HOARE LEA

Bottling Facility.
Derby.
PGFI III Ltd.

SUSTAINABILITY
ENERGY STRATEGY

REVISION F3 – 25.01.2021

Audit sheet.

Rev.	Date	Description of change / purpose of issue	Prepared	Reviewed	Authorised
F1	18.12.2019	Draft issue for comment	CB	MR	JRF
F2	14.02.2020	Issue with comments	CB	MR	JRF
F3	25.01.2021	Revised Geometry and draft EPC	CB	BE	JRF

Project number: 23/23498
Document reference: WIL-01-FPTG-GA-210125-EnergyStrategyReport_F3

Contents.

Executive summary

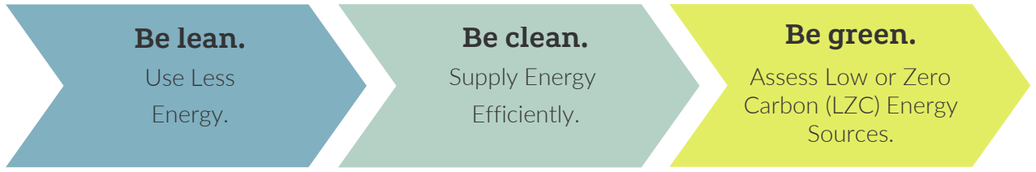
This energy strategy has been prepared on behalf of PGFI III Ltd for the new Bottling Facility to be located at Dove Valley Park, Derby.

This strategy summarises the relevant regulatory and planning policies applicable to the development and sets out how the development will address and achieve the relevant policy targets. The strategy responds to the UK planning and regulatory framework.

This report considers the proposed Bottling Facility, with the output data reflecting the combined energy requirements for this building.

1.1 Approach

This report evaluates the development against the energy hierarchy; be lean, be clean and be green.



Be Lean

The building fabric performance and engineering systems have been optimised to use less energy prior to the inclusion or consideration of Low and Zero Carbon (LZC) technology.

Be Clean

The Be clean step of the energy hierarchy refers to the use of 'clean energy supply'. This includes, but is not limited to, the use of Combined Heat and Power (CHP) and District Heat Networks. Because the majority of the building's heat energy originates from waste heat produced by the process, with the remaining energy being electrically fuelled i.e. chillers, fans, pumps and lighting, the benefit of connecting or using a CHP system is limited. Given that the national grid is continually decarbonising, the use of gas systems is less preferential compared to electrically fuelled systems. The waste heat from the process area is actively recovered and reused to heat the process areas meaning the requirement to consume further energy for spaces conditioning is reduced.

Current Building Regulations (Part L2A 2013) uses a carbon factor of 0.519 $kgCO_2/kWh$ for electricity whereas the reality is that the carbon factor is around 0.200 – 0.250 $kgCO_2/kWh$. This can provide misinterpretation of strategies i.e. systems which offset electricity will demonstrate a better result than reality.

Be Green

The final step of the energy hierarchy is to utilise low and zero carbon technology. Air Source Heat Pumps (ASHP) were discounted at this stage as they are already an intrinsic part of the Variable Refrigerant Flow (VRF) system as introduced in the Be lean stage. The use of a photovoltaic array (PV) would be most effective way of reducing carbon at this stage and is befitting to the Clients ambition to eventually add a PV array to the reinforced roof of the bottling facility; although this is currently prevented by the local network distribution operator.

1.2 Energy Strategy

Combining efficient fabric design and efficiency building services systems provides the following regulated carbon emission results;

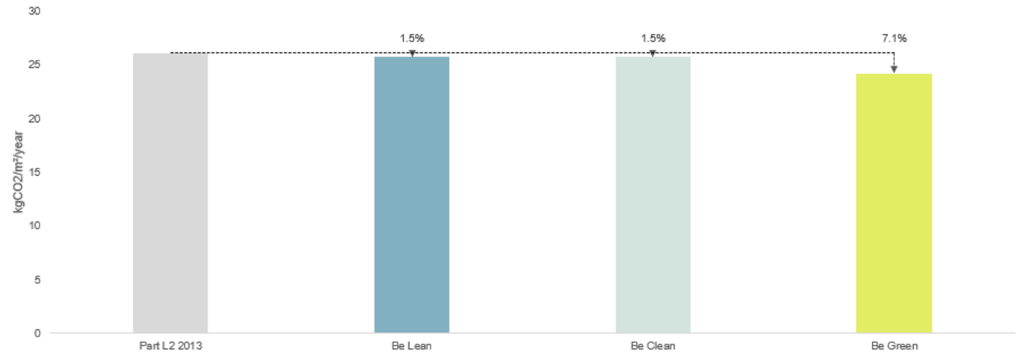


Figure 1 Be Lean, Be Clean and Be Green; combined regulated carbon emission reduction for the considered buildings

The energy strategy indicates that the Proposed Development will achieve 1.5% reduction over the Part L2A 2013 baseline without the addition of a PV array; but could potentially achieve a further 5.6% betterment with the application of a PV array should the Local Network Distribution Operator relax the restriction.

The study shows the building meets with planning requirements by complying with Part L2A 2013.

1.3 Energy Performance Certification (EPC)

The Bottling Facility is projected to achieve a draft EPC rating of B (28) based upon the design parameters stated within this report.

2. Introduction

This strategy has been prepared on behalf PGFI III Ltd in support of the proposed new Bottling Facility, hereafter referred to as the 'Proposed Development', to be located at Dove Valley Park, Derby. The development includes a large bottling facility with smaller auxiliary buildings on the site.

This report will only consider the Bottling Facility.

It is understood that the only planning requirements for the site is for the considered buildings to meet with the criteria set out in approved document Part L2A 2013.

3. Site Context

The Proposed Development is to be situated within the grounds of Dove Valley Park, Derby. A site context assessment was undertaken to evaluate Proposed Development.

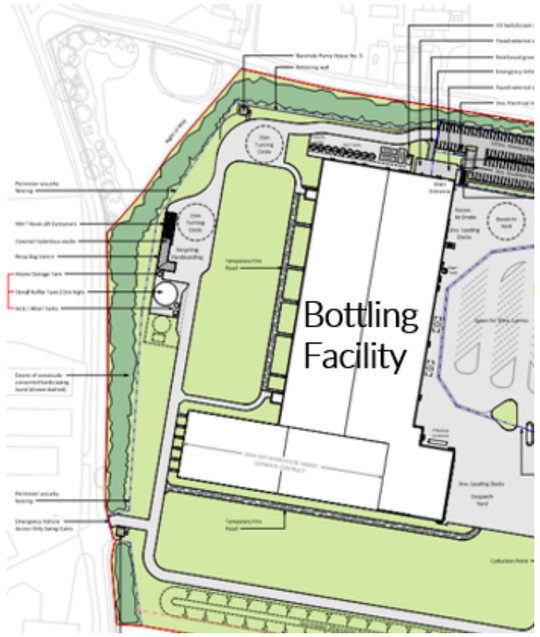


Figure 2 Dove Valley Park, Site Context Assessment

The Bottling Facility has placed its storage facilities to the south – which consist of unconditioned spaces - and the conditioned office accommodation to the north east to prevent excessive solar gain, helping to reduce the annual energy demand associated with space cooling.

The site is remote enough to not cause – or receive – shading to other existing buildings. This energy strategy has considered the façade performance to find the balance between unwanted solar gain, beneficial solar gain and daylight access.

This assessment was undertaken using IES 2019.0.1 by a CIBSE accredited Level 5 Energy Assessor (LCEA 064066) in accordance with CIBSE AM11. The image below shows the 3D dynamic thermal modelling.

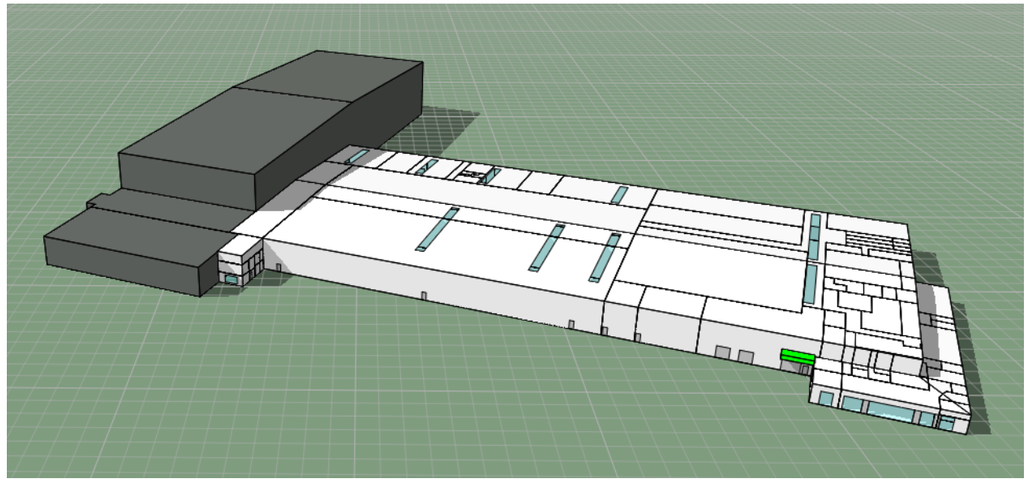
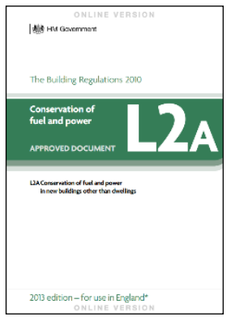


Figure 3 3D dynamic thermal models of the Bottling Facility (Top), and Drivers Rest building (Lower).

4. Policy and Drivers

The following section outlines the national drivers and policies.

4.1.1 Building Regulations Part L (2013)



Approved Document Part L (2013, England edition) is the Building Regulations relating to the conservation of fuel and power in buildings. It is the mechanism by which government is driving reductions in the regulated CO2 emissions from new buildings The Approved Document is separated into two sections: Part L1 and Part L2.

Part L2 relates to buildings other than dwellings. Part L2A, 2013 refers to the 'Conservation of fuel and power in new buildings other than dwellings'.

The Proposed Development has been assessed in accordance to criteria set out in Part L2A 2013.

Schedule 1: Conservation of Fuel and Power

Schedule 1 of the Building Regulations Part L states that reasonable provisions shall be made for the conservation of fuel and power in building by:

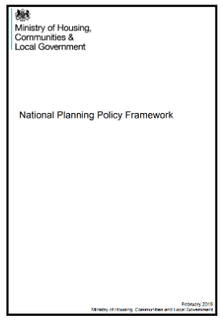
- Limiting heat gains and losses:
- through thermal elements and other parts of the building fabric; and
- from pipes, ducts and vessels used for space heating, space cooling and hot water services
- Providing fixed building services which:
- are energy efficient;
- have effective heat controls; and
- are commissioned by testing and adjusting as necessary to ensure they use no more fuel and power than is reasonable in the circumstances.

Demonstrating compliance

There are five criteria in Part L2A when demonstrating compliance. To gain compliance, only Criterion 1 and parts of Criterion 4 (which states that Building Emissions Rate remains consistent from design through to construction) are regulation and therefore mandatory. The approaches to meet the other criteria are 'reasonable provision' and alternative proposals are permissible. This should be checked with the Building Control Body (BCB) to confirm that they meet energy efficiency requirements approval. art L of the Building Regulations is the mechanism by which government is driving reductions in the regulated CO_2 emissions from new buildings. All new buildings must meet the requirements of Part L2A of the 2013 Building Regulations.

The process areas within the Bottling Facility have been treated as described in Approved Document Part L2A 2013, Appendix C, item 2. This section states that there is the option to exempt the process areas based upon the definition of 'industrial sites, workshop's and non-residential agricultural buildings with low energy demand.' This allows for the process areas to not be part of the of the calculation from a Building Regulations perspective whilst still providing the boundary conditions to the surrounding rooms.

4.1.2 National Planning Policy Framework



The National Planning Policy Framework (NPPF) was published in February 2019 and has superseded all Planning Policy Statements (PPS) and Planning Policy Guidance (PPG) documents, with the exception of PPS10 (Waste). The NPPF sets out the Government's strategy on the delivery of sustainable development.

The NPPF places responsibility for policy making with the Local Planning Authority, who shall communicate their policies through Local Plans and facilitate the creation of Neighbourhood Plans. The NPPF states that there is a presumption in favour of sustainable development.

The following is extracted from paragraph 11 of the NPPF:

"Plans and decisions should apply a presumption in favour of sustainable development.

For plan-making this means that:

- *a) plans should positively seek opportunities to meet the development needs of their area, and be sufficiently flexible to adapt to rapid change;*
- *b) strategic policies should, as a minimum, provide for objectively assessed needs for housing and other uses, as well as any needs that cannot be met within neighbouring areas[5] , unless:*
  - *i. the application of policies in this Framework that protect areas or assets of particular importance provides a strong reason for restricting the overall scale, type or distribution of development in the plan area[6] ; or*
  - *ii. any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in this Framework taken as a whole.*

For decision-taking this means:

- *a) approving development proposals that accord with an up-to-date development plan without delay; or*
- *b) where there are no relevant development plan policies, or the policies which are most important for determining the application are out-of-date7, granting permission unless:*
  - *i. the application of policies in this Framework that protect areas or assets of particular importance provides a clear reason for refusing the development proposed 6; or*
  - *ii. any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in this Framework taken as a whole."*

In respect of energy policy contained within the NPPF, paragraph 151 sets out that:

"To help increase the use and supply of renewable and low carbon energy and heat, plans should:

- *a) provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);*
- *b) consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and*
- *c) identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers."*

It is understood that the only planning requirement for this development is to comply with the criteria set out in Approved Document Part L2A.

5. Energy Strategy

In order to develop the energy strategy, the Part L2A notional model has been used as a 'Baseline' case to provide target end uses of energy. The Baseline case helps to inform the benefit of low and zero carbon technologies – which are implemented in the 'Be Clean' and 'Be Green' stages.

Figure 4 shows the energy demand proportion by end-use for the Part L notional case of the Proposed Development

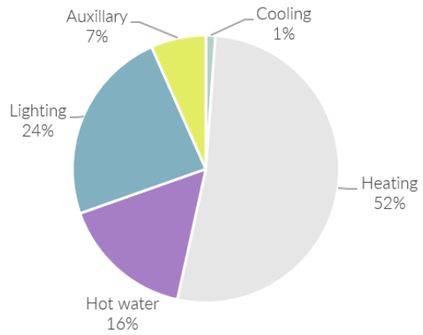


Figure 4 Combined system side fuel requirements for the baseline models for the site

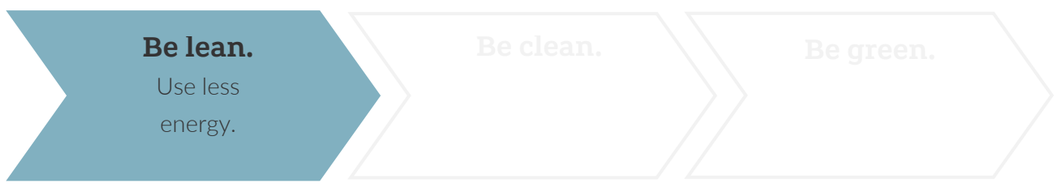
Targeting the following elements will help drive down and improve the carbon emissions for both buildings when compared to the Part L2A notional models,

- Improved thermal envelope; targeting the U values for external walls and roof elements, along with air tightness.
- Improved heating systems; higher efficiency sources of heat.
- Improved lighting systems; higher efficiency light fittings and controls.

As a result of improving the above elements there will be knock-on consequences i.e. reduced cooling demand due to improved lights, increased cooling loads due to retention of internal heat gains i.e. reduced heat loss.

The Be Lean case identifies the balance between these items.

Be Lean
Passive design and energy efficiency measures form the basis for the reduction in overall energy demand and carbon emissions for the proposed development. This energy strategy aims to reduce the energy demand initially by optimising the envelope and building services within the development.



An initial series of Part L compliance calculations have been undertaken to determine the potential reduction in annual regulated carbon emissions using passive measures such as those indicated in Table 1.

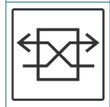
	**Fabric performance** The fabric performance values aim to reduce unwanted heat loss and heat gains, whilst maintaining a comfortable internal environment; - External Walls; 0.25 W/m²K (Bottling Facility) - Exposed Floors; 0.25 W/m²K - Roof; 0.17W/m²K - External Glazing; 1.30 W/m²K - Glazing g value; 0.40 - Glazing visible light transmittance; 65% - Air permeability; 3.00m³/hr.m² @ 50Pa
	**Space cooling & heating** Office and meeting areas use space cooling and heating provided via a VRF system which is served by high efficiency air source heat pump units, (ASHP). Circulation, toilet and storage areas are heated via a mixture of electric space heaters and LTHW radiators using waste heat for the heat source. Waste heat from the process load is recovered and used to reheat the process areas, therefore being the most efficient and least wasteful way to heat the space.
	**Mechanical ventilation** The use of heat recovery is used throughout the development. Recovering heat from the extract air can help reduce annual heating energy considerably with no impact on the air quality of the incoming fresh air. Waste heat from the onsite process spaces is also recovered and used to heat each of the process area via an air distribution system, therefore reducing the amount of wasted energy onsite. The air handling plant will have efficient fan motors and will be designed with low static fan pressures to help reduce the energy consumption associated with delivering fresh air into the building.
	**Lighting** The internal lighting design incorporates the use of high efficiency LED lighting combined with daylight linking (where applicable). The use of presence and absence detection prevents the internal lighting being 'on' when the occupied spaces are not occupied. The efficient lighting design also help to drive down the cooling energy consumption. The lighting gains were based on efficient LED lighting with efficiency of 140 lm/cW in office areas and 90 lm/cW elsewhere.
	**Domestic hot water (DHW) system** Domestic hot water is supplied via local point of use electric water heaters. These building types generally have a low hot water demand; therefore, the use of local water heaters prevents the need for large volumes of stored water and the associated pipework. However, there was a small storage allowance of 600l provided in the design and simulation for the shower rooms.

Table 1 Passive Design Measures

The chart below shows a breakdown of the energy demand following the passive design measures being applied to the base case scenario.

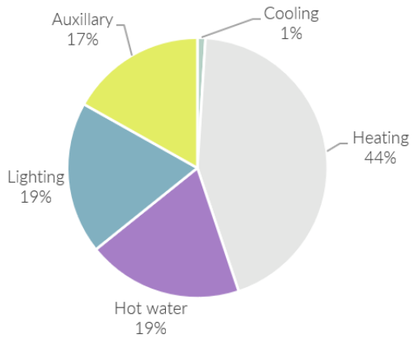


Figure 5 Be Lean combined system side fuel regulated carbon emission reduction for the considered buildings

Due to the lighting and heating energy being reduced compared to the 'Be Lean' case – the percentage breakdown of energy demand is skewed. However, as shown in the figure below, by applying these measures to the dynamic thermal models, the results of the simulations for the Bottling Facility show a 1.5% reduction in regulated carbon emissions when compared to the Part L 2013 notional building.

Figure 6 Be Lean combined regulated carbon emission reduction for the considered buildings

As the carbon emissions for the proposed building is less than the corresponding Part L 2013 target emissions, the Part L2A 2013 Criterion 1 target is met, and therefore meet the requirements of the planning policies. See Appendix A for the front page of the BRUKL for each building.

Be Clean

This stage of the energy hierarchy refers to the use of heat networks which typically consists of Combined Heat and Power (CHP). A CHP system consists of an engine, usually gas fired, which generates thermal energy and electrical energy – which is fed into the development. When carbon factors of electricity are high this arrangement can result in lower carbon emissions overall, however as the grid electricity emission factor reduces, the performance of a CHP system is significantly impacted.

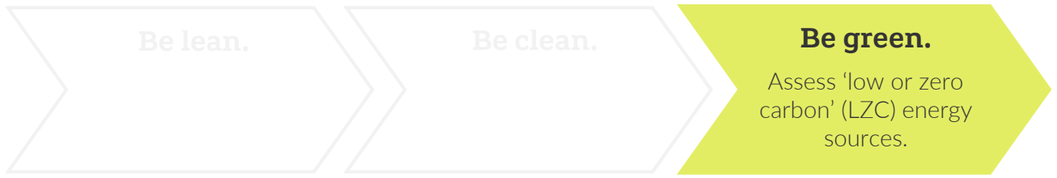
Due to the majority of the building's heat energy originating from waste process heat, with the remaining energy being electrically fuelled i.e. chillers, fans, pumps and lighting, the utilisation of technology such as CHP would offer very little benefit in terms of carbon emission reduction. Furthermore, due to grid decarbonisation, the carbon emission benefit of gas fired CHP will diminish as the national grid continues to decarbonise.

	Combined heat and power (CHP) Due the proposed changes to the carbon emission factors in future revisions of Part L – the use of Combined Heat and Power (CHP) is likely to offer a 'negative benefit' within the next five years and therefore has not been explored as part of the energy strategy. Waste heat from the process load is recovered and used to reheat the process areas, therefore being the most efficient and least wasteful way to heat the space at this stage, However, this was an intrinsic part of the initial HVAC systems and so is included in the Be Lean stage.

Table 2 Clean Energy Supply

Be Green

The final step of the energy hierarchy explores the feasibility of Low and Zero Carbon (LZC) technologies to allow for the production of renewable energy onsite in order to offer a further reduction in carbon emissions.



	Photovoltaics Photovoltaics (PV) capture energy from the sun and convert it into electricity. Solid PV's are commonly mounted in arrays either on roofs or walls. Each array must be configured to allow air to circulate behind to dissipate heat that is generated in the system. It is the Client's ambition to equip a PV array to the reinforced roof of the Bottling facility in the future. However, the Local Network Distribution Operator is currently restricting the connection of PV arrays to the grid.
	Solar thermal A solar hot water system uses solar collectors to trap the thermal energy from the sun in order to heat water for use within the building. The most common application of solar collectors is to provide domestic hot water. Due to the nature of the building there is an associated low demand for hot water and so the use of solar thermal would not provide significant benefit.
	Heat Pumps Air source heat pumps use the air temperature to reject to and extract heat from to provide energy within the building. The ability of the heat pump to transfer heat from the outside air to the building depends on the outdoor temperature. As this temperature drops the ability of the heat pump to absorb heat also drops. In the UK external ambient temperatures do not historically drop to levels that would make air-to-air heat pumps unviable. Heat pump technology is an integral part of the VRF system and so has been applied at the Be Lean stage of this report.

Table 3 Examples of Low and Zero Carbon Technology

As there is no information available to the size of PV array that the client eventually plans to place on the roof of the Bottling Facility a notional 100m^2 PV array was considered to indicate the potential further reduction in regulated carbon emissions. It should be noted that the use of a PV array is not part of the scheme as the Local Network Distribution Operator is currently restricting the connection of PV arrays to the grid.

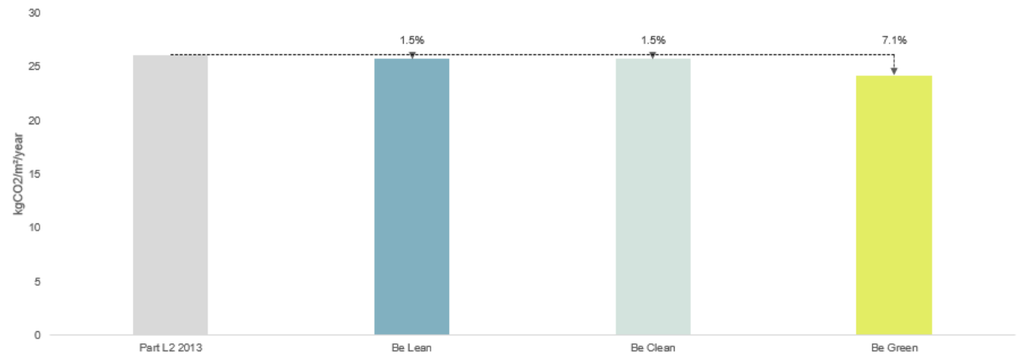


Figure 7 Be Lean, Be Clean and Be Green; combined regulated carbon emission reduction for the considered buildings

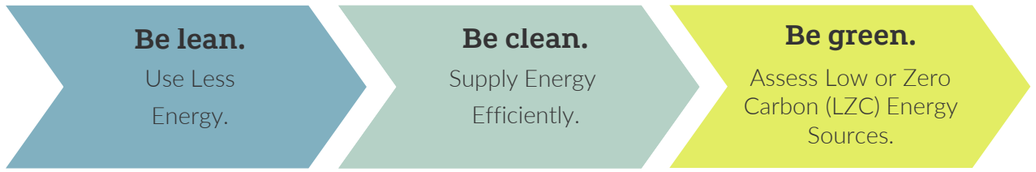
The application of a 100 m^2 PV array to the Bottling Facility resulted in a further 5.6% reduction in annual regulated carbon dioxide emissions, giving the site a 7.1% betterment compared to the Part L 2013 baseline.

6. Conclusion

This energy strategy has been prepared on behalf of PGFI III Ltd for the new Bottling Facility to be located at Dove Valley Park, Derby.

6.1 Approach

This report evaluates the development against the energy hierarchy; be lean, be clean and be green.



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Be Green

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6.2 Energy Strategy

Combining efficient fabric design and efficiency building services systems provides the following regulated carbon emission results;

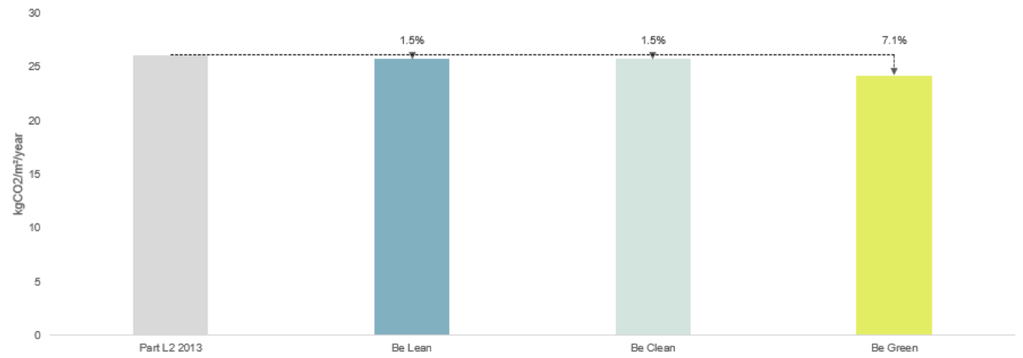

Figure 8 Be Lean, Be Clean and Be Green; combined regulated carbon emission reduction for the considered buildings

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The study shows the proposed building to meet with planning requirements by complying with Part L2A 2013.

6.3 Energy Performance Certification (EPC)

The Bottling Facility is projected to achieve draft EPC ratings of B (28) based upon the design parameters stated within this report (See Appendix 8).

7. Appendix A – BRUKL Forms

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

Bottling Facility As designed

Date: Fri Jan 22 20:18:46 2021

Administrative information

Building Details

Address: Derby,

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.12

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.12

BRUKL compliance check version: v5.6.a.1

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name: Hoare Lea

Telephone number:

Address: Level 6 The Royal Exchange, Cross Stret, Manchester, M2 7FL

Criterion 1: The calculated CO_2 emission rate for the building must not exceed the target

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	26.1
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	26.1
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	25.7
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.22	0.22	L0000031:Surf[3]
Floor	0.25	0.22	0.22	L0000031:Surf[0]
Roof	0.25	0.17	0.17	L0000031:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.3	1.3	L0000001:Surf[4]
Personnel doors	2.2	2.2	2.2	L0000031:Surf[2]
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

* There might be more than one surface where the maximum U-value occurs.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
*** Display windows and similar glazing are excluded from the U-value check.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	3

Page 1 of 9

Figure 9 Front page of BRUKL document generated for the Bottling Facility (Be Lean Stage)

8. Appendix B – Draft EPC Certificate

Energy Performance Certificate

HM Government

Non-Domestic Building

Bottling Facility
Derby

Certificate Reference Number:
0000-0040-0030-9000-0803

This certificate shows the energy rating of this building. It indicates the energy efficiency of the building fabric and the heating, ventilation, cooling and lighting systems. The rating is compared to two benchmarks for this type of building: one appropriate for new buildings and one appropriate for existing buildings. There is more advice on how to interpret this information in the guidance document *Energy Performance Certificates for the construction, sale and let of non-dwellings* available on the Government's website at www.gov.uk/government/collections/energy-performance-certificates.

Energy Performance Asset Rating

More energy efficient

A+ Net zero CO_2 emissions

A 0-25
B 26-50
C 51-75
D 76-100
E 101-125
F 126-150
G Over 150

28 This is how energy efficient the building is.

Less energy efficient

Technical information

Main heating fuel:	Grid Supplied Electricity
Building environment:	Air Conditioning
Total useful floor area (m^2):	2913.870
Building complexity (NOS level):	5
Building emission rate ($kgCO_2/m^2$ per year):	25.7
Primary energy use (kWh/m^2 per year):	178.22

Benchmarks

Buildings similar to this one could have ratings as follows:

28 If newly built

75 If typical of the existing stock

Figure 10 Draft EPC certificate generated for the Bottling Facility (Be Lean Stage)

HOARE LEA

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PRINCIPAL SUSTAINABILITY CONSULTANT

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