a high-level conceptual basis through to practical assessment criteria for evaluating potential initiatives and advising on the monitoring and verification approaches that can be applied to ensure the commitment is achieved.

It has been prepared on a consultative basis. The objectives, approach and criteria in this report have been articulated by Powerfuel's executive team.

Pure Leapfrog has assisted in this process by providing contextual knowledge in relation to available approaches, definitions and by framing the criteria in a manner that makes for easy reference and use.

Consequently, this report does not make recommendations to Powerfuel, instead it serves as a reference point for evaluating potential net zero initiatives against its stated approach. Powerfuel recognises that this is the first step in a process. By designing this approach and communicating it, it is both making clear and public statements about its goals and processes but also enabling the approach to be reviewed and validated before moving into operation.

This report is intended to be useful for both Powerfuel and other stakeholders interested in understanding the approach by which the ERF will achieve net-zero carbon in operation, and subsequently measuring that objective has been achieved in practice.

Sections 5 & 6 set out Powerfuel's approach to achieving carbon neutrality at the Portland site, including the importance of 'designing out' emissions and ensuring behaviours in operation are also consistent with the net zero goal.

Central to this approach are a set of criteria and constraints that govern the actions that Powerfuel may invest in to achieve carbon neutrality. These criteria include those that 'must' be met for any initiative to be worthy and credible, those that from Powerfuel's perspective are essential not just to the standing of initiatives but to the

broader social and environmental contribution they make. Finally, there are a set of 'desired' criteria that add to the value of an initiative.

Three possible pathways to carbon neutrality are explored – they can be undertaken individually or in combination. These pathways are:

- Offsetting – Purchasing accredited carbon credits (either voluntary or compliance) in international, national or local carbon markets.
- Insetting - Environmental programs implemented within companies' direct sphere of influence (core business and supply chains) so as to generate multiple positive sustainable impacts on climate mitigation and adaptation, soils, water, biodiversity, local communities.
- Social Carbon - All carbon absorbed/reduced from actions that financially benefit and improve the livelihoods of communities involved in emission reduction/climate change projects. These projects guarantee welfare and citizenship without degrading resource bases.

Portland Energy Recovery Facility

Powerfuel & the site

Powerfuel Portland, is proposing to construct an Energy Recovery Facility on the north-eastern corner of Portland Island in Dorset. The facility, which will be located on brownfield land owned by Portland Port.

The ERF Planning Application explains that the ERF will have a nominal treatment capacity of around 183,000 tonnes per annum and a maximum treatment capacity of 202,000 tonnes of waste each year, much of which is expected to derive from Dorset or the surrounding areas. Furthermore, because of its port location, the ERF will also be able to secure residual wastes (delivered as baled and wrapped RDF) from other locations within the UK and elsewhere by ship.

The waste to be processed, and from which energy is extracted, by Powerfuel Portland is pre-processed Refuse Derived Fuel (RDF) which consists largely of combustible components of municipal solid waste comprising household/business after recyclable materials such as glass, plastics and metals have been removed. Hazardous or clinical waste will not be processed.

The Planning Application explains, broadly, that the Fichtner Carbon Assessment has been produced as part of the Environmental Impact Assessment to assist decision makers understand how the ERF would compare to the alternative options for dealing with the same waste, and highlights that different waste management approaches will have different emissions through the full lifecycle. The Fichtner Carbon Assessment states:

"[t]he combustion of waste generates direct emissions of carbon dioxide, with the tonnage determined using the carbon content of the waste. "

The ERF has been designed to provide combined heat and power (CHP) and will be 'CHP ready' from the outset. This will facilitate the provision of a shore power facility at Portland Port, with the majority of the electricity sent to the distribution network. The ERF would also be capable of supplying heat to local consumers by means of a future local heat network.

The planning application states:

"A proportion of the energy generation from the ERF is classified as renewable energy, and it would be one of the biggest baseload generators in the county. The project would therefore make a significant contribution to the security of supply, the production of renewable energy and the decarbonisation targets of the local authority area."

Full details are provided in the planning application and supporting documents.

Location:

Portland, Dorset

Emissions Profile

The Fitchner Carbon Assessment states that:

“In the base case, the ERF is predicted to lead to a net reduction in greenhouse gas emissions of approximately 21,900 tonnes of CO₂-equivalent (CO₂e) per annum compared to the landfill counterfactual if operating at the nominal design capacity. At the maximum design capacity, this increases to 34,100 tCO₂e per annum.

There is the potential for the benefit of the ERF to be increased.

a. If the ERF were to export power to ships moored in Portland Port, avoiding the operation of diesel engines, then the carbon benefit of the ERF over landfill would increase by around a further 4,500 to 5,500 tCO₂e per annum.

b. If the ERF were to export heat as well as power, the carbon benefit of the ERF over landfill would increase by around a further 3,000 tCO₂e emissions per annum.

Hence, the overall benefit of the ERF at the nominal design capacity, while exporting heat to a district heating scheme and power to ships moored in the port, is estimated to be about 30,000 tCO₂e per annum. This would be increased if operating at the maximum design capacity.”

Fichtner goes on to summarise their approach and assumptions:

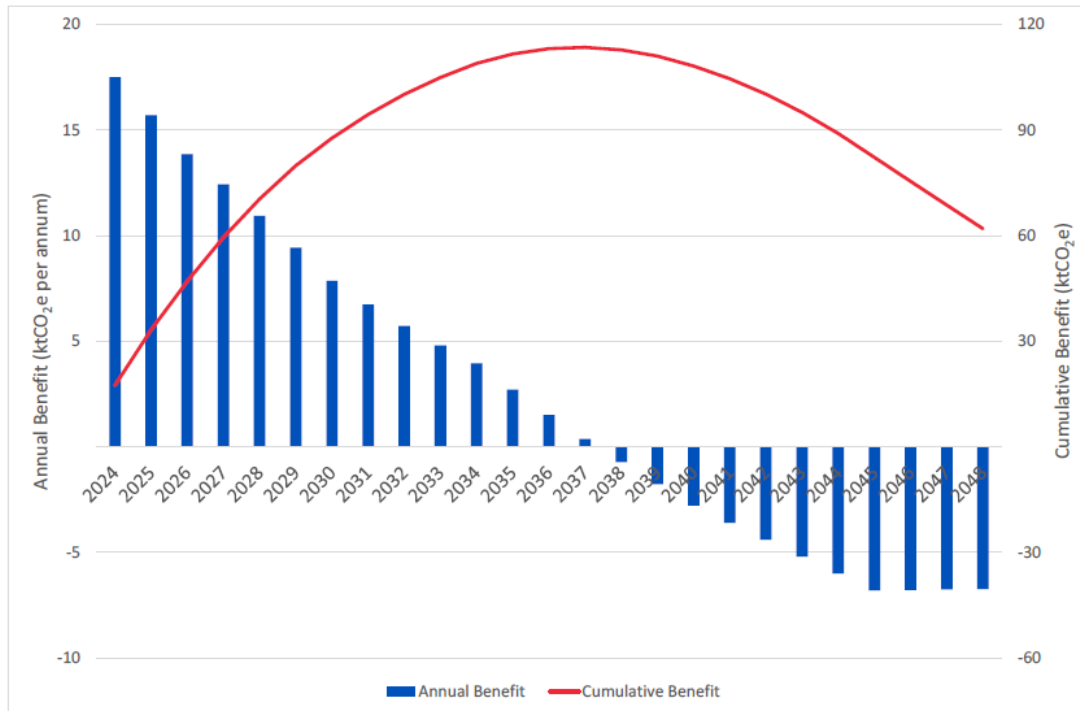
“The carbon assessment is based on assumptions about the waste composition, the plant performance and the emissions avoided by exporting electricity and heat. Once the Portland ERF is operating, it will be possible to carry out a more accurate assessment of the net greenhouse gas emissions each year, taking account of the actual waste which is processed, the actual power exported for shore power and to the national grid, the actual heat exported and the carbon emissions associated with grid electricity. The Applicant suggests that a methodology for carrying out an annual greenhouse gas assessment should be agreed with the planning authority. If the results of this methodology show that the plant has released more greenhouse gas emissions than have been displaced through export of electricity and heat and avoidance of landfill, then the Applicant would commit to offsetting the additional greenhouse gas emissions...”

The benefit of the ERF over its lifetime will vary depending on how the electricity grid develops and when shore power and district heating are implemented. However, we have included an illustrative conservative calculation which shows that the ERF could reduce greenhouse gas emissions by around 62,000 tCO₂e over its lifetime

Future Projections of Lifetime Benefit

Fitchner analysed the projected GHG emissions and include the following illustrative graph:

Figure 1: Lifetime Carbon Benefit



Fitchner discuss this long-term model:

“Lifetime Benefit

The benefits discussed above all relate to a single year. The ERF is expected to start operating in late 2023 and to have a life of at least 25 years, so the carbon benefits will accumulate over time. However, the benefits will vary over time as a number of the key assumptions will vary.

In this section, we have considered the lifetime benefits of the ERF on an illustrative basis. We have varied a number of assumptions with time.

- 1. The government’s policy is to decarbonise grid electricity, which means that the benefit of displacing electricity will reduce. While we consider, as explained in section 3.1.3, that the correct comparator at present is power from CCGTs and that this will remain the case for some time, for illustrative purposes we have used the long run marginal generation-based emission factor taken from the “Green Book supplementary guidance: valuation of energy use and greenhouse gas emissions for appraisal”, published by BEIS. This is considerably more conservative, starting at 0.2191 kg CO₂e/kWh in 2024 and dropping to 0.0276 kg CO₂e/kWh by 2048.*
- 2. Shore power is assumed to ramp up linearly from 20,328 MWh in 2024 to 24,423 MWh in 2048.*
- 3. District heating is assumed to take longer to be developed. First users are assumed to be connected in 2027, with a linear ramp up to the full heat export of 18,307 MWh by 2034, 10 years after the plant opens. (This is expected to be conservative as key potential heat users*

(including the 2 prisons) are interested in a heat supply much sooner, whereas new housing that may connect to the heat network is likely to be delivered in stages).

4. Landfill gas capture rates are assumed to increase gradually from 68% in 2024 to 75% in 2045, as it is likely that landfill performance will improve.

It is likely that waste composition will vary, but we consider that it is not possible to predict waste composition over 25 years and so we have not allowed for this. Variations in waste composition could make the performance of the ERF compared to landfill better or worse. We understand that Powerfuel will take account of the changing composition of the waste when calculating their net carbon position over time for the purposes of their net-zero carbon commitment (discussed in the report "Achieving Carbon Neutrality.")

With these assumptions, the net benefit of the Portland ERF over 25 years is estimated to be 61,926 tCO₂e. The net benefit per year and the cumulative benefit over time are illustrated below.

Net-Zero Objective:

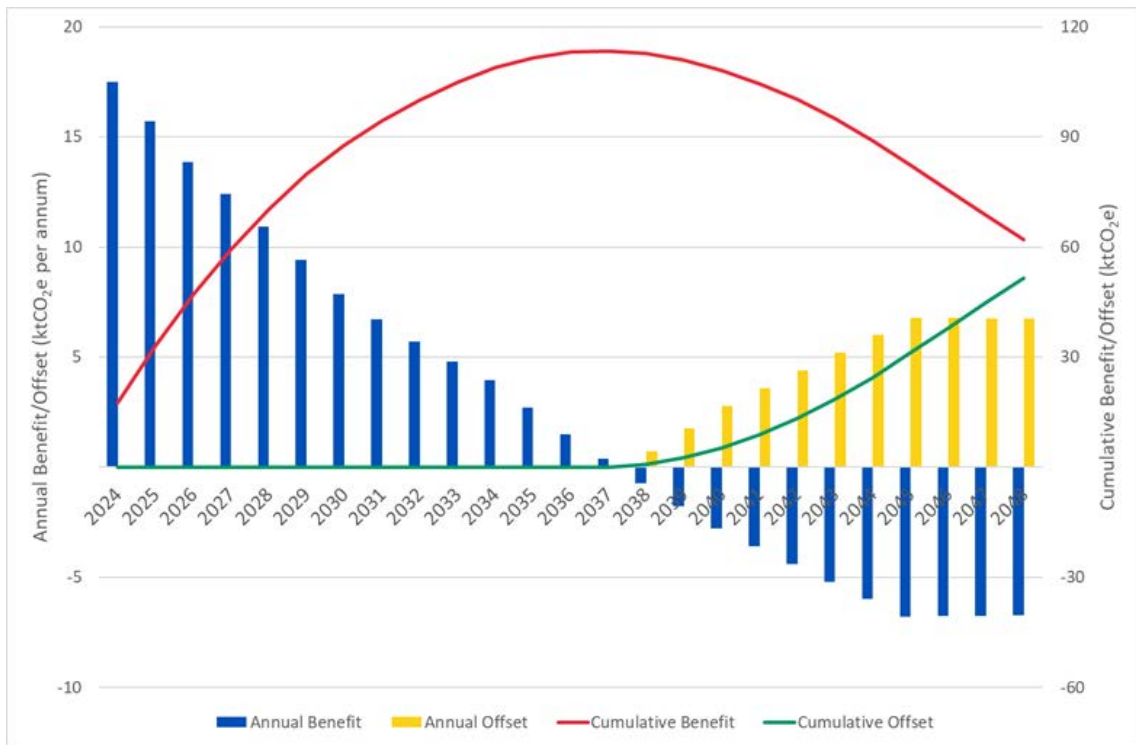
Powerfuel's stated objective is to offset/balance direct carbon emissions over the operational life of the ERF, whilst recognising the subjectivities and uncertainties.

In the Planning Application Powerfuel has explained this objective and its net-zero pledge as follows below and confirmed that it will enter into a legal *Planning obligation with the local planning authority, so that the commitment runs with the land and is legally binding and enforceable.*

"In order to create certainty on the long term net carbon position, the applicant commits that the Portland ERF will operate as a net-zero carbon infrastructure asset for its operational life. It is believed that this would be the first such facility in the UK to commit to achieving net-zero carbon. This means that all process derived greenhouse gas (GHG) emissions from the combustion of the fossil-fuel derived component of the residual waste RDF, in excess of emissions from the counterfactual baseline, would be offset by other measures and activities avoiding the emission of or removing an equivalent amount of GHG from the atmosphere. The applicant is committed to funding additional carbon off-setting measures in each year that the ERF reduces GHG emissions (compared to baseline), and in each year that the ERF increases GHG emissions (compared to the baseline) will compensate for this by purchasing carbon offsets. This means the ERF will reduce GHG emissions over its lifetime and will achieve carbon neutrality, or better in every operating year. A minimum financial contribution of £100,000 per annum will be available for offsetting activity, aggregating to £2.5m over the expected operational life."

Offsetting Profile:

Fichtner prepared the graph below which shows, on the basis of their modelling how offsetting is likely to be required after the annual emission profile shifts from net positive to net negative around 2038.



Definitions

Baseline	<p>In any emissions trading scheme or organisational offsetting programme, the calculation of the baseline is critical. It serves as a reference point against which the impact of a new development can be compared (sometimes referred to as 'business as usual', where assumptions are made on current and future greenhouse gas emissions. For a project like the ERF running over a length of time (here it is expected to run for 25 years) it is clear that certain baseline assumptions made at the start reflecting the situation at that time (for example, based on societal behaviour in relation to the generation of certain types of waste, or the uptake of new renewable energy feeding into the grid) may prove unsound as time passes. Rather than rely on a baseline fixed at day 1 a dynamic baseline can be updated to reflect new realities in future Compliance Periods.</p> <p>This will be as defined by the Fitchner report, and briefly described in this report for context.</p>
Carbon Neutrality	<p>The state of having net zero carbon dioxide emissions achieved by:</p> <ul style="list-style-type: none"> • carbon abatement reducing carbon emissions altogether through: <ul style="list-style-type: none"> ○ 'Designing out' emissions ○ Behavioural changes in use • carbon offsetting • carbon insetting
Carbon Credit	<p>A tradable, intangible environmental instrument representing a unit of carbon dioxide-equivalent (CO₂e) – typically one metric tonne – created either by regulatory schemes promoted by governments (e.g. cap & trade schemes) or by projects which are validated to a recognised carbon standard to ensure each credit represents a genuine additional tCO₂e. Could also include REGOs from UK based renewable energy projects.</p>
Carbon Offsetting	<p>Purchasing accredited carbon credits (either voluntary or compliance) in international, national or local carbon markets.</p>
Carbon Insetting	<p>Environmental programs implemented within companies' direct sphere of influence (core business and supply chains) so as to generate multiple positive sustainable impacts on climate mitigation and adaptation, soils, water, biodiversity, local communities.</p>
Compliance Period	<p>The period of operations for which Carbon Neutrality is to be achieved, which can be settled on an annual or multi-year basis.</p>
Gross Zero	<p>Reducing emissions from all sources uniformly to zero.</p>

Net Negative	Less emissions are taken out of the atmosphere than emitted during the Compliance Period (measured against an agreed counterfactual Baseline)
Net Zero	Achieving an overall balance between emissions produced and emissions taken out of the atmosphere during the Compliance Period (measured against an agreed counterfactual Baseline)
Net Positive	More emissions are taken out of the atmosphere than emitted during the Compliance Period (measured against an agreed counterfactual Baseline).
Quality Assurance	Independent review conducted by an expert third party.
REGOs	Renewable Energy Guarantees of Origin – an Ofgem scheme to provide customers with assurance about the proportion of electricity that suppliers source from renewable generation.
Retirement	Permanent cancellation of carbon credits to prevent future double counting, performed through a third-party registry.
Social Carbon	All carbon absorbed/reduced from actions that financially benefit and improve the livelihoods of communities involved in emission reduction/climate change projects. These projects guarantee welfare and citizenship without degrading resource bases.
Scope 1 emissions	Direct GHG emissions directly attributable to Powerfuel that occur from sources that are owned, leased or controlled by the Powerfuel
Scope 2 emissions	Emissions indirectly attributable to Powerfuel from the generation of electricity, heat, steam or cooling that is acquired and consumed in owned, leased or controlled equipment or operations.
Validation	Validation is focused on the design of an organisation's process for carbon emissions: <ul style="list-style-type: none"> • Measurement; • Reduction; and • Actions to achieve carbon neutrality
Verification	Verification is a rigorous endorsement of the quality of project implementation and the delivery of multiple benefits claimed (commonly as a minimum, in this context, that a project has delivered the carbon benefit claimed for it) during a certain time period.

Statement of Objectives

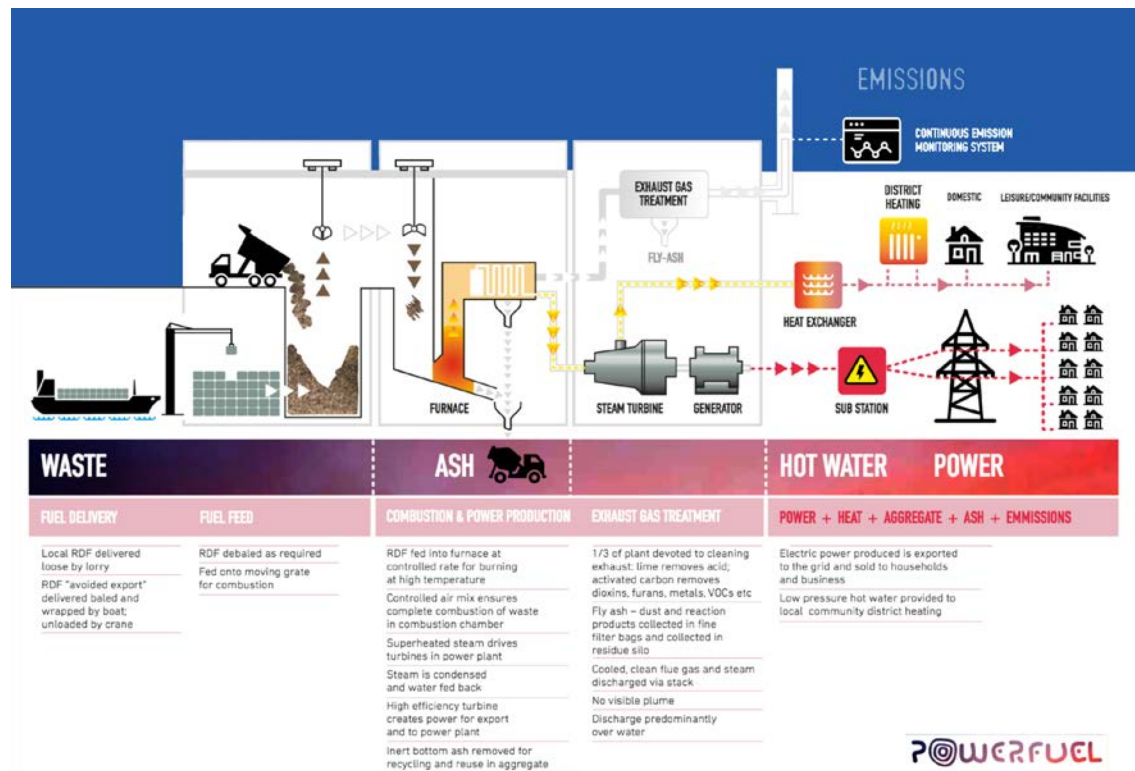
Goal: Net Zero Carbon Emissions in Operation

Definition of 'In Operation' - operational emissions are included in the Fichtner calculations, as described here:

"The carbon emissions have been calculated for the ERF. This takes account of:

- a. carbon dioxide released from the combustion of fossil-fuel derived carbon in the ERF;
- b. releases of other greenhouse gases from the combustion of waste;
- c. combustion of gas oil in auxiliary burners; and
- d. carbon dioxide emissions from the transport of waste, reagents and residues. "

An overview of the processes and emissions associated with the plant is provided below, and described in more detail in the Planning Application:

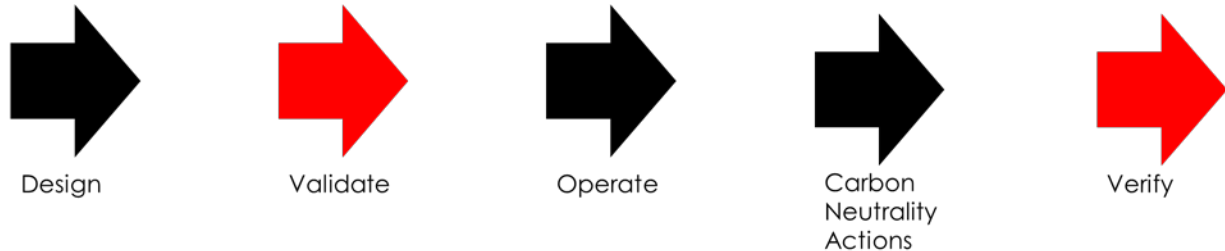


Approach:

Powerfuel Portland is seeking to design-out avoidable emissions and balance unavoidable CO₂ & other gases. This report provides a guide to the process undertaken by Powerfuel in order to select the specific measures that will be put in place.

Process & Approach

Powerfuel Portland is proposing to take the approach below to achieving carbon neutrality and certifying this on an ongoing basis.



Design: The processes by which Powerfuel will Measure Emissions, Reduce Emissions and implement actions to achieve Carbon Neutrality

Validate: An independent review of the programme established by Powerfuel during design

Operate: Operation of the Powerfuel plant for a period of time and calculate actual emissions in accordance with an approved standard

Carbon Neutrality Actions: Offsetting, Insetting & Social Carbon Initiatives

Verify: Independent review and certification that the emissions calculations are correct and the actions taken have achieved carbon neutrality in accordance with an approved standard

This report represents a part of the 'design' phase and is complemented by assessments of the potential annual emissions of the plant.

Approach to Carbon Neutrality

Having established a target of being carbon neutral in operation, there are two broad pathways for Powerfuel's operation to achieve this:

i. Abatement

This is being achieved by:

- i. 'Designing out' carbon through the plant's physical design
- ii. Driving behaviours in the operation of the plant to minimise carbon (through processes and behaviours whether this is achieved on Day 1 or added as a later improvement)

ii. Carbon Balancing

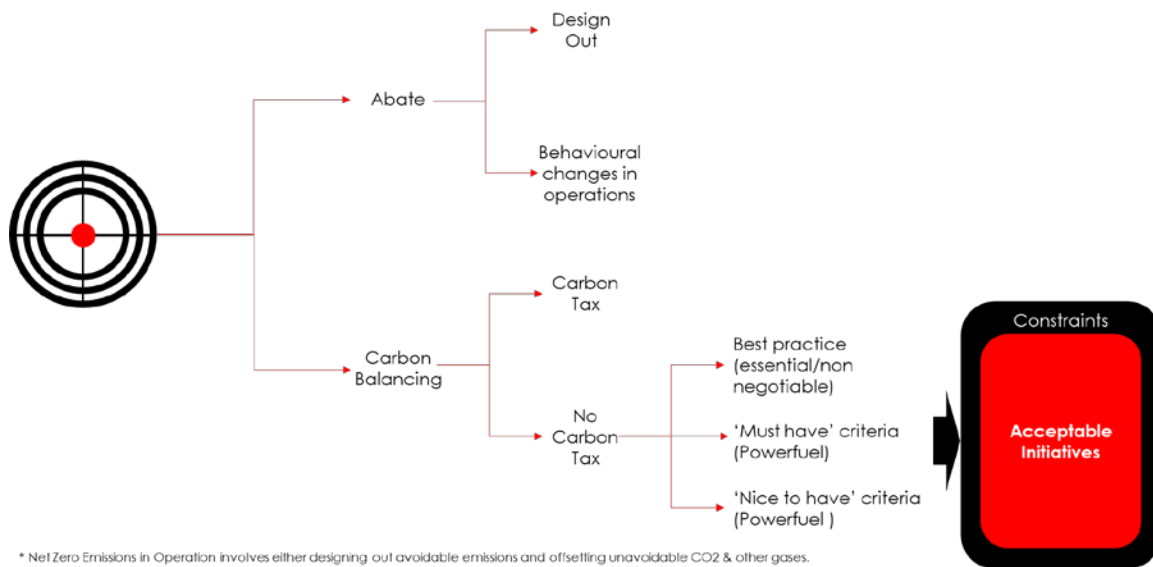
Carbon balancing of the remaining carbon (calculated against an appropriate baseline defined in the Fitchner report) which will be achieved through

- i. Contributions to a carbon tax, or achieved through inclusion in a mandatory emissions trading scheme (or equivalent), should one be in operation during the site's life and should the site be brought within a carbon tax regime.

AND/OR

- ii. Carbon Neutral activities such as:

- Carbon offsetting i.e. the purchase of verified carbon credits on traded markets (or through a specific contract with a certified carbon offset producer).
- Insetting – by undertaking activities that balance the carbon in the operation and supply chain. At the present time, it is not intended to inset the carbon in the incoming supply chain (as this is identified as the responsibility of the Council's providing the waste to site)
- Social carbon – by contributing to activities that reduce the carbon and improve livelihoods, particularly those living in close proximity to the operating site (although activities further afield will be considered).



* NetZero Emissions in Operation involves either designing out avoidable emissions and offsetting unavoidable CO2 & other gases. All operational emissions are included except transport from source to plant which are the responsibility of the waste provider.

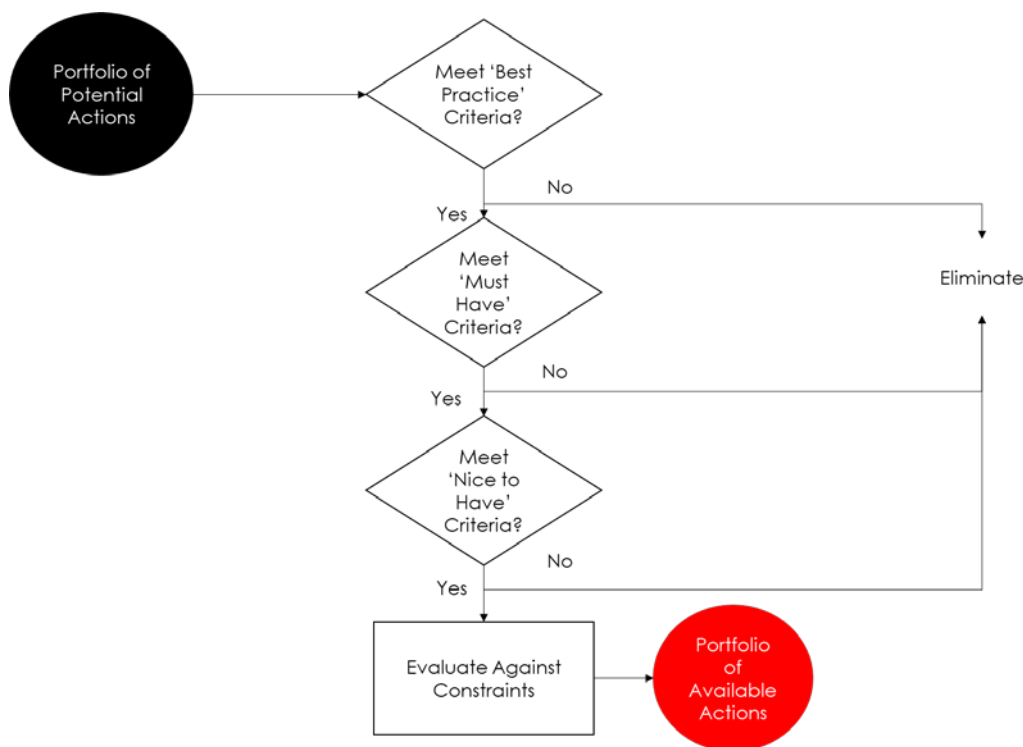
Carbon Neutral Actions

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- Social carbon – by contributing to activities that reduce the carbon and improve livelihoods, particularly those living in close proximity to the operating site (although activities further afield will be considered).

Evaluating Carbon Neutral Actions

To determine what carbon balancing activities to invest in, Powerfuel has taken into account the following factors:

- 'Best Practice' – these criteria are essential, regardless of what you do – whether it is offsetting; inssetting or social carbon. It is Powerfuel's view that any actions taken are not credible without these criteria being met.
- 'Must Have' Criteria
These criteria have been set and ranked by Powerfuel as being a core element of any carbon balancing action they take. They are additional to the 'best practice' criteria and specific to Powerfuel's particular location and operation.
- 'Nice to Have' Criteria
These criteria, also set and ranked by Powerfuel will be a key point of focus where cost and circumstance allow.
- Constraints
As there are constraints on what the project is able to invest in, these must also be taken into account.



Net Carbon Positive Periods

The Fichtner Carbon Assessment and its forward looking calculations indicates that the project is expected to be net positive in certain periods and on a net basis over its operational life (i.e. fewer emissions are created than are taken out of the atmosphere). It is acknowledged that there may be periods of time during which this situation prevails, but there are likely to be periods when emissions are net negative.

Powerfuel Portland still desires to undertake social and environmental actions over this period. However, these actions may not fulfil all the criteria set out as 'best practice' and 'must have'. Instead, they will draw on these criteria as guidance but place a higher emphasis on local social and environmental outcomes so that actions such as addressing local fuel poverty or community building solar could be included.

Emissions that have been reduced as a consequence of social and environmental actions taken during net positive periods are intended to be "banked" and rolled-forward to be used in future Compliance Periods where the emissions are net negative. Banking of credible carbon reductions is a feature of other emission control regimes such as that designed under the auspices of the Kyoto Protocol and must be looked at carefully during the operation of the net-zero programme.

Criteria and Constraints

Best Practice

The Best Practice criteria are those that must be met for an international emission reduction project that generates carbon credits that Powerfuel considers acceptable to use as part of its net-zero offsetting standard, namely:

- Real - The offsets are tangible and measurable. This means there must be a baseline, and the ability to measure and attribute change over time.
- Additional - The emissions reduction would not have occurred in the absence of the project.
- Permanent - The project delivers the claimed emissions reductions in a sustained manner over time.
- No Leakage - The emissions reduction achieved with the project does not lead to an increase in emissions elsewhere.
- Verifiable - A robust audit trail demonstrating the project's goals and its delivery against those goals. Independent verification is required to certify that the goals have been met. This allows the credits to be issued (i.e. credits are not issued until after the goals have been met).
- Retired permanently - Following the sale of the carbon credit, it is permanently removed from the market mechanism, ensuring that there is no double counting or double selling. While ensuring no double counting is essential, there will not necessarily be a market mechanism for initiatives that do not involve the purchase of carbon credits, therefore other means must be found to verify final removal.

Must Have Criteria

These criteria have been set and ranked by Powerfuel as being important elements of any carbon balancing action they take, or which their financial contribution to actions taken by others supports.

- No adverse effects – Carbon Neutrality solutions must be proven and create no adverse social or environmental outcomes.
- Demonstrable – Positive physical change that is visible to the community.
- Location – By preference there should be a meaningful local element to the offsetting. For Powerfuel's purposes local is defined in the following priority order 1. Portland, 2. Dorset, 3. Regional – adjacent regions e.g. Devon/Somerset/Wiltshire/Hampshire and then UK.
- Genuine local inclusion - By preference Powerfuel's actions are not just a 'set and forget' approach but should offer local actors the opportunity to access and benefit from the carbon neutrality actions undertaken.
- Impact – Powerfuel has a strong preference for carbon neutral actions to deliver positive social impact as well as carbon reduction. To this end, the following Sustainable Development Goals provide a frame of reference:
 - SDG 1 - No Poverty

- o SDG 3 - Good Health and Well-being
 - o SDG 7 - Affordable and Clean Energy
 - o SDG 8 - Decent Work and Economic Growth
 - o SDG10 - Reducing Inequality
 - o SDG11 - Sustainable Cities and Communities
 - o SDG14 - Life On Land
- Simplicity – for communication and management purposes, Powerfuel wants the combination of offset activities selected is not overly complex.
 - Flexibility - Powerfuel wants to be able to adapt offset investments to reflect changing circumstances in the market, in the local context, in regulation etc. An examples would be where actions are delivering marginal outcomes or diminishing returns, it would be appropriate to change course.
 - Affordability – linked to the cost constraint outlined below, it is important that initiatives are affordable in the context of the project. This criterion is helpful in particular when comparing initiatives that ranking equally in all other aspects.

Nice to Have

- Setting the standard - Powerfuel sets the standard for what infrastructure projects should do and how they should do it on offsetting.
- Best Available Techniques - Where appropriate, Powerfuel would like to play a role in advancing carbon neutrality techniques for local infrastructure projects.
- Price surety – Where possible and appropriate, Powerfuel has a preference for price surety for carbon neutral actions.
- Capitalisation – If appropriate, an up-front investment or the ability to capitalise the commitment in some form would be beneficial in terms of ‘locking in’ or ‘scaling up’ outcomes.
- Communications – Powerfuel would like to have ongoing outcomes & stories to communicate the value of what they are doing.
- Duration - How long will the programme run for (can it continue for the life of the asset)?

Social Context

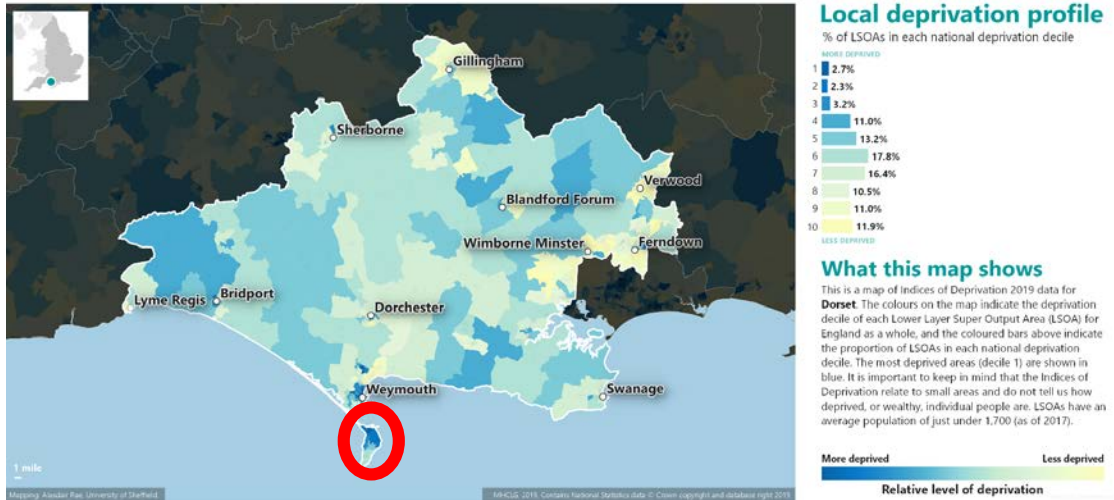
As described more fully in the Planning Application, the Weymouth and Portland area falls in the 10% most deprived in the UK in the 2019 Index of Multiple Deprivation. Although it was in these ranks in the 2015 IMD, its actual ranking fell a further 11 points in the 2019 statistics. The image below summarises this situation.

It is in this context that Powerfuel is seeking to ensure that its activities have a genuine, positive local social and environmental impact.

English Indices of Deprivation 2019


 Ministry of Housing,
 Communities &
 Local Government

DORSET



Constraints

Naturally, there are constraints on what the project is able to invest in and these are driven by the following factors:

- i. Cost – The project must be financially sustainable in order to attract and retain investment. Cost parameters will be set through the initial investment and planning process but reviewed regularly.
- ii. Compliance – The project must comply with all planning requirements, regulation and legislation.

Potential Carbon Neutral Actions

Carbon Offsets

Explanation

A carbon offset is a reduction in emissions of carbon dioxide or other greenhouse gases made in order to compensate for emissions made elsewhere.¹ Offsets are measured in tonnes of carbon dioxide-equivalent (tCO₂e). One tonne of carbon offset represents the reduction of one tonne of carbon dioxide (or its equivalent) in other greenhouse gases.

Carbon offsets can be sourced from two markets:

- Compliance markets – these exist where emissions trading regimes are in operation – in general governments and businesses operate in these markets because they are required to comply with caps on their emissions.
- Voluntary markets – in these markets, individuals, companies, or governments purchase certified carbon offsets to mitigate their own greenhouse gas emissions.

The following types of carbon credit projects presently exist:

1. Renewable Energy – Including hydro, wind, and photovoltaic solar power, solar hot water and biomass power and heat production.
2. Energy Efficiency – these projects are fundamentally about using LESS energy (e.g. LED lighting or installing more efficient cooking stoves).
3. Forestry – Forestry projects can involve either afforestation (the establishment of a new forest or reforestation (rebuilding existing forests.) REDD+ (a UN standard) projects stand for Reducing Emissions from Reforestation and Forest Degradation.
4. Transport – These projects may involve switching transportation to less carbon intensive means or introducing new technologies to improve vehicle fuel efficiency.
5. Agriculture – By changing agricultural process techniques to methods which are more environmentally friendly, significant reductions in carbon emission can be achieved.
6. Water, sanitation and hygiene (WASH) – Projects which improve access to water, water treatment, improved sanitation and hygiene which contribute to climate change mitigation/adaptation can provide offsets.
7. Methane Capture – There are two types of methane projects. The first type captures and burns (flares) methane, converting it to less potent carbon dioxide and water. Alternatively, projects can capture methane and use it to produce hot water or electricity.
8. Waste management and handling – These include projects that reduce the emissions from waste or water management such as composting, biogas etc.

The primary international standards under which voluntary carbon market projects are certified include:

¹ "Carbon offset". *Collins English Dictionary - Complete & Unabridged 11th Edition*. Retrieved September 21, 2012 from CollinsDictionary.com.

- [VCS – Verra](#)
- [Gold Standard](#)
- [Climate, Community and Biodiversity Standards \(CCB Standards\)](#)
- [American Carbon Registry](#)
- [Plan-Vivo](#)

Pros & Cons

a. Pros

- Offsetting is a simple, transparent way to offset carbon with internationally traded markets.
- Carbon Offsetting is well understood and there are globally accepted standards that guide projects.

b. Cons

- Offsetting can be seen as 'outsourcing' the problem.
- Many project developers and carbon offsetting sellers are driven by their own profits and as a consequence, the actual projects and local people often receive very little of the credit cost. This can be avoided by working with sellers who specialise in projects developed by non-profit organisations and by asking for full transparency on the amount of the credit cost that goes to the end project.

Example Projects

[Biogas for animal husbandry, Vietnam](#)

Standard: Gold Standard

Pricing²: (indicative) £3.00/tCO₂e

Biogas displaces smoky cooking fires and improves sanitation by utilising manure.

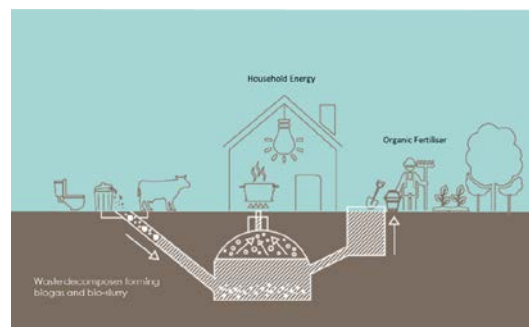
Using biogas instead of wood and charcoal means more of Vietnam's forest is preserved.

Time is also saved on fuel purchases and by women on gathering cooking fuel.

Impact:

- 171,935 biogas plants in 55 Vietnamese provinces
- 500,000 tonnes CO₂e emissions reductions per year
- 790,000+ Vietnamese users
- 15,935 hectares of forest preserved since 2007
- 2757+ rural jobs created
- 1-1.5 hours per day reduced work for women

Awards:



² Note: All pricing is driven by a) volumes b) vintage

- Energy Globe Award 2006
- Ashden Award 2010
- 'Humanitarian Award', World Energy Forum 2012
- Nominee, Zayed Future Energy Prize 2016



CommuniTree, Venezuela

Standard: Plan Vivo

Pricing (indicative): £11.50/tCO₂e

Pioneering programme leveraging the forest carbon offset industry for economic development amongst smallholder farmers in Central America:

- Afforestation
- Agroforestry
- Reforestation
- When farmers are able to earn an income from growing trees, climate change and poverty are addressed simultaneously.
- This project enables farmers to reforest their own land by providing financial incentives to grow trees, advisory services and market access for forest-based commodities (premium coffee, cacao and wood).
- Circular forest enterprises build sustainable livelihoods: creating jobs, increased income for farmers and a source of renewable energy for the community.

Impact:

- 1070 families involved
- 5million trees planted
- \$4million invested in communities
- 900,000 tCO₂ saved

Additional option with CommuniTree – Biochar

Pricing: TBA

As the trees grow, the farmers prune and thin them to help each tree grow as much as it can and ensure the forest is as healthy as possible. Some of these thinnings are sold as firewood or turned into high value woodcrafts to increase farmers' income from their forests. However, sometimes the thinnings are too small to be worthwhile selling or when processed in the woodshop, create waste biomass that is chucked away. This waste, while too small to sell could be turned into biochar.

- Helping trees to grow through a natural soil amendment
- Storing additional carbon in the soil helping to reduce greenhouse gases in the air
- Providing farmers with additional income opportunities and sustainable livelihoods through forest enterprises
- Reducing local and national energy emissions by providing a sustainable alternative to charcoal
- Creating a circular model for impact by upcycling waste



Insetting

Explanation

Carbon insets ensure a company is taking direct responsibility for the carbon emissions in their own supply chain and are improving sustainable management practices directly at the source.

Pros & Cons

a. Pros

- Carbon insetting initiatives can make a company's carbon neutrality seem more 'holistic' as it is addressing carbon at multiple sources.
- Carbon insetting can appeal because these projects can help make a company's supply chain more resilient and improve the quality of its raw materials.

b. Cons:

- Carbon insets are more limited by their very nature because they only address Scope 3 emissions (indirect emissions from a company's supply chain like raw material sourcing). They do not address Scope 1 nor Scope 2 emissions.

Examples

Accor Hotels

When guests spend more than one night in one of the Accor hotels, they encourage them to reuse their towels. They save money because they have fewer towels to wash. They then reinvest 50% of the money they save by planting trees in their hotels' host countries. Their goal now is to develop agroforestry projects, i.e. to plant trees around or among crops or pastureland.

Nespresso

The objective is to restore and preserve coffee ecosystems Nespresso depends upon for the quality of its Grands Crus, as well as to improve coffee farmers' livelihoods. Through the implementation of large scale agroforestry insetting projects in Colombia, Guatemala and Ethiopia, Nespresso and PUR Projet work hand in hand with coffee farmers to plant agroforestry trees within and around their coffee parcels.

Almost 3 million trees were planted with more than 8,000 farmers between 2014 and 2019 in Colombia, Guatemala, Ethiopia and Costa Rica, in addition to Nespresso's historical AAA program on quality sourcing; while the Group plans to reach 100% of its overall offset footprint by extending this programme. By the end of 2020, 5,000,000 trees will be planted as part of the Carbon Project, enabling Nespresso to offset its global footprint Scope 1 and 2 as well as the footprint of its French market.

All the projects are verified against the IALL standard (Insetting via Agroforestry at Landscape Level) developed by the IPI (International Insetting Platform), while the program is being certified against the IPS (Insetting Program Standard); then all the

program aspects, from its inputs and commitments to the verified outcomes, are registered in the IPI blockchain registry.

Cocoa Company

A cocoa company pays smallholder cocoa farmers to produce biochar as well as cocoa, and provides them with carbon payments. The payments are proportionate to the quantity of biochar produced. This revenue provides an incentive for farmers to produce and apply the biochar to the cocoa trees, providing returns to the farmers and the company in the form of increased disease resistance and productivity enhancements.

Ice cream company

An ice cream company buys carbon credits that originate on the farms that produce milk for the ice cream. These innovative dairy farms generate these carbon credits by installing manure separators or digesters.

Possible Insetting Actions by Powerfuel

a) Carbon Neutral Transport to Site

By investing in the means by which waste is transported to site, Powerfuel will be reducing associated emissions.

b) Reducing high energy waste

Powerfuel could also explore ways to reduce sources of incoming waste that require high levels of carbon to convert to energy. For example, it could undertake recycling and composting education programmes in the local region.

Social Carbon

Explanation

Social Carbon encompasses initiatives that reduce carbon outside the company's own direct sphere of influence.

It may involve actions in the local community to reduce carbon emissions or in specific actions that will compensate, for example through rewilding.

Pros & Cons

c. Pros

- Social carbon initiatives can be local and accessible to the community
- Demonstrate a local commitment

d. Cons:

- There is no standardised way to measure, verify and certify these actions. This does not mean they cannot be measured but that by comparison with offsets they are less verifiable.

Examples

Rewilding

Rewilding is focussed on large-scale restoration by allowing nature take care of itself. Through enabling the return of natural processes to shape land and sea, repair damaged ecosystems and restore degraded landscapes.

Its intention is to create a balance between people and the rest of nature where each can thrive.

See [Rewilding Britain](#) for more information

Installing solar and energy efficiency measures in community buildings

Installing solar & energy efficiency measures in local community buildings (including schools, churches, community centres, leisure facilities) can have the effect of reducing carbon as well as costs for non-profit organisations – saving on heating, lighting etc. and creating warm, welcoming spaces for the community.

A suite of case study examples can be found [here](#).

Evaluation

The table below provides an evaluation of potential offsetting, in-setting and social carbon actions against the criteria that Powerfuel have set out.

A legend is provided below.

Notes: Where ‘?’ is used, it does not indicate that the criteria cannot be met, rather it indicates that at the present time a system may not be in place to fulfil this. For example, in relation to standards and verification for rewilding, there is discussion regarding the use of the Peatland and Woodland Carbon Code systems to support verification and reporting, however, thus far there is no legislative or regulatory regime to support this.

	Best Practice						Powerfuel Required								Powerfuel Desired							
	Real	Additional	Permanent	No Leakage	Verifiable	Retired permanently	Simplicity	Flexibility	Affordability	No adverse effects	Location	Demonstrable	Impact	Genuine involvement	Standards	Best Available Techniques	Communication	Setting the standard	Duration	Capitalisation	Price surety	
Options																						
Offsetting																						
Purchase of carbon credits on the carbon markets	Y	Y	Y	Y	Y	Y	H	H	M	M	L	H	M	L	H	H	M	N/A	Y	N	N	
Commission new permanent afforestation in Scotland	Y	Y	Y	Y	Y	Y	M	M	L	M	L	H	M	L	M	H	L	N/A	Y	Y	Y	
Commission new permanent afforestation near site	Y	Y	Y	Y	Y	Y	M	M	L		L	H	M	L	M							
Farming offsets (tradable?)																						
Insetting - direct																						
Supply chain investment e.g. electric transport to site	Y	Y	Y	?	Y	N	M	M	M	M	M	M	L	L	M	M	L	Y	Y	Y	Y	
Community biomass projects	Y	Y	Y	?	Y	N																
Social Carbon																						
Rewilding in the region	Y	Y	Y	Y	?	Y	H	M	M	?	H	H	H	M	?	?	M	Y	Y	Y	Y	
LEDs for local schools	Y	Y	Y	Y	?	?	H	H	H	M	H	H	M	M	L	L	M	N	N	N	N	
LEGEND																						
H = High																						
M = Medium																						
L = Low																						
Y = Yes																						
N = No																						
? = Unclear																						
N/A = not applicable																						

Appendix 1: Standards

- GHG Protocol Corporate Standard: The World Business Council for Sustainable Development (WBCSD) and World Resources Institute's (WRI) Corporate Accounting and Reporting Standard (Corporate Standard). The GHG Protocol Corporate Standard is the most commonly used organisational GHG accounting methodology. It defines emissions reporting under three key scopes, ensuring comprehensive reporting.

- Quantification & Reporting

ISO 14064-1: "Quantification and reporting of GHG emissions and removals at the organisation level".

This standard sets out the principles and requirements for the quantification and reporting of greenhouse gas (GHG) emissions and removals by an organisation. It includes requirements for the design, development, management, reporting and verification of an organisation's GHG inventory.

Key elements include:

- a) Principles for Verification: These principles include independence, ethical conduct, fair presentation, and due professional care.
- b) Verification Fundamentals:
 - the verification level of assurance (defined as either limited or reasonable),
 - objectives,
 - criteria,
 - Scope,
 - Materiality definition – i.e. the level of assertion accuracy sought through the verification, relative to the interests of the intended users of the assertion which all serve as points of reference regarding the expectations and level of effort required by the verification.

- Carbon Neutrality Certification and Reporting

PAS 2060: British Standards Institution (BSI)'s Publicly Available Specification for the demonstration of carbon neutrality. It specifies requirements to be met by any entity seeking to demonstrate carbon neutrality through the quantification, reduction and offsetting of GHG emissions from a uniquely identified subject.

The standard:

- Is the only internationally recognised certification for organisational carbon neutrality.
- Provides guidance on quantification of emissions through carbon foot-printing
- Provides guidance on emissions reductions of emissions with a 12-month review.
- Supports company level action on carbon emissions and climate change
- Addresses the use of offsetting through certified credits