BRIGHTON HOVE & SUSSEX SIXTH FORM COLLEGE

Net-zero action plan

February 2022

v.02

CARBON TRUST

EXECUTIVE SUMMARY

BHASVIC's measured footprint for the academic year 2018/19 was calculated to be 788.2 tCO_2e across all emission scopes (exc. commuting due to data restrictions). The majority of this Action Plan focusses on emission categories recommended for inclusion within the College's net-zero target, though credible carbon action should also address wider emission sources, such as procurement, even if they are not regularly reported due to data constraints.

The College should be aware of standards and best-practice related to net-zero and understand internally what a decarbonised BHASVIC looks like. Currently, the science-based target initiative (SBTi) corporate standard provides the only comprehensive definition of net-zero and sets out that a 2030 net-zero target is extremely hard to achieve, and potentially unattainable. However, impactful climate action can still be realised without strict alignment and transparent communication of BHASVIC's aspirations and subsequent actions should be the primary validation of BHASVIC's climate credentials.

BHASVIC scored 52% in a self-assessment against the Climate Action Roadmap for Further Education Colleges. A self-assessment document has been created to quantify and monitor BHASVIC's performance against the plan, which is recommended to be reported annually alongside standard carbon reporting. The baseline assessment is broadly aligned to the College's aspiration to become a leading institution by September 2023, and BHASVIC should assign actions and action owners to priority activities to continually improve their progress against the roadmap.

An energy audit confirmed that BHASVIC's campus performs to a good level of energy efficiency. The majority of 'low-hanging fruit' that can be readily implemented and achieve quick paybacks is limited, and the College will now have to turn its attention to a) optimising existing systems to achieve incremental gains, and b) displacing fossil fuel use on the campus with step-change heat decarbonisation projects.

Modelling of quantified projects estimates a total emission reduction of 179 tCO_2e on the baseline year, resulting in residual emissions of 232 tCO_2e. Additional emission reductions can also be expected from the implementation of 'further measures' that were identified and not quantified in this analysis. The majority of emission reductions are expected from 2027, when a) the majority of heating on the campus is expected to transition from natural gas to electric, and b) the forecasted emissions intensity of electricity from the national grid significantly decreases.

The above reduction represents an average annual reduction equal to 4.36% of the baseline emissions, which can be considered aligned to the goals of the Paris Agreement where a minimum annual reduction of 4.2% is consistent with a 1.5°C warming scenario.

EXECUTIVE SUMMARY

A total expenditure of £418,275 is anticipated with a combined payback of 24.3 years. The results are reflective of BHASVIC's current position as a high-performing site, and the shift away from cost-effective energy efficiency projects (e.g., LED lighting) to projects that prioritise carbon reduction over financial return. Additional development costs beyond the capital cost estimates provided should be anticipated (e.g., further feasibility studies, additional grid capacity if required)

The modelling estimates that annual fuel will be ~£30,000 higher in 2030 relative to the baseline year due to transition to higher-value electricity. This is often mitigated by complementary opportunities that can achieve quick paybacks (e.g., LED lighting), but which have been largely maximised by BHASVIC already. Existing practices should be optimised as much as possible to achieve incremental gains, the sum of which will help to mitigate the financial impact of pivotal decarbonisation projects.

Significant cost reductions (both capital and operational) are anticipated by the time BHASVIC replace their incumbent heating systems and the figures presented are representative of market costs at the time of analysis and are expected to be outdated by the time the College arrives at the point of replacement.

Despite the costs, low-carbon heating systems must be implemented for the College to achieve their decarbonisation ambitions. Electric heat pumps are recommended and a preliminary feasibility study should be conducted to prepare the College for the transition and notify them if any ancillary work is required in advance of installation. The College should remain aware of advances in other technologies and local schemes, and a contemporary assessment should be performed when heat systems are close to replacement.

The analysis indicates that the College will have some residual emissions in 2030 and offsetting will be required to achieve their decarbonisation ambitions. Whilst there is an understanding that offsetting will be required, the sector is relatively nascent and there is currently a lack of standards defining best-practice, particularly for the public sector.

The College should ratify what factors they consider a priority for offsetting and understand the associated opportunities and constraints to deliver a credible strategy around the agreed priorities. Any strategy should be agile and adapt over time to the expected evolutions in best-practice, and transparent communication of this should be a non-negotiable.

Opportunities for offsetting within BHASVIC's sphere of influence should be explored and prioritised, however the limitations of doing so should be understood, and partnerships should be sought to ease the resource requirement and maximise the co-benefits.

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CONTENTS

INTRODUCTION AND CONTEXT

BHASVIC's climate ambitions

Brighton, Hove and Sussex Sixth Form College (BHASVIC) is a Sixth Form College of over 3,000 students located in Brighton and Hove. The College has a vision to be a contemporary creative learning community and has recently laid out its 2021-2025 strategic plan to achieve the stated vision. Sustainability is embedded into the plan and is one of BHASVIC's five core values. In the plan, the college has committed to:

- Provide and embed carbon literacy education for all students by 2022-23.
- Become a net-zero organisation by 2030.

The Carbon Trust has been commissioned to support the College's sustainability ambitions and provide a net-zero aligned Action Plan. A previous baseline footprint report was delivered to the College in 2021.

Climate Action Roadmap for Further Education Colleges

BHASVIC aims to become a 'leading' institution under the FE Climate Roadmap. The roadmap takes a holistic approach to environmental action and there are several themes under the roadmap, covering leadership and governance, data collection, partnerships and engagement, and teaching, learning and research. The focus of this plan is on **'estates and operations'** and to assist the College in aligning their estates strategy with a net-zero trajectory. This Plan should therefore be viewed as *only part* of the College's overall environmental and biodiversity action, and be complementary to other initiatives being undertaken.

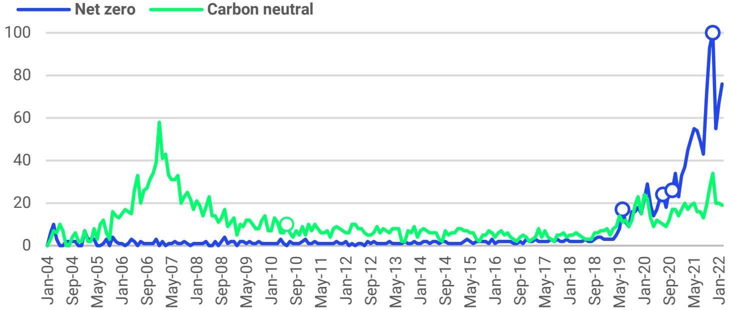
A self-assessment document aligned to the FE Climate Roadmap has been prepared alongside this Action Plan and the College are encouraged to publish the results of the assessment alongside their carbon reporting.

WHAT IS NET-ZERO?

The prevalence of 'net-zero' in the UK has increased rapidly in recent years, starting in 2019 with the Committee on Climate Change's recommendation for the UK to adopt a 2050 net-zero target. This was followed by a flurry of climate action, including the declaration of Climate Emergencies across a large part of the UK's public sector and ambitious corporate declarations, a lot of whom set out the aim of becoming net-zero or carbon neutral. Unlike carbon neutrality, where an international standard was first introduced in 2010, net-zero is a relatively new concept and a thorough definition of what is means to be net-zero has not existed until recently:

Google trends analysis of search terms in the UK

The axis is normalised with 100 representing 'peak popularity'



June 2010 Standard for carbon neutrality (PAS2060) is launched

May 2019 The Committee on Climate Change recommends a 2050 net zero target for the UK

July 2020 Launch of Climate Action Roadmap for FE Colleges

Oct' 2020 BHASVIC aims to become net-zero by 2030 and a leading institution under the FE roadmap

Oct' 2021 The science-based target initiative (SBTi) launches the first comprehensive net-zero standard

BHASVIC set-out their intention to become net-zero organisation a year before the first net-zero standard was officially launched. Whilst the standard is aimed at corporates, and a comprehensive net-zero standard for the public sector does not exist, it is viewed as best-practice and the College should understand their alignment to the standard and the implications of any 'net-zero' declaration.

The net-zero landscape has shifted dramatically in recent years and, even since BHASVIC's net-zero target was set, best-practice has continued to develop and evolve. Alignment to standards is recommended although it is recognised that existing standards are predominantly aimed at corporates, and public-sector accreditation is not possible and may not be desirable in some cases.

The Carbon Trust has worked in collaboration with the College to maximise the potential for decarbonisation across their activities, and the implementation of this Plan and alignment to the FE roadmap would represent ambitious climate action. However, the SBTi standard outlines that any 2030 net-zero target is extremely hard to achieve, and potentially unattainable (*see SBTi net-zero standard*). The College should be aware of standards and best-practice related to net-zero and understand internally what a decarbonised BHASVIC looks like. Whilst aligning to standards is recommended, impactful climate action can still be realised without strict alignment. At its core, transparent communication of BHASVIC's aspirations and subsequent actions should be the primary validation of BHASVIC's climate credentials.

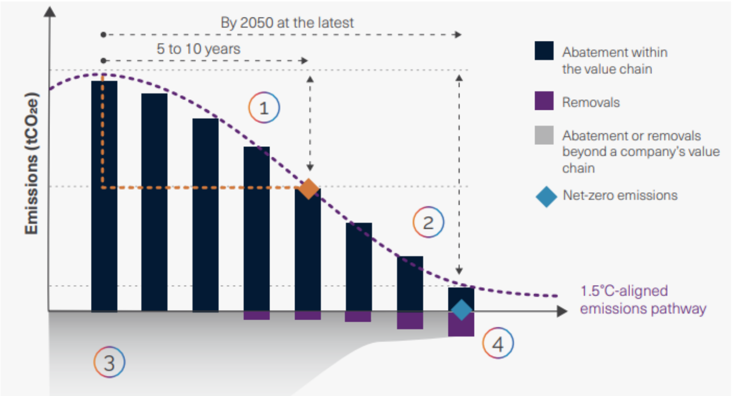
WHAT IS NET-ZERO?

The SBTi net-zero guidance represents the first comprehensive net-zero standard that allows for corporate accreditation. The standard defines net-zero as:

- Reducing scope 1, 2 and 3 emissions to zero, or to a residual level that is consistent with reaching net-zero emissions at the global level, and
- Neutralising any residual emissions at the net-zero target year and any GHG emissions released into the atmosphere thereafter.

The standard elaborates on these and provides conditions in which they can be considered aligned to net-zero. The standard is aimed at corporates and public sector accreditation is not yet possible, however the core elements of the standard are still relevant and should be considered in target setting and communication of BHASVIC's decarbonisation ambitions.

Indicative net-zero pathway under the SBTi guidance:



Core elements of the SBTi net-zero standard:

1. **Scope of emissions:** *all* relevant scope 1, 2, and 3 emission sources should be included in a decarbonisation target to be able to claim a 'net-zero' organisation.
2. **Decarbonisation trajectory:** Net-zero cannot be claimed until an organisation achieves a minimum of 90% emission reduction across all emission scopes. A near- and long-term target should be set if an organisation aspires to reach net-zero emissions in a timeframe that exceeds 10 years, although a long-term target is not required if the eligibility criteria is met by a near-term target (minimum of 5 years and a maximum of 10 years).
3. **Neutralisation of emissions (i.e., offsetting):** At the net-zero target date, all residual emissions are offset through the *permanent removal and storage* of carbon from the atmosphere.
4. **Beyond value chain mitigation:** in the transition to net-zero, companies are encouraged to take action or make investments to mitigate greenhouse gas emissions beyond their value chain (e.g., purchasing high-quality offset credits and/or investing in emerging technologies).

[1] https://sciencebasedtargets.org/resources/files/Net-Zero-Standard.pdf

SECTION 1

Baseline performance

BHASVIC'S CARBON FOOTPRINT

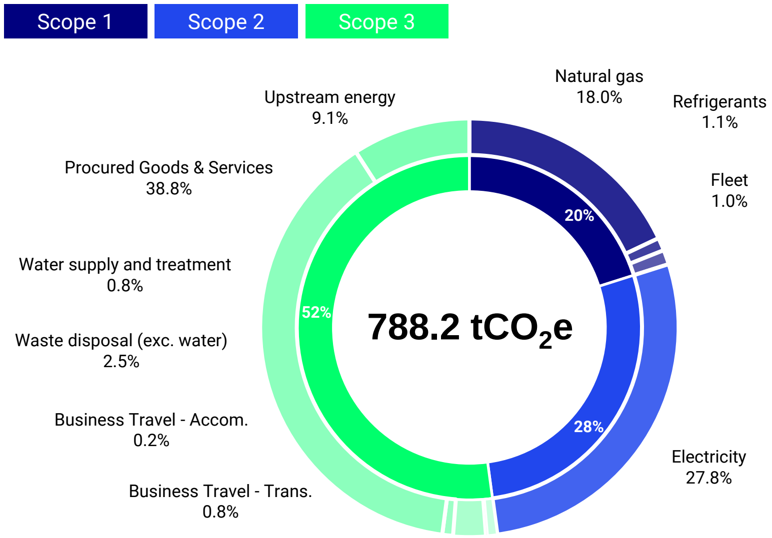
Footprint overview

Across all emission scopes, BHASVIC's measured footprint for the academic year 2018/19 was calculated to be **788.2 tCO2e.** The footprint is relatively evenly split across scopes 1, 2 and 3[†], although scope 3 is anticipated to make up a larger proportion when emission categories omitted due to data availability (employee commuting and capital goods) are considered. Four emission categories make up 93.6% of the footprint:

1. **Procurement of goods and services** from third parties (305.8 tCO2e)
2. **Electricity consumption** in buildings (218.8 tCO2e)
3. **Natural gas consumption** in buildings (141.7 tCO2e)
4. **Extraction, production and transportation** of fuels consumed (65.5 tCO2e)

Additional emissions of **81.7 tCO_2e** were attributed to College trips, with the large majority of these emissions attributed to long-haul air travel. However, business travel is limited to employees in the greenhouse gas (GHG) protocol and its inclusion within BHASVIC's baseline was deemed unsuitable, namely as the College cannot achieve significant emission savings without reducing the number of flights taken, which wasn't deemed excessive and considered a formative and valuable component of the College's provision of education. BHASVIC should continue to monitor these emissions however and is taking action to reduce them, for example by asking trip organisers to consider destinations where air travel is not required.

The baseline footprint excludes the Elms Building, which became operational in the academic year 2021/22 and will become part of reporting in future years.



[†] The greenhouse gas (GHG) protocol is a carbon accounting framework and splits emissions into three scopes. Refer to the College's carbon baseline report for further detail.

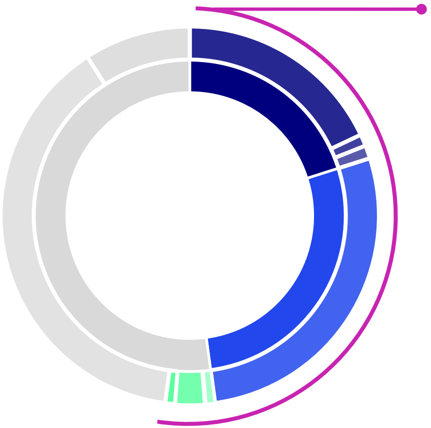
BHASVIC'S CARBON FOOTPRINT

Target setting

The Carbon Trust performed a RAG analysis of emission sources in BHASVIC's carbon baseline considering data availability and sphere of influence, and subsequently recommended that emission sources should be split into two categories:

- **Net-zero target:** emissions that can be readily monitored and are directly impacted by to the College's actions should be habitually reported and reduced as much as possible through target initiatives, with any hard-to-abate residual emissions offset using certified GHG removals at the target year.
- **Proactive focus:** emission sources further removed from the College's influence that cannot be accurately reported without significant engagement and/or advances in carbon reporting, and have a lower degree of sensitivity to the College's actions. These are recommended for outside the target, but can still result in substantial value chain emissions and a proactive focus (e.g. policy implementation, supplier engagement) should be pursued to minimise them.

This Action Plan focusses on emission categories recommended for inclusion within the College's net-zero target, the majority of which are within scope 1 and 2:



Emission sources recommended for inclusion in the College's net-zero target totalled 410 tCO_2e:

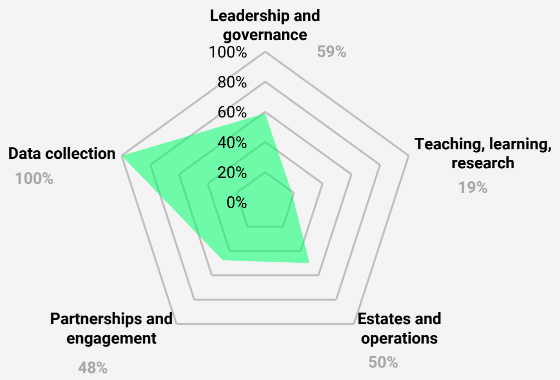
Electricity	219 tCO_2e	53.3%	**Fleet**	7.9 tCO_2e	1.9%
Natural gas	142 tCO_2e	34.5%	**Water**	6.52 tCO_2e	1.6%
Waste	19.4tCO_2e	4.7%	**Business travel**	7.3 tCO_2e	1.8%
Refrigerants	6.52 tCO_2e	1.6%			

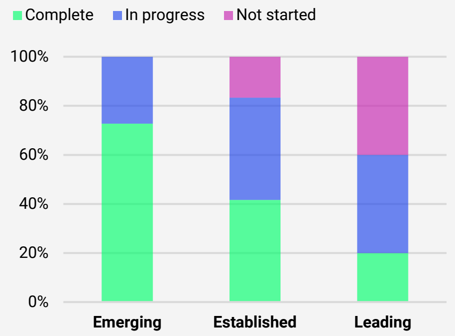
Employee commuting is also recommended for inclusion in the College's net-zero target but not calculated in the baseline footprint due to lack of data. An annual survey should be performed to measure and track commuting emissions.

BHASVIC's PROGRESS AGAINST THE FE ROADMAP

A holistic approach to all emission categories should be promoted by the College, and actions to reduce emissions across their operations will be required for the College to become a leading institution under the FE Climate Roadmap. A self-assessment document has been created to quantify and monitor BHASVIC's performance against the plan, which is recommended to be reported annually alongside standard carbon reporting. A baseline assessment (completed February 2022) has been completed as part of this Action Plan:

FE ROADMAP SELF-ASSESSMENT, FEBRUARY 2022:





METHODOLGY:

The FE Roadmap is presented across the five themes shown, and actions are listed against each and categorised by ambition, from emerging → established → leading.

Scoring is assigned on progress against each action: complete (3), in progress (1), not started (0) and a multiplier is applied depending on the classification: emerging (1x), established (1.5x), leading (2x).

Please note that this methodology has been created independent from the FE roadmap.

In the baseline assessment, BHASVIC's overall score was 52% with individual categories ranging from 19% - 100%. The College outlined an ambition to be Emerging by September 2021, Established by September 2022 and Leading by September 2023. The scores are broadly aligned to this, with almost all actions under the 'emerging' category completed and several 'established' and 'leading' actions either complete or in progress. BHASVIC should assign actions and action owners to priority activities to continually improve their progress against the roadmap. Strengths should be leveraged and improvement beyond the roadmap continually sought as the College progresses it's ambition to become net-zero.

SECTION 2

Project identification

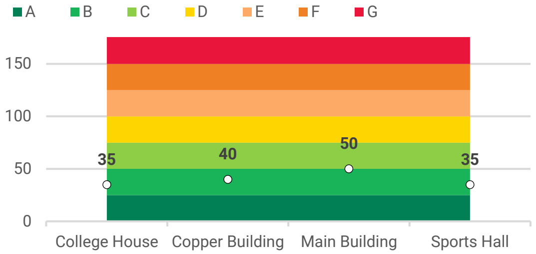
PROJECT IDENTIFICATION

The Carbon Trust performed an energy audit and desk-based analysis of BHASVIC's campus estate to identify decarbonisation initiatives. The audit confirmed findings from benchmarking (*see footprint report*) that the campus performs to a good level of energy efficiency; the campus has LED lighting throughout, generates on-site renewable power, and is double-glazed with high thermal performance. The majority of 'low-hanging fruit' that can be readily implemented and achieve quick paybacks is therefore limited, and the College will now have to turn its attention to **a)** optimising existing systems to achieve incremental gains, and **b)** displacing fossil fuel use on the campus with step-change heat decarbonisation projects.

The decarbonisation measures and assets considered are listed below. More detail on each of the technologies is provided in this section, and further information on assumptions and is outlined in the Appendices. There have been several cases where quantification of measures has not been appropriate and more generalised recommendations and commentary have been provided in these cases. The decarbonisation measures considered include:

- Air-source heat pumps [†]
- Solar PV (carport) and solar thermal [†]
- Optmised HVAC controls [†]
- High-efficiency motors [†]
- Degasification of domestic hot water
- Secondary glazing
- Valve/flange insulation
- Electric vehicle charge points
- Further energy management improvements

All buildings on the BHASVIC campus meet a 'B' rating on their Display Energy Certificate, demonstrating efficient operation:



[†] Carbon and cost savings quantified

PROJECT IDENTIFICATION

Where appropriate, the anticipated financial profile of identified measures was estimated, including capital costs, annual savings, and cost of carbon abated. Additional development costs beyond the capital cost estimates provided should be anticipated, which in some cases are recommended (e.g., further feasibility studies) or may be borne out of necessity (e.g., increased grid capacity for heat pumps and/or EV charging). Please refer to Appendix A for more financial details.

The results are reflective of BHASVIC's current position as a high-performing site, and the shift away from cost-effective energy efficiency projects (e.g., LED lighting) to projects that prioritise carbon reduction over financial return. Notably, the installation of heat pumps represents the largest capital expenditure and longest payback period. The figures are representative of market costs at the time of analysis and significant cost reductions (both capital and operational) are anticipated by the time BHASVIC replace their incumbent heating systems[1]. Whilst the business case remains poor, however, the results highlight the need for BHASVIC to actively include environmental considerations in procurement decisions and ensure that all funding opportunities (e.g., Public Sector Decarbonisation Scheme) are fully assessed to support marginal business cases.

The remaining projects identified have a positive business case and offer an attractive payback. In the case of optimising HVAC controls, savings can be realised through adjusting existing systems with no capital expenditure.

Below: financial summary of the potential projects analysed, all costs exclude VAT.

Project	CAPEX [GBP, 2022]	Annual savings [GBP]	Simple payback [yrs]	10 year carbon saving [tCO_2e]	CAPEX/tCO_2e	Priority level
Electric heat pumps	351,900	5,458	64.5	308	£1143	High
High-efficiency motors	11,970	5,115	2.3	58.8	£204	Medium
HVAC control review and optimisation	0	2,031	[-]	26.4	[-]	Medium
Solar PV carport	54,405	4,612	11.8	55.8	£974	Medium
TOTAL (exc. VAT)	**418,275**	**17,216**	**24.3**	**449**	**£931**	

[1] The UK Government, working with industry, is aiming for the cost of buying and running heat pumps to be the same as fossil fuel boilers by 2030, with large cost reductions of 25 – 50% expected by 2025 as the market expands and technology develops (https://www.gov.uk/government/news/plan-to-drive-down-the-cost-of-clean-heat)

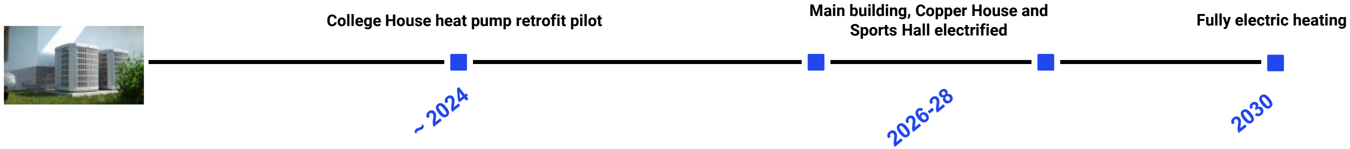
HEAT SOURCES

All major buildings on the BHASVIC campus have good thermal performance and appear suited to the installation of low-temperature heat pumps with minimal retrofit. The installation of air source heat pumps should be considered for every heating system replacement going forward.

Introduction. Heat pumps are a highly efficient form of heating and use an electrically driven pump to upgrade low temperature heat to a temperature usable for space heating. Low temperature heat can be extracted from the air, a water source or the ground. Air source heat pumps (ASHP) are generally preferred for smaller decentralised projects due to lower infrastructure requirements and improved flexibility, and are recommended as a first consideration.

Heat pumps are not a like-for-like replacement for gas boilers and operate most efficiently at low flow temperatures (40–50°C). Ensuring thermal comfort whilst operating at these temperatures requires a building with low heat losses and a large heat transfer area (e.g., radiators, underfloor heating).

State of play. Campus buildings are heated through individual gas condensing boilers, apart from the recently-constructed Elms Building, which provides space heating with an electric heat pump. The gas boilers on-site are in good condition and operating at an efficiency of 85 – 89%, and will not reach the end of their serviceable life until the middle-end of the decade. The system at College House has experienced maintenance issues and is expected to be the first system to be replaced. An indicative timeline of system replacements is provided below. The thermal performance of all buildings is sound and it is expected that efficient operation can be achieved at all buildings on the campus with minimal retrofit, although some ancillary measures may be required (e.g., increased heat emitter size).



Project identification. Low-carbon heat will be central to the College achieving their decarbonisation ambitions and the replacement of all incumbent gas-fired systems was modelled. A reduction of 97 tCO2e could be achieved by 2030, representing ~77% of project emission reductions. Whilst the financial case for heat pumps in current market conditions is poor, significant cost reductions can be expected by the time BHASVIC come to replace their gas systems.

SOLAR PV - CARPORT

BHASVIC is close to maximising the potential for rooftop Solar PV on the campus and a carport is recommended. Emission reductions relative to the National Grid will decrease out to 2030 and solar will increasingly be viewed from a financial standpoint, rather than one that achieves significant emissions reductions across the estate. The visibility of a carport, and potential to integrate with EV charging, can help to drive wider behavioural change amongst staff and students.

Introduction. Solar canopy systems, or carports, are ground-mounted arrays that are installed over car parking spaces. They are dual purpose structures, offering shading at the same time as producing renewable power, and can also be integrated with lighting or electric vehicle charging. The infrastructure requirements of carports systems are greater than an equivalent rooftop system, requiring the installation of frames, foundations, roofs and the PV system. Additional planning considerations (e.g., grid connections) may also be expected to make the associated costs greater and only the most favourable sites are competitive with commercial building rooftop projects. As well as from a cost perspective, the infrastructure requirements result in higher levels of embedded carbon, so lifetime carbon savings are consequently lower than an equivalent rooftop system. Solar carports are therefore only recommended when viable opportunities for rooftop solar have been maximised.

State of play. Solar PV is present across the campus, and rooftop arrays are installed on the Elms building, Copper Building, and the Sports Hall. The site-visit and engagement with the College indicated that opportunities for roof-top solar PV have largely been maximised, and options for further on-site power generation should focus on ground-mounted systems.

Project identification. HelioScope software was used to model a solar canopy system across the south-facing section of the Sports Hall car park:

- There is space for a 40.3 kWp array to be installed, generating 35,320 kWh per annum.
- This would result in marginal emission savings of 2.8 tCO_2e by 2030. However, the visibility of a canopy system, and the potential to integrate EV charging, is expected to drive behavioural change amongst staff and students that could yield further (unquantifiable) emission savings.
- The estimated CAPEX for the array is £54,405 and provide a simple payback of 11.8 years with baseline tariff rates.

The south-facing section of the Sports Hall car park presents an ideal opportunity for a solar carport:

Car park canopy system, 40 kWp

Installed canopy system

BRE National Solar Centre

HEATING, VENTILATION AND AIR CONDITIONING (HVAC) SYSTEMS

Heating, ventilation and air conditioning (HVAC) systems control the temperature, humidity and quality of air in buildings on the BHASVIC campus to a set of chosen conditions. To achieve this, the systems transfer heat and moisture into and out of the air as well as control the level of air pollutants, either by directly removing them or by diluting them to acceptable levels.

Introduction. Heating, ventilation and air conditioning systems account for the majority of BHASVIC's energy consumption. Even small adjustments to these systems can significantly reduce their energy consumption. A number of immediately actionable HVAC control optimisations have been identified, which when combined are expected to result in a reduction of 6.05 tCO_2e.

State of play. Separate HVAC systems serve the Main, Copper, College House, Sports and Elms buildings. The majority of space heating demand is provided by condensing gas-fired boilers (Air Source Heat Pump in the Elms Building) and heat is emitted via both Air Handing Units (AHUs), providing warm air to celling-mounted cassettes, and hot water circuits, which provide heat to wall and floor-mounted radiators. Space/equipment cooling and ventilation is provided by the AHUs, split-system air conditioning units, and Mechanical Ventilation and Heat Recovery (MVHR) units. Each building has a separate Building Management System (BMS) or HVAC controls system(s), which provides control over space heating, cooling and ventilation.

A number of opportunities to improve HVAC control were identified during the energy audit:

- **Increase server room cooling set-points.** It was noted during the site audit that server room cooling units were set to maintain a temperature of 18°C or below. This is below the recommended range for all classes of server and should be increased[1]. As a 'rule-of-thumb' every 1°C increase in cooling set-point typically delivers a 2-4% reduction in energy consumption.
- **Implement holiday schedules/set-points.** No holiday set-points/schedules had been programmed into the BMS, meaning that buildings will be heated to 19-21°C even when unoccupied, unless heating is manually switched off. Setting holiday schedules will help to avoid wasteful energy consumption.
- **Optimise space heating controls.** Run times of the boilers serving the Main, College House, and Sports buildings are manually adjusted based on time of year e.g. increased over winter, however, it is understood that the BMS allows for optimised start/stop control to be set up, which would automate and refine this process based on external weather conditions. Using optimum start instead of fixed time controls typically saves around 10% in energy consumption.

[1] ASHRAE: American Society of Heating, Refrigerating and Air-Conditioning Engineers

ELECTRONICALLY COMMUTATED (EC) MOTORS

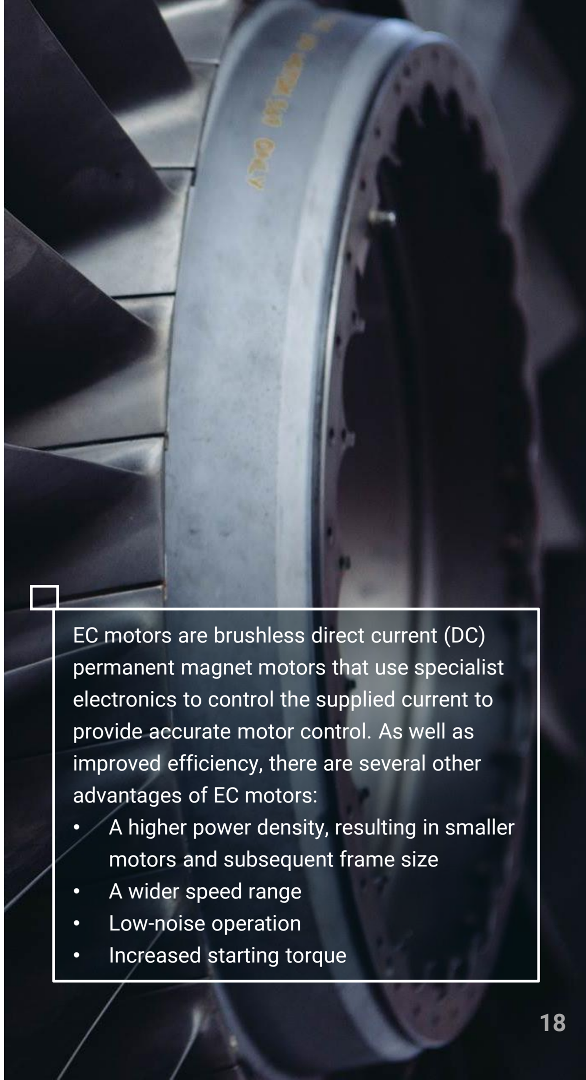
All alternating electric current (AC) motors should be replaced by high-efficiency electronically commutated (EC) motors at the end of their useful life. The cost difference between repairing and replacing a smaller motor (typically below 5.5kW to 11kW) is such that replacement with high efficiency should be the automatic choice irrespective of running hours.

Introduction. Electric motors drive devices such as pumps, fans or conveyors. Electric motors and electric motor-driven systems are large energy draws, and in a single year a running motor can cost up to ten times its purchase cost in energy. The most commonly used motor is the alternating electric current (AC) induction motor. Further efficiency gains in AC motors are becoming increasingly hard to achieve and manufacturers are adapting more efficient technologies traditionally used in specialist applications (e.g., electronically commutated motors). EC motors can be connected directly to an AC supply and around 30% more efficient than AC induction motors.

State of play. There are no EC motors currently installed on the campus, and AC induction motors are used in air handling units in the Copper Building and Sports Hall. The market is maturing and the share of EC motors is expected to rise significantly in the coming years and become standard.

Project identification. Replacement of AC inductions motors with EC motors was modelled at the Copper Building and Sports Hall.

- Across the campus, energy savings of 36,533 kWh per year can be realised, equating to 2.9 tCO_2e of emission reductions by 2030.
- The high ratio of running costs to capital costs creates favourable financial returns, and paybacks of 2.2 – 2.5 years were estimated. The cost benefit of an high efficiency motor replacement will vary according to the motor size and its operating hours.



EC motors are brushless direct current (DC) permanent magnet motors that use specialist electronics to control the supplied current to provide accurate motor control. As well as improved efficiency, there are several other advantages of EC motors:

- A higher power density, resulting in smaller motors and subsequent frame size
- A wider speed range
- Low-noise operation
- Increased starting torque

THE DEGASIFICATION OF DOMESTIC HOT WATER AND SOLAR THERMAL

It is anticipated that the Electrification of Domestic Hot Water (DHW) will be implemented alongside the electrification of space heating. Various options should be considered to meet future DHW demand, from point-of-use (POU) electric water heaters to dedicated electric heat pump systems.

Introduction. There is significant potential to reduce emissions associated with the provision of DHW. This can be achieved in two ways: a) matching storage capacity to demand, and b) electrification of DHW systems. Anecdotal evidence provided during a site energy audit suggests that currently DHW storage exceeds demand e.g. use of sports facility showers is significantly lower than the DHW system was designed for, resulting in unnecessary storage losses.

State of play. High-level profiling of energy consumption estimates that DHW accounts for ~12% of total energy consumption on the campus, and 10% of total natural gas consumption. DHW to the main building and College House is provided by centralised electric water heater systems with storage. Copper, Sports and Elms building DHW is provided by similar, but gas-fired, systems of varying age. As the UK electricity grid continues to decarbonise, gas-fired systems should be replaced with electric ones – potentially supplemented with solar thermal. If current DHW storage needs to be replaced like-for-like then DHW could be provided by either electric water heaters or heat pumps (which would offer increased efficiency). If DHW demand is anticipated to be limited to washbasins and a limited number of showers then potentially all DHW could be provided by POU water heaters, and storage losses eliminated.

Project identification. Decarbonisation of DHW across the campus will be required for the College to achieve deep decarbonisation. The associated costs and carbon savings will vary depending on the route to electrification (i.e., electric water heaters, heat pumps, or POU systems) and quantification has therefore been restricted. It is recommended that an assessment of DHW demand be carried out to determine what type of electric system(s) would be required to meet this demand. This could be as a stand-alone exercise or as part of a feasibility study into the electrification of space heating and DHW.

The majority of DHW demand on campus is met by centralised systems

FURTHER MEASURES

Further estate decarbonisation measures that have the potential to contribute towards the BHASVIC's net zero target were identified in our analysis, however, accurate and reliable quantification of these measures was not possible due to various restricting factors, e.g., limitations of existing energy metering and therefore limited detailed data to inform calculations and analysis.

These further measures are listed below, with anticipated levels of cost and impacts indicated. A 'traffic light' system has been applied to these opportunities to highlight level of priority (informed by both readiness and urgency) of each measure:

Project	Anticipated CAPEX	Anticipated Annual savings	Anticipated simple payback [yrs]	Anticipated carbon savings by 2030	Anticipated CAPEX/tCO_2e	Priority level
Domestic hot water	Medium	Low	5-10	Medium	Medium	High
It is anticipated that the electrification of Domestic Hot Water (DHW) will be implemented alongside the electrification of space heating. Various options should be considered to meet future DHW demand, from point-of-use (POU) electric water heaters to dedicated electric heat pump systems.						
PC/monitor standby	Low	Low	<1	Low	Low	Medium
During a half term site visit it was noted that a number of PC monitors which were not in use remained 'on'. To reduce energy consumption these should be set up to automatically switch to standby mode after a set period of inaction.						
AHU controls	Low	Medium	<1	Medium	Low	Medium
A review of Air Handling Unit (AHU) controls is recommended. It was observed during the site visit that some AHU plant controls were set to 'hand', rather than 'auto', which would allow AHU fans to operate at variable speeds, thus increasing efficiencies.						
Valve/flange insulation	Low	Low	<1	Low	Low	Medium
Valve and flange insulation was observed to be missing in the plant rooms serving the Main, Sports and College Buildings. This is cheap to install and will result in instant savings in gas consumption.						

FURTHER MEASURES

Project	Anticipated CAPEX	Anticipated Annual savings	Anticipated simple payback [yrs]	Anticipated carbon savings by 2030	Anticipated CAPEX/tCO_2e	Priority level
EV Charge Points	Medium	Medium	Dependent on financing model	Medium	Medium	Medium
Aligned to the FE roadmap ambition to *'implement a range of initiatives that support low-carbon travel'*, but should be complemented by additional initiatives to increase uptake of public and active forms of travel.						
Degasifying laboratory gas	Low	Low	unknown	Low	Medium	Medium
Laboratory gas use, e.g. Bunsen burners, could be replaced with readily available electric equivalents.						
Solar shading film	Low	Low	2-5	Low	Low	Medium
Solar shading film reduces heat from the sun during the summer, thus reducing the space cooling demand, while allowing low-angled winter sun to provide some passive heating.						
TRV reinstatement	Low	Low	unknown	Low	Low	Medium
Lots of Thermostatic Radiator Valves (TRVs) are missing from radiators but many of these have been purposefully removed by the Estates team to prevent tampering. This has the disadvantage of also reducing local temperature control, potentially resulting in unnecessary energy use.						
Secondary glazing	Medium	Low	5-10	Low	Medium	Medium
Most of the windows on the campus are double glazed, however, some single glazing remains. Depending on building listed status replacement double glazing may not be appropriate in some areas, therefore secondary glazing is recommended to reduce heat loss.						
Lower GWP refrigerant	Low	Low	unknown	Low	Medium	Medium
The F-gas Regulation phasedown programme is constructed so that over the next 10 years end users and manufacturers will be drawn to using refrigerants with a lower Global Warming Potential (GWP). HVAC plant can be retrofitted with a lower GWP refrigerant (where technically possible).						
EE Catering	Low	Low	unknown	Low	Medium	Medium
Site visit observations suggested that control of various catering systems, e.g. kitchen extract, refrigeration, could be optimised to reduce unnecessary energy use. Implementing time controls to canteen vending machines would also reduce energy use.						

PROCUREMENT

The College's procurement of goods and services has been recommended for outside of BHASVIC's net-zero target on the grounds of data quality (i.e., a reliance on national-level economic proxies) and availability. **However, procurement is the single largest emission source that arises from the College's activities and any credible carbon action should address greening procurement, even if it is not regularly reported due to data constraints.** The footprint report outlined some hotspots that occur within the College's value chain (e.g., catering, paper) and the College should look to prioritise action with the suppliers of these goods and services. As a first step, data improvements can be made to move from a spend-based calculation to company-specific and ultimately goods/service specific:

BHASVIC current position

Spend based on metrics
tCO_2e/£ spend in CPV code or e-classifcation

Supplier's GHG reporting
Tracking supplier's Scope 1 and 2 reporting, per unit of revenue generated

Measurable and specific GHG metrics:
tCO_2e/kg of product or service provided

SECTOR WIDE → COMPANY SPECIFIC → SERVICE SPECIFIC

Once hotspots are identified and improvements in data accuracy are underway, further engagement should be conducted to reduce the carbon intensity of BHASVIC's supply chain. The College should understanding what best-practice looks like for each of their hotspots to help define product and supplier standards, and subsequently engage with suppliers to encourage their alignment to them. The resource required for engagement is expected to be a limitation of the College's ability to abate supply chain emissions and the cost, impact, and feasibility of initiatives should be considered to help select priority actions and suppliers. In time, the increase in company carbon reporting and life-cycle product footprinting is expected to streamline the data collection process and ultimately ease the resource requirement. The College can help catalyse this transition by working with industry groups and coalitions that are actively progressing this messaging and advocating low-carbon products. BHASVIC aspires to be a further education leader in relation to carbon action and should help to progress collaborative initiatives in the sector and be proactive in their outreach.

CASE STUDIES

Several other higher education providers in the UK have declared ambitious decarbonisation targets. These declarations span a range of target dates (2025–2050), terminology (carbon neutrality, net-zero, zero carbon), and scopes (scopes 1 and 2 only, inclusive of selected scope 3, full value chain, etc.); this makes comparison between targets and institutions challenging. Nonetheless, similarities exist in many of the decarbonisation challenges faced across the sector and also the initiatives required to overcome them. Some brief examples from elsewhere in the sector that are applicable to BHASVIC's main challenges are presented below:

	Organisation	Project type	Description	Approximate cost
1	**Barnsley College** [1]	Heat decarbonisation	Installation of an air source heat pump at their Wigfield Farm site, displacing the use of natural gas for space and water heating.	£140,000
2	**Merchant Taylor's School** [2]	EV charging	Installation of four 7kW twin chargers at the School's car park. Access restricted to individuals with a school email address, and a custom price tariff was set to cover cost of energy usage.	Unknown
3	**Berkshire College of Agriculture** [1]	Heat decarbonisation	Delivery of energy efficiency and heat decarbonisation measures at the College's Learning Centre, including replacement of a kerosene boiler system with a ground source heat pump and upgrades to heat distribution and BMS.	£250,000
4	**University of Bristol** [3]	Sustainable catering	The University of Bristol transitioned their catering procurement from a centralised provider to a local model, and now source all their catering needs from several smaller suppliers within a 100-mile radius of the University's campus, with all deliveries being 100% recyclable. Meat-free and flexitarian catering days further encourage sustainable procurement and eating, and catered halls of residence will detail the carbon footprint of every meal served to allow students to more informed decisions on what they eat.	Unknown

[1] Information obtained from successful Public Sector Decarbonisation Scheme applications in 2020 and 2021, see: https://www.gov.uk/government/collections/public-sector-decarbonisation-scheme

[2] https://pod-point.com/business/case-studies/merchant-taylors-school

[3] http://www.bristol.ac.uk/campus-division/about-us/campus-operations/catering/our-food/

SECTION 3

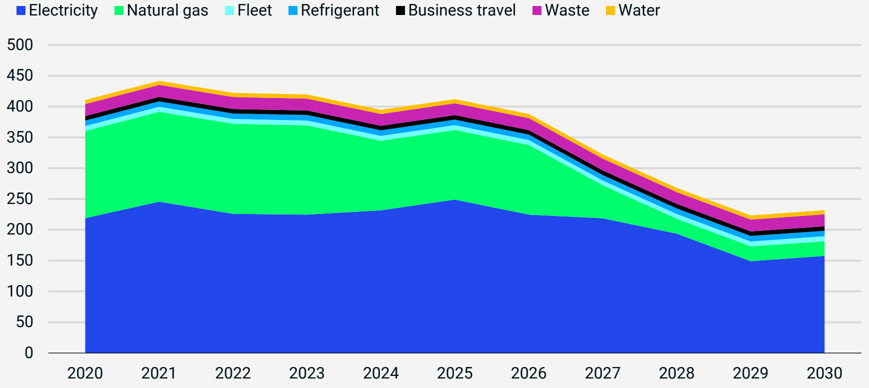
Cost and emissions projection

PATHWAY PROJECTION

Where appropriate, fuel consumption changes associated with the identified projects were estimated to determine the expected impact of the measures out to 2030. The modelling estimates a total **emission reduction of 179 tCO_2e on the baseline year, resulting in residual emissions of 232 tCO2e**. The modelling does not reflect an exhaustive list of projects, and additional emission reductions can also be expected from the implementation of 'further measures' not quantified in this analysis. Despite this, the forecast represents an average annual reduction of 17.9 tCO_2e equivalent to 4.36% of the baseline emissions, which can be **considered aligned to the goals of the Paris Agreement** where a minimum annual reduction of 4.2% is consistent with a 1.5°C warming scenario[1].

Almost 40% of the emission reductions are expected between 2027-30, when **a)** the majority of heating on the campus is expected to transition from natural gas to electric heat pumps and **b)** the forecasted emissions intensity of electricity from the national grid significantly decreases (*see inset*). The carbon emissions associated with the combustion of 1 unit of natural gas is constant, such that, without carbon capture, emission reductions from natural gas can only be realised through a reduction in consumption. This differs from electricity, where the decarbonisation of the national grid will reduce the associated emissions of a constant, or even increasing, electrical demand. This is shown in the modelling: electricity consumption in 2030 is 34% higher relative to the baseline year, due to the Elms Building becoming operational and the electrification of fossil fuels, however the associated emissions are 54% lower than the 2019/20 baseline.

Emissions by fuel type [tCO2e]



DECARBONISATION OF THE NATIONAL ELECTRICITY GRID

Between now and 2030, the carbon intensity of the UK's national grid is forecast to reduce as traditional fossil fuels are displaced by low-carbon power sources (e.g., nuclear, offshore wind). By 2030, the majority of BHASVIC's energy consumption is forecast to be electrical demand that, whilst some will be generated through on-site renewable generation, will make the College's footprint sensitive to the eventual emission factor of national electricity grid.

Forecasts for these figures do vary and an element of caution should be used when communicating these results. The decarbonisation scenario presented is an indexed version of the most conservative forecast made by the National Grid in their Future Energy Scenarios for 2021 (2030: 125 gCO2/kWh).

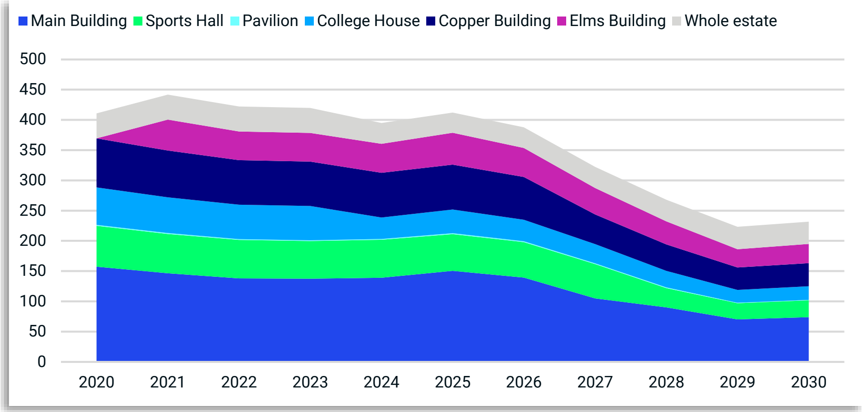
[1] As defined by the science-based target initiative (SBTi) under the absolute emissions contraction: https://sciencebasedtargets.org/resources/files/SBTi-Corporate-Manual.pdf

PATHWAY PROJECTION

Emissions modelling has also been performed at an asset level (*below*). Emission sources reported at a site level and not disaggregated by building (waste, water, business travel, BHASVIC's fleet) have been reported jointly across the whole estate. The modelling highlights the inclusion of the Elm's Building to the College's emissions inventory in 2021/22, and shows that a 1.5°C-aligned reduction is achieved despite its addition. BHASVIC's Main Building is the largest emission source, though the profile is relatively even and residual emissions in 2030 are split across the campus:

- **Hard-to-abate natural gas emissions:** even once space heating is electrified, there is still some natural gas demand anticipated from laboratory use (Main Building and Elms Building) and catering (Copper Building). Natural gas consumption associated with water heating also remains in the modelled scenario, and options for the degasification of water heating should be explored in conjunction with space heating. Reduction or total displacement of these sources is technologically possible and further emission reductions across these buildings could be expected with further fuel switching.
- **Electricity consumption:** best-practice decarbonisation for the BHASVIC campus between now and 2030 revolves around the displacement of fossil fuels with low-carbon energy sources, primarily electricity. The Government has laid out plans to fully decarbonise the UK power system by 2035, and the consumption of electricity is expected to converge to 0 $kgCO_2e/kWh$ out to this date. However, the emission factors assumed in the modelling estimate that electricity will make up almost 70% of total emissions in 2030, which will continue to decrease as the grid further decarbonises.
- **Further emissions:** remaining emission sources of smaller magnitude that have not formed the focus of this plan, but cumulatively make up a reasonable percentage of residual emissions (waste, water, fleet, refrigerant, business travel), can also expected to reduce with sustainable behaviour across the campus, for example recycling, reduced business travel. The College can drive this change through the provision of facilitates and instilling a culture of sustainability across the estate.

EMISSIONS BY ASSET TYPE [tCO_2e]



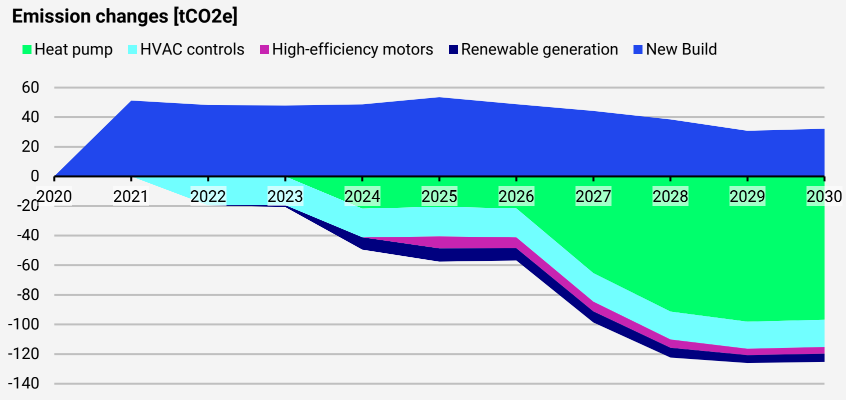
[1] https://www.gov.uk/government/news/plans-unveiled-to-decarbonise-uk-power-system-by-2035

PATHWAY PROJECTION

The modelled reduction in emissions (179 tCO_2e) is the sum of the implementation of projects and the effect of grid decarbonisation on baseline consumption unaffected by the implemented projects. The contribution of each modelled project to the overall reductions (net reduction of 93 tCO_2e, including the addition of the Elm's Building) is presented below.

The modelling demonstrates that ~77% of project-related emission *reductions* are expected to come from the electrification of BHASVIC's space heating. The majority of these emissions are realised in 2027 – 2028 when it is expected current heating systems reach the end of their serviceable life. Emission savings from these projects will continue to increase beyond 2030 as the national grid decarbonises. The combined contribution from other projects is also significant, and makes up almost a quarter of project emission savings by 2030. Whilst small comparative to heat electrification in this analysis, aligning to best-practice will be central to the College achieving net-zero aligned decarbonisation in an economical and efficient manner.

The UK's heat and buildings strategy outlines that a mix of low-carbon technologies will be used for heating, including heat pumps, heat networks and the potential switching of the grid from natural gas to low-carbon hydrogen. Whilst heat pumps are recommended at this stage, the College should remain aware of advances in other technologies and local schemes, and a contemporary assessment should be performed when heat systems are close to replacement. However, heat pumps are a ready solution and waiting on the advancement of other technologies risks stagnating climate action and prolonging the use of fossil fuels



THE COLLEGE SHOULD BE PREPARED FOR THE ROLLOUT OF HEAT PUMPS

The vast majority of emission reductions in the modelling are realised when heat pumps are deployed. These represent step-change projects that must be implemented for the College to achieve their decarbonisation ambitions, and the like-for-like replacement of heating systems with gas boilers is not aligned to a net-zero strategy.

Whilst the building fabric and general thermal performance of the campus is good, indicating good compatibility with an efficient heat pump system, the installation of a heat pump should be carefully considered and a preliminary feasibility study is recommended to prepare the College for the transition to heat pumps and notify them if any ancillary work is required in advance of installation.

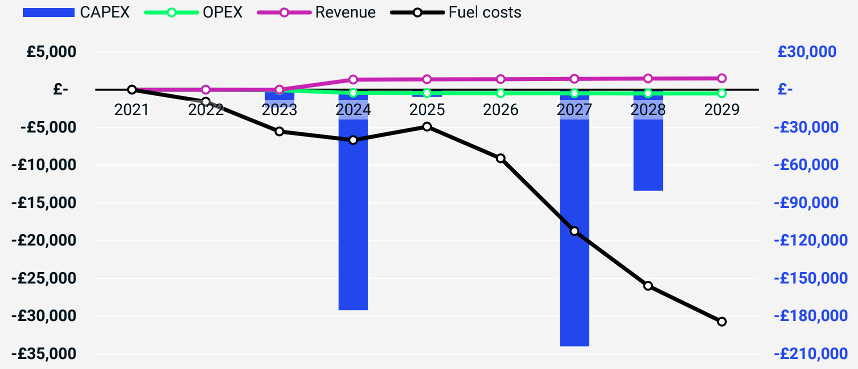
PATHWAY PROJECTION

Whilst beneficial from an emissions perspective, **the changing of fuel types has a social and economic impact**, and the improper installation and/or operation of electrified technologies can result in increased costs or reduced user comfort. In particular, the replacement of a gas boiler with a heat pump is not a like-for-like replacement and the College should develop feasibility studies with accompanying business cases to accurately specify the design parameters and ascertain the wider impacts of any change.

Heat pumps represent the largest investment requirement for the College and expected to cost ~£350,000 across four buildings. As well as the capital requirement, electricity is currently 3-4x more expensive per kWh than natural gas and a heat pump operating with a coefficient of performance (COP) of < 3 is likely to result in increased fuel costs relative to a gas boiler. This is demonstrated in the modelling, and **annual fuel costs are expected to be ~£30,000 higher in 2030 relative to the baseline year** (exc. Elms Building). This is often mitigated by complementary opportunities that can achieve quick paybacks (e.g., LED lighting), but which have been largely maximised by BHASVIC. This stresses the importance to optimise existing practices as much as possible to achieve incremental gains, the sum of which will help to mitigate the financial impact of pivotal decarbonisation projects.

Financial impact [GBP]

Ongoing costs (primary axis) and capital costs (secondary axis)



THE CURRENT ECONOMIC CHALLENGE

This Action Plan highlights the economic challenge with implementing projects that prioritise carbon reduction over financial return, particularly for an organisation such as BHASVIC where it is not possible to monetise sustainable performance like a private-sector organisation may (e.g., improved PR).

However, it is expected that the financial case for heat pumps will significantly improve by the time capital expenditure is required, and these costs are expected to be outdated by the time the College arrives at the point of replacement, particularly towards the end of the decade. The College should remain aware of changes in the market and responsive to potential funding opportunities that could help subsidise the transition from fossil fuels.

[1] Costs do not include any ancillary works (e.g., changes to the heat distribution system) that may be required to facilitate or optimise the performance of a low-temperature electric system.

SECTION 3

Approach to offsetting

CARBON OFFSETTING

Introduction to offsetting

Whilst the pathway projection does not present an exhaustive list of projects, the analysis indicates that the College will have some residual emissions in 2030 and offsetting will be required to achieve their decarbonisation ambitions.

Carbon offsetting is a broad term that refers to the action of reducing greenhouse gas (GHG) emissions or increasing carbon storage to compensate for emissions that occur elsewhere. This involves buying/supporting emission reduction or removal enhancement projects outside of an organisation's GHG inventory. There is no geographical boundary and offsetting projects could occur locally to BHASVIC (sometimes referred to as insetting) or globally.

Whilst there is an understanding that offsetting will be required, the sector is relatively nascent and there is currently a lack of standards defining best-practice, particularly for the public sector where conventional offsetting mechanisms (i.e., buying credits on the Voluntary Offset Market) are increasingly viewed as unsuitable. Preliminary engagement with the College has therefore been performed to understand what BHASVIC's current priorities are and to consider the associated constraints and opportunities with pursuing such a strategy. A briefing paper was also prepared (Appendix C) to outline the latest guidance relevant to the College. Reading of the paper prior to this section is recommended.

The briefing paper outlines several factors that an organisation should consider when developing an offsetting strategy. However, there are interdependencies and trade-offs between these that complicate the development of any approach. With particular relevance to the public sector, a "silver bullet" solution is not available and compromise in some areas is expected. This section is designed to illuminate some of these trade-offs and provide the College with an evidence-base to inform their decision. Ultimately, there are justifiable reasons behind various (and sometimes opposing) approaches to offsetting, however transparent and candid communication of the College's strategy should be non-negotiable and at the heart of the College's approach to their residual emissions.

CARBON OFFSETTING

Defining the College's priorities

The College should ratify what factors they consider a priority for offsetting. From there, the associated opportunities and constraints should be clearly understood for the College to deliver a credible strategy around the agreed priorities. In defining those principles it is recommended that the College consider relevant standards (see offset briefing paper), which are broadly aligned across three key areas and set out how an organisation's offsetting strategy should evolve over time to be considered net-zero aligned:

1 **Cut emissions and use high quality offsets**

Reductions must be prioritised in the first instance to minimise the need for offsets. Where offsets are required, organisations should perform robust due diligence to ensure offsets are credible and maintain environmental integrity. All reporting should be done transparently and current emissions, accounting methodology, target setting, and offsetting strategy should all be disclosed.

2 **Shift to carbon removal offsetting**

To ensure compatibility with the Paris Agreement, users of offsets should increase the portion of offsets that come from carbon removals. By 2050, 100% of offsets should be sourced from emission removals.

3 **Shift to long-lived storage**

Transition to methods of carbon removal that have a low risk of reversal over centuries to millennia, for example storing CO_2 in geological reservoirs or mineralising carbon into stable forms (e.g., timber used in construction).

The above standards reflect a best-practice transition to offsetting and attempt to mitigate some of the shortcomings of existing mechanisms. However, the stages are a transition and recognise that significant market development will be required for the mass uptake of both removals and offsets with long-lived storage. The timing is important, and 2050 (or "no later than 2050" in the case of the SBTi net-zero guidance) is the reference point for when 100% of offsets should be sourced from long-lived removals. BHASVIC's 2030 net-zero target is significantly ahead of this date and the associated market developments, such that a net-zero aligned offsetting strategy may either not be achievable by this point or have very high associated costs per tCO_2e offset.

CARBON OFFSETTING

Defining the College's priorities

The standards do not reference the locality of offsets (i.e., whether offsetting is performed within or outside of an organisation's sphere of influence). Preliminary engagement with BHASVIC has indicated that the College would strive to maximise benefits for the local area through offsetting as much as possible before buying offset credits on the voluntary offset market. This is consistent with the Carbon Trust's viewpoint, particularly for suited sectors (e.g., agriculture) or focal points of a community such as BHASVIC where co-benefits and influence can be maximised. However, there are trade-offs associated with local-based offsetting that the College should acknowledge. Some of these considerations are illustrated with the hypothetical offset methods below:

	Direct-air carbon capture and storage		Local afforestation project	
Generation of co-benefits?	⊖	Lower land and water use associated with carbon sequestration and job creation, although co-benefits are limited and function is primarily carbon removal.	✔	Biodiversity enhancement, climate resilience, improved mental wellbeing could be realised from a well-managed afforestation project in addition to carbon sequestration.
Investment in the local area?	✘	DACCs facilities are likely to be large centralised plants and may well be internationally-based. Investment in the local area is therefore unlikely with co-benefits realised elsewhere.	✔	Afforestation projects likely to be identified in the local area, keeping any investment local and retaining co-benefits in BHASVIC's vicinity.
Net-zero aligned?	✔	DACCs achieves both carbon removal and long-term storage and therefore considered compensatory to the original emissions and aligned to net-zero as per current standards.	⊖	Removal credits could be claimed, however the long-term management and end-use of the woodland should be carefully considered to ensure high permanence.
Easy to quantify and accredit?	✔	Discrete transactions with service providers that have a clear calculation methodology and audit trail externalises and eases the quantification and accreditation process.	⊖	Although anticipated, there are currently no widespread and independently verified standards in place for nature-based carbon dioxide removal. Local projects put a greater onus of responsibility on the College to deliver the requirements of an offset and realise actual and sustained removals, and 3rd party accreditation may be required.
Cost	££££	DACCs is currently scarce and expensive, and significant investment will be required to allow for supply at scale in the future. Accelerated demand for technologies such as DACCs is expected to create a supply gap and maintain high costs.	££	Capital costs can be relatively inexpensive, although active management of the scheme and further costs (e.g., upskilling, accreditation) may be realised.

CARBON OFFSETTING

Prioritising offsets within or outside of the College's sphere of influence is a core decision and will influence several factors. Some of these are explored in the briefing paper but, if offsetting within the College's sphere of influence is pursued, two main considerations are highlighted:

1 Increased resource requirement and responsibility on the College to deliver robust offsetting projects

Projects claimed by the College as an offset should meet robust standards and be backed-up against established standards and accounting methodologies, and all criteria for a credible offset should be met and readily justifiable. Increasing BHASVIC's involvement in the projects puts a greater onus of responsibility on them to deliver these requirements and realise actual reductions and/or removals. This invariably will require for the College to provide additional resource and the associated upskilling to provide the active due diligence and management necessary.

Developing partnerships with other organisations interested in supporting local projects should be explored to dilute the resource requirement on BHASVIC and encourage further community involvement. Brighton and Hove Council has already declared an ambition to deliver offset projects "that have maximum benefits for our local communities and environment" and the College is involved in several FE partnerships in the local area (e.g., FE Sussex, S7 Colleges) and beyond (Sixth Form Colleges Association, Environmental Association for Universities and Colleges). As an aspirational leader in the space, BHASVIC should be proactive in their outreach and support for such collaborations to encourage wider action.

2 Decarbonisation targets may be harder to accredit to and publicly claim

Any claim to a decarbonisation target should be supported and possible to certify against an established standard. Some of the challenges associated with a net-zero target have already been highlighted and the College should be mindful that both a 2030 target date and local offset projects make alignment to current standards challenging, if not unattainable. This should not be a deterrent to climate action however, and well-managed and meaningful initiatives will still have an impact regardless of their ultimate alignment to a net-zero standard. Further, standards related to offsetting and net-zero are new and evolving and any strategy should have an appropriate level of flexibility to evolve with emerging and changing best-practice.

Transparent communication of the College's strategy is emphasised to ensure that any approach is clearly defined with justification provided where appropriate.

CARBON OFFSETTING

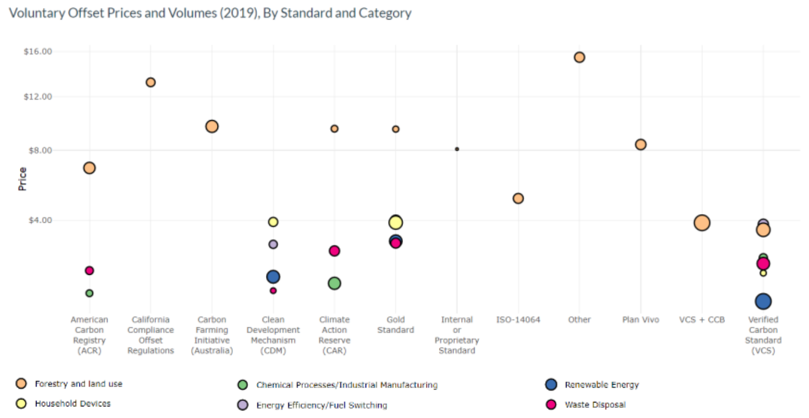
Purchasing offset credits as a secondary mechanism to neutralise residual emissions

Purchasing offset credits could be complementary to offsetting within the College's sphere of influence. Although preliminary engagement suggests that it will not be a priority for the College, the market should be understood before any engagement is conducted.

The voluntary offset market is unregulated but there are several organisations that provide assurance of the underlying offsets, commonly know as 'carbon offset standards'. These organisations provide standards for offset developers to meet and perform independent verification and monitoring exercises to ensure any claims are legitimate. Despite the presence of these organisations, the market often draws criticism for supporting a glut of projects with questionable additionality claims and credibility[1].

This has particular relevance to removal offsets where there is currently no widespread and independently verified standard currently in place, leading to uncertainty around "what good looks like". Because of the lack of consensus on standards, private-sector organisations like Microsoft and Shopify have had to circumnavigate existing carbon markets and carry out their own due diligence directly on removal projects. However, the associated resource requirements are inevitably the same if not greater than offsetting within an organisation's sphere of influence.

The College should be aware of the potential drawbacks of the voluntarily offset market and carefully navigate it to support projects that deliver real and additional benefits. The Carbon Trust recommends ClimateCare as a provider of high quality offset programmes, and has partnered with them due to their track record of providing credible offset programmes.



Above: there is a wide range of standards and costs on the voluntary offset market, indicative of an unregulated market with varying levels of scrutiny.

[1] An analysis of the Clean Development Mechanism – initially set-up under the Kyoto Protocol and involved in setting standards and verifying offset projects – found that 73% of the potential 2013-2020 Certified Emissions Reduction (CER) supply have a low likelihood that emission reductions are additional. Whilst the report focussed on the CDM it found that 'many of the shortcomings identified in this study are inherent to crediting mechanisms in general'. *https://ec.europa.eu/clima/system/files/2017-04/clean_dev_mechanism_en.pdf*

SECTION 4

Implementation and next steps

SUMMARY OF RECOMMENDATIONS

Project identification and pathway projection

BHASVIC's campus performs to a good level of energy efficiency. The majority of 'low-hanging fruit' that can be readily implemented and achieve quick paybacks is limited, and the College will now have to turn its attention to:

a) Optimising existing systems. Several opportunities for incremental gains across the Campus were identified. Whilst the impacts of these measures are relatively small when viewed in isolation, aligning to best-practice across the Campus will be key to the College achieving net-zero aligned decarbonisation in an economical and efficient manner.

b) Displacing fossil fuel use on the campus. The installation of low-carbon heating systems represent step-change projects that must be implemented for the College to achieve their decarbonisation ambitions and the sustained use of fossil fuel systems is not aligned to a net-zero strategy.

- Air-source heat pumps are recommended as a technological solution to replace gas boilers currently on site. However the majority of heating systems do not need replacing until the mid-end of the decade, and the College should remain aware of technological advances and local schemes (e.g., district heating), and a contemporary assessment should be performed when heat systems are close to replacement. Degasification of hot water heating should be performed in parallel.
- A preliminary feasibility study is recommended to prepare the College for the transition to heat pumps and notify them if any ancillary work (e.g., larger heat emitters, air tightness improvements) is required in advance of installation.
- Opportunities to displace residual natural gas demand (e.g., catering, laboratory use) should be explored when appliances reach the end of their serviceable life.

Even if not routinely measured and reported, greening procurement and improving data quality from suppliers should be a priority for the College.

Offsetting

The College should ratify what factors they consider a priority for offsetting and understand the associated opportunities and constraints to deliver a credible strategy around the agreed priorities. Any strategy should be agile and adapt over time to the expected evolutions in best-practice, and transparent communication of the College's strategy should be non-negotiable and at the heart of the College's approach to their residual emissions.

Opportunities for offsetting within BHASVIC's sphere of influence should be explored and prioritised, however the limitations of doing so (e.g., impact on target setting) should be understood, and partnerships should be sought to ease the resource requirement and maximise the co-benefits.

Offsetting on the route to the College's 2030 target date is recommended to maximise impact from the College's climate action.

IMPLEMENTING THE ACTION PLAN

Governance structure

To manage the implementation of this Plan it is important that organisational procedures and resources are put in place to maintain a focus on carbon reduction over time. To achieve carbon reductions that will support decarbonisation ambitions, BHASVIC will have to consider robust yet dynamic organisational structures to ensure that they remain flexible in the approaches being taken to reduce emissions over time. A successful governance structure has support and regular input from senior stakeholders (e.g., Principal-level, Governors) and buy-in from the stakeholders who influence the sustainable performance of the College (e.g., staff, students, suppliers).

The College has a strong culture of self-assessment reports and action plans (SARAPs) and all department subject areas produce SARAPs annually, which are all discussed and validated by senior staff, a governor and an external observer. The SARAPs are distilled into a College Development Plan, which is reviewed three times each year by Senior Managers and Governors. Integrating the governance of this Plan and broader sustainability actions into this established framework is recommended. Rather than having an individual sustainability SARAP, integrating sustainability into existing SARAPs is encouraged to embed sustainable behaviour in all activities and develop a culture of sustainability across the College.

An individual SARAP or alternative process may be required for key activities that don't have a clear 'owner' in existing structures (e.g., carbon footprinting and reporting). Ensuring the buy-in of students is also important and engagement with student groups or specific sustainability student leads should be undertaken.

Broadly, functions of a dedicated project team across BHASVIC should include:

- Gaining senior endorsement and publication of the Carbon Reduction Plan;
- Providing regular and ongoing oversight and monitoring of progress towards achieving decarbonisation target across key delivery team. Assigning sustainability leads across key teams (procurement, estates, transport, student engagement) is recommended;
- Ensuring that carbon reduction stays on the strategic agenda across BHASVIC operations, including at senior management level and among staff;
- Managing the expectations of key stakeholders and recognising achievements on carbon reduction across the organisation.

Appendices

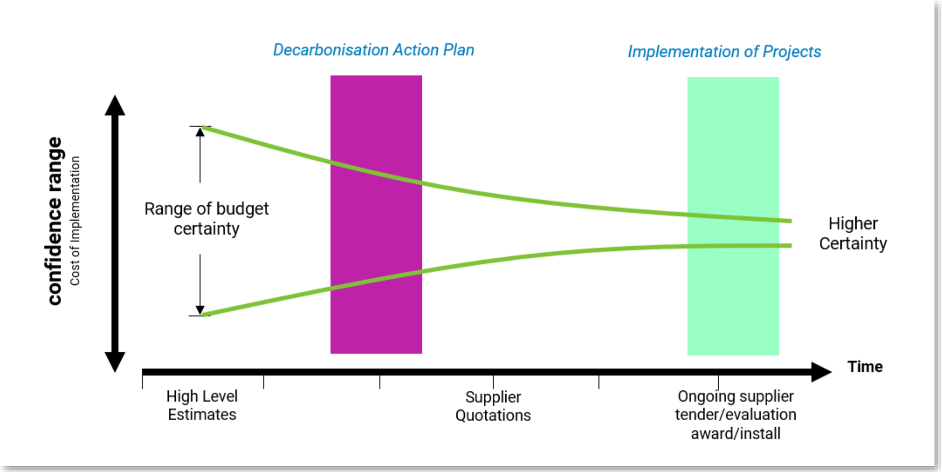
APPENDIX A: Project results and assumptions

APPENDIX A: PROJECT RESULTS AND ASSUMPTION

Action plan cost estimates

Financial figures have been estimated from industry standard benchmarks and the desktop survey. Where data gaps exist we have used reasonable assumptions to complete the data. This Action Plan and the figures presented should only be used as a high level guide; for any detailed business case preparation multiple quotes from suitably qualified suppliers/installers should be sought for specific suggested projects, and all suggested projects will require verification and detailed assessment prior to proceeding with implementation. All opportunities included have each been assessed independently in terms of their potential for saving energy and payback. The overall savings figures shown may not fully be achievable due to interactions between measures.

The College should validate the cost estimates with more detailed feasibility studies, supplier quotations, and ultimately tender responses



General cost assumptions include:

- Baseline natural gas and electricity prices taken from site-specific data provided by the College. Forecasts are taken from BEIS Green Book (https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal) and indexed against baseline tariffs
- Any annual maintenance savings are not considered at this stage but increased maintenance costs (e.g. cleaning on solar panels) are incorporated.
- Costs provided are indicative figures for supply and install only. No cost allowance is included for measurement and verification and other on costs such as contingency, overhead and profit, asbestos removal, design, project management, VAT, business rates etc.
- Life Cycle Cost Analysis was undertaken with a 0.035 discount rate and energy cost escalation in line with a Fixed 0% scenario.
- All costs exclude VAT.

APPENDIX A: PROJECT RESULTS AND ASSUMPTION

Project-specific considerations include:

Solar PV

- Solar capacity and generation were modelled using HelioScope software. Capital costs of the canopy system were estimated using an assumed cost of £1,350/kWp, and annual cleaning/service costs total £8.25/kWp.
- 100% of generation (35,320 kWh) was assumed to be consumed on-site.

Site	Installed capacity [kWp]	Generation [kWh]	Of which on-site [%]	CAPEX [GBP]	Annual OPEX [GBP]	Annual saving [GBP]	NPV [GBP]	IRR [%]
Car park canopy	40.3	35,320	100%	£54,405	£332	£4,612	£2,847	6%

EC plug fans

- Electrical consumption attributed to fans was derived from motor sizes and assumed operational hours, and a 30% reduction in motor size was assumed with constant operating hours.
- Assumed capital cost of £900/kW for the motors.

Site	Upgraded motor size [kW]	Usage [hrs]	CAPEX [GBP]	Annual saving [GBP]	Simple payback [yrs]	NPV [GBP]	IRR [%]
Copper Building	6.3	2,860	£5,670	£2,312	2.5	£20,959	41%
Sports Hall	7.0	3,120	£6,300	£2,802	2.2	£25,977	44%

APPENDIX A: PROJECT RESULTS AND ASSUMPTION

Heat pumps

- Heat pumps have been sized based on monthly metered data and to meet heat demand on 90% of the days over the period.
- The heat pumps are assumed to operate at average coefficients of performance (COP) of 2.75 due to the observed energy efficiency of campus buildings. The costs of ancillary requirements (e.g., larger heat emitters, additional fabric improvements) have not been included and the costs presented are specific to the heat pump only.
- Costs data is a combination of SPONS and soft market testing conducted by the Carbon Trust.

Site	Assumed heat load [kWhg]	Heat pump size [kW]	CAPEX [GBP]	Annual saving [GBP]	Simple payback [yrs]	NPV [GBP]	IRR [%]
College House	138,956	100	£108,375	£1,437	75.4	(£96,424)	-
Main Building	146,307	100	£108,375	£1,513	71.6	(£95,792)	-
Copper Building	114,379	60	£67,575	£1,183	57.1	(£57,738)	-
Sports Hall	128,162	60	£67,575	£1,325	51.0	(£56,552)	-

Appendices

APPENDIX B: FE roadmap self-assessment (.xcl)

APPENDIX C: Carbon offset briefing paper

Carbon offsetting: briefing paper

Prepared for **BHASVIC**

Offsetting

Introduction

Carbon offsetting is a broad term that refers to the action of reducing greenhouse gas (GHG) emissions or increasing carbon storage to compensate for emissions that occur elsewhere. This involves buying/supporting emission reduction or removal enhancement projects outside of an organisation's greenhouse gas inventory boundary. Offsetting can be broken down into four main categories :

	Avoidance/reduction	Removal/sequestration
Nature-based	**Avoided nature loss** Limits the loss of nature such as forests and peatland, which currently sequester large amounts of carbon.	**Nature-based sequestration** Uses nature to sequester more carbon in the biosphere, including reforestation and restoring soil, mangroves, seagrass and peatlands
Technology-based	**'Additional' emissions avoidance/reduction** Reduces emissions from current sources that don't have the financial incentive or regulatory requirement to decarbonise (e.g., cookstoves, renewable energy and energy efficiency)	**Technology-based removal:** Removes CO2 from the atmosphere using technological methods and stores it in the geosphere or through other secure methods such as concrete (e.g., BECCS, DACCS, Construction using renewable timber)

Above: the four categories of carbon offsetting.

This briefing paper is designed to provide BHASVIC with the latest guidance around offsetting, and engagement with the College will be conducted to determine sentiment towards different offsetting strategies. Whilst this section should be used to guide thinking, two points are reemphasised at this stage: **a) offsetting should always come second to reducing emissions within BHASVIC's own GHG inventory**, and b) definitions and standards are still in development and the College should remain informed of any changes and maintain an agile approach to offsetting.

The following questions should be answered as a basis for deciding an offsetting strategy:

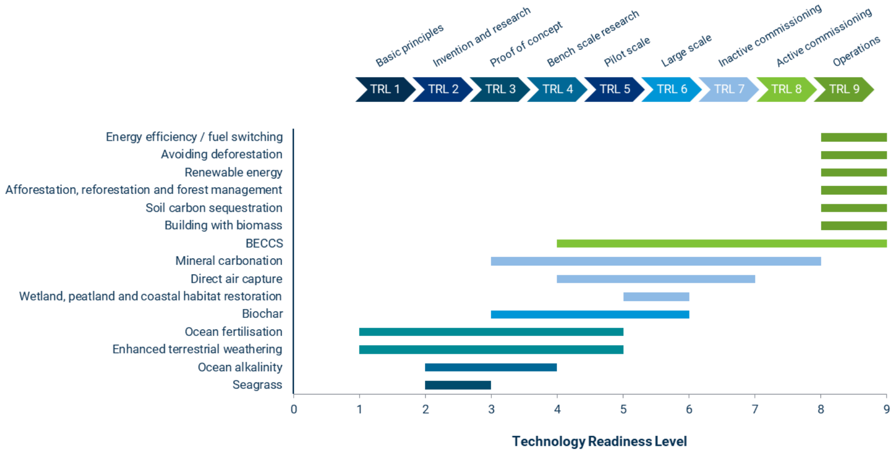
- Do the College want to prioritise any specific offsetting methods, and/or projects within or outside of their sphere of influence?
- What projects could the College support within their sphere of influence?
- Does the College want to align their offsetting strategy to a standard?
- What partnerships and/or initiatives could the College engage with or form?
- What emissions do the College want to offset?

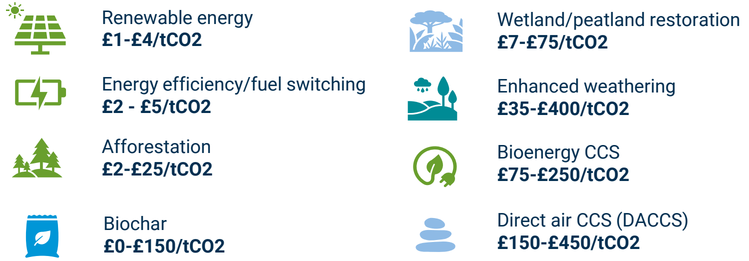
Offset technologies

There are several technologies that can claim carbon offsets, though the readiness and costs of the technologies vary substantially. Established technologies such as energy efficiency, renewable energy and nature based solutions (reduced emissions from deforestation and forest degradation, afforestation, soil carbon sequestration) have dominated the voluntary offset market to date due to their commercial readiness and affordability, with almost three quarters of credits issued in 2020 being either nature-based solutions or renewable energy. However, concerns over the additionality of renewable energy projects and competing land uses for nature-based solutions are often raised and have to be managed carefully, particularly as the voluntary offset market grows globally.

Several technologies are emerging with high scale-up and offsetting potential (e.g., bioenergy with carbon capture and storage, direct air capture). However, they are currently scarce, expensive and resource intensive, and significant investment will be required to allow for their supply at scale in the future.

The readiness and costs of offset technologies varies substantially and will continue to evolve in a dynamic market:





TRL Source: Adaptation from The Royal Society and Royal Academy of Engineering, Royal Society greenhouse gas removal report, 2018

Costs Source: i) https://netzeroclimate.org/greenhouse-gas-removal/, ii) https://www.ecosystemmarketplace.com/carbon-markets/em-data-dashboard

Offset technologies

Cost and readiness level will inevitably play an important role in dictating an organisation's offsetting strategy. However, there are several other factors to consider:

Permanence: the impact of carbon dioxide emitted today is long-lived (~100 – 1,000 years) and offset measures should be equally permanent to be considered entirely compensatory. However, offset mechanisms have different levels of permanence. For example, an afforestation project that grows timber for use at an unabated biomass power plant (i.e., one that doesn't capture and store the subsequent carbon dioxide) will release a substantial amount of the stored carbon years before the originally-offset carbon has been completely neutralised from the atmosphere. A similar afforestation project that grows timber for construction will 'lock-in' the carbon for a far longer period. Likewise, technologically capturing and storing carbon in geological formations (i.e., direct air carbon capture and storage) will achieve long-term carbon removals synonymous with the natural lifetime of carbon.

Reversal risk: linked to permanence, reversal risk refers to the possibility of carbon being (re)emitted after the creation of an offset. This could be unintentional, for example, an afforestation project being used to grow construction-grade timber could experience a fire resulting in a significant proportion of the stored carbon being released to the atmosphere. Reversal risk is greater for some offset methods than others.

Co-benefits: projects can offer secondary benefits, which could include further environmental or ecology gains (e.g., habitat creation, water purification) or social benefits (e.g., provision of jobs). The nature and extent of co-benefits will vary between offsetting methods, and an organisation can select carbon offsets on the basis of alignment with their values and mission.

Additionality: the requirement that a project would not have been undertaken in a realistic business-as-usual scenario (i.e., without the proceeds from the sale of carbon credits) is one of the fundamental requirements of a robust offset (see page 7). Research into crediting mechanisms[1] has cast doubt over the additionally of many available credits, and some analysts point to the low cost of credits as an indicator of projects with dubious additionality.

Time to realise offset: some offset projects (particularly afforestation) can take years after implementation to mature and start to realise substantial carbon savings. This may be prohibitive if an offsetting organisation wants to achieve immediate carbon reductions. Likewise, it should also be an early consideration for organisations that know they will have an offsetting requirement in future years.

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[1] An analysis of the Clean Development Mechanism – initially set-up under the Kyoto Protocol and involved in setting standards and verifying offset projects – found that 73% of the potential 2013-2020 Certified Emissions Reduction (CER) supply have a low likelihood that emission reductions are additional. Whilst the report focussed on the CDM it found that 'many of the shortcomings identified in this study are inherent to crediting mechanisms in general'. *https://ec.europa.eu/clima/system/files/2017-04/clean_dev_mechanism_en.pdf*

Trading offset credits

The total carbon savings of an offsetting project can be calculated and then traded as credits each representing 1 tCO_2e, these are known as carbon or offsetting credits. A credit is a transferable instrument that can be retired from the market at any time to claim the underlying carbon reductions.

Offsets are sold on either mandatory (compliance) or voluntary markets. Participants in mandatory markets buy and trade carbon credits in order to meet emission obligations under different relegation, these include Emission Trading Schemes (ETS) and international offset programmes such as the Clean Development Mechanism set-up under the Kyoto Protocol. Participants in voluntary markets participate at their discretion and buy offsets to meet internal carbon reduction targets that are not enforced by a regulatory body (i.e., BHASVIC's net-zero target). The following terminology is used on carbon credit markets:

- **Issuance:** the year in which the credit was issued and uploaded to the relevant registry.
- **Vintage:** the year in which the emission reduction took place and the credit was produced.
- **Retirement**: holders can retire their credits from the market to claim the underlying offset. Once retired they are permanently removed from circulation.

Offset standards and registries

The voluntary market is unregulated but there are several organisations that provide assurance of the underlying offsets, commonly know as 'carbon offset standards'. These organisations provide standards for offset developers to meet and perform independent verification and monitoring exercises to ensure any claims are legitimate. They are also registry providers and track what offsets are issued, when they're sold, and when they're retired. On the registries each offset credit is assigned a unique serial number that can be transferred during a transaction. If the owner wishes to claim the credit against their own emissions the registry removes the serial number from circulation so that the credit cannot be resold.

Four major standards/registries account for nearly all market activity: Verified Carbon Standard; Gold Standard, Climate Action Reserve and American Carbon Registry. All four registries are reputable, however there are differences in the focus of each standard. For example, the Gold Standard requires every project to verify it's benefitting neighbouring communities whereas the Verified Carbon Standard focuses on GHG reduction attributes only and does not require further environmental or social benefits. More information on each standard can be found at the Offset Guide[1].

Other organisations such as the Internal Carbon Reduction Offset Alliance (ICROA) aim to promote best practices in voluntary action on climate change. ICROA was established as a non-profit in 2008 and has a core purpose to develop, apply and advance best practices in voluntary climate action.

[1] https://www.offsetguide.org/understanding-carbon-offsets/carbon-offset-programs/voluntary-offset-programs/

Approaches to offsetting

There are two main ways that BHASVIC can offset their residual emissions: within, and beyond their sphere of influence. In the context of this report, sphere of influence could refer to geographic area or BHASVIC's fiscal supply chain. Offsetting within an organisation's sphere of influence is sometimes referred to as insetting, which can be categorised in the same way as offsets (i.e., emission avoidance or emission removals). Insetting is still a relatively recent concept for which there is no universal definition or standard, and definitions are expected to continue evolving as an agreed methodology to account for the emission reductions/removal enhancements is developed. Offsetting beyond an organisation's sphere of influence can be viewed as analogous to buying offset credits on global carbon offset markets.

Some of the benefits and considerations for both approaches are outlined:

	Local - Offsetting within sphere of influence	Global - Offsetting beyond sphere of influence
Benefits	• Strengthens supply chain and community relations with benefits from the resulting projects (e.g., environmental restoration, increased climate resilience, improved air quality) benefitting the stakeholders and communities engaged with the entity. • Benefits can be more easily communicated to stakeholders. • Greater control, oversight and transparency over projects and the ability to self-verify the project's credentials.	• Minimal work on behalf of the organisation required for measuring and verifying carbon reductions. • High availability with more choices across locations and methods, lowering a) the risk of not achieving offset reductions, and b) costs by allowing developers to use cost-effective methods. • "Global issue requires global solutions" – 1tCO_2e carbon offset locally is analogous to 1tCO_2e internationally.
Considerations	• Requires additional resource input from the organisation (inc. upskilling) and active management to ensure carbon reductions and/or removals are achieved and meet robust standards. • Measuring and verifying offsets can be complex and reporting standards and guidance is currently under development. • Inherently restricted to the type, size, and number of projects that can be implemented, increasing the risk of not meeting an offset target.	• The market infrastructure required to ensure quality offsets is not yet fully developed, and there are doubts over the credibility of many credits on the market today. The offsetting organisation also has little-to-no oversight over the quality and delivery of offsets. • Exposed to market dynamics (e.g., increasing credit prices, credit supply). • More difficult to communicate benefits to stakeholders.

Approaches to offsetting

Whilst there are several considerations, it is our recommendation that an organisation prioritises offsetting within their sphere of influence before purchasing credits beyond their sphere of influence. This is particularly relevant for focal points of a community, such as BHASVIC, where co-benefits and influence can be maximised.

The Carbon Trust's action hierarchy, whilst the approaches are listed in order of priority, they should be considered simultaneously given the interdependencies of each:

	Reducing emissions	Offsetting
Within sphere of influence	**1st** Take measures to reduce emissions within own value chain to **greatest possible extent**	**2nd** Organisations that are well-suited to realising offsets within their sphere of influence, and can maximise the co-benefits, should do so before considering beyond their sphere of influence.
Beyond sphere of influence	**3rd** In the near term as global emissions are high, there is a role for all types of offsetting. Remaining emissions should be offset by purchasing credits beyond the sphere of influence	

Locality, whilst providing benefits, invariably increases the resource requirement on the insetting entity and should not be undertaken unless projects can be appropriately implemented and monitored. There are a number of standards and accounting rules in development that will provide guidance on how companies should record insets (especially carbon removals), however in the meantime organisations should act as transparently as possible to ensure reported insets are credible. Third-party validation of any scheme could also be considered to ensure robust procedures are being followed.

What are the requirements of an offset or inset?

Not all offsets are created equal

Regardless of the exact nature of the scheme, the following criteria are required for an offset/inset scheme to be credible, and a robust due diligence process should be implemented to ensure all criterion are met.

Below: criteria for a credible offsetting/insetting strategy

	Criteria	Description
1	**Real**	All the GHG emission reductions or removal enhancements and the projects that generate them must be proven to have genuinely taken place.
2	**Additional**	Double causality: Reductions/removals would not have been realised if the project had not been carried out, and the project itself would not have been undertaken without the proceeds from the sale of carbon credits.
3	**Based on realistic and credible baselines**	Credited only beyond performance against a defensible, conservative baseline estimate of emissions that assumes the BAU trajectory in the absence of the activity. Baselines should be recalculated at a regular, conservative timeframe.
4	**Monitored, reported and verified**	Projects calculated in a conservative and transparent manner, based on accurate measurements and quantification methods. Must be verified by an accredited, third-party entity. MRV should be conducted at specified intervals.
5	**Permanent**	Only issued for GHG reductions or removals that are permanent or, if they have a reversal risk, must have requirements for a multi-decadal term and a comprehensive risk mitigation and compensation mechanism in place, with a means to replace any units lost.
6	**Leakage accounted for and minimised**	Leakage is defined as an unintended increase in GHG emissions caused by a project. E.g., a forest sequestration project that simply shifts deforestation activities to other forest land, thereby reducing or eliminating the net sequestration from the project.
7	**Only counted once**	Not double-issued or sold.

Offsetting standards and frameworks

Even under an accelerated decarbonisation pathway, BHASVIC will have some residual emissions in 2030 and offsetting will be required to achieve their net-zero ambition. It is unlikely that there will be a single definition of net-zero, but organisations should align with credible net-zero standards frameworks and standards where available and applicable. In relevance to BHASVIC and wider net-zero targets, there are currently three main standards that outline approaches to offsetting:

Science-based target initiative net-zero corporate standard

October 2021

First net-zero standard that private-sector organisations can be accredited against

COP26 Universities Network: FE and HE carbon offset briefing

January 2021

Guidance to support the development of further and higher education offsetting policies

The Oxford Principles for Net Zero Aligned Carbon Offsetting

September 2020

Outline of key principles required to ensure offsetting helps to achieve a net-zero society

Each of the standards is nuanced and there is slight variation between them. However, they are broadly aligned across three key areas, which set out how an organisation's offsetting strategy should evolve over time to be considered net-zero aligned.

1 **Cut emissions and use high quality offsets**

Reductions must be prioritised in the first instance to minimise the need for offsets. Where offsets are required, organisations should perform robust due diligence to ensure offsets are credible and maintain environmental integrity. All reporting should be done transparently and current emissions, accounting methodology, target setting, and offsetting strategy should all be disclosed.

2 **Shift to carbon removal offsetting**

To ensure compatibility with the Paris Agreement, users of offsets should increase the portion of offsets that come from carbon removals. By 2050, 100% of offsets should be sourced from emission removals.

3 **Shift to long-lived storage**

Transition to methods of carbon removal that have a low risk of reversal over centuries to millennia, for example storing CO_2 in geological reservoirs or mineralising carbon into stable forms (e.g., timber used in construction).

Offsetting standards and frameworks

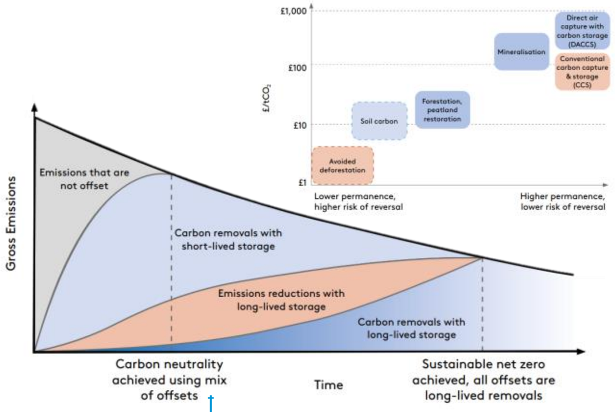
The carbon offset briefing for FE institutes provides an indicative evolution of an organisation's offsetting strategy (*right inset*). It outlines:

- Net-zero is only achieved once all residual emissions are counterbalanced by carbon removal offsets with long-lived storage;
- Offsets should be considered on the route to net-zero and not just at the target date, and the composition of an organisation's offsets should evolve as the market for more preferential methods (removals and/or long-lived storage) develops.

This advice is consistent with the SBTi net-zero standard, which states that net-zero can only be achieved once a) a long-term decarbonisation has been achieved, and b) all residual emissions are offset through the *permanent removal and storage* of carbon from the atmosphere. The SBTi also encourages mitigation on the route to net-zero, through the purchase of high-quality credits or through investment in emerging technologies requiring scale-up (e.g., direct air capture).

Evolution of a net-zero aligned offset strategy

COP26 Universities Network: Carbon offset briefing



However, the current market for both removal and long-lived storage is nascent and requires significant development. Current and future carbon removal costs are uncertain but can be expected to be significantly higher than current carbon credit prices – McKinsey analysis has estimated future 2050 costs ranging between £30-£100 per tonne of CO_2 (~£6 was the average price paid on the voluntary offset market in 2020). There is also a lack of widely verified or recognised standards related to carbon removals, with a recent review by Carbon Plan finding that none of the 14 most commonly used soil carbon removal offset protocols do enough to guarantee good outcomes. Organisations will need to pay a premium for, and establish robust due diligence to ensure, high-quality carbon removal options, and pioneering organisations like Microsoft and Shopify have had to circumnavigate existing carbon markets and carry out their own due diligence directly on carbon removal projects. However, this requires significant expertise and resource, which BHASVIC cannot be reasonably expected to deliver. Establishing partnerships and coalitions with similar institutions should be prioritised to navigate the carbon offset market and deliver the most impactful portfolio possible with available resource.

[†] Carbon neutrality is reached once all residual emissions are counterbalanced by an equivalent amount of carbon offsets of any type and not specifically long-lived removals.

[1] Coalition for Negative Emissions & McKinsey, The Case for Negative Emissions

[2] https://carbonplan.org/research/soil-protocols-explainer

Offsetting standards and frameworks

What emission sources should be included?

BHASVIC's carbon baseline report, produced by the Carbon Trust, recommended that emission sources should be split into two categories:

- **Net-zero target:** emissions that can be readily monitored and are directly impacted by to the College's actions should be habitually reported and reduced as much as possible through target initiatives, with any hard-to-abate residual emissions offset using certified GHG removals at the target year.
- **Proactive focus:** emission sources further removed from the College's influence that cannot be accurately reported without significant engagement and/or advances in carbon reporting, and have a lower degree of sensitivity to the College's actions. These include procured goods and services, capital goods, upstream energy emissions, and student travel.

Regardless of their classification, all emission sources are acknowledged by the College as originating from their activities and within their wider emissions boundary, and could be considered for offsetting. This would invariably result in an increased expenditure, and is currently only recommended if it can be done without restricting available funds for a) the core function of the College as an education provider, and b) decarbonisation initiatives within the College's core emissions boundary. This is particularly pertinent in current market conditions where the quality of offsets is often questioned and a significant time and cost premium is required for securing high-quality offsets.

However, these emissions should be reported and offset for the College to claim net-zero across all operations. The FE offset briefing also advises that student flights are included within carbon reporting, and the SBTi standard (whilst aimed at private-sector organisations) specifies that the full value chain should be included within a net-zero target. BHASVC has ambitions decarbonisation targets and aspires to be a leading institution, and their offsetting strategy should reflect this. Conversations should weigh ambition against resource to deliver a strategy that optimises positive outcomes within inevitable resource constraints. Regardless, any offsetting strategy should be clearly communicated with transparency at it's core.