SEAI Energy Audit Scheme

Phase 3 Report

Britvic

Kylemore Park West, Kylemore, Dublin

Prepared by:

SLR Consulting Limited

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Making Sustainability Happen

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
1	27 November 2023	Bob Robinson	Sarah Grindrod	
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Basis of Report

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1.0 Executive Summary

The Energy Efficiency Directive (EED) (Directive 2012/27/EU) mandates large organisations to complete energy audits every four years. This requirement was transposed into Irish legislation in SI 426 of 2014, known as the SEAI Energy Auditing Scheme Regulations.

A large 'undertaking' is defined as any business that complies with the following:

- 250 or more employees in Ireland; or
- Has fewer than 250 employees, but has
  - an annual turnover exceeding €50M, and
  - a balance sheet total exceeding €43M

Britvic qualifies as a 'Large Undertaking' as had 459 employees (Annual Report for year ending 30th June 2022).

Under the regulations a company must assess the potential for energy savings across at least 85% of its organisation, as defined by the energy consumption i.e.: it must assess parts of the organisation that consume at least 85% of the organisation's total energy consumption. Britvic Ireland Ltd. (Britvic) have appointed Bob Robinson of SLR Consulting Ltd. as their SEAI Registered Energy Auditor (EA 10072). Bob has achieved Registered Energy Auditor status through the Association of Energy Engineers (AEE) Certified Energy Manager accreditation (CEM-I).

Energy is a major cost block for Britvic.

Energy assessments have been completed at two sites, which encompass together 90.4% of the total energy consumption, which is above the minimum 85% as defined in the legislation. The tables below summarise the opportunities for energy efficiency as identified through this exercise.

A total of 75 energy saving opportunities were considered.

- Savings with 1 year's payback or less amount to 1,451,155 kWh/yr equivalent to a cost saving of €292K/yr
- Savings with 2 years payback or less amount to 1,948,701 kWh/yr equivalent to a cost saving of €402K/yr
- Savings with 3 years payback or less amount to 2,284,194 kWh/yr equivalent to a cost saving of €461K/yr
- There are in addition 25 further opportunities identified but for which savings have not been evaluated.

Table 1-1 Identified Savings for Each Site

		Energy saving kWh/yr	Carbon saving tCO2e/yr	Cost saving €/yr	CAPEX €	OPEX €/yr	Payback yrs
Kylemore 001	T1 - M4 SDB1 Offices - Syrup Room baseload						
Kylemore 002	T1 – Main Office baseload	11,544	1.1	2,863	0	0	0.0
Kylemore 003	Steam line and valve insulation	237,325	43.7	37,977	11,800	0	0.3
Kylemore 004	Boiler upgrades	446,652	82.2	70,583	50,000	0	0.7
Kylemore 005	Fit heat recovery to low pressure compressors	245,280	45.2	39,246	50,000	0	1.3
Kylemore 006	Boiler blowdown heat recovery	49,628	9.1	7,939	20,000	0	2.5
Kylemore 007	Airveyor controls	132,000	12.3	32,719	20,000	0	0.6
Kylemore 008	Syrup room powder charging room exhaust ventilation VSD	11,924	1.1	2,955	5,000	0	1.7
Kylemore 009	Thermographics						
Kylemore 010	Use one UV chamber	8,760	0.8	2,170	0	0	0.0
Kylemore 011	Use air amplifier cleaning guns						
Kylemore 012	Use air amplifiers in place of compressed air nozzles						
Kylemore 013	Palletisers change compressed air ejectors to vac pump						
Kylemore 014	Line 6 shrink tunnel VSD fans	3,794	0.4	943	6,000	0	6.4
Kylemore 015	Hydrogen Peroxide to CIP tank	109,500	20.1	17,518	10,000	0	0.6
Kylemore 016	Vendmiser in canteen	1,400	0.1	345	600	0	1.7
Kylemore 017	Options to eliminate gas boilers						
Kylemore 018	Rinse water recovery skid						
Kylemore 019	Light weighting	447,529	41.8	110,893		Being implemented	
Kylemore 020	Grundfoss energy efficient pump commissioning	258,880	24.2	64,174		Being implemented	
Kylemore 021	HP compressor heat recovery						
Kylemore 022	Heat pump project						
Kylemore 023	Cool air fed to LP air compressors	12,264	1.1	2,962	5,000	0	1.6
Kylemore 024	Airveyors replace fan motors	79,200	7.4	19,632	60,000	0	3.1
Kylemore 025	IT Policy	153	0.0	37	0	0	0.0
Kylemore 026	Change motors on conveying lines	72,765	1.6	17,685	tbd	0	tbd
Kylemore 027	Conveyor sequencing of conveyors on all lines						
Kylemore 028	Lighting	24,866	2.3	6,162	9,600	0	1.6
Kylemore 029	replace Gram compressors	55,650	7.2	13,795	100,000	0	7.2
Kylemore 030	Close lids on powder charging	1,400	0.1	338	0	0	0.0
Kylemore 031	Vacuum seal water on pasteurizer Line 7						
Kylemore 032	Bottle blower heat recovery	88,211	19.1	14,310	150,000	0	10.5
Kylemore 033	Bottle blower Eco-oven						
Kylemore 034	Bottle blower compressed air recovery to LP air						
Kylemore 035	Line 4 can rinse, use air amplifier	6,720	0.6	1,663	2,000	0	1.2
Kylemore 036	Line 4 reject air jet, air amplifier						
Kylemore 037	Steam trap survey and repair						
Kylemore 038	EC fans after each shrink tunnel for cooling	27,750	0.6	6,743	18,000	0	2.7
Kylemore 039	Engineering standards for motor efficiency						
Kylemore 040	EC fans for flat bed coolers for HP compressors	52,034	1.2	13,170	27,000	0	2.1
Kylemore 041	CIP insulation of top and bottom of tanks	109,220	20.1	17,476	7,560	0	0.4
Kylemore 042	Replace office heating boilers with air source heat pump	333,518	91.9	-4,514	30,000	0	
Kylemore 043	Server room set point						
Kylemore 044	Switch off conferencing screens in meeting rooms when not need	3,066	0.3	740	0	0	0.0
NW 001	Additional weekend consumption	15,446	5.3	4,452	0	0	0.0
NW 002	Increased diesel consumption	2,430	0.6	411	0	0	0.0
NW 003	Reduce low pressure compressed air set point	46,305	16.0	13,356	5,000	0	0.4
NW 004	Monitoring and targeting	87,567	29.6	24,334	10,000	0	0.4
NW 005	Air leak detection	33,075	11.4	9,537	2,000	0	0.2
NW 006	Bottle blower air recovery	181,940	62.8	52,473	100,000	0	1.9
NW 007	Control cooling water flowrate to HP compressors using VSD	121,050	41.8	34,913	25,500	0	0.7
NW 008	Insulation jacket for plate heat exchanger on CIP	8,470	1.8	703	500	0	0.7
NW 009	Replace compressed air vibrators with electric	12,101	4.2	3,492	2,000	0	0.6
NW 010	Hot glue set back temperature	1,401	0.5	405	0	0	0.0
NW 011	HP compressor circulation pumps	15,048	5.2	4,343	25,500	0	5.9
NW 012	Low pressure compressor heat recovery	132,300	27.8	10,965	30,000	0	2.7
NW 013	Cool air feed to LP air compressors	6,613	2.3	1,908	5,000	0	2.6
NW 014	Cooling water from HP compressors to preheat CIP						
NW 015	CO2 evaporator economiser	21,600	7.5	6,233	20,000	0	3.2
NW 016	Airveyor controls	44,000	15.1	12,683	10,000	0	0.8
NW 017	Airveyor replace fan motors	13,152	4.5	3,790	6,000	0	1.6
NW 018	IT policy						
NW 019	Line 1 chiller Jetting						
NW 020	Line 1 chiller EC fans						
NW 021	Change fans on AHUs to EC fans	40,836	14.1	11,778	tbd	OPEX	tbd
NW 022	Wellhead 98-1 use energy efficient pump						
NW 023	Palletisers/depalletizes change compressed air ejectors to vac pump						
NW 024	Line 1 replace old conveyor motors with IE5						
NW 025	EC fans after each shrink tunnel for cooling	3,274	1.1	762	3,000	0	3.2
NW 026	External lighting						
NW 027	Server room temperature set point	440	0.2	130	0	0	0.0
NW 028	EC fans for free coolers on roof	63,612	21.9	16,853	1,489	0	2.1
NW 029	VSD on submersible pump on well head	3,556	1.2	942	82	0	2.9
NW 030	Insulate CIP lines	15,235	3.2	1,045	6,000	0	4.8
NW 031	Control softened water pump	19,250	6.6	5,549	0	0	0.0

Table 1-2 Identified Prioritised Savings for Each Site

		Energy saving kWh/yr	Carbon saving tCO2e/yr	Cost saving €/yr	CAPEX €	OPEX €/yr	Payback yrs
Kylemore 002	T1 – Main Office baseload	11,544	1.1	2,863	0	0	0.0
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Kylemore 025	IT Policy	153	0.0	37	0	0	0.0
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Kylemore 016	Vendmiser in canteen	1,400	0.1	345	600	0	1.7
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Kylemore 040	EC fans for flat bed coolers for HP compressors	52,034	1.2	13,170	27,000	0	2.1
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NW 011	HP compressor circulation pumps	15,048	5.2	4,343	25,500	0	5.9
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Kylemore 012	Use air amplifiers in place of compressed air nozzles						
Kylemore 013	Palletisers change compressed air ejectors to vac pump						
Kylemore 017	Options to eliminate gas boilers						
Kylemore 018	Rinse water recovery skid						
Kylemore 021	HP compressor heat recovery						
Kylemore 022	Heat pump project						
Kylemore 027	Conveyor sequencing of conveyors on all lines						
Kylemore 031	Vacuum seal water on pasteurizer Line 7						
Kylemore 033	Bottle blower Eco-oven						
Kylemore 034	Bottle blower compressed air recovery to LP air						
Kylemore 036	Line 4 reject air jet, air amplifier						
Kylemore 037	Steam trap survey and repair						
Kylemore 039	Engineering standards for motor efficiency						
Kylemore 043	Server room set point						
NW 014	Cooling water from HP compressors to preheat CIP						
NW 018	IT policy						
NW 019	Line 1 chiller Jetting						
NW 020	Line 1 chiller EC fans						
NW 022	Wellhead 98-1 use energy efficient pump						
NW 023	Palletisers/depalletizes change compressed air ejectors to vac pump						
NW 024	Line 1 replace old conveyor motors with IE5						
NW 026	External lighting						

Declaration of Compliance

The operations of Britvic have been considered in respect to the SEAI Energy Audit Scheme, which represents the Irish interpretation and requirements for compliance with Article 8 of the EU Energy Efficiency Directive (Directive 2012/27/EU).

An SEAI Registered Energy Auditor has been appointed and energy audits have been completed considering more than 85% of the total energy consumption. This audit has been completed according to the methodology laid out in BS16247: Energy Audits.

SEAI Registered Energy Auditor ((EA 10072)

Company: SLR Consulting

Signature: MA Robinson

Date: 27/11/2023

Company Director

I confirm I have:

- reviewed the recommendations of the assessment or alternative routes to compliance
- am satisfied, to the best of their knowledge, that the organisation is within the scope of the scheme
- am satisfied, to the best of their knowledge, that the organisation is compliant with the scheme
- am satisfied, to the best of their knowledge, that the information provided in the organisation's notification is correct

Name: Kevin Donnelly

Position: Managing Director

Signature: Kevin Donnelly

Date: 27/11/2023

2.0 Organisation Description and Background

Britvic manufacture both carbonated and non-carbonated soft drinks.

Britvic is registered at:

Kylemore Park West, Ballyfermot, Dublin 10

CRO Company no: 14264.

Andrew Grange, Group Health, Safety & Environment Manager, has responsibility for implementing compliance with the requirements of the SEAI Energy Audit Scheme.

Refer to the Britvic annual report 2018 for descriptions of the legal entities within the Republic of Ireland on 31st December 2018. This includes the following which account for all energy use in the Republic of Ireland:

Table 2-1 Britvic Ireland legal entities

Name		Principal Activity	% equity interest
Aquaporte Limited	10 Earlsfort Terrace, Dublin 2	Active	100
Britvic Americas Limited	10 Earlsfort Terrace, Dublin 2	Body corporate	100
Britvic Ireland Limited	10 Earlsfort Terrace, Dublin 2	Body corporate	100
Britvic Ireland Pension Trust DAC	10 Earlsfort Terrace, Dublin 2	Pension funding vehicle	100
Britvic Irish Holdings Limited	10 Earlsfort Terrace, Dublin 2	Holding Company	100
Britvic Northern Ireland Limited	10 Earlsfort Terrace, Dublin 2	Body corporate	100
Robinson's Finance Limited	10 Earlsfort Terrace, Dublin 2	Holding Company	100
Britvic Licensed Wholesale Limited	10 Earlsfort Terrace, Dublin 2	Dormant	100
Britvic Munster limited	10 Earlsfort Terrace, Dublin 2	Dormant	100

3.0 SEAI Energy Auditing Scheme Summary

The SEAI Energy Auditing Scheme is being implemented to meet Article 8 of the EU Energy Efficiency Directive (EED) (2012/27/EU). The SEAI’s guiding principles for implementing the Energy Audit Scheme are to:

- ensure that the Energy Audit Scheme provides high quality and well-targeted advice to large enterprises on cost-effective energy efficiency opportunities,
- The Energy Audit Scheme fits with and is complementary to the landscape of existing energy efficiency and climate change policy instruments.

The SEAI Energy Audit Scheme gave effect to the scheme in the summer of 2014. The regulations are implemented on a four-year cycle.

The SEAI Energy Audit Scheme is to be applied to undertakings which are defined as a large undertaking. If part of an organisation is defined as a large undertaking, then all operations with the same top ROI parent entity must be included in the assessment.

A large ‘undertaking’ defined as any business that complies with the following:

- 250 or more employees in Ireland; or
- Has fewer than 250 employees, but has

  - an annual turnover exceeding €50M, and
  - a balance sheet total exceeding €43M

Under the regulations (SI 426 of 2014) a company must either:

i. Undertake a standalone energy audit(s), on the basis of the minimum criteria set out in Annex VI of the EED, every four years. Each audit must be completed by a Registered Energy Auditor; OR
ii. If your organisation has a valid, certified energy or environmental management system (ISO 50001, ISO 14001 or equivalent) and it can demonstrate to SEAI that the management system includes an energy audit that meets the minimum criteria set out in Annex VI of the EED, then your organisation can engage a Register of Energy Auditors to confirm in writing that the management system fulfils the requirement for an audit.

This must be repeated every four years. The full requirements for compliance are set out in (SI) 426 of 2014, as amended by SI 646 of 2016 and SI 599 of 2019. The minimum requirements for compliance have been summarised by SEAI[1].

The chosen route must assess the potential for energy savings across at least 85% of its organisation, as defined by the energy consumption i.e.: The scope of the audit or compliance route must cover at least 85% of that legal entity's total delivered energy use in the Republic of Ireland. Unlike other legislation, energy consumption includes all energy sources where the organisation is responsible for paying for the energy or is the primary consumer. This includes electricity, natural gas, oil, biomass and alternative fuels, business travel and haulage and any other energy sources paid for. Additional energy sources may for example include imported steam, hot water, explosives etc.

If ISO50001 ISO 50001, ISO 14001 or equivalent is in place and it can demonstrate to SEAI that the management system includes an energy audit that meets the minimum criteria across 100% of the organisation, then the organisation only needs to notify the SEAI that they are complying. Where ISO 50001 does not cover 100%, the organisation must undertake an EED Assessment which for Phase 2 will include:

- Compliant audits up to 24 months prior to the final on-line declaration;
  - Each compliant audit must consider a minimum of 12 months of contiguous energy data;
- Identification of energy saving opportunities at the company through audits and based on at least 90% of the total energy use;
- Setting up and maintain an Evidence Pack; and
- Report compliance to SEAI.

3.1 Definition of Britvic Ireland as a Large Undertaking

Britvic Ireland Ltd qualifies as a 'Large Undertaking' as had 459 employees (Annual Report for year ending 30th June 2022).

3.2 SEAI Registered Energy Auditor

Britvic Ireland have appointed Bob Robinson of SLR Consulting Ltd as their Registered Energy Auditor (EA 10072). He has achieved Registered Energy Auditor status through the

[1] https://www.seai.ie/publications/Minimum-Criteria-for-Energy-Audits.pdf

Association of Energy Engineers (AEE) Certified Energy Manager accreditation (CEM-I). Details of the inclusion on the SEAI Registered Energy Auditor register can be found at:

https://www.seai.ie/grants/find-a-registered-professional/

As an external Lead Assessor has been appointed it is only necessary for one Director of Britvic to sign off the Assessment.

The role of a Registered Lead Auditor is that they must:

- approve methodology and scope of audit programme;
- Perform or approve of all energy audits;
- check any existing audits for compliance;
- sign off whole programme when complete;
- help agree reference energy and any de minimis exclusion;
- carry out new audits; and
- select other experts to support audits.

3.3 On-Site Energy Auditor

A number of Britvic sites have undergone detailed energy audits as part of the Energy Audit Scheme process. These site audits have been undertaken or assessed by Bob Robinson (Technical Director for SLR Consulting Ltd). Site audits were undertaken for the following Britvic operations:

- Kylemore
- Ballygowan

Details of each of the site audit findings are presented in Appendices A to B.

4.0 Baseline Energy Consumption and Analysis

4.1 Baseline Data Sources

The energy consumption baseline for the study was taken for the financial year 2022. This data was obtained from a number of sources and has been compiled as a baseline. The sources of available information were:

- Energy invoices; and
- Transport data for company cars, car allowances and grey fleet details were extracted from accounting information and expense records and have been included.

Table 4-1 Baseline Energy Consumption

	Electricity kWh/yr	Gas kWh/yr	LPG kWh/yr	Diesel kWh/yr	Petrol kWh/yr	Total kWh/yr
Kylemore	9,922,617	5,514,238	521,124	0	0	15,957,979
Ballygowan	2,769,863	0	149,049	14,721	0	2,933,633
Transport				86,430	272,733	359,163
	12,692,480	5,514,238	670,173	101,151	272,733	19,250,775

SEAI energy Audit coverage	98.1%

5.0 Audit Strategy and Methodology

5.1 Audit Strategy

Several site audits were conducted for RoI operations. Only production sites were included in the audit programme. The sites audited were:

- Kylemore
- Ballygowan

As mentioned above the audit was limited to considering electricity, oil and diesel consumption.

5.2 Audit Methodology

The audit methodology follows that of

BS EN 16247-1 (2022) – Energy Audits. Part 1 – General Requirements
BS EN 16247-2 (2022) – Energy Audits. Part 2 – Buildings
BS EN 16247-3 (2022) – Energy Audits. Part 3 – Processes
BS EN 16247 5 (2015) – Energy Audits. Part 5 – Competence of energy auditors

The audit process consists of a number of stages.

5.2.1 Stage 1 - Preliminary Contact

SLR Consulting Ireland was engaged by Britvic to conduct energy assessments.

It was determined that the main contacts for discussions and arrangements between Britvic and SLR Consulting would be:

- Bob Robinson – Technical Director (SLR Consulting Ltd); and
- Andrew Grange – Group Health, Safety & Environment Manager (Britvic)

5.2.2 Stage 2 - Data Request

A significant amount of data was required from Britvic for the sites to be audited and for all other Irish operations. A data request in the form of a Word document was emailed to the main contact in Britvic.

By sending a data request the sites were able to collect and collate data prior to the on-site audits and were pre-warned of the detail of information required in order to complete the Energy Audit Scheme audits. Some of the data was collected and sent prior to the on-site audits, whereas other data was collected and presented whilst on site.

During the audit and following analysis further data was requested to allow for more detailed evaluation of energy saving opportunities.

Data requested on the formal data request included:

- Site main contacts;
- Safety requirements and induction;
- Main site contacts names, mobiles and emails;
- Site operations summary – areas, operations;
- Site details – drawings and diagrams, interval consumption, metering, copies of recent studies; and
- Utility system descriptions – compressed air and boilers.

5.2.3 Stage 3 - Kick off Meeting

The objectives of the kick-off meeting were:

- Ensure all present understood the requirement of the assessment;
- Role descriptions for the site, directors and Registered Energy Auditor;
- Time scale and resource requirements for site work; and
- Preliminary data analysis based on data sent prior to the on-site work.

5.2.4 Stage 4 - Site Visits

Site visits were conducted at each site. The kickoff meeting was combined with the site work.

On the audit day the following procedure was followed at the site:

- Safety induction;
- Kick off meeting;
- Site familiarisation, through discussions with site managers/engineers and walk-through audit of all process areas;
- Targeted site investigations and data collection; and
- Summary meeting.

At the end of the site work a close out presentation was also given in the form of a PowerPoint presentation in order to confirm the timescales and to discuss any preliminary findings.

5.2.5 Stage 5 – Analysis of Data Obtained

All analysis was based on data for financial year 2022.

Analysis of the data obtained from Britvic and during the site visit and audit was preformed off site, but with regular contact to confirm and assumptions and to fill gaps in knowledge or data. The overall site energy performance and data trends were initially analysed.

For each energy efficiency opportunity an evaluation was made of the saving potential, costs in terms of OPEX and CAPEX. The detail in the evaluation and the costs were dependent on the information available. An indication was also provided of the assumptions made and the calculations performed. Details of each opportunity evaluated are presented in the Appendices A to G in this report.

Britvic primarily use simple payback as their measure to evaluate and prioritise opportunities and projects, with a hurdle of 2 years payback.

7.0 APPENDIX A – Kylemore Audit Details

7.1 Site Description

Kylemore produces both carbonated and uncarbonated soft drinks in cans, PET and glass. In the reference year of October 2014 to September 2015 there were only carbonated drinks being manufactured, however during the audit it was noted that concentrated soft drinks (CSD) were also being manufactured and packed.

The site also produces compound (concentrate for making CSD and carbonated drinks) to use at other sites, which is packed into 200 litre drums and shipped in bulk. In The financial year they made 836,226 litres. As this is a formulation and bulk pack exercise only very little energy is associated with this activity.

The production areas include a range of operations:

- Water treatment
- Bottle blowing
- Syrup room
- Filling lines
- Despatch

There are several production lines, however not all lines are used at any one time.

- Line 2 – PET line. Operates as and when required
- Line 3 – PET line. Operates 24/7
- Line 4 – Can line. Operated 24/7.
- Line 6 – PET line fed by two Sidel bottle blowers. Operates 24/7
- Line 7 – Compounds and powders. Operates as and when required

Maintenance activities are mainly carried out during evenings or weekends.

Separate from the main production building is North Block. This contains water treatment, effluent and powder room for Line 7.

The site operates continuously.

Energies used include:

- Gas
- Electricity
- LPG

The key energy using process equipment include various chiller plant, steam boilers, filling & packing lines, HP air compressors and bottle blowing and plant air compressors.

The main production steps include the following:

- Mixing the drinks
- Filling and packing
- Packaging
- Rinsing, filling and capping

- Labelling
- Quality inspection and coding

Figure 7-1 Kylemore Aerial View

7.2 Energy analysis

The site uses mainly gas for the boilers used in the syrup room and for CIP. Electricity is used for various process equipment. There was also a small amount of LPG used for forklift trucks.

Figure 7-2 Britvic Kylemore energy consumption FY22/23

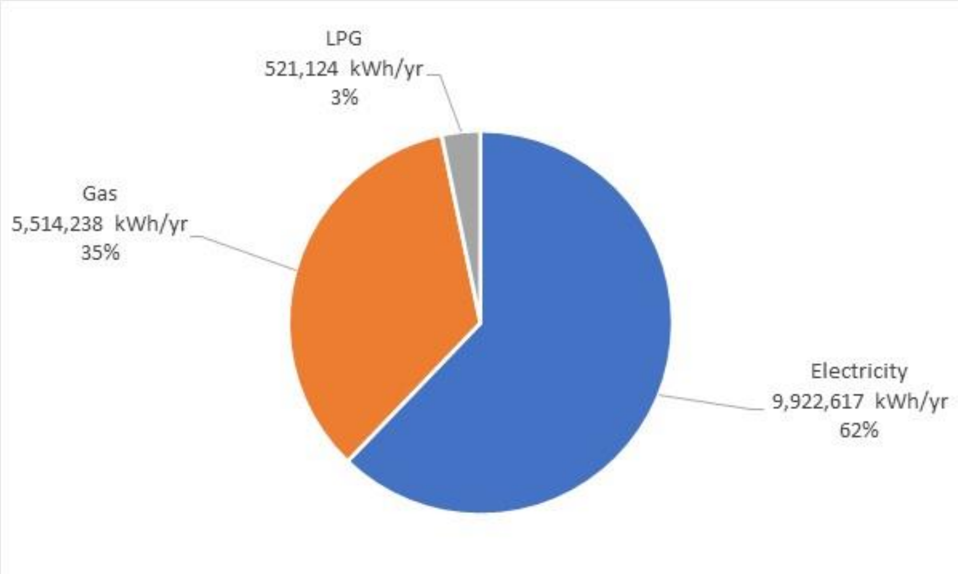


Table 7-1 Britvic Kylemore energy consumption 2022

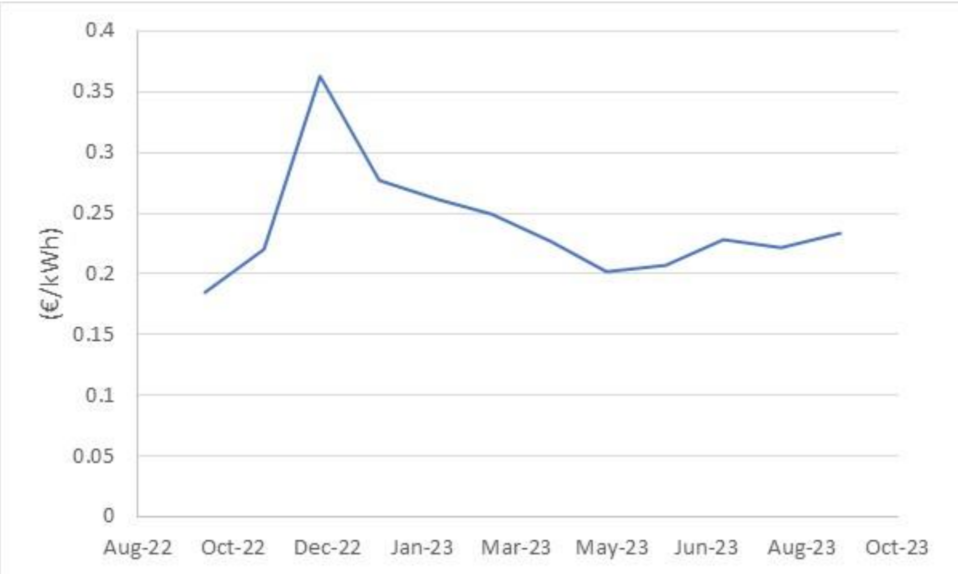
Electricity	9,922,617 kWh/yr
Gas	5,514,238 kWh/yr
LPG	521,124 kWh/yr

7.2.1 Energy costs

Energy costs have been taken from invoices

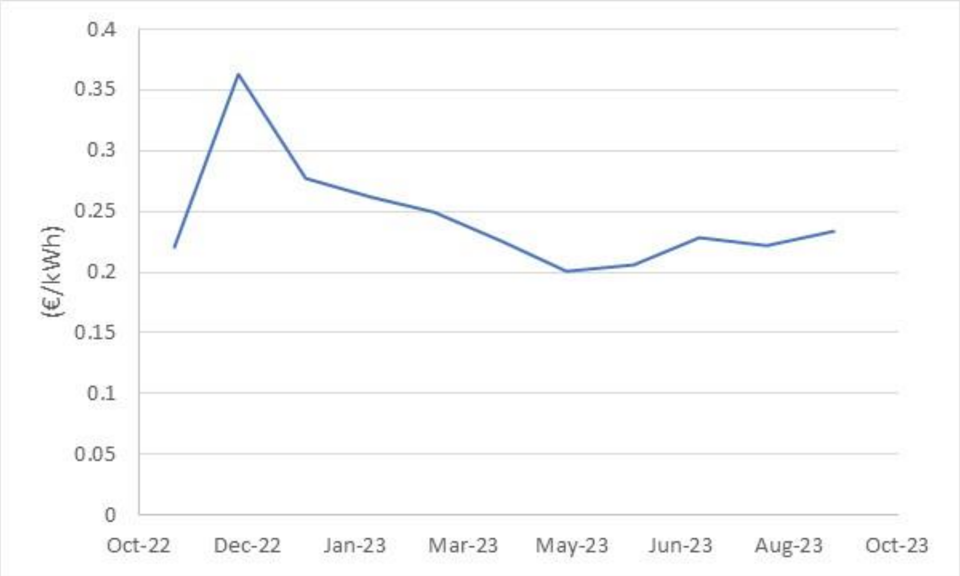
The average variable electricity cost for 2022 was 24.154 c/kWh and this cost has been used in calculations. The electricity used on site is a blend of grid electricity and renewable electricity, 72.9% of the electricity being from wind and 27.1% being from grid electricity. The grid emission factor was 0.345 kgCO2e/kWh. The blended emission factor of 0.0935 kgCO2e/kWh will be used.

Figure 7-3 Britvic Kylemore variable electricity cost



There is one gas incomer. The cost rates increased significantly from July 2022 and this higher rate will be used for savings calculations, at 14.75 c/kWh variable cost. An emission factor taken from national published data of 0.184 kg CO2e/kWh will be applied.

Figure 7-4 Britvic Kylemore variable gas cost



LPG is purchased in bulk and although the costs have fluctuated a little over 2022, they are considered to be fairly stable and on average 6.630 c/kWh. An emission factor taken from national published data of 0.210 kg CO2e/kWh will be applied.

Figure 7-5 Britvic Kylemore variable LPG cost

Diesel for the shunter is included in the service charge from DFDS, who operate the shunter.

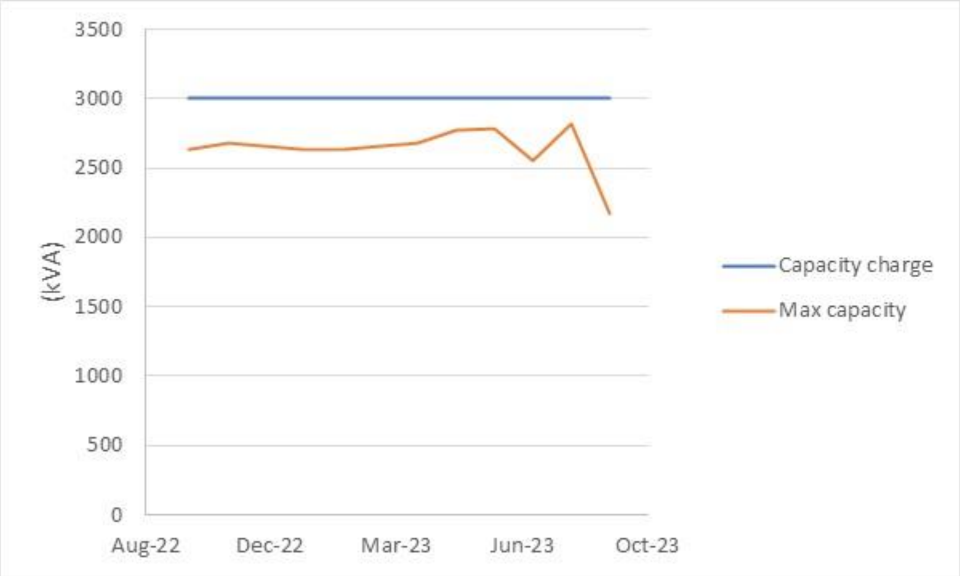
A carbon cost of 68 €/tCO2e will be used.

7.2.2 Energy data analysis

7.2.2.1 Electricity data analysis

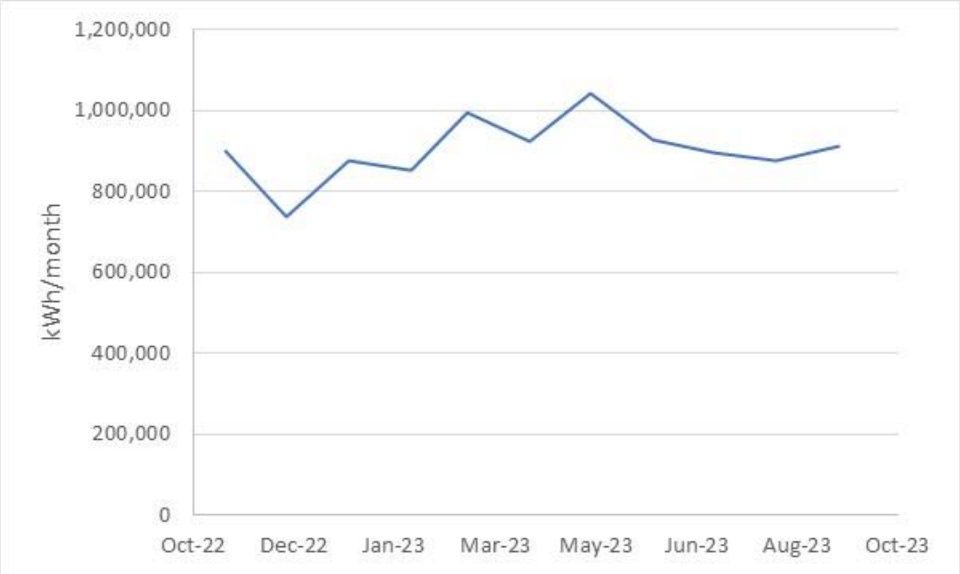
The site pays for an electrical capacity of 3,000 kVA, and the maximum peak kVA actually encountered in FY22/23 was only 2,823 kVA. Therefore, the capacity charge is appropriate.

Figure 7-6 Britvic Kylemore electricity capacity charge



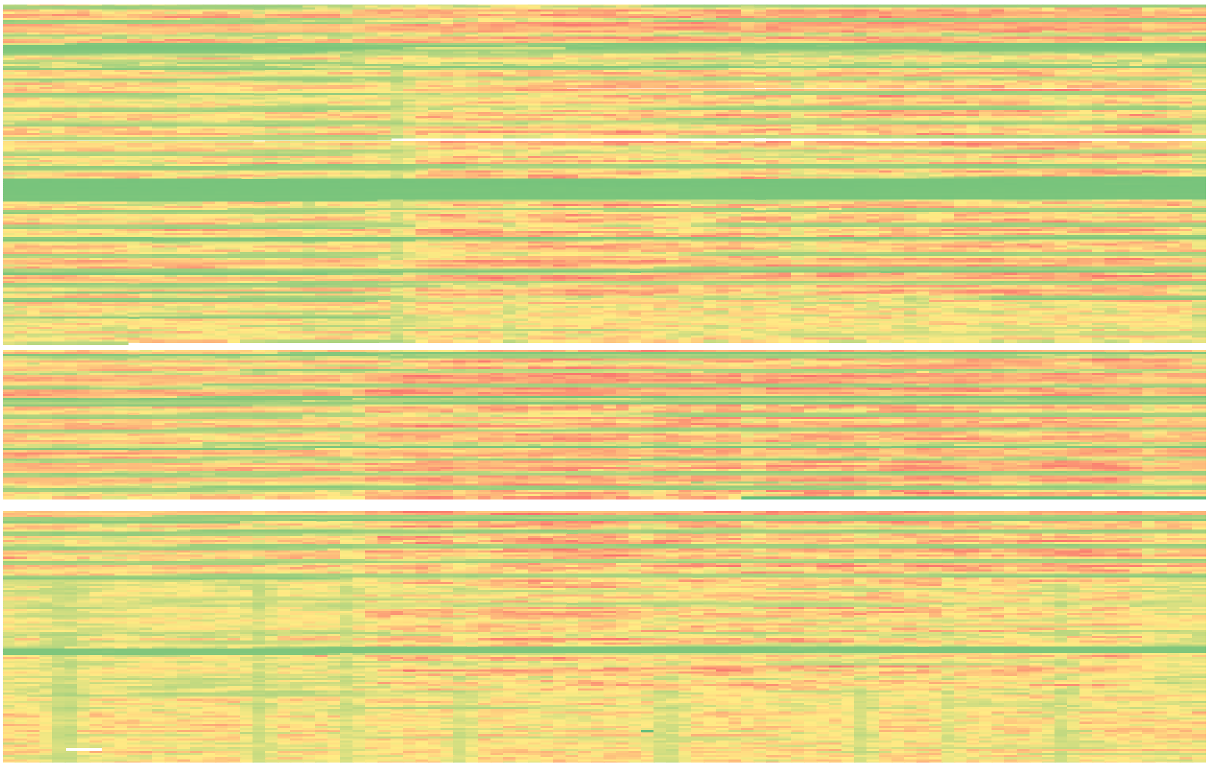
The monthly electrical consumption shows an increase until May 2022 and then a decrease.

Figure 7-7 Britvic Kylemore Monthly electricity consumption 2022



15 minute data from the energy supplier clearly shows shutdowns and breaks in production, but does not show any other notable trends. The heat map below shows half hourly data for 2022, with columns across the page for each half hourly period from midnight to midnight and each row representing one day. Higher consumption is shown in red and lower consumption in green.

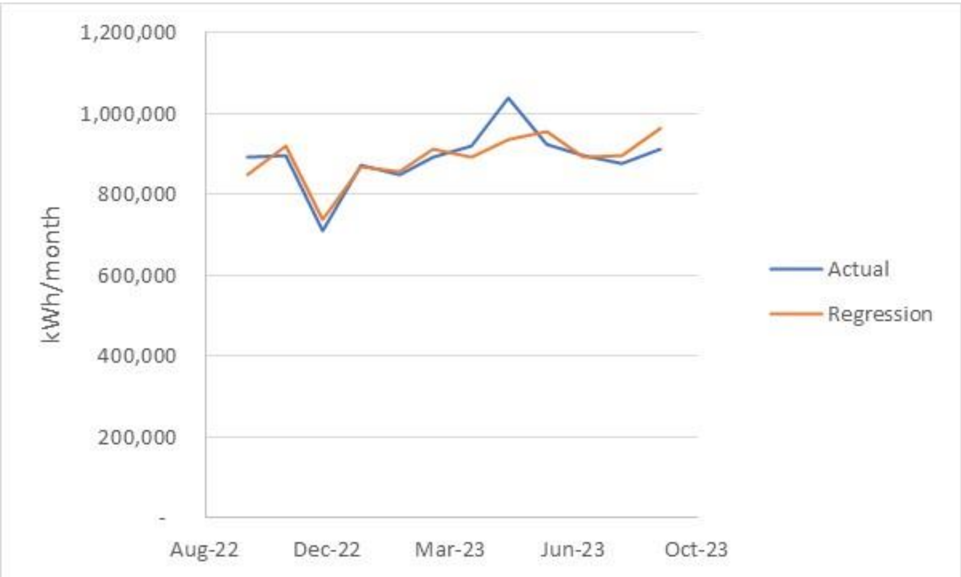
Figure 7-8 Britvic Kylemore electricity 15 minute heat map



The electrical consumption may be dependent on production rate and product mix for each production line, and ambient temperature due to impact on heating and cooling. As production data was available on a monthly basis only, analysis has been performed using weekly meter readings. Ambient temperature values have been downloaded on a monthly basis from www.wunderground.com .

Regression analysis shows a good fit between electricity consumption and both production rate and ambient temperature, with no significant underlying trends detected.

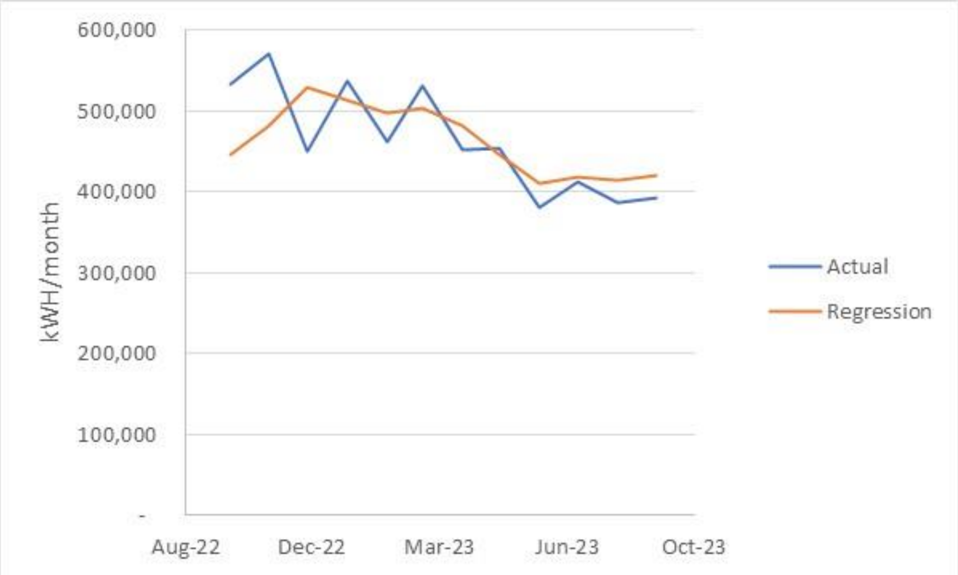
Figure 7-9 Britvic Kylemore monthly electricity regression



7.2.3 Gas data analysis

Gas is used largely for space heating and CIP and would therefore be expected to correlate with ambient temperature and not to production. This is seen in regression analysis.

Figure 7-10 Britvic Kylemore monthly gas regression

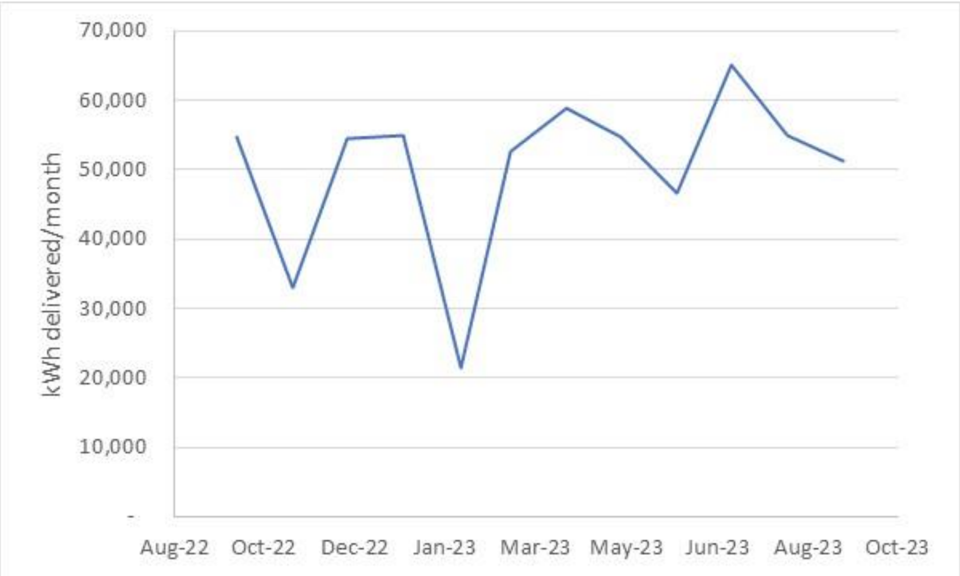


CuSum analysis shows some underlying reduction in gas consumption from May 2023 onwards amounting to a 4% reduction in gas consumption.

7.2.4 LPG data analysis

LPG is used for a domestic boiler for office heating and for forklift trucks. LPG consumption is not directly metered, rather the deliveries are monitored. This monitoring does not correlate well with ambient temperature.

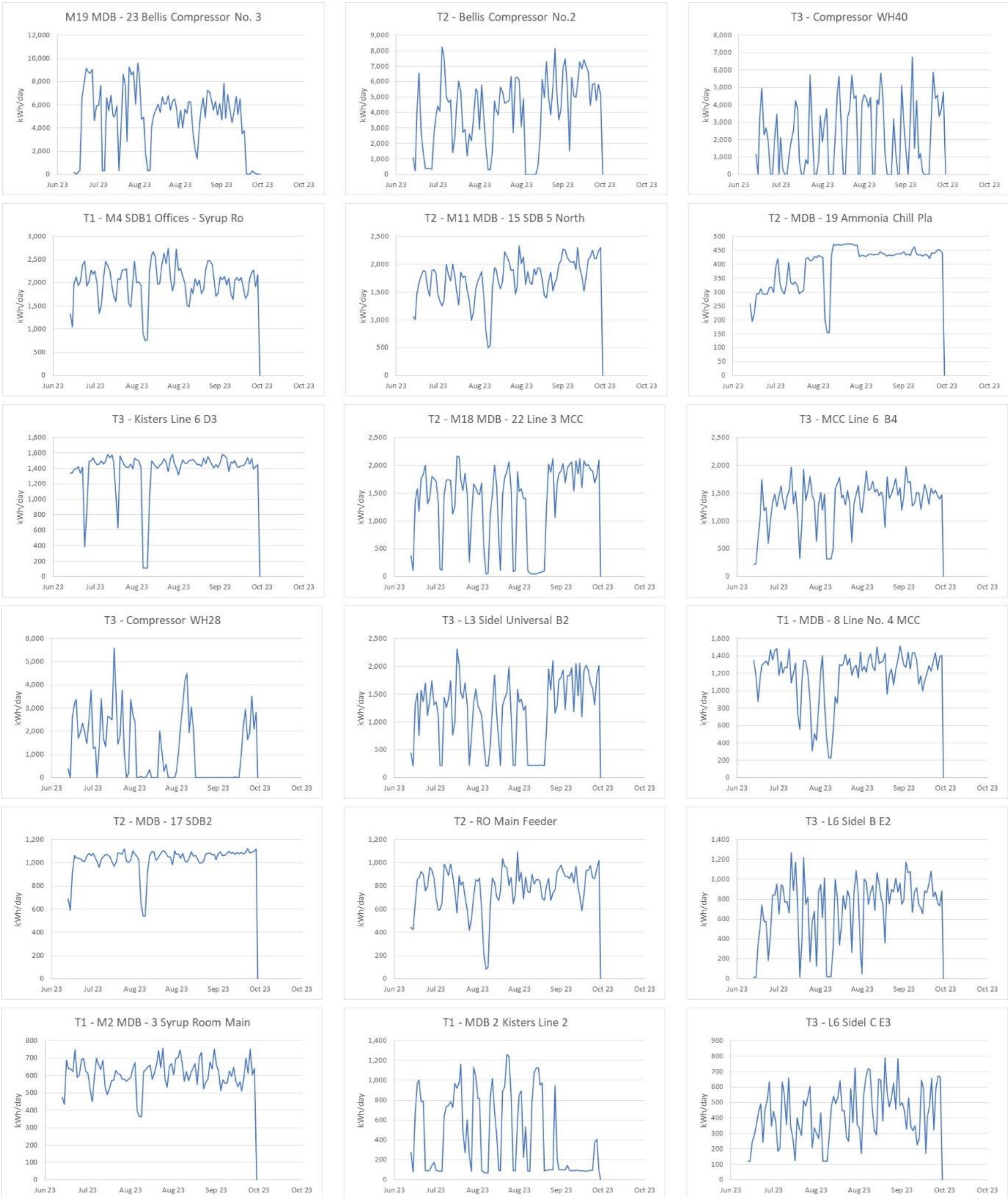
Figure 7-11 Britvic Kylemore monthly LPG regression

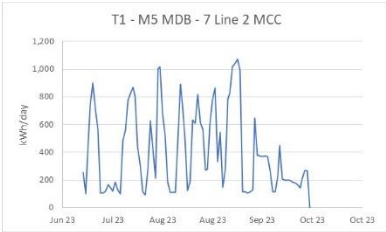


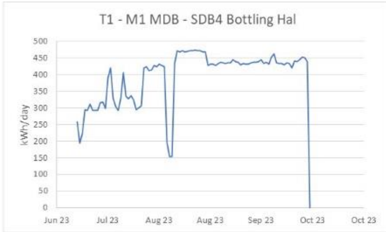
7.2.5 Sub metering analysis

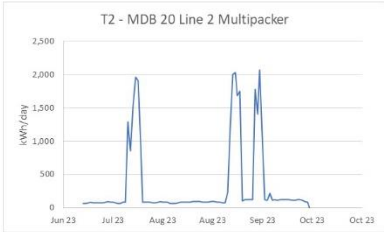
There are also a large number of electricity sub-meters at Kylemore. Data was only available for June 2023 to October 2023

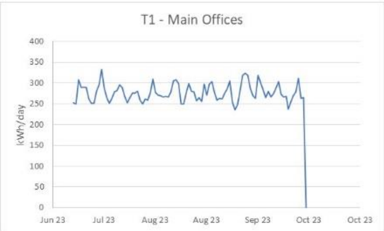
Figure 7-12 Britvic Kylemore sub-meter daily electricity

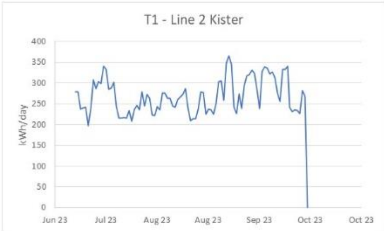


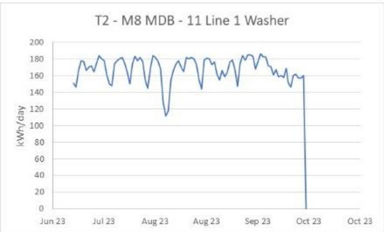


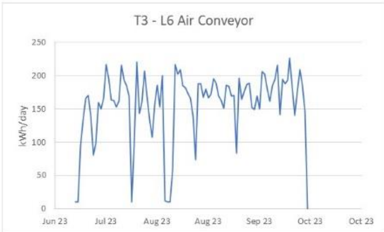


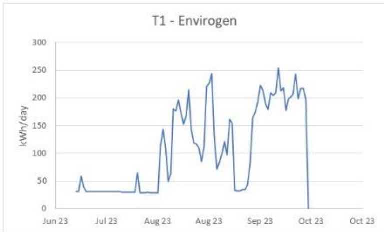


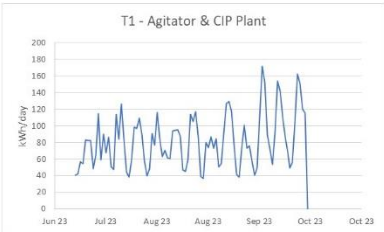












Most of these are for specific pieces of equipment and there are no specific observations to make, but on some sub-meter analysis there are trends or observations that require explanation.

M19 MDB - 23 Bellis Compressor No. 3

The peak daily loads reduced significantly from 7 August 2023. This may have been due to maintenance work on this compressor, the reason should be investigated. If this reduction can be repeated on other high pressure compressors very significant savings.

T2 - Bellis Compressor No.2

No specific trends

T3 - Compressor WH40

No specific trends

T1 - M4 SDB1 Offices - Syrup Room

The consumption has become more stable with fewer high consumption days since August 23. It is noted that there is very little consumption on the night shift. This is expected to be because the consumption on this meter is dominated by office consumption. The overnight and weekend baseload should be investigated as this may be high, however the consumption of the office and syrup room cannot be segregated.

Figure 7-13 T1 - M4 SDB1 Offices - Syrup Room, electricity heat map

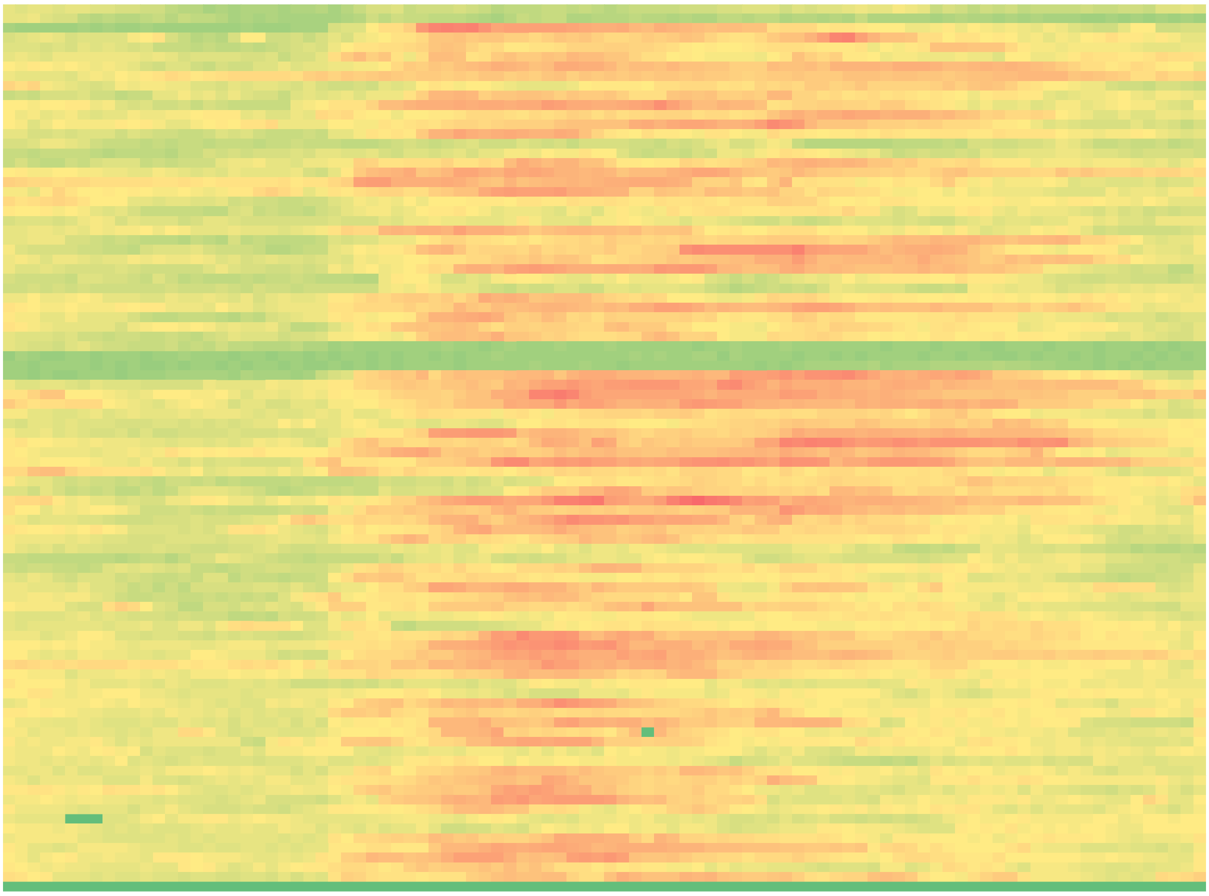
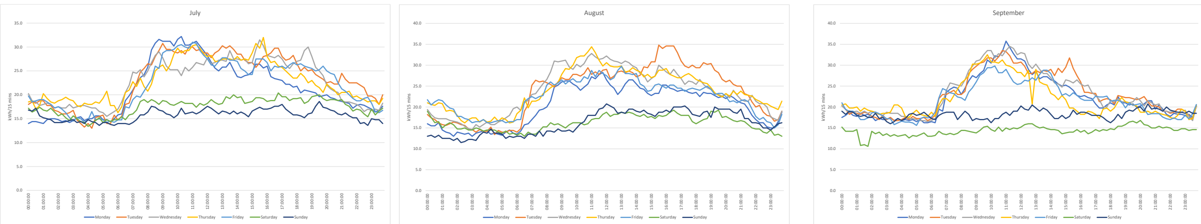


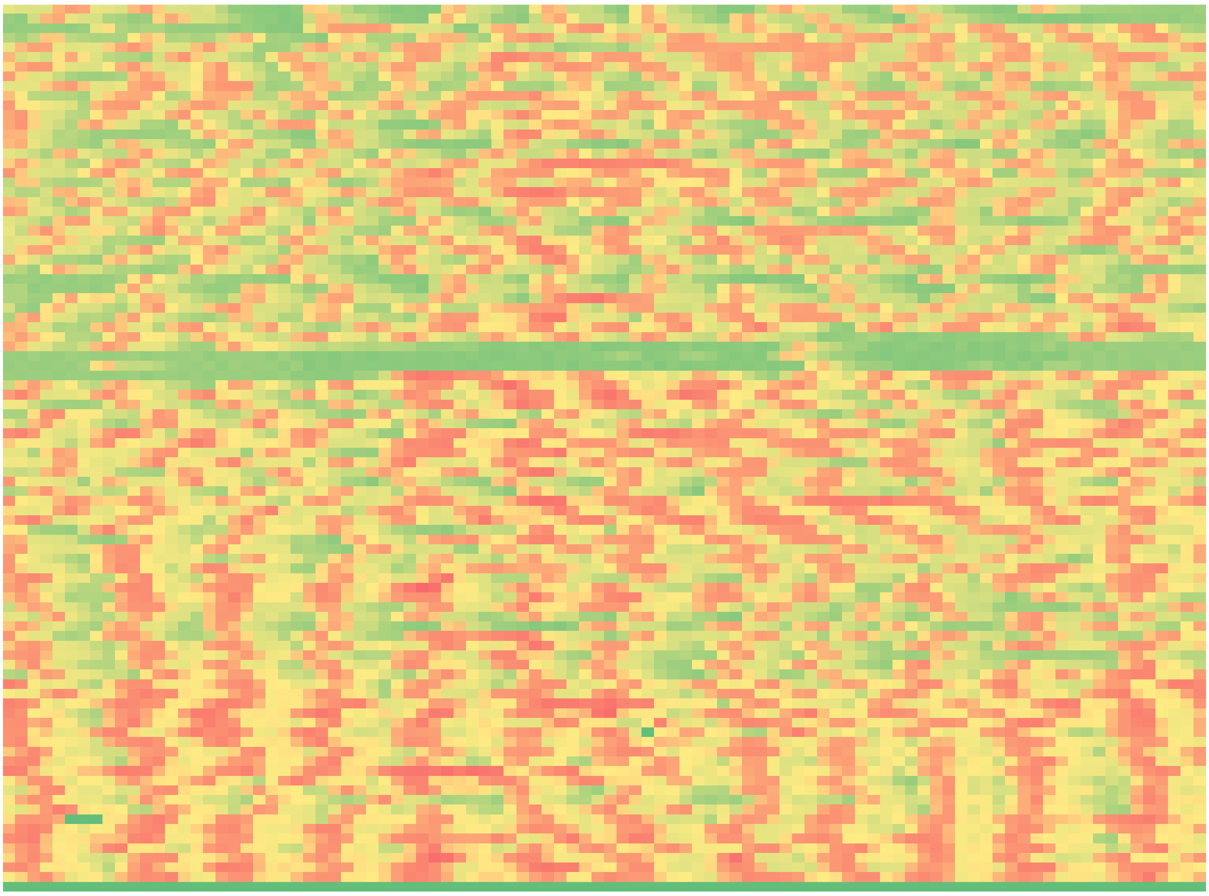
Figure 7-14 T1 - M4 SDB1 Offices - Syrup Room, electricity daily profiles



T2 - M11 MDB - 15 SDB 5 North

The peak daily load on this sub meter has increased since 7 August 2023. This appears to be longer periods of high consumption. The reason for this should be investigated.

Figure 7-15 T2 - M11 MDB - 15 SDB 5 North, electricity heat map



T2 - MDB - 19 Ammonia Chill Plant

The consumption since August 7 2023 has been very constant and significantly higher than previously. It is also unusual that higher consumption is seen over night. The daily electricity profiles clearly show the lower consumption on days and higher consumption on nights for July, August and September respectively. The operating parameters of the ammonia chilling plant should be checked to see if these trends can be explained.

Figure 7-16 T2 - MDB - 19 Ammonia Chill plant, electricity heat map

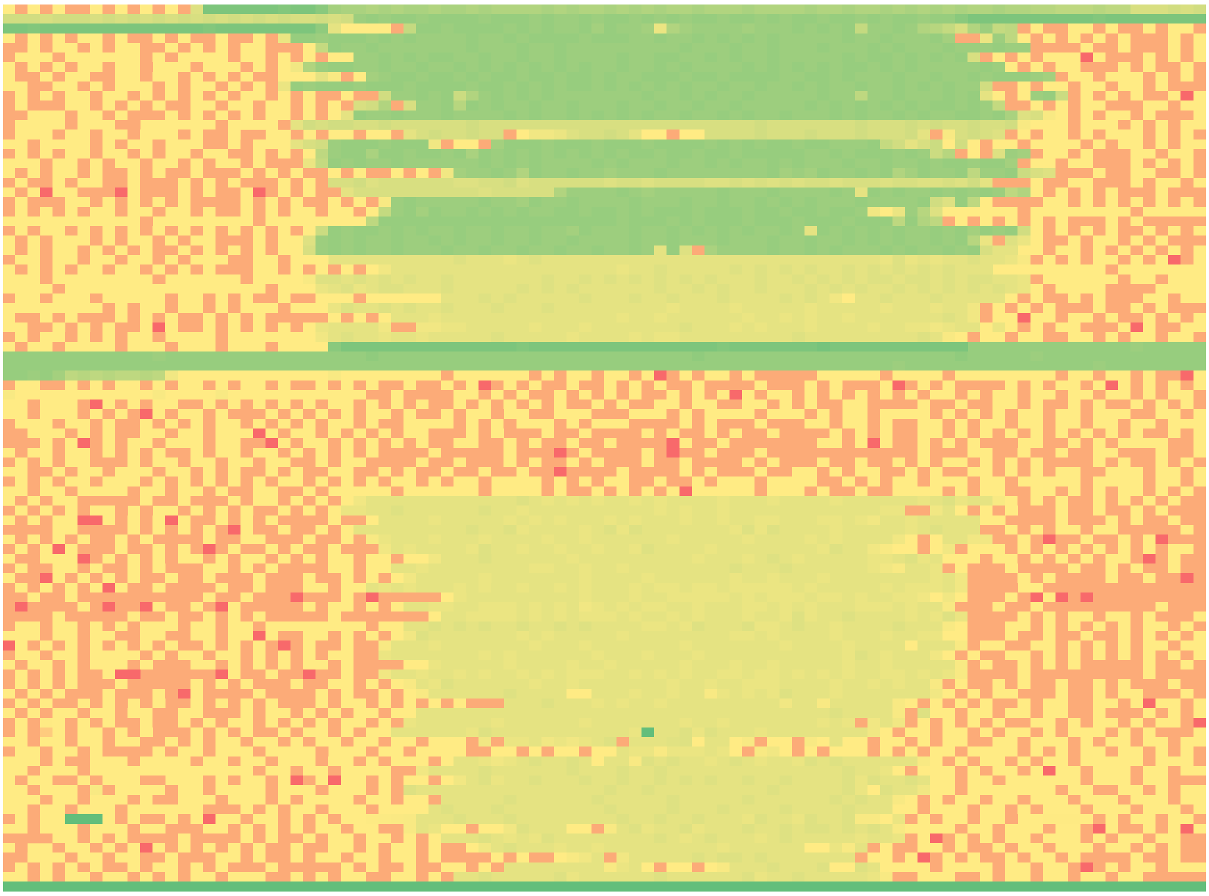
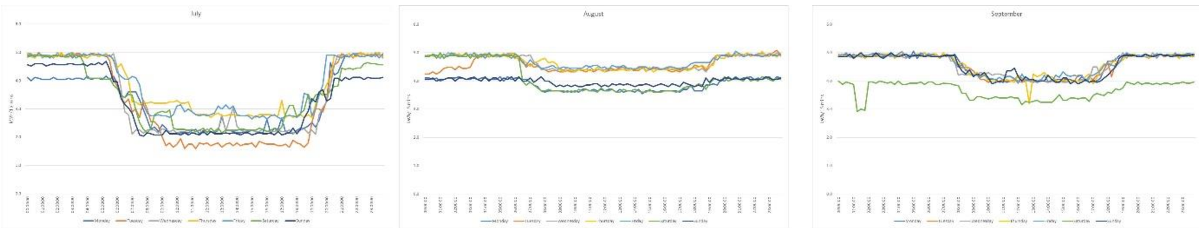


Figure 7-17 T2 - MDB - 19 Ammonia Chill plant, daily electricity profiles



T3 - Kisters Line 6 D3

No specific trends

T2 - M18 MDB - 22 Line 3 MCC

After August 7 the consumption is more often high, but at a similar consumption as to the peaks beforehand. This is likely due to equipment being used for regularly.

T3 - MCC Line 6 B4

No specific trends.

T3 - Compressor WH28

This compressor is used less after 7 August. There are no specific trends in consumption levels.

T2 - RO Main Feeder

No specific trends

T3 - L6 Sidel B E2

No specific trends

T1 - M2 MDB - 3 Syrup Room Main

No specific trends

T1 - MDB 2 Kisters Line 2

No specific trends

T3 - L6 Sidel C E3

The peak daily consumption has increased since August 7. This appears to be more constant use.

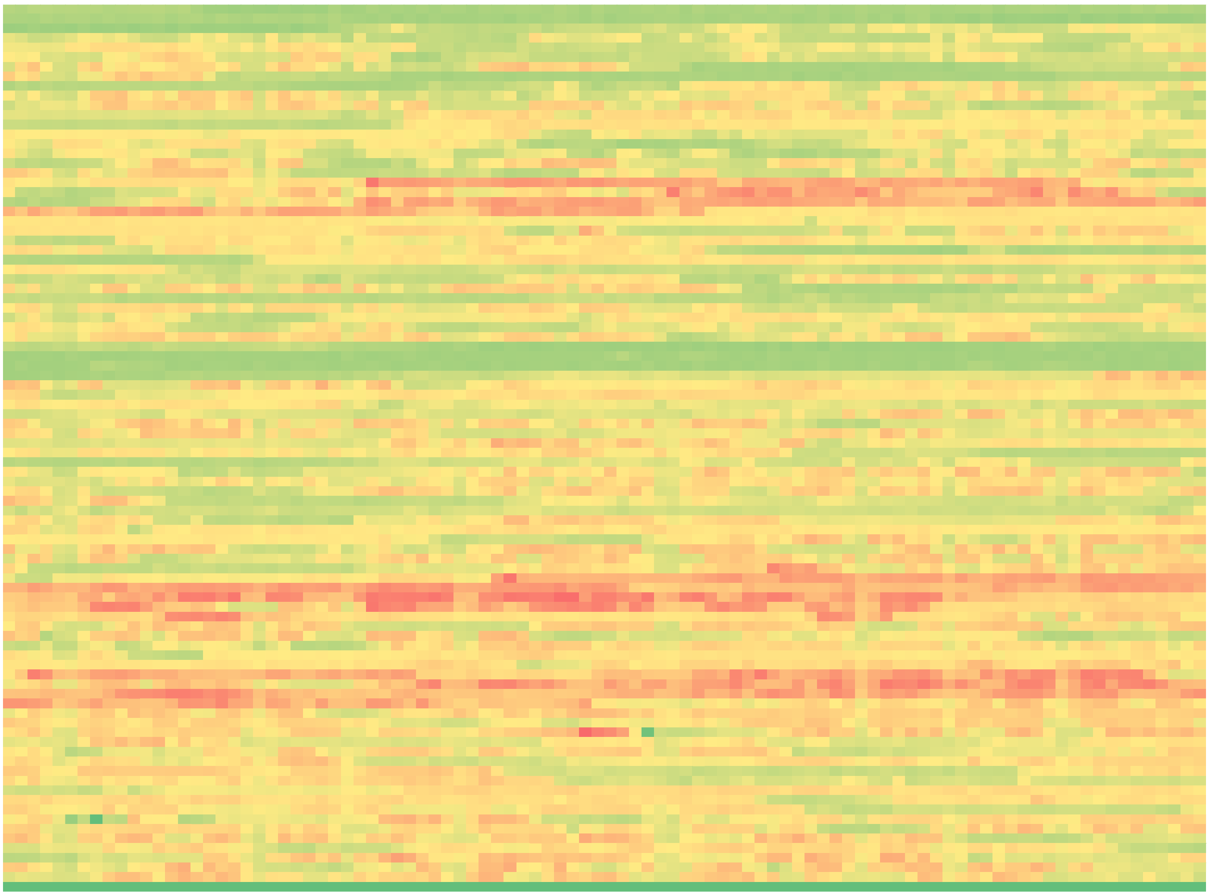
T1 - M5 MDB - 7 Line 2 MCC

It would appear that Line 2 is used less since August 7

T1 - M1 MDB - SDB4 Bottling Hall

The consumption since August 7 is higher and more consistent. This is largely due to more hours of operation. There are also three weeks with much higher consumption, which it is assumed is due to a specific piece of equipment only running during these weeks. It should be checked what equipment this corresponds to.

Figure 7-18 M1 MDB - SDB4 Bottling Hall, electricity heat map



T2 - MDB 20 Line 2 Multipacker

This equipment is seen to be rarely used. No specific trends.

T1 - Main Offices

The daily base load is seen to be high, with little variation between week days and weekends – typical peak power on weekday 16 kW, overnight and at weekends 9 kW. The weekend and over night baseload should be checked. It may be expected through rationalising switch off overnight and at weekends a 20% saving in baseload should be possible. This would amount to 11,544 kWh/yr worth €2,788/yr.

Figure 7-19 T1 – Main offices electricity heat map

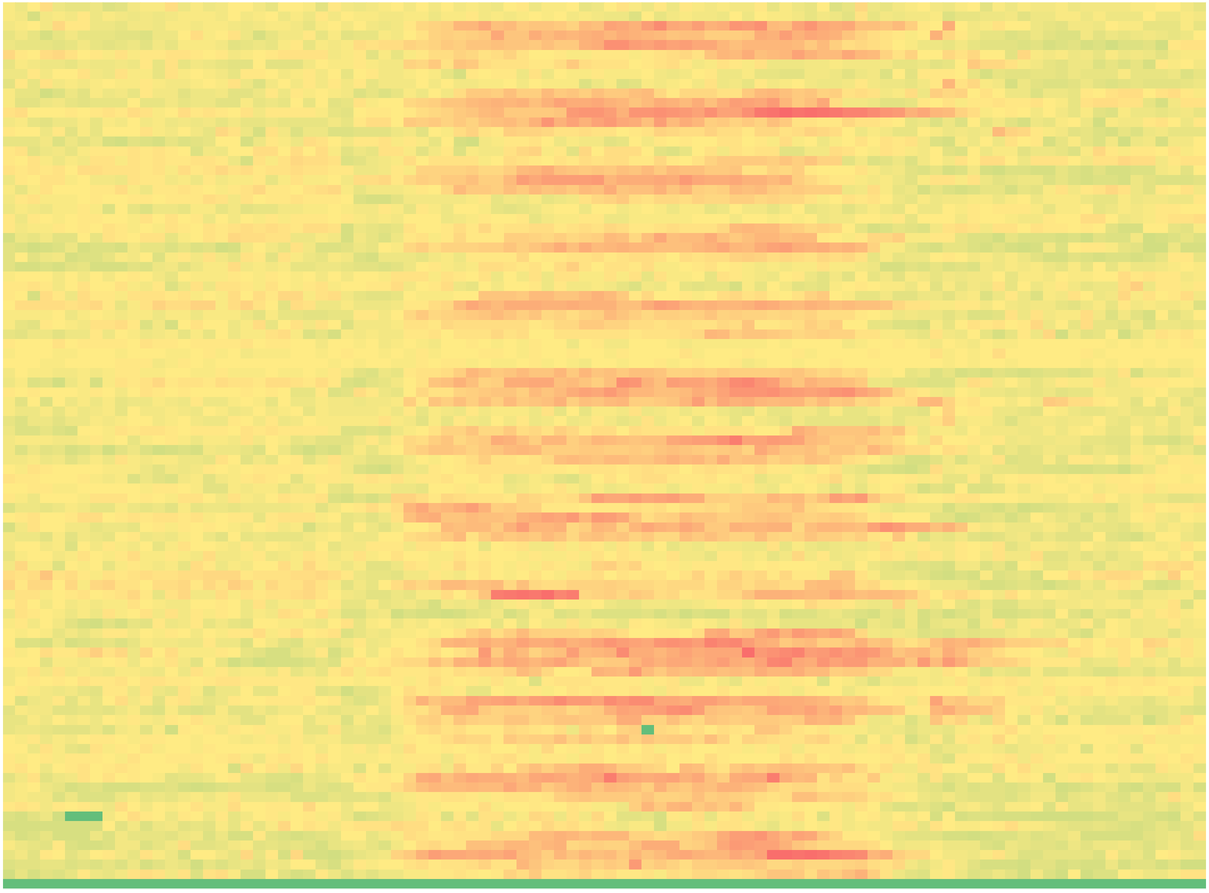
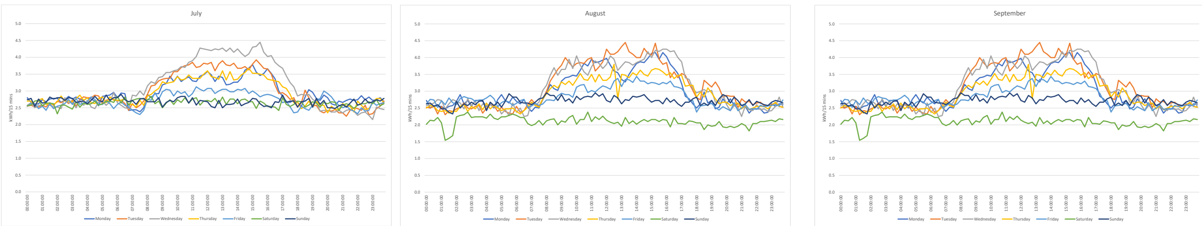


Figure 7-20 T1 – Main offices, daily electricity profile



T1 - Line 2 Kister

No specific trends.

T1 - Line 2+3 air conv

No specific trends

T2 - M8 MDB - 11 Line 1 Washer

No specific trends

T3 - L6 Air Conveyor

No specific trends.

T1 - Envirogen

No consumption was indicated before August 7 and significant consumption after. It is suspected that this was due to a metering error.

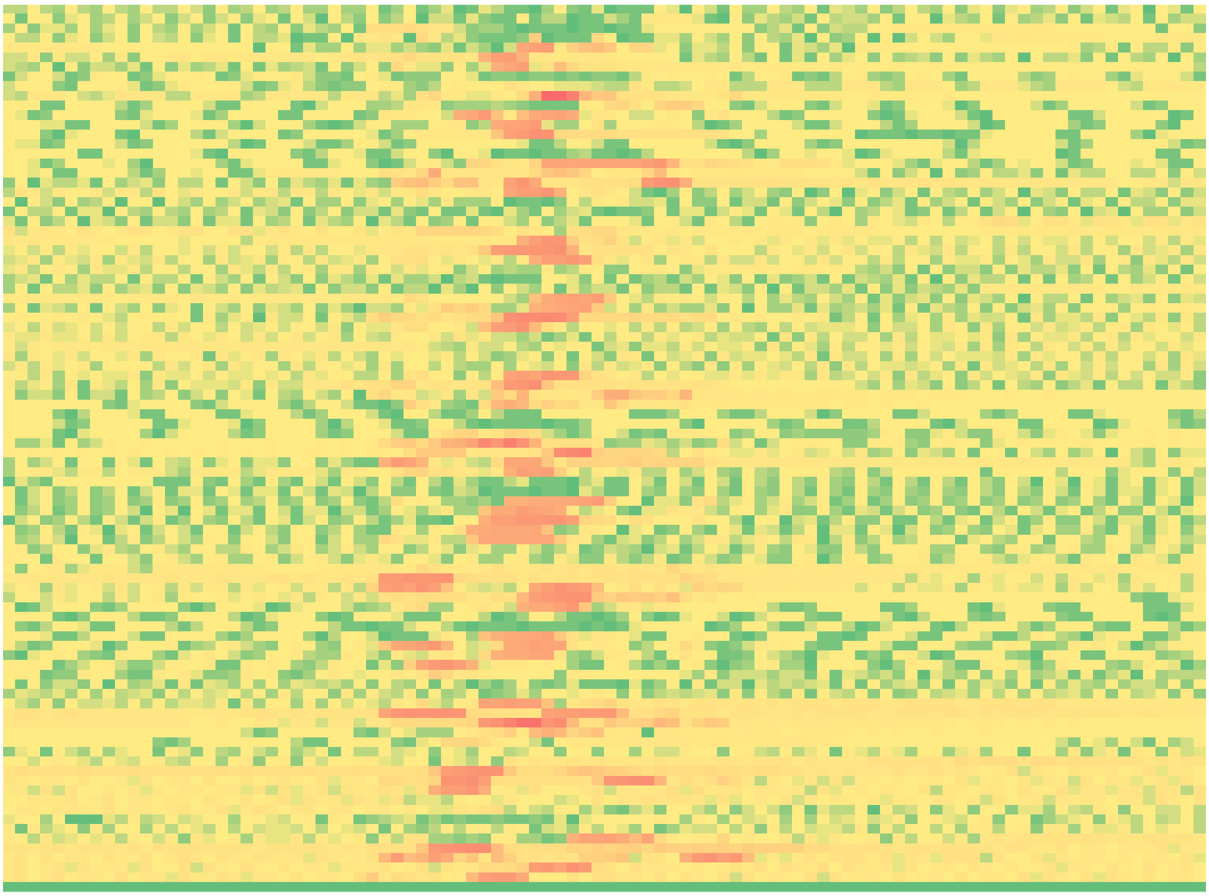
Homogenizer

No specific trends

T1 - Agitator & CIP Plant

The daily peak consumptions are much higher in September. It would appear this was due to more periods of running the CHP, possibly due to more product changes.

Figure 7-21 T1 - Agitator & CIP Plant, electricity heat map



7.3 Energy saving opportunities summary

Table 7-2 Britvic Kylemore Opportunity Summary

		Energy saving kWh/yr	Carbon saving tCO2e/yr	Cost saving €/yr	CAPEX €	OPEX €/yr	Payback yrs
Kylemore 001	T1 - M4 SDB1 Offices - Syrup Room baseload						
Kylemore 002	T1 – Main Office baseload	11,544	1.1	2,863	0	0	0.0
Kylemore 003	Steam line and valve insulation	237,325	43.7	37,977	11,800	0	0.3
Kylemore 004	Boiler upgrades	446,652	82.2	70,583	50,000	0	0.7
Kylemore 005	Fit heat recovery to low pressure compressors	245,280	45.2	39,246	50,000	0	1.3
Kylemore 006	Boiler blowdown heat recovery	49,628	9.1	7,939	20,000	0	2.5
Kylemore 007	Airveyor controls	132,000	12.3	32,719	20,000	0	0.6
Kylemore 008	Syrup room powder charging room exhaust ventilation VSD	11,924	1.1	2,955	5,000	0	1.7
Kylemore 009	Thermographics						
Kylemore 010	Use one UV chamber	8,760	0.8	2,170	0	0	0.0
Kylemore 011	Use air amplifier cleaning guns						
Kylemore 012	Use air amplifiers in place of compressed air nozzles						
Kylemore 013	Palletisers change compressed air ejectors to vac pump						
Kylemore 014	Line 6 shrink tunnel VSD fans	3,794	0.4	943	6,000	0	6.4
Kylemore 015	Hydrogen Peroxide to CIP tank	109,500	20.1	17,518	10,000	0	0.6
Kylemore 016	Vendmiser in canteen	1,400	0.1	345	600	0	1.7
Kylemore 017	Options to eliminate gas boilers						
Kylemore 018	Rinse water recovery skid						
Kylemore 019	Light weighting	447,529	41.8	110,893		Being implemented	
Kylemore 020	Grundfoss energy efficient pump commissioning	258,880	24.2	64,174		Being implemented	
Kylemore 021	HP compressor heat recovery						
Kylemore 022	Heat pump project						
Kylemore 023	Cool air fed to LP air compressors	12,264	1.1	2,962	5,000	0	1.6
Kylemore 024	Airveyors replace fan motors	79,200	7.4	19,632	60,000	0	3.1
Kylemore 025	IT Policy	153	0.0	37	0	0	0.0
Kylemore 026	Change motors on conveying lines	72,765	1.6	17,685	tbd	0	tbd
Kylemore 027	Conveyor sequencing of conveyors on all lines						
Kylemore 028	Lighting	24,866	2.3	6,162	9,600	0	1.6
Kylemore 029	replace Gram compressors	55,650	7.2	13,795	100,000	0	7.2
Kylemore 030	Close lids on powder charging	1,400	0.1	338	0	0	0.0
Kylemore 031	Vacuum seal water on pasteurizer Line 7						
Kylemore 032	Bottle blower heat recovery	88,211	19.1	14,310	150,000	0	10.5
Kylemore 033	Bottle blower Eco-oven						
Kylemore 034	Bottle blower compressed air recovery to LP air						
Kylemore 035	Line 4 can rinse, use air amplifier	6,720	0.6	1,663	2,000	0	1.2
Kylemore 036	Line 4 reject air jet, air amplifier						
Kylemore 037	Steam trap survey and repair						
Kylemore 038	EC fans after each shrink tunnel for cooling	27,750	0.6	6,743	18,000	0	2.7
Kylemore 039	Engineering standards for motor efficiency						
Kylemore 040	EC fans for flat bed coolers for HP compressors	52,034	1.2	13,170	27,000	0	2.1
Kylemore 041	CIP insulation of top and bottom of tanks	109,220	20.1	17,476	7,560	0	0.4
Kylemore 042	Replace office heating boilers with air source heat pump	333,518	91.9	-4,514	30,000	0	
Kylemore 043	Server room set point						
Kylemore 044	Switch off conferencing screens in meeting rooms when not need	3,066	0.3	740	0	0	0.0

Table 7-3 Britvic Kylemore Prioritised Opportunity Summary

		Energy saving kWh/yr	Carbon saving tCO2e/yr	Cost saving €/yr	CAPEX €	OPEX €/yr	Payback yrs
Kylemore 019	Light weighting	447,529	41.8	110,893		Being implemented	
Kylemore 020	Grundfoss energy efficient pump commissioning	258,880	24.2	64,174		Being implemented	
Kylemore 002	T1 – Main Office baseload	11,544	1.1	2,863	0	0	0.0
Kylemore 010	Use one UV chamber	8,760	0.8	2,170	0	0	0.0
Kylemore 025	IT Policy	153	0.0	37	0	0	0.0
Kylemore 030	Close lids on powder charging	1,400	0.1	338	0	0	0.0
Kylemore 044	Switch off conferencing screens in meeting rooms when not need	3,066	0.3	740	0	0	0.0
Kylemore 003	Steam line and valve insulation	237,325	43.7	37,977	11,800	0	0.3
Kylemore 041	CIP insulation of top and bottom of tanks	109,220	20.1	17,476	7,560	0	0.4
Kylemore 007	Airveyor controls	132,000	12.3	32,719	20,000	0	0.6
Kylemore 015	Hydrogen Peroxide to CIP tank	109,500	20.1	17,518	10,000	0	0.6
Kylemore 004	Boiler upgrades	446,652	82.2	70,583	50,000	0	0.7
Kylemore 035	Line 4 can rinse, use air amplifier	6,720	0.6	1,663	2,000	0	1.2
Kylemore 005	Fit heat recovery to low pressure compressors	245,280	45.2	39,246	50,000	0	1.3
Kylemore 023	Cool air fed to LP air compressors	12,264	1.1	2,962	5,000	0	1.6
Kylemore 028	Lighting	24,866	2.3	6,162	9,600	0	1.6
Kylemore 008	Syrup room powder charging room exhaust ventilation VSD	11,924	1.1	2,955	5,000	0	1.7
Kylemore 016	Vendmiser in canteen	1,400	0.1	345	600	0	1.7
Kylemore 040	EC fans for flat bed coolers for HP compressors	52,034	1.2	13,170	27,000	0	2.1
Kylemore 006	Boiler blowdown heat recovery	49,628	9.1	7,939	20,000	0	2.5
Kylemore 038	EC fans after each shrink tunnel for cooling	27,750	0.6	6,743	18,000	0	2.7
Kylemore 024	Airveyors replace fan motors	79,200	7.4	19,632	60,000	0	3.1
Kylemore 014	Line 6 shrink tunnel VSD fans	3,794	0.4	943	6,000	0	6.4
Kylemore 029	replace Gram compressors	55,650	7.2	13,795	100,000	0	7.2
Kylemore 032	Bottle blower heat recovery	88,211	19.1	14,310	150,000	0	10.5
Kylemore 026	Change motors on conveying lines	72,765	1.6	17,685	tbd	0	tbd
Kylemore 042	Replace office heating boilers with air source heat pump	333,518	91.9	-4,514	30,000	0	
Kylemore 001	T1 - M4 SDB1 Offices - Syrup Room baseload						
Kylemore 009	Thermographics						
Kylemore 011	Use air amplifier cleaning guns						
Kylemore 012	Use air amplifiers in place of compressed air nozzles						
Kylemore 013	Palletisers change compressed air ejectors to vac pump						
Kylemore 017	Options to eliminate gas boilers						
Kylemore 018	Rinse water recovery skid						
Kylemore 021	HP compressor heat recovery						
Kylemore 022	Heat pump project						
Kylemore 027	Conveyor sequencing of conveyors on all lines						
Kylemore 031	Vacuum seal water on pasteurizer Line 7						
Kylemore 033	Bottle blower Eco-oven						
Kylemore 034	Bottle blower compressed air recovery to LP air						
Kylemore 036	Line 4 reject air jet, air amplifier						
Kylemore 037	Steam trap survey and repair						
Kylemore 039	Engineering standards for motor efficiency						
Kylemore 043	Server room set point						

7.4 Energy saving opportunities details

Opportunity ID	Title			
Kylemore 001	T1 - M4 SDB1 Offices - Syrup Room baseload			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
		-	-	-
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
-				
Opportunity Summary:	Investigate possible high over night baseload			
Description of Savings and Assumptions:	The overnight and weekend baseload should be investigated as this may be high, however the consumption of the office and syrup room cannot be segregated.			
Next steps	Investigate baseload			

Opportunity ID	Title			
Kylemore 002	T1 – Main Office baseload			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
11,544	2,788	75	0	-
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
-	1.1			
Opportunity Summary:	Investigate possible high over night baseload			
Description of Savings and Assumptions:	The daily base load is seen to be high, with little variation between week days and weekends – typical peak power on weekday 16 kW, overnight and at weekends 9 kW. The weekend and over night baseload should be checked. It may be expected through rationalising switch off overnight and at weekends a 20% saving in baseload should be possible. This would amount to 11,544 kWh/yr worth €2,788/yr.			
Next steps	Investigate baseload			

Opportunity ID	Title			
Kylemore 003	Steam line and valve insulation			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
237,325	35,005	2,972	11,800	-
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
0.3	43.7			
Opportunity Summary:	Across the site the insulation on steam lines, flanges and valves was poor. Conduct insulation survey and have programme to repair/replace insulation			
Description of Savings and Assumptions:	Insulation had been used in areas for the steam lines; however, the quality of the insulation was generally poor. In many cases insulation designed for HVAC in commercial buildings was being used (fibreglass with thin foil covering). This become damaged very quickly and was susceptible to soaking up water and other materials. It is recommended that all lines are insulated with preformed rock wool insulation with outer metal cladding. All flanges and valve bodies should be insulated with jackets to minimise heat loss. Using www.pipeinsulation.org, the energy saving through insulation has been calculated for a 10m equivalent length of pipe (heat losses for valves and flanges. The biggest uninsulated areas were: Steam line to silos in North Block 8 m 2" line and 5 valves/flanges not insulated. However, these are isolated most of the time and only used ca. once every 6 weeks. Insulation would be good practice and would prevent contact with hot surfaces, but can not be justified here on energy efficiency grounds • The pipe bridge between North Block and the main production building, where the steam main was completely uninsulated, 30 m 3" line and 4m 1" line • Boiler house, 4 6" valves and 2m 6" line uninsulated • Production, 6m 3" uninsulated • Line 6 steam sleeve shrink, 6m 2" uninsulated • It was estimated that there was at least 10m of 125mm pipe and fittings uninsulated $Energy\ saving = 23.5\ kW\ x\ 8{,}760\ \left(\frac{hrs}{yr}\right) x \left(\frac{1}{0.8}\right) boiler\ eff = 237{,}325\ (\frac{kWh}{yr})$ $Energy\ cost\ saving = 237{,}325\ \left(\frac{kWh}{yr}\right) x\ 14.75\ \left(\frac{c}{kWh}\right) = 35{,}005\ (\frac{€}{yr})$ $Carbon\ saving = 237{,}325\ \left(\frac{kWh}{yr}\right) x\ 0.184\ \left(\frac{kgCO2e}{kWh}\right) = 43.7\ (\frac{tCO2e}{yr})$ CAPEX of €200/m is assumed, average valve jacket €200			
Next steps	Complete insulation			

Opportunity ID	Title			
Kylemore 004	Steam line and valve insulation			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
237,325	35,005	2,972	11,800	-
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
0.3	43.7			
Opportunity Summary:	Across the site the insulation on steam lines, flanges and valves was poor. Conduct insulation survey and have programme to repair/replace insulation			
Description of Savings and Assumptions:	Insulation had been used in areas for the steam lines; however, the quality of the insulation was generally poor. In many cases insulation designed for HVAC in commercial buildings was being used (fibreglass with thin foil covering). This become damaged very quickly and was susceptible to soaking up water and other materials. It is recommended that all lines are insulated with preformed rock wool insulation with outer metal cladding. All flanges and valve bodies should be insulated with jackets to minimise heat loss. Using www.pipeinsulation.org, the energy saving through insulation has been calculated for a 10m equivalent length of pipe (heat losses for valves and flanges. The biggest uninsulated areas were: Steam line to silos in North Block 8 m 2” line and 5 valves/flanges not insulated. However, these are isolated most of the time and only used ca. once every 6 weeks. Insulation would be good practice and would prevent contact with hot surfaces, but can not be justified here on energy efficiency grounds • The pipe bridge between North Block and the main production building, where the steam main was completely uninsulated, 30 m 3” line and 4m 1” line • Boiler house, 4 6” valves and 2m 6” line uninsulated • Production, 6m 3” uninsulated • Line 6 steam sleeve shrink, 6m 2” uninsulated • It was estimated that there was at least 10m of 125mm pipe and fittings uninsulated $Energy\ saving = 23.5\ kW\ x\ 8{,}760\ \left(\frac{hrs}{yr}\right) x \left(\frac{1}{0.8}\right) boiler\ eff = 237{,}325\ (\frac{kWh}{yr})$ $Energy\ cost\ saving = 237{,}325\ \left(\frac{kWh}{yr}\right) x\ 14.75\ \left(\frac{c}{kWh}\right) = 35{,}005\ (\frac{€}{yr})$ $Carbon\ saving = 237{,}325\ \left(\frac{kWh}{yr}\right) x\ 0.184\ \left(\frac{kgCO2e}{kWh}\right) = 43.7\ (\frac{tCO2e}{yr})$ CAPEX of €200/m is assumed, average valve jacket €200			
Next steps	Complete insulation			

Opportunity ID	Title			
Kylemore 005	Low pressure compressor heat recovery			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
245,280	36,178	3,073	50,000	-
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
1.3	45.2			
Opportunity Summary:	Fit heat recovery to low pressure compressors			
Description of Savings and Assumptions:	This opportunity was identified on SEAI Audit Scheme phase 2 There is a large amount of waste heat in air compressors. Specific coolers on low pressure air compressors can provide water at up to 80ºC. The low-pressure compressors are about 20% efficient ie: 80% of the energy input results in heat. Of the order of 40% of the available heat can be recovered as hot water. Assumptions: • Three GA45 (one U/S) and one GA55 • Assume two compressors running at average 70% load $Energy\ saving = \left(100\ kW\ x\ 70\%\ load\ x\ 8{,}760\ \left(\frac{hrs}{yr}\right)\right) x\ 40\%\ heat\ recovery = 245{,}280\ (\frac{kWh}{yr})$ $Energy\ cost\ saving = 245{,}280\ \left(\frac{kWh}{yr}\right) x\ 14.75 \left(\frac{c}{kWh}\right) = 36{,}178\ \left(\frac{€}{yr}\right)$ $Carbon\ saving = 245{,}280\ \left(\frac{kWh}{yr}\right) x\ 0.184\ \left(\frac{kgCO2e}{kWh}\right) = 45.2\ (\frac{tCO2e}{yr})$ CAPEX on the LP compressors as is estimated as €50,000 for 2 compressors			
Next steps	Investigate with compressor suppliers			

Opportunity ID	Title			
Kylemore 006	Boiler blowdown heat recovery			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
49,628	7,320	619	20,000	-
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
2.5	9.1			
Opportunity Summary:	Blowdown from the boiler is water at the boiler discharge temperature. It is possible to collect flash steam on letting down the blowdown to atmospheric pressure and using the low-pressure steam hot well steam purge.			
Description of Savings and Assumptions:	This opportunity was identified on SEAI Audit Phase 2. https://www.energy.gov/sites/prod/files/2014/05/f16/steam10_boiler_blowdown.pdf Expected efficiency improvements come from: Boiler blowdown heat recovery – 1% saving (assuming 5% blowdown rate) $Energy\ saving = \left(5{,}514{,}238\ \left(\frac{kWh}{yr}\right) x\ 90\%\right) x\ 1\%\ saving =\ 49{,}628\ (\frac{kWh}{yr})$ $Cost\ saving = 49{,}628\ \left(\frac{kWh}{yr}\right) x\ 14.75\ \left(\frac{c}{kWh}\right) = 7{,}320 \left(\frac{€}{yr}\right)$ $Carbon\ saving = 49{,}628\ \left(\frac{kWh}{yr}\right) x\ 0.184\ \left(\frac{kgCO2e}{kWh}\right) = 9.1\ (\frac{tCO2e}{yr})$ $CAPEX\ installed\ est$ €20,000			
Next steps	Investigate with suppliers			

Opportunity ID	Title			
Kylemore 007	Airveyor controls			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
132,000	31,883	836	20,000	-
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
0.6	12.3			
Opportunity Summary:	All Airveyors are single speed and continue running when the line is not filling. Fit controls to switch of blowers when line is not producing			
Description of Savings and Assumptions:	This opportunity was identified on SEAI Audit Phase 2. The Air veyors on Lines 2, 3 and 6 have single speed fans and will continue running when the line is down. Introduce control logic to switch off blowers when production not running. There are controls at Beckton where sensors on the first and last Airveyor control whether the other fans run ie: other fans only run when there are bottles being transported. Assumptions: 10 off 2.2 kW Air-veyor blowers per line. Save 2,000 hrs running time $Energy\ saving = 30\ x\ 2.2\ kW\ x\ 2{,}000 \left(\frac{hrs}{yr}\right) = 132{,}000 \left(\frac{kWh}{yr}\right)$ $Energy\ cost\ saving = 132{,}000 \left(\frac{kWh}{yr}\right) x\ 24.154 \left(\frac{c}{kWh}\right) = 31{,}883 \left(\frac{€}{yr}\right)$ $Carbon\ saving = 132{,}000 \left(\frac{kWh}{yr}\right) x\ 0.0935 \left(\frac{kgCO2e}{yr}\right) = 12.3 \left(\frac{tCO2e}{yr}\right)$ Assumption has been made that this can be performed through PLC logic and programme changes. CAPEX to reprogramme €20,000			
Next steps	Internal discussions with other Britvic sites where solution already installed			

Opportunity ID	Title			
Kylemore 008	Syrup room powder charging room exhaust ventilation VSD			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
11,924	2,880	75	5,000	-
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
1.7	1.1			
Opportunity Summary:	Run fan to provide fixed suction pressure			
Description of Savings and Assumptions:	This opportunity was identified on SEAI Audit Phase 2. The extract fan currently runs at single speed, regardless of how many or which charging hoppers are in use. Control the fan speed to give a constant suction when running. Assumptions: • Fan 11 kW • Running estimated 4,000 hrs/yr • Slow fan by average 10% $Energy\ saving = 11\ kW\ x\ 4{,}000\ \left(\frac{hrs}{yr}\right) x\ (1 - 0.9^3) = 11{,}924\ \left(\frac{kWh}{yr}\right)$ $Energy\ cost\ saving = 11{,}924\ \left(\frac{kWh}{yr}\right) x\ 24.154\ \left(\frac{c}{kWh}\right) = 2{,}880\ \left(\frac{€}{yr}\right)$ $Carbon\ saving = 11{,}924\ \left(\frac{kWh}{yr}\right) x\ 0.0935\ \left(\frac{kgCO2e}{kWh}\right) = 1.1 (\frac{tCO2e}{yr})$ CAPEX for VSD and pressure sensor control €5,000			
Next steps	Engineering project			

Opportunity ID	Title			
Kylemore 009	Thermographics			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
Opportunity Summary:	Perform thermographics of insulation at the same time as thermographics of distribution boards			
Description of Savings and Assumptions:	This opportunity was identified on SEAI Audit Phase 2. Under cladding it is common for lagging to slump, such that from the outside it looks OK, but is resulting in a high heat loss. A thermographic camera is available, that is used for scanning electrical distribution boards. Perform routine lagging thermographics to loom for hot and cold spots. Repair lagging as necessary.			
Next steps	Scheduled scans of insulation and repairs			

Opportunity ID	Title			
Kylemore 010	Use one UV chamber			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
8,760	2,115	55	0	0
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
0	0.8			
Opportunity Summary:	Currently run with two UV chambers, but capacity only needs to run on one. Change controls			
Description of Savings and Assumptions:	This opportunity was identified on SEAI Audit Phase 2. Assumptions: • 1kW lamp • Runs 8,760 hrs/yr $Energy\ saving = 8{,}760\ \left(\frac{kWh}{yr}\right)$ $Energy\ cost\ saving = 8{,}760\ \left(\frac{hrs}{yr}\right) x\ 24.154\ \left(\frac{c}{kWh}\right) = 2{,}115\ \left(\frac{€}{yr}\right)$ $Carbon\ saving = 8{,}760\ \left(\frac{kWh}{yr}\right) x\ 0.0935\ \left(\frac{kgCO2e}{kWh}\right) = 0.8$			
Next steps	Quality risk assessment			

Opportunity ID	Title			
Kylemore 011	Use air amplifier cleaning guns			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
Opportunity Summary:	Compressed air nozzles are used around production for machine cleaning. Fit air amplifier nozzles to reduce compressed air consumption			
Description of Savings and Assumptions:	This opportunity was identified on SEAI Audit Phase 2. Air amplifiers enable nozzles to reduce compressed air consumption Air amplifier cleaning nozzles use much less than 50% of the air used on a standard cleaning nozzle. https://www.brauer.co.uk/airmiser-nozzles-s149.aspx https://meech.com/product/energy-saving-safety-blowgun/			
Next steps				

Opportunity ID	Title			
Kylemore 012	Use air amplifiers in place of compressed air nozzles			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
Opportunity Summary:	Fit air amplifiers in place of air nozzles for removing water from bottles, blowing labels, rejecting bottles.			
Description of Savings and Assumptions:	This opportunity was identified on SEAI Audit Phase 2. Air nozzles use compressed air to blow water from the bottles before printers and labellers. These use 80-90% less compressed air. https://www.brauer.co.uk/air-amplifiers-r3.aspx https://airknife.co.uk/product-category/economic-blowing/air-amplifiers/ https://airknife.co.uk/product-category/economic-blowing/air-amplifiers/ https://meech.com/en/applications/air-technology-applications/air-amplifier-applications/			
Next steps				

Opportunity ID	Title			
Kylemore 013	Palletisers/depalletizes change compressed air ejectors to vac pump			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
Opportunity Summary:	The palletiser/depalletisers use air ejectors using compressed air to produce vacuum to lift cardboard sheets and place them. These were seen to be left on when the packing line was not in use. They also use a lot of compressed air. Replace with vacuum pump.			
Description of Savings and Assumptions:	This opportunity was identified on SEAI Audit Phase 2. Consider using vacuum pump instead of air ejectors. The air ejectors use compressed air to form a vacuum, typically in the range 1.5 SCFM (42.5 SLPM) to 17 SCFM (476 SLPM) at 80 PSIG (5.5 Bar) and there are 4 ejectors/nozzles per palletiser. Further investigations are needed to check the model and air flowrate being used. This could then be compared with a vacuum pump. https://blog.exair.com/tag/vacuum-ejector/ As a minimum it should be ensured that the sheet placer/remover is back in the park/off position when no pallet is present.			
Next steps				

Opportunity ID	Title			
Kylemore 014	Line 6 shrink tunnel VSD fans			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
3,794	916	27	6,000	0
Simple Payback, Years	Carbon Savings (tCO_2e/yr)			
6.4	0.4			
Opportunity Summary:	The sleeve shrink tunnel has two small extract fans running at single speed, air flowrate controlled by throttles dampers. Fit variable speed drives to fans and remove dampers			
Description of Savings and Assumptions:	This opportunity was identified on SEAI Audit Phase 2. It would be possible to fit variable speed drives to the extract fans instead of controlling with dampers, however the unit utilisation is very low and it would not be possible to develop an economic case for fitting. Assumptions: • 2 x 3kW fans • Could reduce speed by at least 10% • Running hours 2,000 hrs/yr. This may be an over-estimate as sleeve shrink is now rarely used. $Energy\ saving = (2\ x\ 5\ kW\ x\ 70\%\ load) x\ (1 - 0.9^3) x\ 2{,}000\ \left(\frac{hrs}{yr}\right)$ $= 3{,}794\ \left(\frac{kWh}{yr}\right)$ $Energy\ cost\ saving = 3{,}794\ \left(\frac{kWh}{yr}\right) x\ 24.154\ \left(\frac{c}{kWh}\right) = 916$ $Carbon\ saving = 3{,}794\ \left(\frac{kWh}{yr}\right) x\ 0.0935\ \left(\frac{kgCO2e}{kWh}\right) = 0.4$ CAPEX est €6,000			
Next steps				

Opportunity ID	Title			
Kylemore 015	Hydrogen Peroxide to CIP tank			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
109,500	16,151	1,367	10,000	0
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
0.6	20.1			
Opportunity Summary:	Add Hydrogen Peroxide to CIP caustic tank and reduce temperature			
Description of Savings and Assumptions:	It has been estimated that if the caustic tank on the CIP was dosed with Hydrogen Peroxide the caustic wash temperature could be reduced by 30°C from ca. 80°C to 50°C. A full quality risk assessment would be needed before considering this opportunity. Savings have been estimated based on: • 50% utilisation • Reduce heat losses from caustic circuit and caustic tank by lower temperature • Using www.pipeinsulation.org, the energy saving has been estimated • Estimated CIP system equivalent to 200m 2" pipe, uninsulated. $Energy\ saving = 20\ kW\ x\ 8{,}760\ \left(\frac{hrs}{yr}\right) x\ 50\%\ utilisation\ x\ \left(\frac{1}{0.8}\right) boiler\ eff = 109{,}500\ \left(\frac{kWh}{yr}\right)$ $Energy\ cost\ saving = 109{,}500\ \left(\frac{kWh}{yr}\right) x\ 14.75\ \left(\frac{c}{kWh}\right) = 16{,}151\ \left(\frac{€}{yr}\right)$ $Carbon\ saving = 109{,}500\ \left(\frac{kWh}{yr}\right) x\ 0.184\ \left(\frac{kgCO2e}{kWh}\right) = 20.1\ \left(\frac{tCO2e}{yr}\right)$ CAPEX for dosing pump and controller, and piping connection est €10,000 OPEX for cost of Hydrogen Peroxide is not known.			
Next steps				

Opportunity ID	Title			
Kylemore 016	Vendmiser in canteen			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
1,400	338	7	600	0
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
1.7	0.1			
Opportunity Summary:	The site has two vending machines in the canteen that are constantly operating. Installing a 'vending miser' will reduce the amount of electricity used by the vending machines. The vending miser works by using a Passive Infrared (PIR) Sensor to monitor the surrounding area and power down the vending machine when the surrounding area is vacant. It also monitors the room's temperature and automatically repowers the vending machine at 1-3 hour intervals (independent of occupancy) to ensure that the vended product remains at the correct temperature. Savings are estimated to be approximately 20% of the machine's consumption.			
Description of Savings and Assumptions:	$Energy\ saving = 2\ x\ 400\ W\ x\ 8{,}760\ \left(\frac{hrs}{yr}\right) x\ 20\%\ saving = 1{,}400\ (\frac{kWh}{yr})$ $Energy\ cost\ saving = 1{,}400\ \left(\frac{kWh}{yr}\right) x\ 24.154\ \left(\frac{c}{kWh}\right) = 338\ (\frac{€}{yr})$ $Carbon\ saving = 1{,}400\ \left(\frac{kWh}{yr}\right) x\ 0.0935\ \left(\frac{kgCO2e}{kWh}\right) = 0.1$ CAPEX est €300 installed each			
Next steps				

<table>
<tr><th>Opportunity ID</th><th colspan="4">Title</th></tr>
<tr><td>Kylemore 017</td><td colspan="4">Options to eliminate gas boilers</td></tr>
<tr><th>Energy Savings (kWh)</th><th>Energy Cost Saving (€/yr)</th><th>Other Savings (€/yr)</th><th>Budget Capital Cost (€)</th><th>O&M Cost (€/yr)</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><th>Simple Payback, Years</th><th>Carbon Savings (tCO2e/yr)</th><th></th><th></th><th></th></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><th>Opportunity Summary:</th><td colspan="4">The gas boilers represent significant energy use and carbon emissions. If the gas boilers could be eliminated it would save.</td></tr>
<tr><th>Description of Savings and Assumptions:</th><td colspan="4">Identified heat recovery opportunities mentioned above would reduce the gas demand by an estimated 978,885 kWh/yr, 17.7% reduction.
There are several other options to be considered to eliminate the remaining gas consumption:
• An electric boiler would reduce energy consumption by 589,585 kWh/yr but would cost an additional €284,100/yr in energy costs. The existing electrical incomer may not have enough capacity and it is likely that a new larger electrical incomer would be needed
• A heat pump to raise water to 80°C, followed by an electric boiler would not significantly improve the financial situation.
• Alternative fuel boilers could be used:
o The existing boilers could be modified to run on HVO. This would remove gas, decarbonise the boilers with minimal capital costs.
o A new biomass boiler could be constructed. This would be very capital intensive and would rely on a reliable and sustained supply of biomass.
• Process technology change:
o Change all heat tunnels to use electrical heating.
o Development of a cold CIP using chemicals</td></tr>
<tr><th>Next steps</th><td colspan="4">A detailed engineering options analysis would be required</td></tr>
</table>

Opportunity ID	Title			
Kylemore 018	Rinse water recovery skid			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
Opportunity Summary:	Fit system to recover rinse water			
Description of Savings and Assumptions:	PET bottles are generally rinsed before filling using ionized water. This water then runs to drain, resulting in high water consumption. One option would be to install a rinse water recovery unit (https://www.sidel.com/en/line-improvement/eco-options-upgrades/rinser-recovery-water-skid-opup-9). These are claimed to be able to recover 60% of the rinse water, however they will increase energy consumption			
Next steps	A full engineering feasibility study would be required			

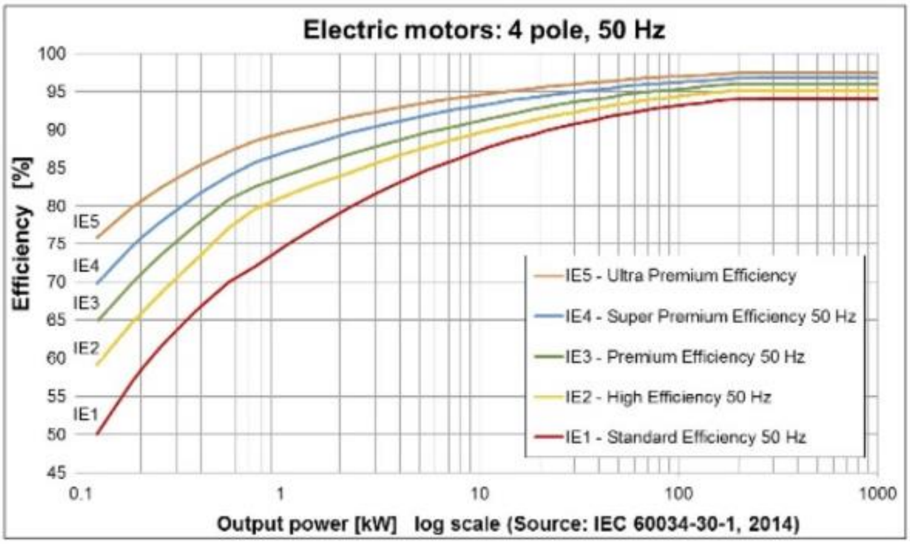
Opportunity ID	Title			
Kylemore 019	Light weighting			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
447,529	108,069	2,824		
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
	41.8			
Opportunity Summary:	Blow lighter weight bottles, which use less plastic, required lower blowing pressure.			
Description of Savings and Assumptions:	This opportunity was identified on Phase 1: Other manufacturers have optimised their bottle blowing to use light weight preforms to make bottles with thinner walls. The energy saving is realised as thinner walled bottles require less energy to blow. It is estimated that 10% energy on bottle blowing could be saved by light weighting without detriment to the bottle integrity. The main driver for light weighting is ton reduce the amount of plastic being used. $Energy\ saving = \left(4{,}475{,}288\frac{kWh}{yr}\right) x\ 10\% = 447{,}529\ \left(\frac{kWh}{yr}\right)$ $Energy\ cost\ saving = 447{,}529\left(\frac{kWh}{yr}\right) x\ 24.154\ \left(\frac{c}{kWh}\right) = 108{,}069\ (\frac{€}{yr})$ $Carbon\ saving = 447{,}529\ \left(\frac{kWh}{yr}\right) x\ 0.0935\ \left(\frac{kgCO2e}{kWh}\right) = 41.8\ (\frac{tCO2e}{yr})$ This project is in the process of being completed, and is due to be commissioned Q1-Q2 2024			
Next steps	Complete project.			

Opportunity ID	Title			
Kylemore 020	Grundfoss energy efficient pump commissioning			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
258,880	62,529	1,645		
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
	24.2			
Opportunity Summary:	Several high efficiency pumps have been purchased from Grundfoss. These are to be installed and commissioned.			
Description of Savings and Assumptions:	On examination of delivered energy efficient pumps it was noted that these were marked as IE3 and not IE5. It is noted that IE3 pumps are not the most efficient, and that higher energy savings could have been realised by specifying IE5 pumps. $Energy\ saving = 258{,}880\ (\frac{kWh}{yr})$ $Energy\ cost\ saving = 258{,}880\left(\frac{kWh}{yr}\right) x\ 24.154\ \left(\frac{c}{kWh}\right) = 62{,}529\ (\frac{€}{yr})$ $Carbon\ saving = 258{,}880\ \left(\frac{kWh}{yr}\right) x\ 0.0935\ \left(\frac{kgCO2e}{kWh}\right) = 24.2\ (\frac{tCO2e}{yr})$ This project is in the process of being completed, and is due to be commissioned June 2024			
Next steps	Complete project.			

Opportunity ID	Title			
Kylemore 021	HP compressor heat recovery			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
Opportunity Summary:	Recover waste heat from the water cooling circuits on the HP compressors			
Description of Savings and Assumptions:	Alone this project would have limited benefit, as any recovered heat would be too low temperature to be useful.			
Next steps				

Opportunity ID	Title			
Kylemore 022	Heat pump project			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
Opportunity Summary:	Shadow heat pump project as implemented at Beckton and Leeds			
Description of Savings and Assumptions:	Large Capex projects are being installed at Beckton and Leeds to recover heat from the HP compressors and ammonia refrigeration plant and to upgrade using a heat pump, to supply the site with all hot water requirements at up to 80°C. Due to the high CAPEX cost, both of these projects are being supported by a 30% CAPEX grant from government in the UK. Potential routes for funding support in the Republic of Ireland include: • Enterprise Emissions Reduction Investment Fund: Capital investment for decarbonisation processes supports investment in carbon reducing technologies in manufacturing combustion processes. This provides a maximum grant rate of 30-50%, dependent on company size, up to a maximum support of €1 million. (Heat pump and heat recovery to reduce gas consumption in conventional gas boilers) • Support Scheme for Renewable Heat: The Support Scheme for Renewable Heat - SEAI is open to commercial, industrial, agricultural, district heating, public sector and other non-domestic heat users. The scheme offers 30% of installation costs of selected renewable technologies as well a multi-annual payment, for a period of up to 15 years. • EXEED Grant Scheme: The EXEED Grant Scheme - SEAI is designed for organisations who are planning an energy investment project. Grant support of up to €1,000,000 per project is available.			
Next steps				

<table>
<tr><th>Opportunity ID</th><th colspan="4">Title</th></tr>
<tr><td>Kylemore 023</td><td colspan="4">Cool air fed to LP air compressors</td></tr>
<tr><th>Energy Savings (kWh)</th><th>Energy Cost Saving (€/yr)</th><th>Other Savings (€/yr)</th><th>Budget Capital Cost (€)</th><th>O&M Cost (€/yr)</th></tr>
<tr><td>12,264</td><td>2,962</td><td>75</td><td>5,000</td><td>0</td></tr>
<tr><th>Simple Payback, Years</th><th>Carbon Savings (tCO2e/yr)</th><th></th><th></th><th></th></tr>
<tr><td>1.6</td><td>1.1</td><td></td><td></td><td></td></tr>
<tr><th>Opportunity Summary:</th><td colspan="4">Improve cold air to the air compressor inlets</td></tr>
<tr><th>Description of Savings and Assumptions:</th><td colspan="4">During the assessment it was noted that the ambient temperature around the low pressure air compressors was elevated. If cooler air could be ducted to the air compressors from outside it is expected that the temperature could be dropped by at least 5°C, which would reduce the electricity consumption by 2%
• 5°C reduction in inlet temperature to a compressor would result in ca. 2% reduction in electricity consumption.
• Three GA45 (one U/S) and one GA55
• Assume two compressors running at average 70% load
$Energy\ saving = \left(100\ kW\ x\ 70\%\ load\ x\ 8{,}760\ \left(\frac{hrs}{yr}\right)\right) x\ 2\%\ saving = 12{,}264\ (\frac{kWh}{yr})$
$Energy\ cost\ saving = 12{,}264\ \left(\frac{kWh}{yr}\right) x\ 24.154 \left(\frac{c}{kWh}\right) = 2{,}962\ \left(\frac{€}{yr}\right)$
$Carbon\ saving = 12{,}264\ \left(\frac{kWh}{yr}\right) x\ 0.0935\ \left(\frac{kgCO2e}{kWh}\right) = 1.1\ (\frac{tCO2e}{yr})$
CAPEX for better ventilation €5,000</td></tr>
<tr><th>Next steps</th><td colspan="4"></td></tr>
</table>

Opportunity ID	Title			
Kylemore 024	Airveyors replace fan motors			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
79,200	19,129	503	60,000	0
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
3.1	7.4			
Opportunity Summary:	All Airveyors motors are pre IE1 efficiency. Change to IE5			
Description of Savings and Assumptions:	 Assumptions: 10 off 2.2 kW Air-veyor blowers per line. Save 2,000 hrs running time $Energy\ saving = 30\ x\ 2.2\ kW\ x\ 6{,}000 \left(\frac{hrs}{yr}\right) x\ 20\%\ saving = 79{,}200 \left(\frac{kWh}{yr}\right)$ $Energy\ cost\ saving = 79{,}200 \left(\frac{kWh}{yr}\right) x\ 24.154 \left(\frac{c}{kWh}\right) = 19{,}129 \left(\frac{€}{yr}\right)$ $Carbon\ saving = 79{,}200 \left(\frac{kWh}{yr}\right) x\ 0.0935 \left(\frac{kgCO2e}{yr}\right) = 7.4 \left(\frac{tCO2e}{yr}\right)$ Replacement cost for motors €60,000			
Next steps				

Opportunity ID	Title			
Kylemore 025	IT Policy			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
153	37	0	0	0
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
0	0			
Opportunity Summary:	Set IT policy to switch computers to standby when not used, instead of leaving on standby.			
Description of Savings and Assumptions:	A small number of computer screens were seen to be left on standby for long periods of time. Assumptions: • On screensaver , a computer screen may use 50W • On standby a computer screen should only use 0.5W $Energy\ saving = 5\ screens\ x\ (50W - 0.5W) x\ 3{,}000\ \left(\frac{hrs}{yr}\right) = 153\ (\frac{kWh}{yr})$ $Energy\ cost\ saving = 153\ \left(\frac{kWh}{yr}\right) x\ 24.154\ \left(\frac{c}{kWh}\right) = 37\ (\frac{€}{yr})$			
Next steps				

Opportunity ID	Title			
Kylemore 026	Change motors on conveying lines			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
72,765	17,575	110	Tbd	0
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
0	1.6			
Opportunity Summary:	All motors on conveying lines were seen to be of efficiency IE1 or earlier. Change to Ie4 or IE5 motors			
Description of Savings and Assumptions:	Assumptions: • Existing 1.1 kW IE1 motor has maximum efficiency of 59% • New IE4/5 motor would have minimum efficiency of 80% • Assume motors run at 70% load • Lines 3, 4, 6 have ca. 30 motors each • Line utilisation average 5,000 hrs/yr $Energy\ saving = 90\ motors\ x\ 1.1\ kW\ x\ (80\% - 59\%) x\ 70\%\ load\ x\ 5{,}000\ (\frac{hrs}{yr})$ $= 72{,}765\ (\frac{kWh}{yr})$ $Energy\ cost\ saving = 72{,}765\ \left(\frac{kWh}{yr}\right) x\ 24.154\ \left(\frac{c}{kWh}\right) = 17{,}575\ (\frac{€}{yr})$ $Carbon\ saving = 17{,}575\ \left(\frac{kWh}{yr}\right) x\ 0.0935\ \left(\frac{kgCO2e}{kWh}\right) = 1.6\ \left(\frac{tCO2e}{yr}\right)$ Coveyors have been converted to IE% motors at other Britvic sites. These sites should be approached for details of quotations on project costs			
Next steps				

Opportunity ID	Title			
Kylemore 027	Conveyor sequencing of conveyors on all lines			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
Opportunity Summary:	Sequence control of conveyors			
Description of Savings and Assumptions:	When a line is running all conveyors on the line tend to run. Sequence control would detect whether there is product (bottles/cans) present and would only run the conveyors when required. There is a risk on stopping conveyors if they are fully loaded that the starting torque could be high and would damage belts or gear boxes. It is therefore recommended to conduct a full risk assessment before detailed design is carried out.			
Next steps				

Opportunity ID	Title			
Kylemore 028	Lighting			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
24,866	6,006	156	9,600	0
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
1.6	2.3			
Opportunity Summary:	Upgrade to LED and fit lighting controls			
Description of Savings and Assumptions:	There were several lighting opportunities noted: Old glass line area: 10 x 70W LED switch off as unoccupied area $Energy\ saving = (10\ x\ 70W) x\ 8{,}760\ \left(\frac{hrs}{yr}\right) = 6{,}132\ \left(\frac{kWh}{yr}\right)$ North building 1st floor: 10 x 58W T8 to LED and sensor switch off when not needed $Energy\ saving = (10\ x\ 58W\ ) x\ 8{,}760\ \left(\frac{hrs}{yr}\right) - (10\ x\ 11W) x\ 2{,}000\ (\frac{hrs}{yr}) = 4{,}860\ (\frac{kWh}{yr})$ Syrup room: 26 x 58W T8 + 10 x70W LED, all LED and daylight sensors $Energy\ saving\ (\ 26\ x\ 58W + 10\ x\ 70W) x\ 8{,}760\ \left(\frac{hrs}{yr}\right) - (26\ x\ 11W + 10\ x\ 70W) x\ 6{,}000\ \left(\frac{hrs}{yr}\right) = 13{,}462\ \left(\frac{kWh}{yr}\right)$ Workshop: 8 x 58W T8 to 11W LED $Energy\ saving = (58W - 11W)\ x\ 8{,}760\ (\frac{hrs}{yr}) = 412\ (\frac{kWh}{yr})$ Together $Energy\ cost\ saving = 24{,}866\ \left(\frac{kWh}{yr}\right) x\ 24.154\ \left(\frac{c}{kWh}\right) = 6{,}006\ \left(\frac{€}{yr}\right)$ $Carbon\ saving = 24{,}866\ \left(\frac{kWh}{yr}\right) x\ 0.0935\ \left(\frac{kgCO2e}{kWh}\right) = 2.3\ (\frac{tCO2e}{yr})$ CAPEX based on €200/fitting installed €9,600			
Next steps				

Opportunity ID	Title			
Kylemore 029	Replace Gram refrigeration compressors			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
55,650	13,441	354	100,000	0
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
7.2	5.2			
Opportunity Summary:	Replace Gram refrigeration compressors			
Description of Savings and Assumptions:	Two Gram refrigeration compressors, dating from 1969 and 1974 respectively are still in use occasionally, each fitted with a 300 kW motor. • New these would have had ca. 95% efficiency but wear and ageing would have reduced this to ca. 90% efficiency. These motors also use belt drive transmission using solid V-belts. The belt drive efficiency would account for additional 4% loss. • A modern direct drive motor would have efficiency of 96.5%. • Therefore changing the motors could save a minimum 6.5% • There will also be wear of the compressor itself, and a modern compressor would be expected to be at least 20% more efficient. Assume: Annual running hours 500 hrs/yr $Energy\ saving = 2\ x\ 300\ kW\ x\ 70\%\ load\ x\ 500\ \left(\frac{hrs}{yr}\right) x\ 26.5\%\ saving$ $= 55{,}650(\frac{kWh}{yr})$ $Cost\ saving = 55{,}650\ \left(\frac{kWh}{yr}\right) x\ 24.154\ \left(\frac{c}{kWh}\right) = 13{,}441\ \left(\frac{€}{yr}\right)$ $Carbon\ saving = 55{,}650\ \left(\frac{kWh}{yr}\right) x\ 0.0935\ \left(\frac{kgCO2e}{yr}\right) = 5.2\ \left(\frac{tCO2e}{yr}\right)$ If the Gram compressors were replaced it would have to be motors and compressors combined, which would cost over €100K			
Next steps	Replacement of the Gram compressors cannot be justified on electrical savings as they are only occasionally run. Analysis of maintenance and risk of leakage would be needed to justify replacement.			

Opportunity ID	Title			
Kylemore 030	Close lids on powder charging			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
1,400	338	7	0	0
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
0	0.1			
Opportunity Summary:	Close lids on powder charging when charging not in progress			
Description of Savings and Assumptions:	It was noted during the assessment that the solids on the powder charging hoppers were left open when no powder charging was in progress. This leads to the dust extraction fans running at full speed to remove dust. Ensure lids on Allmix 1 and 2 are closed when not charging, thereby minimising LEV. Assumption: LEV fan 2 kW Left running unnecessarily 1,000 hrs/yr $Energy\ saving = 2\ kW\ x\ 70\%\ load\ x\ 1{,}000\ (\frac{hrs}{yr}) =\ 1{,}400(\frac{kWh}{yr})$ $Cost\ saving = 1{,}400\ \left(\frac{kWh}{yr}\right) x\ 24.154\ \left(\frac{c}{kWh}\right) = 338\ \left(\frac{€}{yr}\right)$ $Carbon\ saving = 1{,}400\ \left(\frac{kWh}{yr}\right) x\ 0.0935\ \left(\frac{kgCO2e}{yr}\right) = 0.1\ \left(\frac{tCO2e}{yr}\right)$			
Next steps	Procedural			

Opportunity ID	Title			
Kylemore 032	Bottle blower heat recovery			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
88,211	13,011	1,299	150,000	0
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
10.5	19.1			
Opportunity Summary:	Integrate bottle blower heat recovery			
Description of Savings and Assumptions:	The oven on the bottle blower creates a lot of waste heat which is removed by a forced ventilation hood. This heat could be captured and used to provide hot water. Heat is captured along with ambient air from the surrounding building. Sidel manufacture an Oven Heat Recovery System, which captures the heat from the oven without dilution with ambient air, therefore resulting in higher temperature captured waste heat. No details were made available of the extracted air flowrate or of the temperature of the exhaust air being extracted. https://www.options-upgrades.sidel.com/en/oandu/oven-heat-recovery-system-1031 Assumptions: 60% of bottle blowing electricity consumption is in the bottle blowing oven. Most of the heat provided by the lamps results in waste heat. There is no heat balance but assuming 30% of heat is lost and 1/3 of this can be recovered ie: 10% of bottle blower electricity as heat recovered $Energy\ saving = 882{,}110\ \left(\frac{kWh}{yr}\right) x\ 10\% = 88{,}211\ \left(\frac{kWh}{yr}\right)$ $Energy\ cost\ saving = 88{,}211\ \left(\frac{kWh}{yr}\right) x\ 14.75\ \left(\frac{c}{kWh}\right) = 13{,}011\ \left(\frac{€}{yr}\right)$ $Carbon\ saving = 88{,}211\ \left(\frac{kWh}{yr}\right) x\ \frac{1}{0.85} boiler\ eff\ x\ 0.184\ \left(\frac{kgCO2e}{kWh}\right) = 19.1\ \left(\frac{tCO2e}{yr}\right)$ Separate heat recovery would be needed on each extract, estimate €150,000			
Next steps	Engineering project			

Opportunity ID	Title			
Kylemore 033	Bottle blower Eco-oven			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
Opportunity Summary:	If investing in new bottle blowers, install Eco-Oven			
Description of Savings and Assumptions:	Sidel market an Eco-Oven for bottle blowers, which claims to use energy consumption by 20-40%. This oven has: • Fewer lamps for 11% less installed power • A ceramic oven to retain heat • More efficient top reflector, to reflect energy back into the oven https://www.options-upgrades.sidel.com/en/search?ouref=&combine=oven&themes=All This would be a major investment at high cost and could not be justified on energy efficiency alone			
Next steps	Investigate with supplier potential benefits and costs of an Eco-oven			

Opportunity ID	Title			
Kylemore 034	Bottle blower compressed air recovery to LP air			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
Opportunity Summary:	Air recovery is fitted to each bottle blower, but it was not certain if this was working on any blower. Check and repair			
Description of Savings and Assumptions:	Air recovery will recover the high pressure air used to blow the bottles as LP air. This can be used to replace LP air demands on the bottle blower and may be enough to export to the LP air main, thus reducing the damns on the LP compressors. The supplier claims up to 40% of HP air can be recovered and reused A detailed study would be required to define the HP and LP air demands on each blower, the potential volume of air that could be exported to the LP air network, and in what condition the existing air recovery installation is on each blower and the cost of repair. https://www.options-upgrades.sidel.com/en/search?ouref=&combine=air+recovery&themes=All			
Next steps	Investigate with suppliers the benefit of air recovery			

Opportunity ID	Title			
Kylemore 035	Line 4 can rinse, use air amplifier			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
6,720	1,623	40	2,000	0
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
1.2	0.6			
Opportunity Summary:	Use air amplifier on can rinse to reduce compressed air usage			
Description of Savings and Assumptions:	Compressed air is ionised and used in the can rinse to remove any residual particles of dust or dirt. By using an air amplifier to supply compressed air to the ionizer and can rinse, it may be possible to reduce the compressed air consumption by up to 80%. An air amplifier is a nozzle with built in ejector, where a small amount of compressed air is used to suck in a volume of ambient air https://www.codimfg.com/canning-line-infeed/ionized-air-rinse#:~:text=How%20It%20Works,to%20fall%20from%20the%20can. https://canrinser.com/products/hyion-can-rinser/ https://solvair.co.uk/air-knife-systems/ionized-air-systems/ https://meech.com/product/ionrinse/ Assumptions: Suppliers literature suggest 8 CFM if using compressed air (ca. 14m³/hr) Other suppliers use a dedicated blower for the ionized air rinse and do not use compressed air LP compressed air energy use: ca. 0.1 kWh/m³ $Energy\ saving = 14 \left(\frac{m^3}{hr}\right) x\ 0.1 \left(\frac{kWh}{m^3}\right) x\ 6{,}000 \left(\frac{hrs}{yr}\right) x\ 80\%\ saving = 6{,}720 \left(\frac{kWh}{yr}\right)$ $Energy\ cost\ saving = 6{,}720 \left(\frac{kWh}{yr}\right) x\ 24.154 \left(\frac{c}{kWh}\right) = 1{,}623 \left(\frac{€}{yr}\right)$ $Carbon\ saving = 6{,}720 \left(\frac{kWh}{yr}\right) x\ 0.0935 \left(\frac{kgCO2e}{kWh}\right) = 0.6 \left(\frac{tCO2e}{yr}\right)$ CAPEX would be need to modify the air supply, €2,000			
Next steps	Investigate suppliers			

Opportunity ID	Title			
Kylemore 036	Line 4 reject air jet and cap sorting air jet, air amplifier			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
Opportunity Summary:	Use air amplifier on can rinse to reduce compressed air usage			
Description of Savings and Assumptions:	Air nozzles use compressed air to reject cans in the can filler. These use 80-90% less compressed air. https://www.brauer.co.uk/air-amplifiers-r3.aspx https://airknife.co.uk/product-category/economic-blowing/air-amplifiers/ https://airknife.co.uk/product-category/economic-blowing/air-amplifiers/ https://meech.com/en/applications/air-technology-applications/air-amplifier-applications/			
Next steps	Investigate suppliers			

Opportunity ID	Title			
Kylemore 037	Steam trap survey and repair			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
Opportunity Summary:	Perform regular steam trap surveys			
Description of Savings and Assumptions:	To run a steam system safely, and at peak operational efficiency, it is essential all steam lines are cleared of condensate properly. This means ensuring that steam traps are working efficiently, a task best achieved by implementing a regular maintenance schedule. In steam systems that have not been maintained for 3 to 5 years, between 15% to 30% of the installed steam traps may have failed — thus either allowing live steam to escape into the condensate return system or for condensate to build up in steam lines. Even in well maintained steam systems the underlying failure rate of steam traps is closer to a generally accepted 15% - 20% per year.			
Next steps	Arrange steam trap survey minimum of once per year			

Opportunity ID	Title			
Kylemore 038	EC fans after each shrink tunnel for cooling			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
27,750	6,702	41	18,000	0
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
2.7	0.6			
Opportunity Summary:	Change fans to fit EC fans			
Description of Savings and Assumptions:	EC stands for Electronically Commutated, and it combines AC and DC voltages. The energy losses in these motors and fans are much lower than using conventional fans, and can give up to 70% saving. https://www.airtecnics.com/technology/ec-fans-advantages https://www.axair-fans.co.uk/all-technical-information/ec-technology-ec-fans/ Assumptions: 4 x 1.1 kW fans on each line Average utilisation 80% for Lines 3, 4 and 6 Conservative 30% saving $Energy\ saving = 12\ x\ 1.1\ kW\ x\ 8760\ \left(\frac{Hrs}{yr}\right) x\ 80\%\ uilisation\ x\ 30\%\ saving$ $= 27{,}750\ \left(\frac{kWh}{yr}\right)$ $Energy\ cost\ saving = 27{,}750\ \left(\frac{kWh}{yr}\right) x\ 24.154\ \left(\frac{c}{kWH}\right) = 6{,}702\ \left(\frac{€}{yr}\right)$ $Carbon\ saving = 6{,}702\ \left(\frac{kWh}{yr}\right) x\ 0.0935\ \left(\frac{kgCO2e}{kWh}\right) = 0.6$ CAPEX est €18,000			
Next steps	Arrange steam trap survey minimum of once per year			

Opportunity ID	Title
Kylemore 038	Engineering standards for motor efficiency

Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
Simple Payback, Years	**Carbon Savings (tCO2e/yr)**			

Opportunity Summary:	Specify high efficiency motors. Decision based on life time costs
Description of Savings and Assumptions:	The standard specification for electrical motors is to use IE3 motors or IE2 motors with variable speed. However there are more efficient motors available. It is recommended to set up engineering standards to specify the most efficient motor based on life time costs (the capital costs and life time running costs.
Next steps	Policy

Output	IE1				IE2				IE3				IE4			
kW	2 pole	4 pole	6 pole	8 pole	2 pole	4 pole	6 pole	8 pole	2 pole	4 pole	6 pole	8 pole	2 pole	4 pole	6 pole	8 pole
0.12	45.0	50.0	38.3	31.0	53.6	59.1	50.6	39.8	60.8	64.8	57.7	50.7	66.5	69.8	64.9	62.3
0.18	52.8	57.0	45.5	38.0	60.4	64.7	56.6	45.9	65.9	69.9	63.9	58.7	70.8	74.7	70.1	67.2
0.20	54.6	58.5	47.6	39.7	61.9	65.9	58.2	47.4	67.2	71.1	65.4	60.6	71.9	75.8	71.4	68.4
0.25	58.2	61.5	52.1	43.4	64.8	68.5	61.6	50.6	69.7	73.5	68.6	64.1	74.3	77.9	74.1	70.8
0.37	63.9	66.0	59.7	49.7	69.5	72.7	67.6	56.1	73.8	77.3	73.5	69.3	78.1	81.1	78.0	74.3
0.40	64.9	66.8	61.1	50.9	70.4	73.5	68.8	57.2	74.6	78.0	74.4	70.1	78.9	81.7	78.7	74.9
0.55	69.0	70.0	65.8	56.1	74.1	77.1	73.1	61.7	77.8	80.8	77.2	73.0	81.5	83.9	80.9	77.0
075	72.1	72.1	70.0	61.2	77.4	79.6	75.9	66.2	80.7	82.5	78.9	75.0	83.5	85.7	82.7	78.4
1.1	75.0	75.0	72.9	66.5	79.6	81.4	78.1	70.8	82.7	84.1	81.0	77.7	85.2	87.2	84.5	80.8
1.5	77.2	77.2	75.2	70.2	81.3	82.8	79.8	74.1	84.2	85.3	82.5	79.7	86.5	88.2	85.9	82.6
2.2	79.7	79.7	77.7	74.2	83.2	84.3	81.8	77.6	85.9	86.7	84.3	81.9	88.0	89.5	87.4	84.5
3	81.5	81.5	79.7	77.0	84.6	85.5	83.3	80.0	87.1	87.7	85.6	83.5	89.1	90.4	88.6	85.9
4	83.1	83.1	81.4	79.2	85.8	86.6	84.6	81.9	88.1	88.6	86.8	84.8	90.0	91.1	89.5	87.1
5.5	84.7	84.7	93.1	81.4	87.0	87.7	86.0	83.8	89.2	89.6	88.0	86.2	90.9	91.9	90.5	88.3
7.5	86.0	86.0	84.7	83.1	88.1	88.7	87.2	85.3	90.1	90.4	89.1	87.3	91.7	92.6	91.3	89.3
11	87.6	87.6	86.4	85.0	89.4	89.8	88.7	86.9	91.2	91.4	90.3	88.6	92.6	93.3	92.3	90.4
15	88.7	88.7	87.7	86.2	90.3	90.6	89.7	88.0	91.9	92.1	91.2	89.6	93.3	93.9	92.9	91.2
18.5	89.3	89.3	88.6	86.9	90.9	91.2	90.4	88.6	82.4	92.6	91.7	90.1	93.7	94.2	93.4	91.7
22	89.9	89.9	89.2	87.4	91.3	91.6	90.9	89.1	92.7	93.0	92.2	90.6	94.0	94.5	93.7	92.1
30	90.7	90.7	90.2	88.3	92.0	92.3	91.7	89.8	93.3	93.6	92.9	91.3	94.5	94.9	94.2	92.7
37	91.2	91.2	90.8	88.8	92.5	92.7	92.2	90.3	93.7	93.9	93.3	91.8	94.8	95.2	94.5	93.1
45	91.7	91.7	91.4	89.2	92.9	93.1	92.7	90.7	94.0	94.2	93.7	92.2	95.0	95.4	94.8	93.4
55	92.1	92.1	91.9	89.7	93.2	93.5	93.1	91.0	94.3	94.6	94.1	92.5	95.3	95.7	95.1	93.7
75	92.7	92.7	92.6	90.3	93.8	94.0	93.7	91.6	94.7	95.0	94.6	93.1	95.6	96.0	95.4	94.2
90	93.0	93.0	92.9	90.7	94.1	94.2	94.0	91.9	95.0	95.2	94.9	93.4	95.8	96.1	95.6	94.4
110	93.3	93.3	93.3	91.1	94.3	94.5	94.3	92.3	95.2	95.4	95.1	93.7	96.0	96.3	95.8	94.7
132	93.5	93.5	93.5	91.5	94.6	94.7	94.6	92.6	95.4	95.6	95.4	94.0	96.2	96.4	96.0	94.9
160	93.8	93.8	93.8	91.9	94.8	94.9	94.8	93.0	95.6	95.8	95.6	94.3	96.3	96.6	96.2	95.1
200	94.0	94.0	94.0	92.5	95.0	95.1	95.0	93.5	95.8	96.0	95.8	94.6	96.5	96.7	96.3	95.4
250	94.0	94.0	94.0	92.5	95.0	95.1	95.0	93.5	95.8	96.0	95.8	94.6	96.5	96.7	96.5	95.4
315	94.0	94.0	94.0	92.5	95.0	95.1	95.0	93.5	95.8	96.0	95.8	94.6	96.5	96.7	96.6	95.4
355	94.0	94.0	94.0	92.5	95.0	95.1	95.0	93.5	95.8	96.0	95.8	94.6	96.5	96.7	96.6	95.4
400	94.0	94.0	94.0	92.5	95.0	95.1	95.0	93.5	95.8	96.0	95.8	94.6	96.5	96.7	96.6	95.4
450	94.0	94.0	94.0	92.5	95.0	95.1	95.0	93.5	95.8	96.0	95.8	94.6	96.5	96.7	96.6	95.4
500-1000	94.0	94.0	94.0	92.5	95.0	95.1	95.0	93.5	95.8	96.0	95.8	94.6	96.5	96.7	96.6	95.4

There are even more efficient electrical motors that can be specified, and that have been specified for pumps and conveyor motors within Britvic:

- IE5 motors are higher efficiency, and are becoming more widely available
- Synchronous Reluctance motors have different operating principles, are rated IE5, and have the additional advantage that with variable speed a high efficiency is maintained at all motor speeds.

Opportunity ID	Title			
Kylemore 040	EC fans for flat bed coolers for HP compressors			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
52,034	13,088	82	27,000	0
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
2.1	1.2			
Opportunity Summary:	Change fans to fit EC fans			
Description of Savings and Assumptions:	EC stands for Electronically Commutated, and it combines AC and DC voltages. The energy losses in these motors and fans are much lower than using conventional fans, and can give up to 70% saving. https://www.airtecnics.com/technology/ec-fans-advantages https://www.axair-fans.co.uk/all-technical-information/ec-technology-ec-fans/ Assumptions: 4 coolers each with 6 x 2.2 kW IE1/IE2 fans Average utilisation 80% for blowers 50% (will swap which blowers run) Conservative 30% saving $Energy\ saving = 18\ x\ 2.2\ kW\ x\ 8760\ \left(\frac{Hrs}{yr}\right) x\ 50\%\ uilisation\ x\ 30\%\ saving = 52{,}034\ \left(\frac{kWh}{yr}\right)$ $Energy\ cost\ saving = 52{,}034\ \left(\frac{kWh}{yr}\right) x\ 24.154\ \left(\frac{c}{kWH}\right) = 13{,}088\ \left(\frac{€}{yr}\right)$ $Carbon\ saving = 13{,}088\ \left(\frac{kWh}{yr}\right) x\ 0.0935\ \left(\frac{kgCO2e}{kWh}\right) = 1.2$ CAPEX est €27,000			
Next steps	Arrange steam trap survey minimum of once per year			

Opportunity ID	Title			
Kylemore 041	CIP insulation of top and bottom of tanks			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
109,220	16,109	1,367	7,560	0
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
0.4	20.1			
Opportunity Summary:	Insulate			
Description of Savings and Assumptions:	The top and bottom of each heated CIP tank are not insulated. Heat losses have been calculated using 3e -Plus (https://insulationinstitute.org/tools-resources/free-3e-plus/) $Energy\ saving = 4 \text{ x } 6.3 \text{ m}^2\text{x} \left(658\frac{\text{W}}{\text{m}^2} - 44\frac{\text{W}}{\text{m}^2}\right) \text{x } 6{,}000 \left(\frac{\text{hrs}}{\text{yr}}\right) \text{x} \frac{1}{0.85} \text{boiler eff}$ $= 109{,}220 \left(\frac{kWh}{yr}\right)$ $Energy\ cost\ saving = 109{,}220 \left(\frac{kWh}{yr}\right) x\ 14.75 \left(\frac{c}{kWh}\right) = 16{,}109 \left(\frac{€}{yr}\right)$ $Carbon\ saving = 109{,}220 \left(\frac{kWh}{yr}\right) x\ 0.184 \left(\frac{kgCO2e}{kWh}\right) = 20.1$ CAPEX est at €300/m² = €7,560			
Next steps	Insulate			

Opportunity ID	Title			
Kylemore 042	Replace office heating boilers with air source heat pump			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
333,518	-10,763	6,249	30,000	0
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
-	91.9			
Opportunity Summary:	Replace domestic heating boilers with heat pump			
Description of Savings and Assumptions:	Replace domestic heating boilers for offices (2 x Rehema Quina Pro LPG boilers), with air source heat pumps Assumptions: Boiler efficiency of 90% Heat pump COP of 2.5 $Energy\ saving = 521{,}123\ \left(\frac{\text{kWh}}{\text{yr}}\right) \text{x}\ (1 - \frac{0.9}{2.5}) = 333{,}518\ \left(\frac{kWh}{yr}\right)$ $Additional\ electricity\ for\ heat\ pump = 521{,}123\ \left(\frac{\text{kWh}}{\text{yr}}\right)\ x\ \frac{0.9}{2.5}$ $= 187{,}604\ (\frac{kWh}{yr})$ $Energy\ cost\ saving$ $= 521{,}123\ \left(\frac{\text{kWh}}{\text{yr}}\right) \text{x}\ 6.63\ \left(\frac{\text{c}}{\text{kWh}}\right)$ $- 187{,}604\ \left(\frac{\text{kWh}}{\text{yr}}\right) \text{x}\ 24.154\ \left(\frac{\text{c}}{\text{kWh}}\right) = -10{,}763\ \left(\frac{€}{yr}\right)$ $Carbon\ saving =$ $= 521{,}123\ \left(\frac{\text{kWh}}{\text{yr}}\right) \text{x}\ 0.210\ \left(\frac{\text{c}}{\text{kWh}}\right)$ $- 187{,}604\ \left(\frac{\text{kWh}}{\text{yr}}\right) \text{x}\ 0.0935\ \left(\frac{\text{c}}{\text{kWh}}\right) = 91.9\ (\frac{\text{tCO2e}}{\text{yr}})$ CAPEX est for air source heat pumps €30,000			
Next steps	It would be more expensive currently to operate electrically driven air source heat pumps compared with LPG boilers, however the change would yield a significant carbon saving.			

Opportunity ID	Title			
Kylemore 043	Server room set point			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
Opportunity Summary:	Increase server room set point from 19°C to 22°C			
Description of Savings and Assumptions:	The air conditioners (4 off) in the server room were set to 19°C. This temperature is not required for modern servers and the set point could be raised to 22°C. Assumptions • 1°C temperature increase would yield 2% energy saving No details of the air conditioning units was provided.			
Next steps	Increase temperature set point			

Opportunity ID	Title			
Kylemore 044	Switch off conferencing screens in meeting rooms when not needed			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
3,066	740	20	0	0
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
0	0.3			
Opportunity Summary:	Procedure to switch off unless needed			
Description of Savings and Assumptions:	The display screens used in meeting rooms for video conferencing were left on permanently but were only used occasionally. Switch off unless needed. Assumptions: • 7 screens left on • Not needed 50% of the time • Power consumption 100W each $Energy\ saving = 7\ x\ 100\ W\ x\ 8{,}760\ \left(\frac{hrs}{yr}\right) x\ 50\% = 3{,}066\ (\frac{kWh}{yr})$ $Energy\ cost\ saving = 3{,}066\ \left(\frac{kWh}{yr}\right) x\ 24.154\ \left(\frac{c}{kWh}\right) = 740\ \left(\frac{€}{yr}\right)$ $Carbon\ saving = 3{,}066\ \left(\frac{kWh}{yr}\right) x\ 0935\ \left(\frac{kgCO2e}{kWh}\right) = 0.3\ (\frac{tCO2e}{yr})$			
Next steps	Switch off screens			

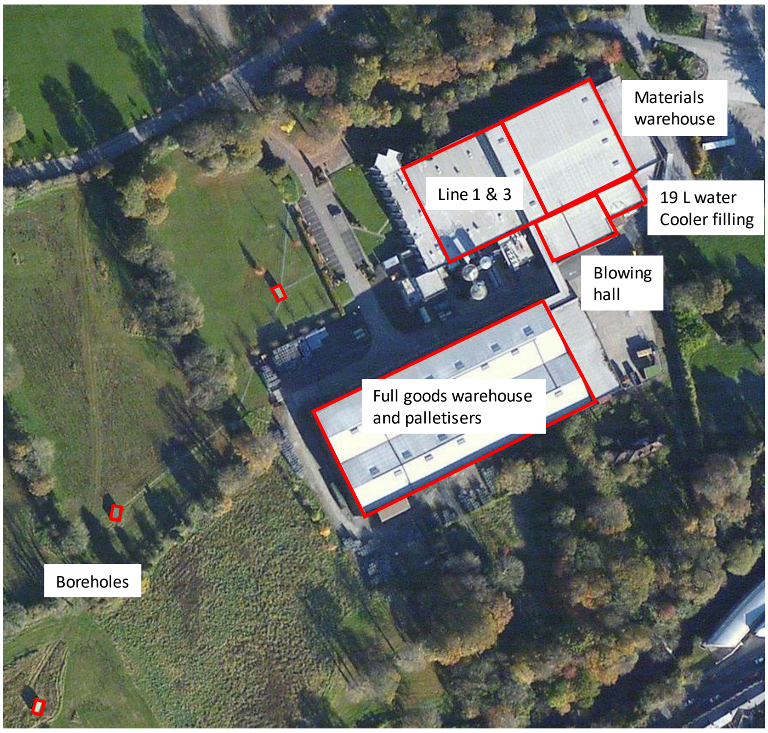
8.0 APPENDIX B – Ballygowan (NW) Audit Details

8.1 Site Description

The Ballygowan (NW) site is located in Newcastle West in County Limerick. The site consists of a production building and a warehouse building, with offices attached at one end of the production building. In the surrounding field area there are a number of well heads from which mineral water is pumped.

Figure 8-1 Britvic Ballygowan (NW) arial view

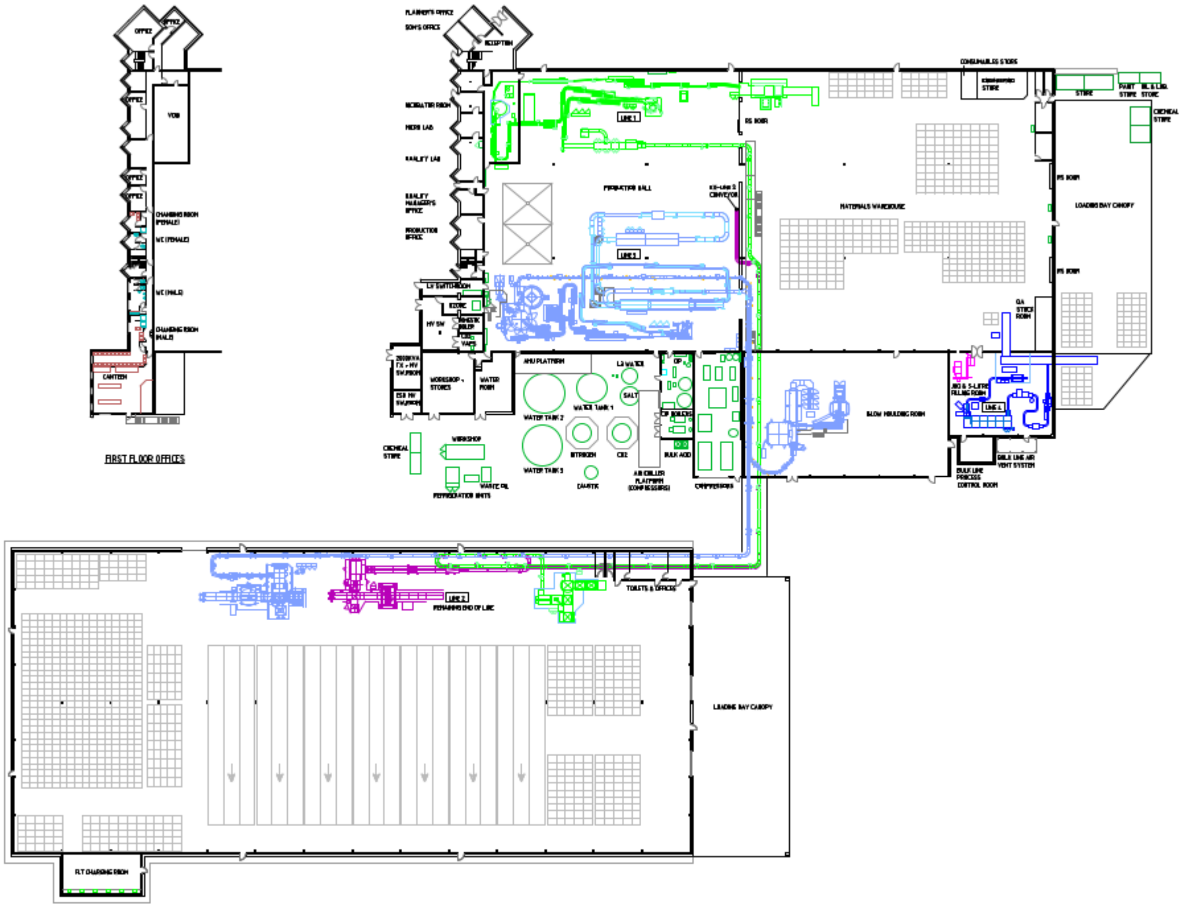
Figure 8-2 Britvic Ballygowan (NW) site layout arial view



Ballygowan (NW) site produces both carbonated and still mineral water in glass bottles, PET bottles and in bulk containers for water dispensers. There are three production lines

- Utilities (chiller, HP compressors, LP compressors CIP and boilers) are located between the two buildings.
- Also between the two buildings are raw water tank, water room and pure water tansk.
- Line 1: Fills glass bottles with carbonated or still water
- Line 3: Blow moulding of PET bottles in a separate blow moulding room. The empty bottles are transferred using an Airveyor to be filled with carbonated or still water.
- Line 4: Empty bulk containers for water dispensers are washed and sterilized. The clean bottles are filled with still water.
- Filled cases from Line 1 and Line 3 are transferred via conveyors into the warehouse building where the end of line palletising and wrapping takes place.

Figure 8-3 Britvic Ballygowan (NW) process layout



The site operates Monday to Friday. Line 3 operates 24/7 whilst Line 1 and 4 operate as and when required.

Energies used include:

- Electricity
- LPG
- Diesel

The key energy using process equipment include CIP boilers, filling & packing lines, HP air compressors and bottle blowing and plant air compressors.

8.2 Energy analysis

The site uses LPG for the boilers for the CIP. A new electric boiler has been fitted but has yet to be commissioned. There is also a heat pump fitted for domestic hot water. Electricity is used for various process equipment. There is also a small amount of diesel.

Figure 8-4 Britvic Ballygowan (NW) annual energy consumption

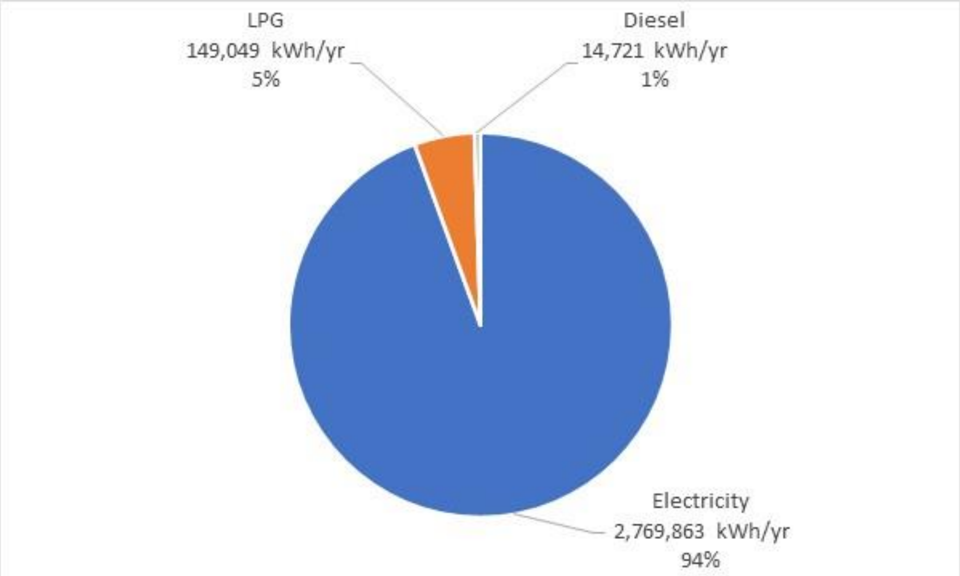


Table 8-1 Britvic Ballygowan (NW) annual energy consumption

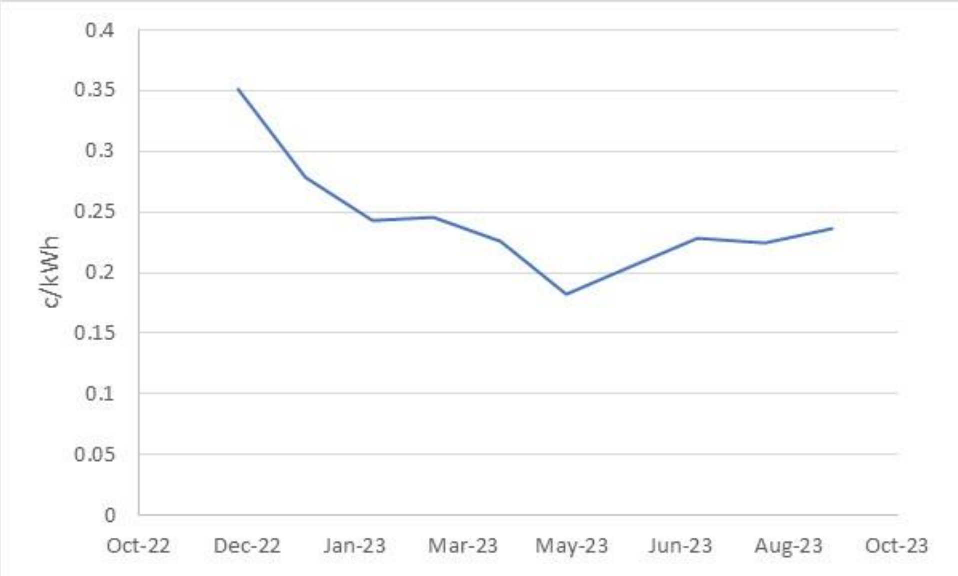
Electricity	2,769,863 kWh/yr
LPG	149,049 kWh/yr
Diesel	14,721 kWh/yr

8.2.1 Energy costs

Energy costs have been taken from invoices

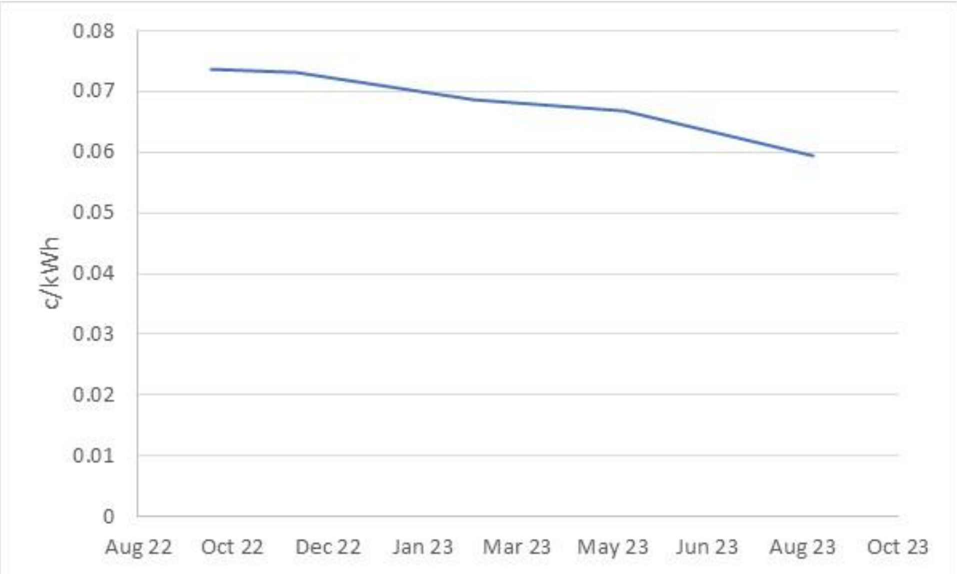
The average variable electricity cost for 2023 was 26.494 c/kWh and this cost has been used in calculations. The electricity used on site is of grid electricity. The grid emission factor was 0.345 kgCO2e/kWh.

Figure 8-5 Britvic Ballygowan (NW) variable electricity cost



LPG is purchased in bulk and although the costs have fluctuated a little over 2022, they are considered to be fairly stable and on average 6.860 c/kWh. An emission factor taken from national published data of 0.210 kg CO2e/kWh will be applied.

Figure 8-6 Britvic Ballygowan (NW) variable LPG cost



Diesel is used on site, though no costs were available. Based on average pump prices the cost rate will be assumed to be 15.220 c/kWh. The standard emission factor for diesel has been used, 0.24 kg CO2e/kWh.

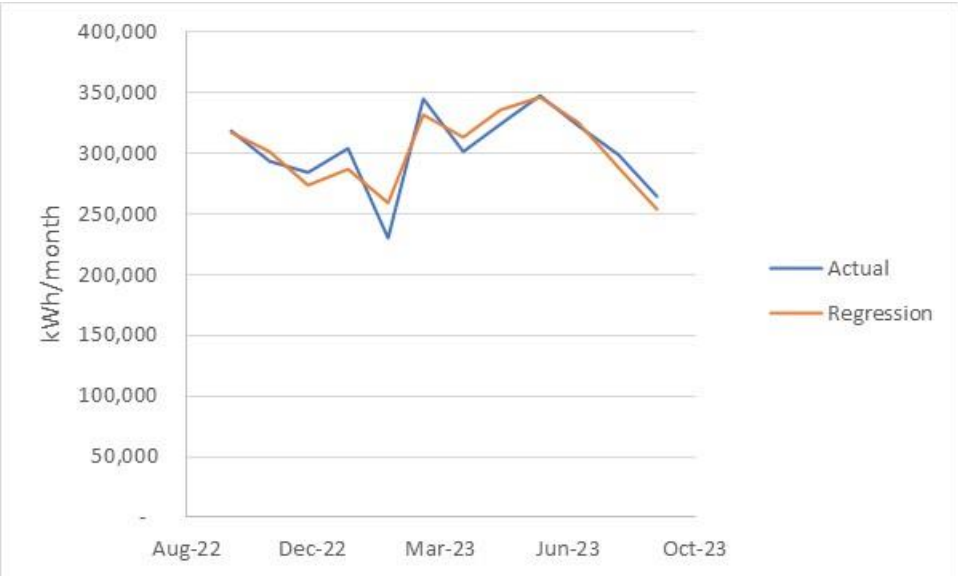
A carbon cost of 68 €/tCO2e will be used.

8.3 Energy analysis

8.3.1 Electricity data analysis

An error has been corrected in Baseline Volume and Energy.xlsx for April 2023, where comparison with invoiced energy shows the value to be incorrect. There is good correlation between electricity consumption and production and to a lesser extent to ambient temperature. It would be expected that production volumes would impact the production electricity consumption directly and chilling electricity consumption would be impacted by ambient temperature.

Figure 8-7 Britvic Ballygowan (NW) monthly electricity regression

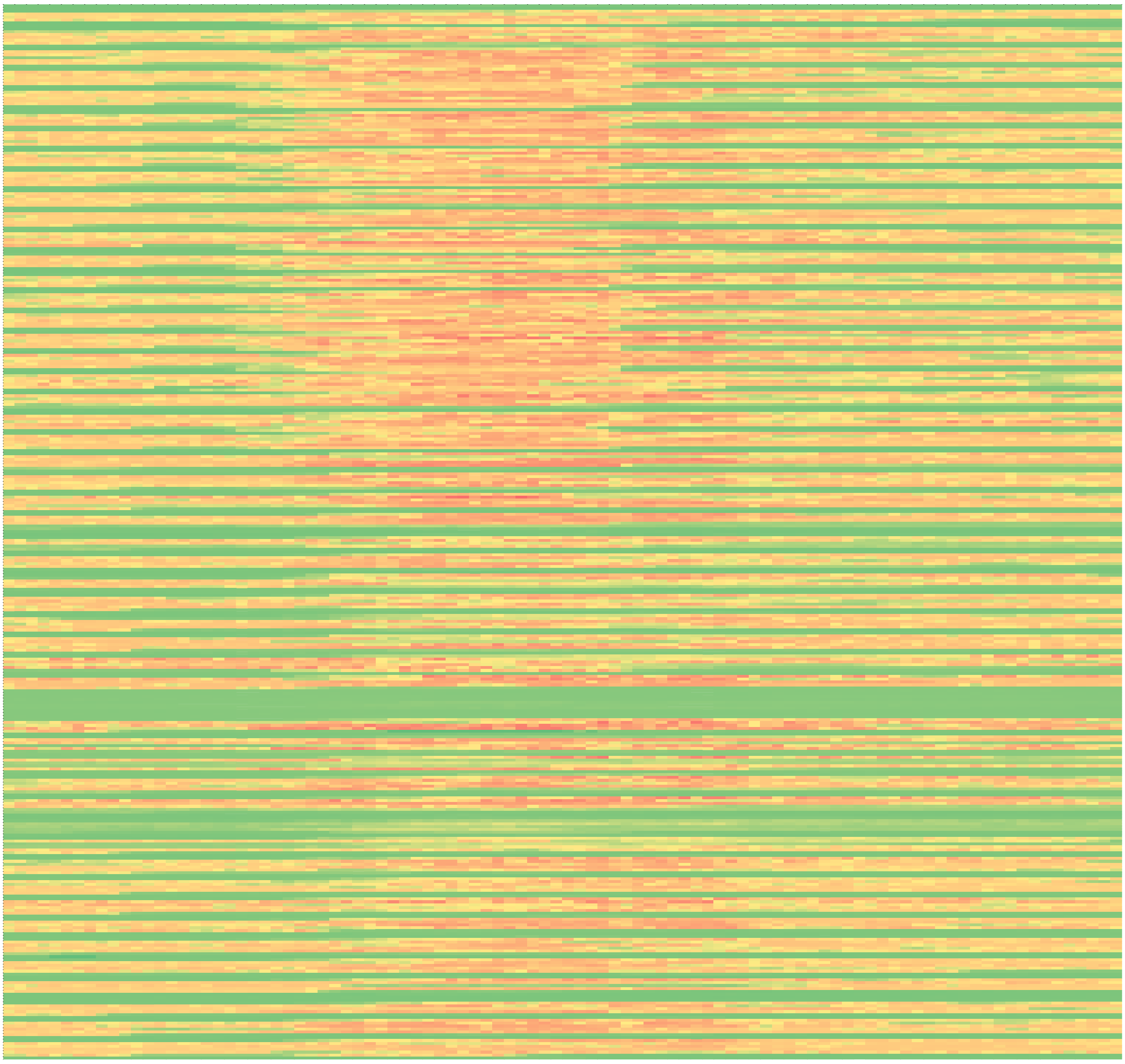


CuSum analysis does not show any significant underlying trends.

15 minute data from the energy supplier clearly shows shutdowns and breaks in production, but does not show any other notable trends. The heat map below shows half hourly data for 2022, with columns across the page for each half hourly period from midnight to midnight and each row representing one day. Higher consumption is shown in red and lower consumption in green. This clearly shows that at weekends there is no additional consumption on nights, but there is significant additional consumption during the day at weekends amounting to 15,446 kWh/yr costing €4,092. Analysis is recommended to determine what leads to this additional consumption at weekends.

Figure 8-8 Britvic Ballygowan (NW) weekday energy profiles

Figure 8-9 Britvic Ballygowan (NW) 15 minute electricity heat map



An electricity demand charge for 1,500 kVA is charged each month, however the maximum demand utilised over the period concerned was a 1,084 kVA. It would be possible to reduce the capacity charge to 1,300 kVA, however on the current tariff there are no charges associated with maximum demand charges. There is therefore currently no benefit in reducing the demand.

There is reactive power (kVArh) measured and quoted on the invoice, however there are currently no charges for reactive power. Reducing reactive power at source would reduce the current in cabling but otherwise would have no cost benefit.

There is a plan to install Solar PV on the roof to supply an estimated 6% of the site consumption. This will not save energy but will reduce carbon emissions by an estimated 57.4 tCO2e/yr.

8.3.2 LPG data analysis

LPG is ordered as and when the tank needs topping up, and there is no monitoring of consumption profiles.

8.3.3 Diesel data analysis

Diesel consumption is for mobile plant and would not be expected to correlate with either production or weather, however analysis does show a correlation with weather, although it is not a good correlation. It is very noticeable that diesel consumption was 30% higher over the period April to September, which may be due to ground maintenance. The additional consumption amounted to 2,430 kWh/yr with an additional cost of €370. This should be confirmed.

8.3.4 Sub metering data analysis

On SEAI energy efficiency audit Phase 2, sub-meters at Ballygowan (NW) were recorded on the same system as used in Kylemore. It would appear this sub metering data is no longer available. It is recommended to reconnect sub-meters at Ballygowan (NW) to a data historian, such that detailed analysis of energy performance can be conducted.

8.4 Energy saving opportunities summary

Table 8-2 Britvic Ballygowan (NW) Opportunity Summary

		Energy saving kWh/yr	Carbon saving tCO2e/yr	Cost saving €/yr	CAPEX €	OPEX €/yr	Payback yrs
NW 001	Additional weekend consumption	15,446	5.3	4,452	0	0	0.0
NW 002	Increased diesel consumption	2,430	0.6	411	0	0	0.0
NW 003	Reduce low pressure compressed air set point	46,305	16.0	13,356	5,000	0	0.4
NW 004	Monitoring and targeting	87,567	29.6	24,334	10,000	0	0.4
NW 005	Air leak detection	33,075	11.4	9,537	2,000	0	0.2
NW 006	Bottle blower air recovery	181,940	62.8	52,473	100,000	0	1.9
NW 007	Control cooling water flowrate to HP compressors using VSD	121,050	41.8	34,913	25,500	0	0.7
NW 008	Insulation jacket for plate heat exchanger on CIP	8,470	1.8	703	500	0	0.7
NW 009	Replace compressed air vibrators with electric	12,101	4.2	3,492	2,000	0	0.6
NW 010	Hot glue set back temperature	1,401	0.5	405	0	0	0.0
NW 011	HP compressor circulation pumps	15,048	5.2	4,343	25,500	0	5.9
NW 012	Low pressure compressor heat recovery	132,300	27.8	10,965	30,000	0	2.7
NW 013	Cool air feed to LP air compressors	6,613	2.3	1,908	5,000	0	2.6
NW 014	Cooling water from HP compressors to preheat CIP						
NW 015	CO2 evaporator economiser	21,600	7.5	6,233	20,000	0	3.2
NW 016	Airveyor controls	44,000	15.1	12,683	10,000	0	0.8
NW 017	Airveyor replace fan motors	13,152	4.5	3,790	6,000	0	1.6
NW 018	IT policy						
NW 019	Line 1 chiller Jetting						
NW 020	Line 1 chiller EC fans						
NW 021	Change fans on AHUs to EC fans	40,836	14.1	11,778	tbd	OPEX	tbd
NW 022	Wellhead 98-1 use energy efficient pump						
NW 023	Palletisers/depalletizes change compressed air ejectors to vac pump						
NW 024	Line 1 replace old conveyor motors with IE5						
NW 025	EC fans after each shrink tunnel for cooling	3,274	1.1	762	3,000	0	3.2
NW 026	External lighting						
NW 027	Server room temperature set point	440	0.2	130	0	0	0.0
NW 028	EC fans for free coolers on roof	63,612	21.9	16,853	1,489	0	2.1
NW 029	VSD on submersible pump on well head	3,556	1.2	942	82	0	2.9
NW 030	Insulate CIP lines	15,235	3.2	1,045	6,000	0	4.8
NW 031	Control softened water pump	19,250	6.6	5,549	0	0	0.0

Table 8-3 Britvic Ballygowan (NW) Prioritised Opportunity Summary

		Energy saving kWh/yr	Carbon saving tCO2e/yr	Cost saving €/yr	CAPEX €	OPEX €/yr	Payback yrs
NW 001	Additional weekend consumption	15,446	5.3	4,452	0	0	0.0
NW 002	Increased diesel consumption	2,430	0.6	411	0	0	0.0
NW 010	Hot glue set back temperature	1,401	0.5	405	0	0	0.0
NW 027	Server room temperature set point	440	0.2	130	0	0	0.0
NW 031	Control softened water pump	19,250	6.6	5,549	0	0	0.0
NW 005	Air leak detection	33,075	11.4	9,537	2,000	0	0.2
NW 003	Reduce low pressure compressed air set point	46,305	16.0	13,356	5,000	0	0.4
NW 004	Monitoring and targeting	87,567	29.6	24,334	10,000	0	0.4
NW 009	Replace compressed air vibrators with electric	12,101	4.2	3,492	2,000	0	0.6
NW 007	Control cooling water flowrate to HP compressors using VSD	121,050	41.8	34,913	25,500	0	0.7
NW 008	Insulation jacket for plate heat exchanger on CIP	8,470	1.8	703	500	0	0.7
NW 016	Airveyor controls	44,000	15.1	12,683	10,000	0	0.8
NW 017	Airveyor replace fan motors	13,152	4.5	3,790	6,000	0	1.6
NW 006	Bottle blower air recovery	181,940	62.8	52,473	100,000	0	1.9
NW 028	EC fans for free coolers on roof	63,612	21.9	16,853	1,489	0	2.1
NW 013	Cool air feed to LP air compressors	6,613	2.3	1,908	5,000	0	2.6
NW 012	Low pressure compressor heat recovery	132,300	27.8	10,965	30,000	0	2.7
NW 029	VSD on submersible pump on well head	3,556	1.2	942	82	0	2.9
NW 015	CO2 evaporator economiser	21,600	7.5	6,233	20,000	0	3.2
NW 025	EC fans after each shrink tunnel for cooling	3,274	1.1	762	3,000	0	3.2
NW 030	Insulate CIP lines	15,235	3.2	1,045	6,000	0	4.8
NW 011	HP compressor circulation pumps	15,048	5.2	4,343	25,500	0	5.9
NW 021	Change fans on AHUs to EC fans	40,836	14.1	11,778	tbd	OPEX	tbd
NW 014	Cooling water from HP compressors to preheat CIP						
NW 018	IT policy						
NW 019	Line 1 chiller Jetting						
NW 020	Line 1 chiller EC fans						
NW 022	Wellhead 98-1 use energy efficient pump						
NW 023	Palletisers/depalletizes change compressed air ejectors to vac pump						
NW 024	Line 1 replace old conveyor motors with IE5						
NW 026	External lighting						

8.5 Energy saving opportunities details

Opportunity ID	Title			
NW 001	Additional weekend consumption			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
15,446	4,092	360	0	0
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
0	5.3			
Opportunity Summary:	Investigate additional consumption at weekends			
Description of Savings and Assumptions:	15 minute data analysis clearly shows that at weekends there is no additional consumption on nights, but there is significant additional consumption during the day at weekends amounting to 15,446 kWh/yr costing €4,092. Analysis is recommended to determine what leads to this additional consumption at weekends.			
Next steps	Investigate baseload			

Opportunity ID	Title			
NW 002	Increased diesel consumption			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
2,430	370	41	0	0
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
0	0.6			
Opportunity Summary:	Investigate additional diesel consumption over summer			
Description of Savings and Assumptions:	It is very noticeable that diesel consumption was 30% higher over the period April to September, which may be due to ground maintenance. The additional consumption amounted to 2,430 kWh/yr with an additional cost of €370. This should be confirmed.			
Next steps	Investigate increased consumption			

Opportunity ID	Title			
NW 003	Reduce low pressure compressed air set point			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
46,305	12,268	1,088	5,000	0
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
0.4	16.0			
Opportunity Summary:	Reduce low pressure compressed air set point			
Description of Savings and Assumptions:	This opportunity was identified on Phase 1 and Phase 2: The low pressure air compressors were running at 8.5 barg (125 psig), to ensure enough pressure was available at the furthest points of the compressed air main. The pressure drop on the compressed air network seemed excessive, in that at the bottle blower (ca. 30m from compressor room) the pressure had dropped to 95 psi. Check compressed air pipework for restrictions causing pressure drop (size changes in pipe, excess fittings, partially open valves, very sharp bends). Modify pipework as required and reduce LP air pressure. It should be possible to reduce the LP compressor pressure to 6.5 barg (96 psig A 1 bar pressure reduction would save ca. 7% of the LP compressor power consumption. $Energy\ saving = 75\ kW\ x\ 70\%\ load\ x\ 6{,}300\ \left(\frac{hrs}{yr}\right) x\ 14\%\ saving$ $= 46{,}305\ \left(\frac{kWh}{yr}\right)$ $Energy\ cost\ saving = 46{,}305\ \left(\frac{kWh}{yr}\right) x\ 26.494\ \left(\frac{c}{kWh}\right) = 12{,}268\ (\frac{€}{yr})$ $Carbon\ saving = 46{,}305\ \left(\frac{kWh}{yr}\right) x\ 0.345\ \left(\frac{kgCO2e}{kWh}\right) = 16.0\ (\frac{tCO2e}{yr})$ It is suspected that there are minor pipework modifications needed to reduce the pressure drop (remove reducers etc). CAPEX of €5,000 is considered adequate			
Next steps	Check piping pressure drop and modify			

Opportunity ID	Title			
NW 004	Monitoring and targeting			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
87,567	22,321	2,013	10,000	0
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
0.4	29.6			
Opportunity Summary:	Complete update of EFT Energy Manager software, and use for monitoring and targeting			
Description of Savings and Assumptions:	This opportunity was identified on Phase 1 and Phase 2: KPIs are the most common method to measure energy performance, typically expressed as specific energy consumption (SEC). However, it is known that energy consumption per tonne is also dependent on production rate and product mix – a fixed KPI target does not take into account these known influencers. Monitoring and targeting (M&T) is a technique whereby dynamic energy consumption targets are calculated for main and sub meters, these targets being a function of variables such as production rate and weather conditions. Statistical methods are used to determine the target equations. Good electrical sub metering is already installed. One gas meter would be recommended, estimated installed and networked cost of €5,000. Some costs would also need to be allocated to set up appropriate reports and for training. An allowance of €5,000 is considered to be adequate. Experience across many similar production sites has shown a conservative potential to save 3% electricity and gas consumption through sub metering and analysis of data. $Energy\ saving = 3\%\ x\ (2{,}769{,}863\ (\frac{kWh}{yr})\ elec + \ 149{,}049\ (\frac{kWh}{yr})\ LPG) = 87{,}567\ (\frac{kWh}{yr})$ $Energy\ cost\ saving = 83{,}095\ \left(\frac{kWh}{yr}\right) x\ 26.494\ \left(\frac{c}{kWh}\right) + \ 4{,}471 \left(\frac{kWh}{yr}\right) x\ 6.860\ \left(\frac{c}{kWh}\right) = 22{,}321\ (\frac{€}{yr})$ $Carbon\ saving = 83{,}095\ \left(\frac{kWh}{yr}\right) x\ 0.345\ \left(\frac{kgCO2e}{kWh}\right) + \ 4{,}471 \left(\frac{kWh}{yr}\right) x\ 0.210\ \left(\frac{kgCO2e}{kWh}\right) = 29.6\ (\frac{tCO2e}{yr})$ Good energy management is the foundation on which an energy reduction effort is based, and it is recommended that energy management is improved as follows: • Improve metering and monitoring. Metering should be read automatically with consumption evaluated against a regression derived target from appropriate variables. • Allocate accountability for energy consumption according to the meters and site management structure.			

Opportunity ID	Title
	• Nominate energy champions for all areas of the site and set up a site energy improvement team that would meet regularly under the leadership of the energy manager. • Improve energy awareness and communication across the site and at all levels.
Next steps	Update software and connection to same system as Kylemore

Opportunity ID	Title			
NW 005	Air leak detection			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
33,075	8,762	775	2,000	0
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
0.2	11.4			
Opportunity Summary:	Ultrasonic compressed air leak detection would allow compressed air leaks to be detected and quantified whilst the plant was running			
Description of Savings and Assumptions:	This opportunity was identified on Phase 1 and Phase 2: An effective leak detection program includes checks and repairs at least every quarter and should reduce the compressed air consumption by 10% $Energy\ saving = 75\ kW\ x\ 70\%\ load\ x\ 6{,}300\ \left(\frac{hrs}{yr}\right) x\ 10\%\ saving = 33{,}075\ \left(\frac{kWh}{yr}\right)$ $Energy\ cost\ saving = 33{,}075\ \left(\frac{kWh}{yr}\right) x\ 26.494\ \left(\frac{c}{kWh}\right) = 8{,}762\ (\frac{€}{yr})$ $Carbon\ saving = 33{,}075\ \left(\frac{kWh}{yr}\right) x\ 0.345\ \left(\frac{kgCO2e}{kWh}\right) = 11.4\ (\frac{tCO2e}{yr})$ CAPEX would be required to purchase an ultrasonic leak tester. It is recommended to buy an analogue meter which will indicate a decibel reading, such that each leak can be quantified. €2,000 The cost of leak repairs is considered these repairs should be included in ongoing maintenance good practice.			
Next steps	Recommendation is that air leak detection is completed every 3 months. It is suggested that this is completed using internal resources.			

Opportunity ID	Title			
NW 006	Bottle blower air recovery			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
181,940	48,203	4,270	100,000	0
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
1.9	62.8			
Opportunity Summary:	Recover exhausted low pressure air from bottle blowing and reuse as low pressure supply on bottle blower			
Description of Savings and Assumptions:	This opportunity was identified on Phase 1 and Phase 2: Many manufacturers offer air recovery in order to minimise low pressure air generation. The site obtained a quotation about 14 years ago (by John Roche), at which time the CAPEX quoted was €30,000 (an estimate of €100,000 for current costs has been used). The manufacturer estimates 15% energy saving through air recovery (bottle blower + high pressure blowers). This opportunity is limited currently at Ballygowan due to the limited operating hours. Should the plant in the future operate 24/7 this opportunity should be re-evaluated, as the payback should half. http://www.sidel.com/media/138697/blowing_solutions_gb_2012.pdf Energy consumption was measures on ESOS Phase 2 and this value has been used below, as up to date actual consumption figures were not available. $Energy\ saving = 1{,}212{,}933\ \left(\frac{kWh}{yr}\right) x\ 15\% = 181{,}940\ \left(\frac{kWh}{yr}\right)$ $Cost\ saving = 181{,}940\ \left(\frac{kWh}{yr}\right) x\ 26.494\ \left(\frac{€}{yr}\right) = 48{,}203\ (\frac{€}{yr})$ $Carbon\ saving = 181{,}940\ \left(\frac{kWh}{yr}\right) x\ 0.345\ \left(\frac{kgCO2e}{kWh}\right) = 62.8\ (\frac{tCO2e}{yr})$ CAPEX €100,000			
Next steps	Get up to date quotations and benefits analysis from Sidel			

Opportunity ID	Title			
NW 007	Bottle blowing Tricool circulation pumps			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
121,050	32,071	2,842	25,500	0
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
0.7	41.8			
Opportunity Summary:	All of the cooling water pumps for the HP compressors run continuously at single speed. Fit variable speeds to slow down the pumps when the compressor is not in use. The cooling systems are not shut off at any point because the compressors can come on and off load at any point due to the control system.			
Description of Savings and Assumptions:	This opportunity was identified on Phase 2. Detailed description of this opportunity is included in Britvic Kylemore and Ballygowan Sites – Grundfos Proposal, dated 09/09/2022 $Energy\ saving = 121{,}050\ \left(\frac{kWh}{yr}\right)$ $Energy\ cost\ saving = 121{,}050\ \left(\frac{kWh}{yr}\right) x\ 26.494\ \left(\frac{c}{kWh}\right) = 32{,}071\ \left(\frac{€}{yr}\right)$ $Carbon\ saving = 121{,}050\ \left(\frac{kWh}{yr}\right) x\ 0.345\ \left(\frac{kgCOe}{kWh}\right) = 41.8\ \left(\frac{tCO2e}{yr}\right)$ $CAPEX\ quotation$ €25,500			
Next steps				

Opportunity ID	Title			
NW 008	Insulation jacket for plate heat exchanger on CIP			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
8,470	581	122	500	0
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
0.7	1.8			
Opportunity Summary:	Insulate jacket plate pack in CIP room			
Description of Savings and Assumptions:	This opportunity was identified on Phase 2. Heat losses have been calculated using 3E-Plus https://insulationinstitute.org/tools-resources/free-3e-plus/ $Energy\ saving\ =\ 2.4\ kW\ x\ 3{,}000\ \left(\frac{hrs}{yr}\right)\ x\ \left(\frac{1}{0.85}\right) boiler\ eff\ = 8{,}470\ (\frac{kWh}{yr})$ $Energy\ cost\ saving\ = 8{,}470 \left(\frac{kWh}{yr}\right) x\ 6.860\ (\frac{c}{kWh}) = 581 \left(\frac{€}{yr}\right)$ $Carbon\ saving\ = 8{,}470\ \left(\frac{kWh}{yr}\right) x\ 0.210\ \left(\frac{kgCO2e}{yr}\right) = 1.8\ (\frac{tCO2e}{yr})$ CAPEX €500			
Next steps	Insulate			

Opportunity ID	Title			
NW 009	Replace compressed air vibrators with electric			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
12,101	3,206	286	2,000	0
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
0.3	4.2			
Opportunity Summary:	2 compressed air driven vibrators are used on Line 3 These use compressed air and use 83 L/min at 2 barg. These are also not isolated when the line is down. Replace with electric vibrators			
Description of Savings and Assumptions:	Assume: • Running hours of 5,800 hrs/yr • Existing vibrator will use 83 L/min air at 2 barg, equivalent to 249 L/min at STP, this compressed air will cost roughly 0.36 c/min, or 12,275 kWh/yr • Equivalent electric vibrator will use 30W. If running continuously 174 kWh/yr There are two vibrators $Electricty\ saving = 2\ x\ (12{,}275\ (\frac{kWh}{yr}) - 174\ (\frac{kWh}{yr})) = 12{,}101\ (\frac{kWh}{yr})$ $Energy\ cost\ saving = 12{,}101 \left(\frac{kWh}{yr}\right) x\ 26.494\ \left(\frac{c}{kWh}\right) = 3{,}206(\frac{€}{yr})$ $Carbon\ saving = 12{,}101\ \left(\frac{kWh}{yr}\right) x\ 0.345\ \left(\frac{kgCO2e}{kWh}\right) = 4.2\ (\frac{tCO2e}{yr})$ CAPEX ca. €1,000 each installed			
Next steps	Engineering project			

Opportunity ID	Title			
NW 010	Hot glue set back temperature			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
1,401	371	34	0	0
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
0	0.5			
Opportunity Summary:	Hot glue is used on all lines for the top and bottom of cartons. Use automatic set back temperatures to reduce the glue temperature and power consumption when the line is idle			
Description of Savings and Assumptions:	This opportunity was identified on Phase 2. Assumptions: • Used power consumption calculator https://www.nordson.com/en/divisions/adhesive-dispensing-systems/service-and-support/calculators • Power consumption on temperature but not delivering ca. 525 W • Power consumption at set back temperature ca. 350 W • 20% of time not producing • 2 Glue pot per line on Lines 1 and 3 $Energy\ saving = (525\text{W} - 325\text{W})\text{x } 4 \text{ pots x } 8{,}760 \left(\frac{\text{hrs}}{\text{yr}}\right) \text{x } 20\% = 1{,}401 \left(\frac{\text{kWh}}{\text{yr}}\right)$ $Energy\ cost\ saving = 1{,}401 \frac{kWh}{yr} x\ 26.494 \left(\frac{\text{c}}{\text{kWh}}\right) = 371 \left(\frac{€}{\text{yr}}\right)$ $Carbon\ saving = 1{,}401 \left(\frac{kWh}{yr}\right) x\ 0.345 \left(\frac{kgCO2e}{kWh}\right) = 0.5 \left(\frac{tCO2e}{yr}\right)$ There is no CAPEX as the setback function is built into each glue melter.			
Next steps	Use function			

Opportunity ID	Title			
NW 011	HP compressor circulation pumps			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
15,048	3,986	357	25,500	0
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
5.9	5.2			
Opportunity Summary:	Each of three compressors has a circulation pump. These could be replaced with more efficient pumps			
Description of Savings and Assumptions:	A full description of this opportunity can be found in Britvic Kylemore and Ballygowan Sites – Grundfos Proposal, dated 09/09/2022 $Energy\ saving = 15{,}048\ \left(\frac{\mathrm{kWh}}{\mathrm{yr}}\right)$ $Energy\ cost\ saving = 15{,}048 \frac{kWh}{yr} x\ 26.494 \left(\frac{\mathrm{c}}{\mathrm{kWh}}\right) = 3{,}986\ \left(\frac{€}{\mathrm{yr}}\right)$ $Carbon\ saving = 15{,}048\ \left(\frac{kWh}{yr}\right) x\ 0.345\ \left(\frac{kgCO2e}{kWh}\right) = 5.2\ \left(\frac{tCO2e}{yr}\right)$ CAPEX from the Grundfos proposal would be €25,500			
Next steps	Use function			

Opportunity ID	Title			
NW 012	Low pressure compressor heat recovery			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
132,300	9,075	1,890	30,000	-
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
2.7	27.8			
Opportunity Summary:	Fit heat recovery to low pressure compressors			
Description of Savings and Assumptions:	There is a large amount of waste heat in air compressors. Specific coolers on low pressure air compressors can provide water at up to 80ºC. The low-pressure compressors are about 20% efficient ie: 80% of the energy input results in heat. Of the order of 40% of the available heat can be recovered as hot water. $Energy\ saving = 75\ kW\ x\ 70\%\ load\ x\ 6{,}300\ \left(\frac{hrs}{yr}\right) x\ 40\%\ heat\ recovery$ $= 132{,}300\ (\frac{kWh}{yr})$ $Energy\ cost\ saving = 132{,}300\ \left(\frac{kWh}{yr}\right) x\ 6.860 \left(\frac{c}{kWh}\right) = 9{,}075\ \left(\frac{€}{yr}\right)$ $Carbon\ saving = 132{,}300\ \left(\frac{kWh}{yr}\right) x\ 0.210\ \left(\frac{kgCO2e}{kWh}\right) = 27.8\ (\frac{tCO2e}{yr})$ CAPEX on the LP compressors as is estimated as €30,000 for 2 compressors			
Next steps	Investigate with compressor suppliers			

Opportunity ID	Title			
NW 013	Cool air feed to LP air compressors			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
6,613	1,752	156	5,000	-
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
2.6	2.3			
Opportunity Summary:	Fit heat recovery to low pressure compressors			
Description of Savings and Assumptions:	During the assessment it was noted that the ambient temperature around the low pressure air compressors was elevated. If cooler air could be ducted to the air compressors from outside it is expected that the temperature could be dropped by at least 5°C, which would reduce the electricity consumption by 2% • 5°C reduction in inlet temperature to a compressor would result in ca. 2% reduction in electricity consumption. $Energy\ saving = 75\ kW\ x\ 70\%\ load\ x\ 6{,}300\ \left(\frac{hrs}{yr}\right) x\ 2\%\ saving = 6{,}613\ (\frac{kWh}{yr})$ $Energy\ cost\ saving = 6{,}613\ \left(\frac{kWh}{yr}\right) x\ 26.494 \left(\frac{c}{kWh}\right) = 1{,}752\ \left(\frac{€}{yr}\right)$ $Carbon\ saving = 6{,}613\ \left(\frac{kWh}{yr}\right) x\ 0.345\ \left(\frac{kgCO2e}{kWh}\right) = 2.3\ (\frac{tCO2e}{yr})$ CAPEX for better ventilation €5,000			
Next steps	Investigate with compressor suppliers			

Opportunity ID	Title			
NW 014	Cooling water from HP compressors to preheat CIP			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
Opportunity Summary:	Heat recovery from cooling water to preheat CIP			
Description of Savings and Assumptions:	This is an existing project being developed at Ballygowan			
Next steps				

Opportunity ID	Title			
NW 015	CO2 evaporator economiser			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
21,600	5,723	510	20,000	0
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
3.2	7.5			
Opportunity Summary:	CO2 is evaporated using electricity (9 x 6kW) and the resultant gaseous CO2 is ca. 70-80°C. Fit economiser to recover heat from gaseous CO2 to pre-heat			
Description of Savings and Assumptions:	Such an economiser has been installed recently at Beckton. Assumptions: Operating hours 4,000 hrs/yr 50% load when running Through heat recovery 20% saving $Energy\ saving = (9\ x\ 6kW\ x\ 50\%) x\ 4{,}000 \left(\frac{hrs}{yr}\right) x\ 20\%\ saving$ $= 21{,}600 \left(\frac{kWh}{yr}\right)$ $Energy\ cost\ saving = 21{,}600 \left(\frac{kWh}{yr}\right) x\ 26.494 \left(\frac{c}{kWh}\right) = 5{,}723 \left(\frac{€}{yr}\right)$ $Carbon\ saving = 21{,}600 \left(\frac{kWh}{yr}\right) x\ 0.345 \left(\frac{kgCO2e}{kWh}\right) = 7.5 \left(\frac{tCO2e}{yr}\right)$ CAPEX est €20,000			
Next steps	Contact Beckton to get details of design and project			

Opportunity ID	Title			
NW 016	Airveyor controls			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
44,000	11,657	1,026	10,000	-
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
0.8	15.1			
Opportunity Summary:	All Airveyors are single speed and continue running when the line is not filling. Fit controls to switch of blowers when line is not producing			
Description of Savings and Assumptions:	The Air veyors on Line 3 has single speed fans and will continue running when the line is down. Introduce control logic to switch off blowers when production not running. There are controls at Beckton where sensors on the first and last Airveyor control whether the other fans run ie: other fans only run when there are bottles being transported. Assumptions: 10 off 2.2 kW EFF2 Air-veyor blowers per line. Save 2,000 hrs running time $Energy\ saving = 10\ x\ 2.2\ kW\ x\ 2{,}000 \left(\frac{hrs}{yr}\right) = 44{,}000 \left(\frac{kWh}{yr}\right)$ $Energy\ cost\ saving = 44{,}000 \left(\frac{kWh}{yr}\right) x\ 26.494 \left(\frac{c}{kWh}\right) = 11{,}657 \left(\frac{€}{yr}\right)$ $Carbon\ saving = 44{,}000 \left(\frac{kWh}{yr}\right) x\ 0.345 \left(\frac{kgCO2e}{yr}\right) = 15.1 \left(\frac{tCO2e}{yr}\right)$ Assumption has been made that this can be performed through PLC logic and programme changes. CAPEX to reprogramme €10,000			
Next steps	Internal discussions with other Britvic sites where solution already installed			

<table>
<tr><th>Opportunity ID</th><th colspan="4">Title</th></tr>
<tr><td>NW 017</td><td colspan="4">Airveyor replace fan motors</td></tr>
<tr><th>Energy Savings (kWh)</th><th>Energy Cost Saving (€/yr)</th><th>Other Savings (€/yr)</th><th>Budget Capital Cost (€)</th><th>O&M Cost (€/yr)</th></tr>
<tr><td>13,152</td><td>3,484</td><td>306</td><td>6,000</td><td>-</td></tr>
<tr><th>Simple Payback, Years</th><th>Carbon Savings (tCO2e/yr)</th><th></th><th></th><th></th></tr>
<tr><td>1.6</td><td>4.5</td><td></td><td></td><td></td></tr>
<tr><th>Opportunity Summary:</th><td colspan="4">All Airveyors are single speed and continue running when the line is not filling. Fit controls to switch of blowers when line is not producing</td></tr>
<tr><th>Description of Savings and Assumptions:</th><td colspan="4">The Air veyors on Line 3 has single speed fans and will continue running when the line is down. Introduce control logic to switch off blowers when production not running.
There are controls at Beckton where sensors on the first and last Airveyor control whether the other fans run ie: other fans only run when there are bottles being transported.
Assumptions:
• 10 off 2.2 kW EFF2 Air-veyor blowers per line.
• Running 5,000 hrs/yr
• 2.2 kW EFF2 4 pole, 81% efficient
• 2.2 kW IE4 4 pole, 92% efficiency
$Energy\ saving = 10\ x\ 2.2\ kW\ x\ 5{,}000 \left(\frac{hrs}{yr}\right)\ x\ (1 - \left(\frac{81}{92}\right)) = 13{,}152 \left(\frac{kWh}{yr}\right)$
$Energy\ cost\ saving = 13{,}152 \left(\frac{kWh}{yr}\right) x\ 26.494 \left(\frac{c}{kWh}\right) = 3{,}484 \left(\frac{€}{yr}\right)$
$Carbon\ saving = 13{,}152 \left(\frac{kWh}{yr}\right) x\ 0.345 \left(\frac{kgCO2e}{yr}\right) = 4.5 \left(\frac{tCO2e}{yr}\right)$
Assume CAPEX €500 each plus €100 fitting</td></tr>
<tr><th>Next steps</th><td colspan="4">Internal discussions with other Britvic sites where solution already installed</td></tr>
</table>

Opportunity ID	Title			
NW 018	IT Policy			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
Opportunity Summary:	Set IT policy to switch computers to standby when not used, instead of leaving on standby.			
Description of Savings and Assumptions:	A small number of computer screens were seen to be left on standby for long periods of time. Assumptions: • On screensaver , a computer screen may use 50W • On standby a computer screen should only use 0.5W			
Next steps				

Opportunity ID	Title			
NW 019	Line 1 chiller Jetting			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
Opportunity Summary:	Jet clean condenser on Line 1 chiller			
Description of Savings and Assumptions:	External condenser units tend to gradually foul with dust and pollen. Jetting from inside to outside once or twice a year has been shown to reduce energy consumption by ca. 10% The chiller on Line 1: Onda TBE/22/2/S There are no measurements of power consumption on the chiller available. Further investigations and measurements are therefore required in order to quantify this opportunity.			
Next steps	Add jetting from inside to outside for all chilling units on the maintenance schedule			

Opportunity ID	Title			
NW 020	Line 1 chiller EC fans			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
Opportunity Summary:	Fit EC fans on line 1 chiller			
Description of Savings and Assumptions:	The chiller has a number of fans. These are standard AC motors. EC fans have a different type of motor which could save up to 30% energy consumption			
Next steps	Investigate with refrigeration contractor the potential for fitting EC fans			

Opportunity ID	Title			
NW 021	Fit EC fans to AHUs			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
40,836	10,819	959	Tbd	0
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
tbd	14.1			
Opportunity Summary:	Change AHU fans			
Description of Savings and Assumptions:	EC fans are electrically commutated fans and have much higher efficiency than standard induction motors with variable speeds. Change the existing fans for EC plug fans. https://www.axair-fans.co.uk/industrial-applications-industrial-fans/ec-plug-fans-ec-fangrid-retrofits/ https://www.ebmpapst.com/content/dam/ebm-papst/loc/apac/australia/brochures/ebm-papst_EC_Plug_Fans_in_AHU_Applications_Best_Practice_Guide_2018-01_r1.pdf https://www.ziehl-abegg.com/en-gb/product-range/centrifugal-fans AHU 1: 37 KW, 1.5KW, 4KW. AHU 2: 37 KW, 4KW, 1.6KW. AHU 3 7.5 KW Assumptions: Claims by suppliers of up to 30% saving, assume conservative 10% saving 6,300 hrs/yr operation 70% load $Energy\ saving = 92.6\ kW\ x\ 70\%\ load\ x\ 6{,}300\ \left(\frac{hrs}{yr}\right) x\ 10\%\ saving$ $= 40{,}836\ (\frac{kWh}{yr})$ $Energy\ cost\ saving = 40{,}836\ \left(\frac{kWh}{yr}\right) x\ 26.494\ \left(\frac{c}{kWh}\right) = 10{,}819\ \left(\frac{€}{yr}\right)$ $Carbon\ saving = 40{,}836\ \left(\frac{kWh}{yr}\right) x\ 0.345\ \left(\frac{kgCO2e}{kWh}\right) = 14.1\ \left(\frac{tCO2e}{yr}\right)$ CAPEX would be required for new fans and there would need to be structural changes to fit the fans			
Next steps	Further engineering investigations are required to determine CAPEX.			

<table>
<tr><th>Opportunity ID</th><th colspan="4">Title</th></tr>
<tr><td>NW 022</td><td colspan="4">Wellhead 98-1 use energy efficient pump</td></tr>
<tr><td>Energy Savings (kWh)</td><td>Energy Cost Saving (€/yr)</td><td>Other Savings (€/yr)</td><td>Budget Capital Cost (€)</td><td>O&M Cost (€/yr)</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Simple Payback, Years</td><td>Carbon Savings (tCO2e/yr)</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Opportunity Summary:</td><td colspan="4">Change pump/motor</td></tr>
<tr><td>Description of Savings and Assumptions:</td><td colspan="4">Current pump 7.5 kW Grundfos 27/9. With submersible ground water pumps there are special submersible motors. It is not known whether alternative efficiency motors would be available for this specialist application.

Investigations with suppliers is recommended.</td></tr>
<tr><td>Next steps</td><td colspan="4">Investigations with suppliers is recommended.</td></tr>
</table>

Opportunity ID	Title			
NW 023	Palletisers/depalletizes change compressed air ejectors to vac pump			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
Opportunity Summary:	The palletiser/depalletisers use air ejectors using compressed air to produce vacuum to lift cardboard sheets and place them. These were seen to be left on when the packing line was not in use. They also use a lot of compressed air. Replace with vacuum pump.			
Description of Savings and Assumptions:	Consider using vacuum pump instead of air ejectors. The air ejectors use compressed air to form a vacuum, typically in the range 1.5 SCFM (42.5 SLPM) to 17 SCFM (476 SLPM) at 80 PSIG (5.5 Bar) and there are 4 ejectors/nozzles per palletiser. Further investigations are needed to check the model and air flowrate being used. This could then be compared with a vacuum pump. https://blog.exair.com/tag/vacuum-ejector/ As a minimum it should be ensured that the sheet placer/remover is back in the park/off position when no pallet is present.			
Next steps				

Opportunity ID	Title			
NW 024	Line 1 replace old conveyor motors with IE5			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
Opportunity Summary:	Replace old conveyor motors with energy efficient motors and drives			
Description of Savings and Assumptions:	The motors and drives on Line 1 conveyors are old and inefficient. Change to IE4/IE5 would achieve an energy saving of It is likely that to replace old motors on Line 1, both motors and drives would need to be replaced. This has been achieved elsewhere within Britvic: Leeds Line 5: IE4 motors Beckton Line 5: IE4 motors Beckton Line 6: IE5 motors An efficiency gain of 8-10% would be expected by changing the motor alone, and additional 5-10% would also be achieved by changing the drive			
Next steps	Internal discussions with Leeds and Beckton on implementation of IE4 and IE5 motors.			

Opportunity ID	Title			
NW 025	EC fans after each shrink tunnel for cooling			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
3,274	867	75	3,000	0
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
3.2	1.1			
Opportunity Summary:	Change fans to fit EC fans			
Description of Savings and Assumptions:	EC stands for Electronically Commutated, and it combines AC and DC voltages. The energy losses in these motors and fans are much lower than using conventional fans, and can give up to 70% saving. https://www.airtecnics.com/technology/ec-fans-advantages https://www.axair-fans.co.uk/all-technical-information/ec-technology-ec-fans/ Assumptions: 2 x 1.1 kW fans on each line Average utilisation 80% for Line 3. With low utilisation on Line 1 would not be economic to change Conservative 30% saving $Energy\ saving = 2\ x\ 1.1\ kW\ x\ 6{,}200\ \left(\frac{Hrs}{yr}\right) x\ 80\%\ uilisation\ x\ 30\%\ saving$ $= 3{,}274\ \left(\frac{kWh}{yr}\right)$ $Energy\ cost\ saving = 3{,}274\ \left(\frac{kWh}{yr}\right) x\ 26.494\ \left(\frac{c}{kWH}\right) = 867\ \left(\frac{€}{yr}\right)$ $Carbon\ saving = 3{,}274\ \left(\frac{kWh}{yr}\right) x\ 0.345\ \left(\frac{kgCO2e}{kWh}\right) = 1.1$ CAPEX est €3,000			
Next steps	Arrange steam trap survey minimum of once per year			

Opportunity ID	Title			
NW 026	External lighting			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
Opportunity Summary:	Switch lighting off during daylight hours and at weekends			
Description of Savings and Assumptions:	It was noted that some lighting was on during the day, and on discussion it was stated that external lighting was still used at weekends. Investigate lighting controls to ensure off in the day and switched off at weekends			
Next steps	Investigate lighting controls			

Opportunity ID	Title			
NW 027	Server room temperature set point			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
440	116	14	0	0
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
0	0.2			
Opportunity Summary:	Increase server room temperature set point to 22-24°C			
Description of Savings and Assumptions:	The server room temp3erature set point was 19°C. Modern servers do not need such a low temperature, and a set point of 22-24°C should be adequate. The server room was fitted with a Mitsubishi MSZ-AP42VGK, when cooling uses 1.2 kW. Assumptions • 1°C temperature increase would yield 2% energy saving $Energy\ saving = 1.2\ kW\ x\ 70\%\ av\ load\ x\ 8.760\ \left(\frac{hrs}{yr}\right) x\ 6\%\ saving = 440\ \left(\frac{kWh}{yr}\right)$ $Energy\ cost\ saving = 440\ \left(\frac{kWh}{yr}\right) x\ 26.494\ \left(\frac{c}{kWH}\right) = 116\ \left(\frac{€}{yr}\right)$ $Carbon\ saving = 440\ \left(\frac{kWh}{yr}\right) x\ 0.345\ \left(\frac{kgCO2e}{kWh}\right) = 0.2$			
Next steps	Investigate lighting controls			

Opportunity ID	Title			
NW 028	EC fans for free coolers on roof			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
63,612	16,853	1,489	39,000	0
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
2.1	21.9			
Opportunity Summary:	Change fans to fit EC fans			
Description of Savings and Assumptions:	EC stands for Electronically Commutated, and it combines AC and DC voltages. The energy losses in these motors and fans are much lower than using conventional fans, and can give up to 70% saving. https://www.airtecnics.com/technology/ec-fans-advantages https://www.axair-fans.co.uk/all-technical-information/ec-technology-ec-fans/ Assumptions: Cooler 1 6 x 3.9 kW Cooler 2 6 x 1.6 kW Cooler 3 6 x 3.9 kW Cooler 4 8 x 1.5 kW Average utilisation 50% Conservative 30% saving $Energy\ saving = 68.4\ \mathrm{kW}\ x\ 6{,}200\ \left(\frac{Hrs}{yr}\right) x\ 50\%\ uilisation\ x\ 30\%\ saving$ $= 63{,}612\ \left(\frac{kWh}{yr}\right)$ $Energy\ cost\ saving = 63{,}612\ \left(\frac{kWh}{yr}\right) x\ 26.494\ \left(\frac{c}{kWH}\right) = 16{,}853\ \left(\frac{€}{yr}\right)$ $Carbon\ saving = 63{,}612\ \left(\frac{kWh}{yr}\right) x\ 0.345\ \left(\frac{kgCO2e}{kWh}\right) = 21.9\ (\frac{\mathrm{tCO2e}}{\mathrm{yr}})$ CAPEX est 26 x €1,500			
Next steps	Approach suppliers			

Opportunity ID	Title			
NW 029	VSD on submersible pump on well head			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
3,556	942	82	3,000	0
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
2.9	1.2			
Opportunity Summary:	Fit variable speed drive and slow at weekends			
Description of Savings and Assumptions:	The well head pumps runs continuously at single speed, including at weekends. It is suggested to fit a variable speed drive and to slow to 80-90% speed at weekends. This would still ensure that there is a constant flow to maintain good quality water. Assumptions: • 7.5 kW pump running normally at 70% load • 10% sped reduction at weekends $Energy\ saving = 7.5\ \mathrm{kW\ x\ 70\%\ load\ x\ 2{,}500} \left(\frac{\mathrm{hrs}}{\mathrm{yr}}\right) \mathrm{x}\ (1 - 0.9^3)\ = 3{,}556 \left(\frac{kWh}{yr}\right)$ $Energy\ cost\ saving = 3{,}556 \left(\frac{kWh}{yr}\right) x\ 26.494 \left(\frac{c}{kWH}\right) = 942 \left(\frac{€}{yr}\right)$ $Carbon\ saving = 3{,}556 \left(\frac{kWh}{yr}\right) x\ 0.345 \left(\frac{kgCO2e}{kWh}\right) = 1.2\ (\frac{\mathrm{tCO2e}}{\mathrm{yr}})$ CAPEX est for one off 7.5 kW VSD €3,000 installed			
Next steps	Approach suppliers			

Opportunity ID	Title			
NW 030	Insulate CIP lines			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
15,235	1,045	218	6,000	0
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
4.8	3.2			
Opportunity Summary:	Insulate			
Description of Savings and Assumptions:	Insulate all hot CIP lines. Heat losses have been calculated using 3e -Plus (https://insulationinstitute.org/tools-resources/free-3e-plus/) $Energy\ saving = 20\text{ m x }\left(281\frac{\text{W}}{\text{m}} - 22\frac{\text{W}}{\text{m}}\right)\text{x } 2{,}500\ \left(\frac{\text{hrs}}{\text{yr}}\right)\text{x}\frac{1}{0.85}\text{boiler eff}$ $= 15{,}235\ \left(\frac{kWh}{yr}\right)$ $Energy\ cost\ saving = 15{,}235\ \left(\frac{kWh}{yr}\right) x\ 6.860 \left(\frac{c}{kWh}\right) = 1{,}045\ \left(\frac{€}{yr}\right)$ $Carbon\ saving = 15{,}235\ \left(\frac{kWh}{yr}\right) x\ 0.210\ \left(\frac{kgCO2e}{kWh}\right) = 3.2\ (\frac{\text{tCO2e}}{\text{yr}})$ CAPEX est at €300/m = €6,000			
Next steps	Arrange steam trap survey minimum of once per year			

Opportunity ID	Title			
NW 031	Control softened water pump			
Energy Savings (kWh)	Energy Cost Saving (€/yr)	Other Savings (€/yr)	Budget Capital Cost (€)	O&M Cost (€/yr)
19,250	5,100	449	0	0
Simple Payback, Years	Carbon Savings (tCO2e/yr)			
0	6.6			
Opportunity Summary:	Pump control			
Description of Savings and Assumptions:	An 11 kW softened water pump operates continuously at 18 barg delivery pressure, whereas only actually need 3 barg delivery pressure. Reduce the pump speed to control the delivery pressure instead of using a valve. Assumptions: Based on pump curves this could save 50% $Energy\ saving = 11\text{ kW x }70\%\text{ load x }5{,}000\left(\frac{\text{hrs}}{\text{yr}}\right)\text{ x }50\%\text{ saving} = 19{,}250\left(\frac{kWh}{yr}\right)$ $Energy\ cost\ saving = 19{,}250\ \left(\frac{kWh}{yr}\right) x\ 26.494\left(\frac{c}{kWh}\right) = 5{,}100\ \left(\frac{€}{yr}\right)$ $Carbon\ saving = 19{,}250\ \left(\frac{kWh}{yr}\right) x\ 0.345\ \left(\frac{kgCO2e}{kWh}\right) = 6.6\ (\frac{\text{tCO2e}}{\text{yr}})$			
Next steps	Adjust pump			

9.0 Closure

This report has been prepared by SLR Consulting Ltd with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the client. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.

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