



Race to Zero Report
2025

Introduction	3
Executive Summary	3
Our Commitment	5
Race to Zero.....	5
Responsibilities & Reporting.....	5
Decarbonisation Contribution to the UN Sustainable Development Goals.....	5
Interaction with Sustainability Strategy	6
Energy Goals	6
Energy Targets	6
Decarbonisation Goals	6
Decarbonisation Targets	7
Historic Progress	8
Electricity.....	9
Natural Gas	9
Energy Use Intensity.....	9
Comparison to UK Net Zero Carbon Buildings Standard	10
Embodied Carbon	11
Source of Scope 1 and 2 Emissions	12
Scope 3 Emissions.....	14
Scope 3 Methodology	14
Upstream.....	15
Downstream.....	16
Student Commuting	16
Total CO2 Emissions – All scopes.....	16
Scope 3 Gaps.....	17
Achieving Zero	18
Our goals.....	18
Decarbonisation Scenario	18
Existing activities.....	19
Next Steps.....	20
Anticipated Projects.....	25
Building improvements	25
Low-carbon heating systems	26
Anticipated Costs	26

Introduction

Welcome to the Buckinghamshire New University (BNU) Race to Zero report for academic year 2023-2024. This report will provide an update on our progress towards our decarbonisation ambitions and an annual performance update. It ends with an outline of current and proposed projects.

We aspire to become a leader in sustainable education, meeting and exceeding our ethical and social responsibilities. By working closely with our learners, staff, communities, and partners, we aim to create a lasting positive impact. We invite our stakeholders to join us on this journey towards sustainability, as we work together to achieve our ambitious goals. By reducing our environmental impact through our actions and the education we offer, BNU can transform lives and be a positive influence on society and our future climate.

Executive Summary

Over the past year, we delivered substantial energy efficiency and CO₂ emissions improvements. We have a pipeline of promising projects lined up to reduce our environmental impacts further. Our commitment to the environment remains a cornerstone of Thrive 28, our University Strategy, and we have delivered substantial progress against most of our sustainability performance metrics.

We have implemented multiple energy and CO₂ reduction projects over the last year, including a major investment in building fabric and energy efficiency. Our pipeline of projects continues to grow, and we are in a stronger position than we were a year ago. We are investing in the electrical infrastructure needed to transition from fossil fuel and support our future growth. However, due to bottlenecks in the regional electrical network outside of our control, we may need to extend our net zero ambition beyond 2030. These challenges have reinforced the value and necessity of our energy efficiency improvements; without our investments in decarbonisation over the last few years, our position would be substantially worse.

We will continue to follow an interdisciplinary approach to Climate change adaptation and mitigation. This includes changes to how we use our buildings; value the environment; and how we can adapt our campuses to better match the future needs of BNU and wider society.

Our Scope 1 & 2 emissions over 2023-2024 came to 1,245 tonnes of CO₂, of which 40% of our emissions were a result of our residences which are also responsible for 40% of our total gas consumption. This marks a reduction of 923 tonnes against our 2022-2023 emissions. Largely following a shift to Renewable Energy Guarantees of Origin backed electricity.

Over the last year, we have successfully implemented energy efficiency and carbon reduction projects that are expected to reduce our direct CO₂ emissions by 60 tonnes per year. In addition to these direct emissions reduction projects, we have committed to replacing a further 1,700 lights on our main campus over the year 24-25. This investment will pay for itself within two years and will continue to support our drive to improve energy efficiency and alleviate grid constraints

We have assessed our Scope 3 emissions for the first time. Though our approach to Scope 3 is still in development, this exercise has delivered useful information. We now know that our Scope 3 emissions are equivalent to approximately 28,819 tonnes of CO₂. To put this into perspective, this is 23 times greater than the emissions associated with operating our buildings. Over two-thirds of our Scope 3 emissions are a result of the goods and services we procure. We have begun the process of engaging with our supply chain to reduce emissions, however, this will be a long process, and our ability to reduce these emissions is somewhat limited.

The Higher Education sector is in a period of financial pressure, though BNU is performing well, careful consideration must be given to all capital expenditure. However, this represents an opportunity to reflect and refresh our data collection processes. Data is the foundation on which all decisions are made, and several lower-cost opportunities will help us improve the quality of our data, making it easier to measure opportunities and track our successes.

While we recognise the scale and complexity of the challenge, we are proud of our progress over the last year.

Our Commitment

Race to Zero

In 2020, we joined the Race to Zero Pledge, a global campaign to rally leadership and support from businesses, cities, regions, and investors for a healthy, resilient, zero-carbon recovery. By joining the pledge, BNU stands with more than 1,200 like-minded educational institutions committed to reducing greenhouse gas emissions to net zero as soon as possible, a process we refer to as 'Decarbonisation'.

We have set an ambitious target of reducing our Scope 1 (direct consumption of fuels) and Scope 2 (electricity) emissions to zero by the end of the 2030 academic year. This target reflects our recognition of the environmental and social damage caused by greenhouse gas emissions and the challenge of balancing global decarbonisation with the ongoing need for development in the global south. We are reviewing our net zero target date, due to several outside factors that may force a delay, primarily related to regional electrical infrastructure limitations. Nonetheless, as an institution in a developed nation, we must achieve net zero as soon as possible. To this end, we are implementing multiple strategies, including transitioning to renewable energy sources and enhancing energy efficiency across our campuses.

Our Scope 3 commitments are equally ambitious. While we acknowledge that achieving a complete reduction by 2030 may not be feasible, we aspire to reduce our emissions as much as possible by then. Like many organisations, our plan to achieve net-zero Scope 3 emissions is still under development, but we are taking steps such as engaging with our supply chain to promote sustainable practices.

Responsibilities & Reporting

Our Race to Zero commitment is embedded within our Thrive 28 strategy. Carbon reduction is one of our published key performance indicators and is part of how we will measure our success.

The University Executive Team are responsible for our success against our carbon emissions and wider sustainability, these fall within the remit of our Chief Financial Officer, with support from our Director of Estates & Facilities, and the Head of Sustainability. UET receive updates on our carbon reduction works through presentations and reports, such as this. We also present these to our Senate and University Council to inform our decision-makers and allow open discussion. These groups include student and staff representatives.

Decarbonisation Contribution to the UN Sustainable Development Goals

Our decarbonisation projects are expected to have a positive impact on the following Sustainable Development Goals. Where possible, our projects will also positively affect other goals.



Figure 1. UN Sustainable Development Goals relevant to Decarbonisation

Interaction with Sustainability Strategy

We launched our inaugural Sustainability Strategy in April 2023. Our strategy outlines how we define sustainability, our priorities, and ten Strategic Areas in which we believe we could have a positive impact. The Strategy also includes goals and targets for each of the Strategic Areas, we have extracted our goals and targets for Energy and Decarbonisation below.

Energy Goals

- To maximise our use of renewable energy through self-generation and greening our energy supplies
- To minimise the use of fossil fuels
- To improve the energy efficiency of our buildings and operations

Energy Targets

1. Reduction in the proportion of total energy consumption from fossil fuels
2. Ensure that all future electricity contracts include traceable renewable electricity when our current energy contracts expire in 2022-2023.
3. Complete a programme of energy-efficiency and decarbonisation surveys by the end of 2022-2023.
4. Reduction in Energy Use Intensity (EUI), defined as the energy use per square metre of internal floor area relative to a 2018 baseline.

Target	Energy Intensity
2018 baseline:	168 kWh/m ² /year
2026	159 kWh/m ² /year
2028	149 kWh/m ² /year
2030	144 kWh/m ² /year

Table 1. BNU Sustainability Strategy targets for energy intensity

These targets have been amended following the discovery of a data discrepancy that artificially reduced our footprint. This falsely inflated our energy intensity, however, the targets for % reduction remain unchanged.

Decarbonisation Goals

- To reduce our energy-related greenhouse gas emissions to zero by 2030
- To measure, monitor and reduce our indirect greenhouse gas emissions as far as possible by 2030

Decarbonisation Targets

1. Identify which areas of indirect (Scope 3) emissions we can measure and develop a measurement plan by the end of the academic year 2023-2024
2. To complete the initial baseline assessment of indirect emissions by the end of 2024-2025
3. Work with our supply chain to identify the suppliers and partners we can encourage and support to reduce our emissions and drive sustainability improvements
4. Develop an emissions reduction plan for our indirect emissions by the end of 2025-2026

Further information can be found in our Sustainability Strategy, available from our website.

Due to the level of detail involved in developing energy and decarbonisation plans, we have adopted a hierarchical approach to our document management. With each descending level, the number of documents increases, but each one adopts a narrower focus with a greater level of detail. Our Sustainability Strategy is at the top of this hierarchy and outlines our overall attitudes, methods, and ambitions to guide all later documents.

Supplemental route maps and plans will address specific aspects of sustainability based on the attitudes, ambitions and methods set out in the Sustainability Strategy. Using decarbonisation as an example, our Sustainability Strategy sets out our high-level ambitions, goals, and targets and subsequent documents outline the details of individual projects or document our rationale.

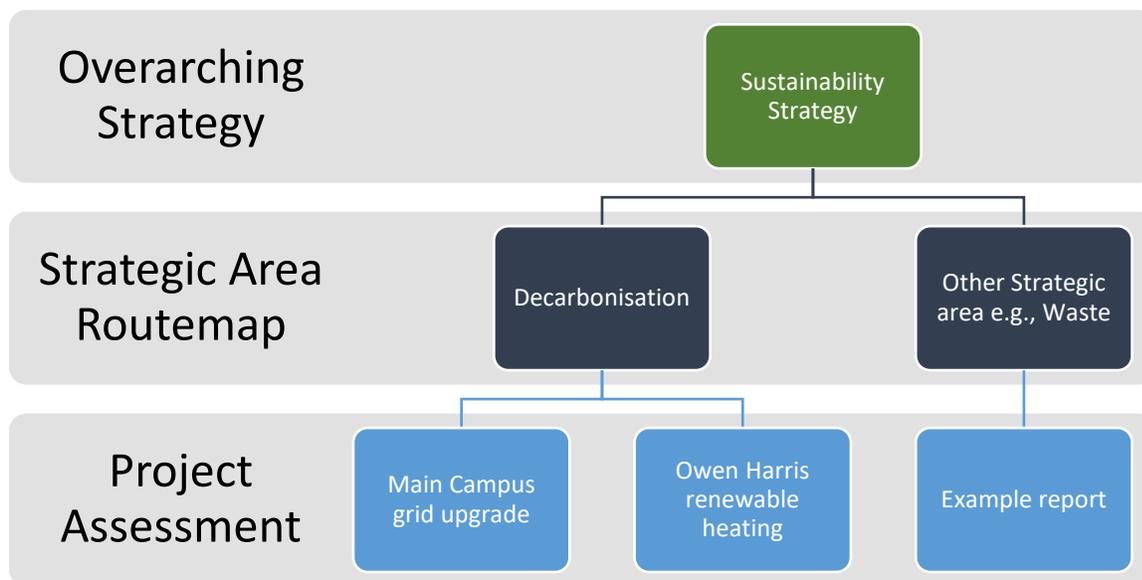


Figure 2. Hierarchy of Sustainability Governance

Historic Progress

The following chart shows Scope 1 and 2 CO2 emissions each academic year from 2005 to 2023. The orange bars show our targets, and the grey line shows our actual performance. Since 2005 we have reduced our CO2 emissions by 82% against our baseline. There was no CO2 target for 2021.

Our CO2 emissions fell substantially from 2022-2023, with a reduction in emissions of 923 tonnes.

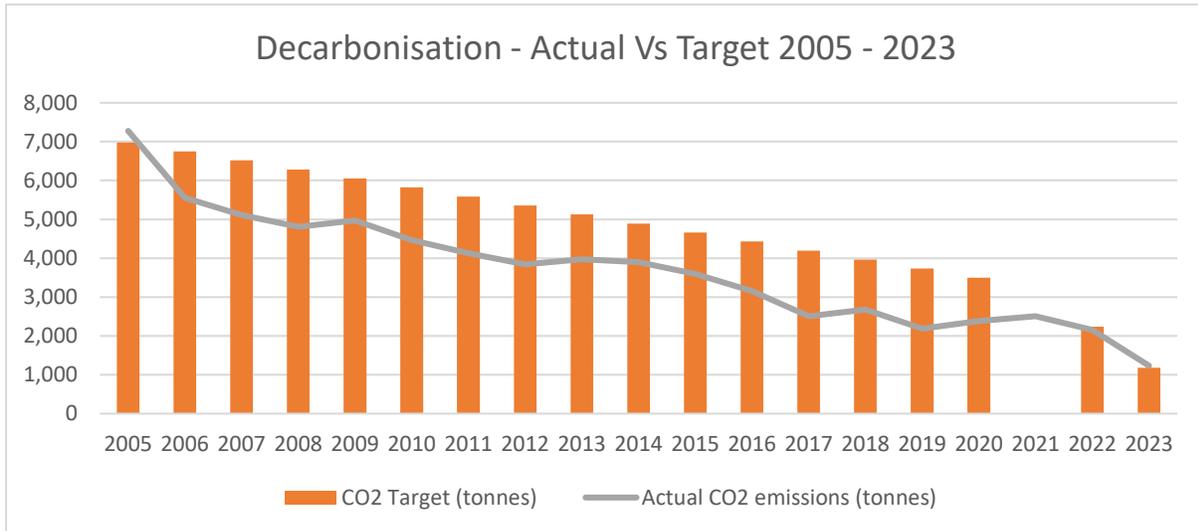


Figure 3. BNU CO2 emissions against targets 2005-2022

The following graph shows our Scope 1 and 2 energy consumption and CO2 emissions for 2015 to 2023.

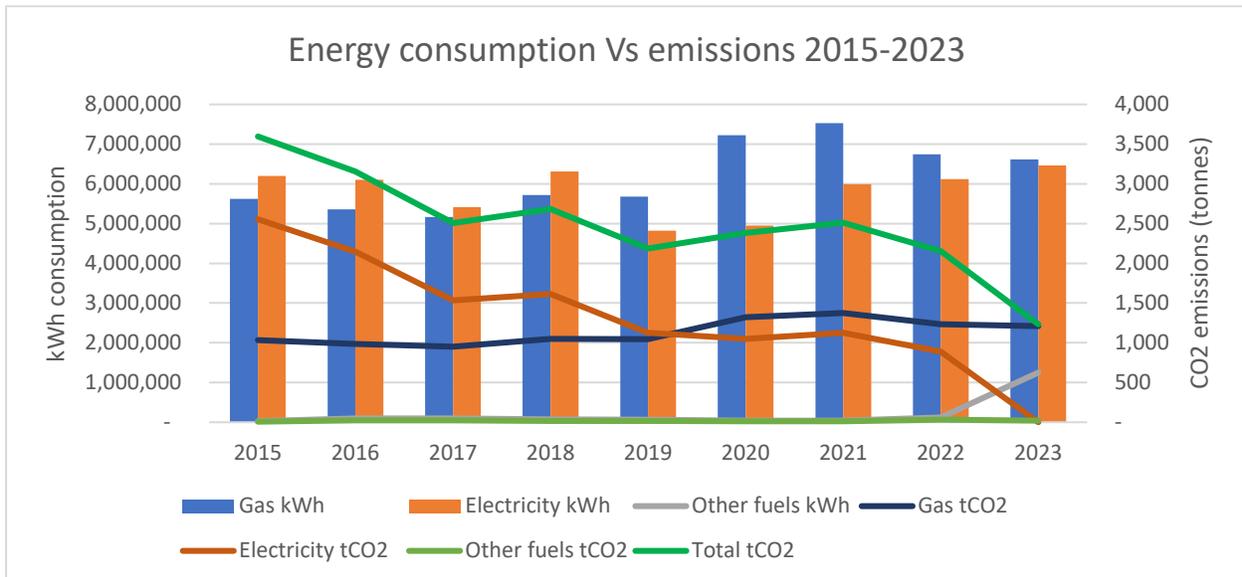


Figure 4. BNU energy consumption against CO2 emissions

Energy consumption from other fuels increased to 1GWh in 2022-2023 due to the use of temporary generators fuelled by hydrotreated vegetable oil. A form of biofuel with very low CO2 emissions.

Electricity

Our grid electrical consumption has remained comparable to our 2015 baseline. However, this does not consider the electricity generated by the temporary generators on the main campus, which is a further 0.5GWh that results in an adjusted total electricity consumption of c.6.9GWh. An increase of c.13% over 2015. This increase in electricity consumption is due to an expansion in operations on our main campus with the introduction of a new commercial kitchen, and multiple electrically heated, cooled & ventilated spaces. In practice, recent investments in LED lighting mean that we have saved a substantial amount of electricity and have become far more efficient.

As of April 2023, all electricity purchased by BNU is backed by Renewable Electricity Guarantees of Origin (REGO) certificates. As per the Greenhouse Gas Reporting Protocol, these certificates allow us to evidence that our scope 2 electricity results in zero CO₂ emissions. This has resulted in a reduction in electricity-related emissions of 1,338 tonnes of CO₂.

Natural Gas

Our gas consumption fell 2% between 2022-23 and 23-24, this is lower than anticipated and partly explained by a reduction in heat gains from inefficient old lighting. As we changed most of the lighting on our main campus for LEDs, the amount of heat generated by the lights fell. Our boilers needed to provide additional heat to replace this heat. As gas remains substantially cheaper than electricity, this was a cost-saving.

When gas use was normalised against both square metres and outside weather (Heating Degree Days), our gas efficiency fell. This means that we used heat unnecessarily when the weather was cooler. We expect that this is a result of poor control systems wasting heat in mild weather. To counter this, we have commissioned a BMS specialist to audit our systems and identify opportunities for improvement.

We carried out energy efficiency and building insulation projects during the period, but the savings will only be seen in the years 24-25. Further opportunities to reduce our gas consumption remain, these include the installation of improved controls. More information on these projects can be found in later sections.

Energy Use Intensity

Due to the use of temporary generators to generate power, and an increase in the energy intensity of our operations e.g., the creation of a new industrial kitchen, our EUI per square metre increased from a 2018 baseline of 168kWh/m² to 196kWh/m². However, once adjusted to reflect the efficiency of the generators, our EUI would have been 188 kWh/m². This represents an improvement on our energy performance in 2021-22. While generators will be needed for the year 24-25, we anticipate that we will not require generators in 2025-2026. In addition, further energy savings will be delivered because of our continued investment in energy efficiency.

Comparison to UK Net Zero Carbon Buildings Standard

2024 marked the release of the pilot version of a new voluntary standard on how we might quantify Net Zero in buildings. This standard considers both the energy & emissions needed to operate the building and the carbon associated with building/maintaining/demolishing the building at the end of its life.

The UK Net Zero Carbon Buildings Standard Pilot includes aspirational targets for how much energy a 'Net Zero' building should use. These targets allow us to compare the performance of our existing buildings against 'Net Zero best practice'. While the use of this standard is not mandatory or tied to our Race to Zero commitment, it does offer a useful comparison tool that allows us to see how we perform. In addition to having an energy use no greater than these targets, the building cannot rely on fossil fuels for any energy, and they should also generate a proportion of the energy used from renewable sources.

Building use	Energy Use Intensity (EUI) Target
Higher Education	75 kWh/m ² /year
Student Residence	75 kWh/m ² /year
Hotel	125 kWh/m ² /year

Table 2. Net Zero Standard Pilot – Energy Utilisation Intensity targets for a stepped reduction where works end in 2040.

Building	Current EUI (kWh/m ² /yr)	Reduction required
Gateway*	207	64%
Owen Harris	131	43%
Brook Street Student Residences	208	64%
Hughenden Student Residences	164	54%
Windsor House	142	47%
Missenden Abbey	460	74%
Aylesbury	110	32%
Uxbridge	164	54%
Rest of Main Campus	159	53%
Average/Total	194	57%

Table 3. Comparison of current EUI against targets from the Net Zero Buildings Standard Pilot

*Data for Gateway is estimated due to lack of sub-metering

We used targets for 2040 as these are tighter than the targets for 2030. This allows the consideration of a 'worst case' scenario, should events outside of our control delay our progress. Such as the inability to

convert the main campus heating systems from natural gas to electricity until late 2029. The Standard has tighter targets as we get closer to 2050. Therefore, the targets for 2040 are stricter than those of our 2030 net zero target.

Embodied Carbon

There is a clear need to prioritise refurbishment and retrofitting over the traditional cycle of demolishing and replacing buildings after 40-50 years. Refurbishing buildings allows us to retain vast amounts of embodied CO₂ associated with the original construction of the building. A key priority is the retention of structural concrete and steelwork as these typically have the highest embodied carbon footprint of any building material and are the easiest to retain or repurpose.

It will not always be possible to retrofit or repurpose existing buildings, but it should always be our first point of call. We have yet to explore the embodied carbon of our buildings, but it is needed if we are to truly shift to a net zero future. The embodied CO₂ associated with constructing or refurbishing a building will typically result in higher CO₂ emissions than decades of operating that building.

Source of Scope 1 and 2 Emissions

Table 4, below, shows our Scope 1 and Scope 2 emissions for 2023-2024. Our gas emissions fell slightly, and our electricity emissions fell to zero. Our overall emissions fell by 923 tonnes. We missed our target by 51 tonnes of CO₂. In part due to the increased efficiency of LED lighting, and the use of generators.

	CO ₂ emissions (tonnes)	%
Electricity	0	0%
Natural gas	1,210	98%
Other fuels	22	2%
Total	1,233	100%

Table 4. BNU Scope 1 and 2 CO₂ emissions 2023-2024

Relevant UK Greenhouse Gas Conversion Factors are shown below.

	Emission factor (kg CO ₂ e per kWh)									
	2024	2023	2022	2021	2020	2019	2018	2017	2016	2015
Natural gas	0.183	0.183	0.183	0.184	0.184	0.184	0.184	0.184	0.184	0.185
Electricity*	0.0	0.145	0.193	0.212	0.233	0.256	0.283	0.352	0.412	0.462

Table 5. CO₂ conversion factors (Source: UK GHG conversion Factors 2015-2024) *0 scope 2 emissions due to use of REGOs.

Reduction of fossil fuels remains our priority. Table 6, below, shows rounded total electricity use by site.

	Electricity (kWh)	Gas (kWh)	Other (kWh)	Total (kWh)	%
Brook Street	412,000	1,283,000	0	1,694,000	12%
Uxbridge	591,000	128,000	0	719,000	5%
High Wycombe campus	3,984,000	2,582,000	1,181,680	7,748,000	54%
Hughenden	471,000	1,168,000	0	1,639,000	11%
Owen Harris	-	323,000	0	323,000	2%
Missenden Abbey	379,000	946,000	68,349	1,393,000	10%
Windsor House	167,000	172,000	0	343,000	2%
Aylesbury	452,000	11,000	0	463,000	3%
Brunel Engine Shed	8,000	0	0	8,000	0%
Total	6,464,000	6,616,000	1,250,029	14,330,000*	

Table 6 Energy consumption by each site. *Excluding electricity generated from on-site renewables

Owen Harris has a dedicated gas supply, but power is received from the High Wycombe Campus buildings.

The data in Table 6 shows that the sites with the highest total gas use are our High Wycombe Campus, followed by our Brook Street and Hughenden student halls of residence then Missenden Abbey.

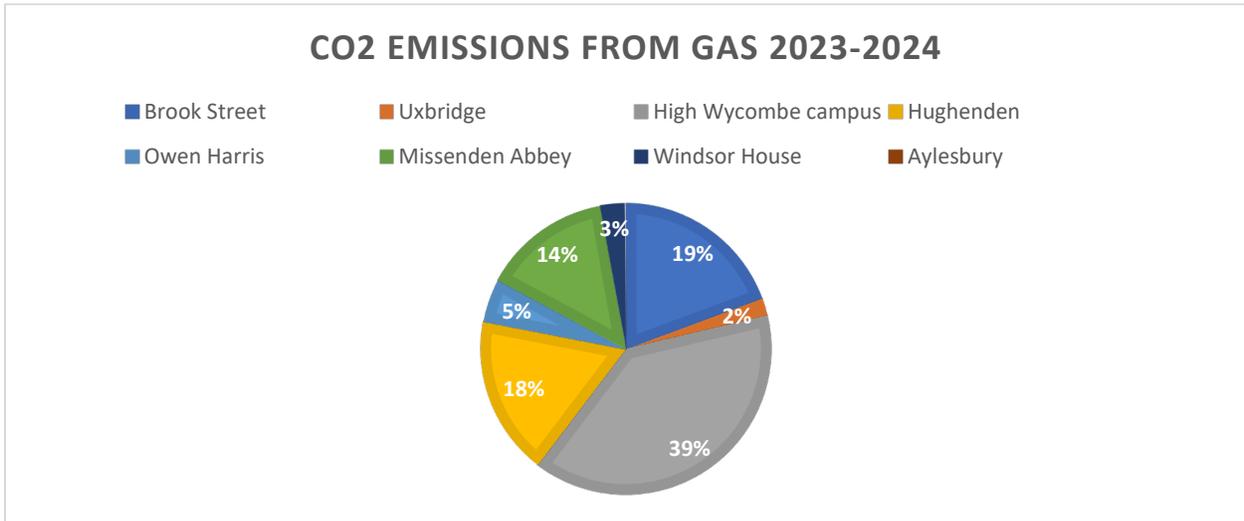


Figure 5. BNU gas emissions by site

Our High Wycombe campus, Missenden Abbey, and our Brook Street Student Accommodation require substantial investments to increase the size of the electricity connection. Such increases are required before we can start to convert our heating systems. These three sites are responsible for 72% of our total gas consumption. While we commission these upgrades, we intend to carry out works to improve the insulation standards and energy efficiency of these sites. However, our efforts at Missenden Abbey may be limited due to its Grade II listing.

This gas consumption data can be simplified by comparing total volumes by end-use.

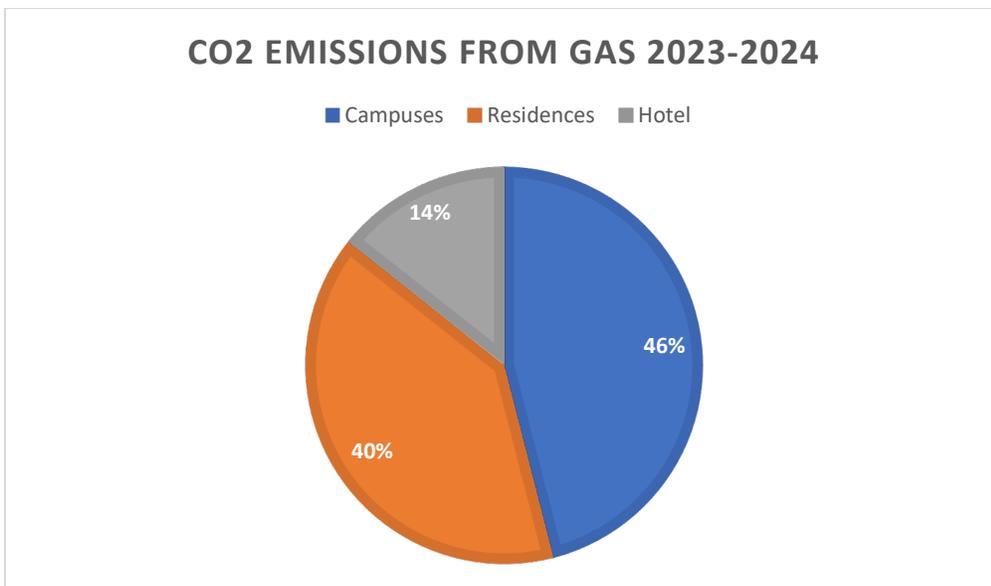


Figure 6. BNU gas emissions by use

Scope 3 Emissions

Scope 3 Methodology

We have assessed our Scope 3 emissions in line with the GHG Reporting Protocol, and, where possible, in line with the Standardised Carbon Emissions Framework developed by EAUC.

We used the Southern Universities Procurement Consortium procurement framework data to estimate our procurement-related emissions. SUPC uses the HESCET tool to estimate CO₂ emissions based on spending in different sectors. However, only about 60% of our procurement activity goes through the SUPC, so extrapolation is required.

These figures include the purchase of goods and services but not the embodied emissions associated with construction, which are listed separately. All procurement-related emissions have a 1-year lag due to how the data is reported. This means that we can only report the CO₂ emissions associated with 2022-2023 this year. As a result, there will be a discrepancy as the year 2022-2023 marked higher procurement spend due to increased construction activity.

CO₂ emissions associated with staff and student commuting are estimated based on the extrapolated results of our staff and student travel and transport survey. We use GHG conversion factors to estimate the emissions associated with each staff or student. As such surveys are voluntary, we cannot guarantee a high level of responses. Therefore, the data is only an approximate estimate.

The CO₂ emissions associated with our water are estimated based on billed volumes for water supply & sewerage, combined with conversion factors from the UK GHG Conversion Factors.

Waste emissions are estimated based on the masses & disposal pathways reported by our waste contractor.

Our Scope 3 emissions are classified as either 'Upstream' or 'Downstream'. Upstream emissions can be thought of as emissions associated with the operation of the University e.g., staff travelling to conferences, construction or refurbishment of buildings, use of natural resources, or the disposal of waste. Downstream emissions are those associated with the goods and services provided to others. In our case, those associated with the delivery of education, primarily overseas student travel, and student commuting.

We have listed each of the CO₂ emissions sources listed in the GHG Reporting Protocol and summarised our emissions according to source and outlined whether that measure of CO₂ emissions is relevant to BNU and whether we have a means of measuring it. Wherever possible, we have included an estimate of those CO₂ emissions.

Upstream

	Relevant to BNU	Possible to measure	CO2e (tonnes)
Waste	Yes	Yes	1
Water	Yes	Yes	18
Electrical transmission and distribution	Yes	Yes	118
Leased assets	No	operational resource use elsewhere	N/A
Employee commuting	Yes	Yes	1,641
Business travel	Yes	Yes	133
Capital goods	Yes	Yes	2,325
Purchased goods and services	Yes	Yes	20,038
Employee homeworking	Yes	Yes	192
Total			24,467

Table 7. Scope 3 upstream emissions

Employee Commuting

Our 2024 Staff and Student Commuting survey showed that our staff get to work using a range of methods. Like many universities, some of our staff commute great distances, others live close to their place of work. Those who live close to their place of work are more likely to commute through active transport methods such as walking or cycling. A thorough review of how our staff and students commute to work will be issued in the coming year. This will explore how people commute and what opportunities may be available to us to both reduce our emissions and potentially deliver benefits to our staff and students.

Of our c.1,452 FTE employees, 56 completed the transport survey, 4% of total staff. Consequently, the data cannot be considered accurate, but it represents the best estimate we can make now. A 4% return is a reasonable result for the first run of any survey, but we aim to achieve 10% completion next year. This data does not include staff from our partner institutions.

Downstream

	Relevant to BNU	Possible to measure	CO2e (tonnes)
Investments	Yes	No	N/A
Franchises	Possibly	Further investigation required	To be determined
Leased assets - downstream	No	No	N/A
Use of sold products	No	No	N/A
Processing of sold products	No	No	N/A
Student travel	Yes	No	To be determined
Student commuting	Yes	Yes	1,223
Total			1,223

Table 8. Scope 3 downstream emissions

Student Commuting

We received survey responses from 88 students, these came from a mixture of apprenticeship, undergraduate and postgraduate learners from across our sites. The resurvey response rate is estimated to be c.1%, and as a result, the data cannot be considered accurate. The margin for error is substantial. However, this represents the best estimate we can make now, and the best data we have ever had. We aim to improve this response rate in future years.

The survey only considered those learners on programs delivered by BNU, we have yet to assess the commuting emissions of learners with our partner institutions.

Total CO2 Emissions – All scopes

	CO2 emissions (tonnes)	%
Scope 1	1,245	4%
Scope 2	0	0%
Scope 3	28,819	96%
Total	30,064	100%

Table 9. BNU Scope 1, 2 & 3 emissions

As Table 9 makes clear, no matter how impressive our progress on our Scope 1 & 2 emissions. It pales in comparison to the challenge associated with Scope 3. Even if we were to cut our Scope 1 CO2 emissions to zero, we would still have annual CO2 emissions of almost 29,000 tonnes per year.

Scope 3 Gaps

Despite our best efforts, there are still a few areas where we don't have any data. The biggest anticipated gap is that we do not currently have any means of estimating the CO2 from international student travel. We expect these emissions to be a significant share of our total CO2 emissions. Similarly, we do not currently have a means of estimating emissions associated with our Waste Electrical and Electronic Equipment (WEEE) waste.

Quantifying the emissions associated with our partner institutions will be challenging. While learners studying at these institutions are BNU students, we must be careful to ensure that emissions are not double counted.

Data is not available for the CO2 emissions associated with our long-term investments. However, we recently considered the sustainability of our banks. We considered the results of the Bloomberg ESG assessment when reviewing our accounts. We hold accounts with four of the five top-ranked banks.

Achieving Zero

Our goals

To reduce our Scope 1 and Scope 2 CO₂ emissions to zero by 2030

To measure and monitor our Scope 3 greenhouse gas emissions where feasible and to reduce our emissions as far as possible.

Decarbonisation Scenario

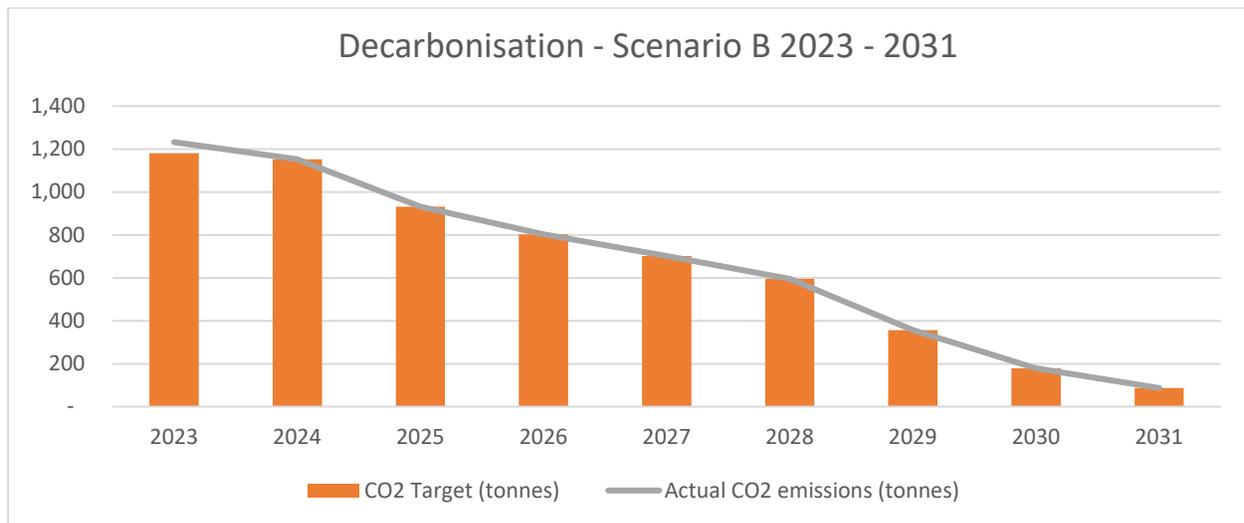


Figure 7. Stepped decarbonisation – Early use of renewable power followed by fabric efficiency and heat decarbonisation works

Advantages:

- Accurate consideration of electricity emissions
- Includes an estimate of the change in electricity demand in line with a shift from gas
- Emissions reductions are possible, funding allowing

Disadvantages:

- Like all decarbonisation plans, net zero is only possible by decarbonising heat
- Electricity emissions reduction requires the annual purchase of REGOs
- Carbon offsets likely required to mitigate potentially unavoidable emissions in later years and from 2031 onward

It may not be possible to fully decarbonise all forms of heating and hot water across our sites. This is due to some aspects being either too technically challenging, too disruptive, or simply not cost-effective to replace. Due to the Grade 2 listing of Missenden Abbey, it is anticipated that it may not be technically feasible to fully decarbonise the heating of the site. Where we are unable to fully decarbonise our

operations, we will explore the annual purchase and retirement of CO₂ offsets. Any offsets would be purchased annually via a third-party verified system, such as the Certified Emission Reductions Certificates available via the UN Carbon offset platform, or other evidence-backed offsetting platform.

Existing activities

Since 2022 we have engaged in a programme of projects designed to improve the comfort and energy efficiency of our buildings. These projects improved several of our higher-priority buildings by improving the insulation levels and building services system. Each project has helped to boost the sustainability of our buildings while making them more comfortable for occupants. While we have made good progress, many opportunities for improvement remain.

This programme of enabling works also includes commissioning both medium and long-term energy infrastructure upgrades for our main campus. These are essential to both future growth, and long-term sustainability of BNU.

After the completion of this first phase of energy-efficiency projects, we expect to begin gradually introducing low-carbon heating systems across our better-insulated buildings. Our building insulation programme will continue to reduce the demand for heat, thereby ensuring that our buildings can be fitted with low-carbon heating systems.

Over the last year, we have carried out works to insulate one major roof, insulated the walls of four buildings, and piloted a project that will improve the efficiency of our heating systems by 10-15%. These projects are anticipated to save c.60 tonnes of CO₂ per year. These insulation projects are necessary as they reduce the size of the heating systems required. This cuts down both future capital costs and lifetime operational costs.

We are in the process of replacing the last 1,700 non-led lights on our main campus, which will make our main campus both more efficient and more pleasant to walk at night. Furthermore, we have commissioned a major study to explore how we can enhance our Building Management System to reduce energy & carbon waste, free up electrical capacity, and improve occupant comfort. Both projects are due to be completed by the end of the 2024-2025 academic year.

In the meantime, we have already begun working with our supply chain and partners. We are developing sustainable procurement methods and standards that will allow us to identify how we can best influence our suppliers and partners to reduce our emissions reduction and drive sustainability improvements.

Next Steps

Five key aspects need to be considered to ensure a net zero plan is practical & realistic:

- Planned use of the building – Minimise spending money in year 1 to remove and redo in year 6
- Data & controls – Do we know how much energy the building uses? Can we minimise waste
- Improving insulation – Better insulated buildings need less energy
- Grid connections – Do we have the infrastructure needed to move away from gas?
- Services - Changing systems from gas to electric is often more complex than a straight swap

Failure to consider one of these aspects risks fitting systems that are: far more expensive to buy and run than needed, incapable of keeping the building comfortable, or, in the worst case can't be used as the infrastructure is lacking.

Over the last year, we've carried out a mixture of low-hanging fruit efficiency projects, and major insulation projects. These have helped us to reduce our emissions and reduce our energy consumption.

We have identified that our electrical infrastructure is a bottleneck and identified a short-term solution for our main campus. In addition, we have set out an overarching route to decarbonisation. To further support our net zero transition, we have identified a robust pipeline of projects to improve our awareness of our energy & carbon emissions, be more efficient, and further cut gas demand. This will happen through a mixture of the remaining low-hanging fruit, and additional insulation projects.

The following diagram outlines the steps involved in developing and enacting the detailed net zero plan.

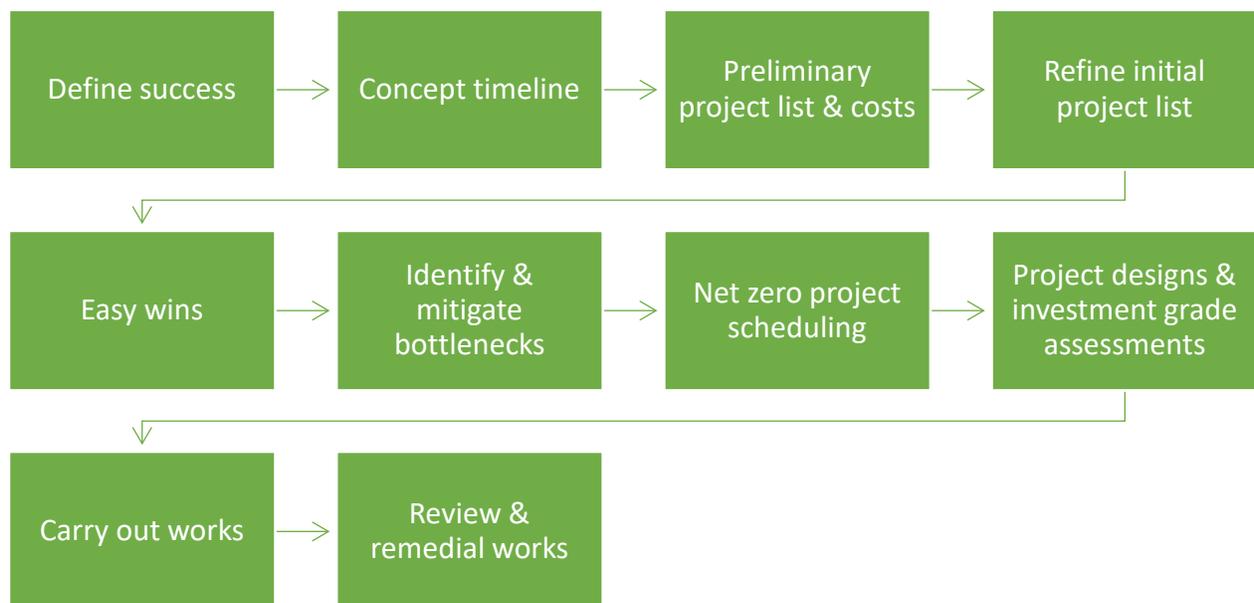


Figure 8. Steps to achieving net zero

We are currently in a mix of two phases, 'Identify & mitigate bottlenecks', and 'Net zero project scheduling'. Some easy wins remain and are being scheduled for this year, and some building fabric projects are being scheduled. We have commissioned the grid upgrade required for our main campus.

Our efforts to develop our net zero plan from concept through to technical detail have progressed substantially over the last year. We have commissioned both a short-term, interim grid upgrade required to alleviate immediate bottlenecks, as well as the major grid upgrade required for our main campus, which will take 5-years to be completed. A further grid upgrade will be required for our Brook Street residences; however, this needs to be looked at in consideration of our wider need for further student accommodation.

In addition to our infrastructure works, we have carried out multiple further energy-efficiency projects to greatly improve the thermal performance of multiple buildings. A necessary pre-requisite to changing from fossil fuel to zero carbon heating systems. We will continue to improve the energy efficiency of our buildings as we await the major grid upgrade on our main campus. It is paired with an increased focus on controls and metering that will allow us to reduce energy/CO₂ waste, and provide data needed to accurately size future heating and hot water systems. This method allows us to move quickly once the upgrade is in place.

Due to these power constraints, it is not currently possible to accurately forecast when we will be able to convert some of our largest sites from gas heating to heat pump systems. However, we do have preliminary costs and indicators of the level of disruption involved in each project.

The following tables outline our energy efficiency/decarbonisation works planned for this year and a wider list of other projects planned.

Live building insulation & services projects

Planned for this year	kWh	tCO2	Reduction in demand	Project Stage
Electricity				
	kWh	tCO2	Reduction in electrical demand*	Project Stage
Replace the remaining Main Campus lights	443,935	-	10%	Outline cost & savings
Improved metering	-	-	-	Project Brief
The main campus improved controls	442,550	-	10%	In progress
Electricity total savings	886,485	0	20%	
Heat	kWh	tCO2	Reduction in heat demand	
Improved metering	-	-	-	Outline cost & savings
Timberlake Windows	125,000	16	3%	Tender
Glazed wall replacement (East & North Wings, Timberlake)	55,722	7.5	1%	Tender
The main campus improved controls	368,497	67	8%	Project Brief
Main campus heat transfer fluid	258,230	47	0%	Project Brief
Brook Street improved controls	305,000	56	-	Outline cost & savings
Missenden Abbey heat transfer fluid	99,932	19	0%	Project Brief
Missenden Coach House cavity wall insulation				Project Brief
Heat total savings	1,212,381	213	12%	

Table 9. Decarbonisation and energy efficiency works planned for 2024-2025

Works planned, not yet scheduled	Stage	Pre-requisites	Complexity
Project			
Main campus grid upgrade	In progress	Local grid	Challenging
North Wing window replacement	Outline cost & savings	Technical solution	Challenging
West Wing window replacement	Tender	None	Simple
Red Shed window replacement	Outline cost & savings	None	Simple
West Wing roof replacement	Project brief	None	Medium
Timberlake roof insulation	Feasibility Assessment	None	Medium
East Wing roof insulation	Feasibility assessment	None	Medium
Owen Harris window repairs	Feasibility Assessment	None	Simple
Owen Harris heating and ventilation system replacement	Feasibility Assessment	Power	Medium
Brook Street window replacement	Feasibility Assessment	None	Medium
Brook Street roof insulation	Feasibility Assessment	Technical solution	Medium
Brook Street grid upgrade	Feasibility Assessment	Local grid	Challenging
Hughenden Student Village heating and hot water replacement	Feasibility Assessment	Power	Challenging
Missenden Coach House window replacement	Project brief	None	Medium
Missenden Coach House roof insulation	Project brief	None	Medium
Missenden Abbey listed building windows	Feasibility Assessment	Technical solution	Major challenge
Missenden Abbey listed wall insulation	Feasibility Assessment	Technical solution	Major challenge
Missenden Abbey heating & hot water replacement	Feasibility Assessment	Power	Challenging
Missenden Abbey grid upgrade	Feasibility Assessment	Local grid	Medium
Missenden Abbey building management system upgrade	Feasibility Assessment	Technical solution	Medium
Alexandra House heating & hot water system replacement	Feasibility Assessment	Power	Medium
Alexandra House window replacement	Project brief	None	Medium
Alexandra House heating controls	Project brief	None	Medium
Gateway heating and hot water replacement	Feasibility Assessment	Power	Challenging
Gateway ventilation upgrade/replacement	Feasibility Assessment	Power	Challenging
Gateway cooling upgrade/replacement	Feasibility Assessment	Power	Medium

Red Shed roof insulation	Feasibility Assessment	None	Medium
South Wing heating and hot water replacement	Feasibility Assessment	Power	Simple
East Wing heating and hot water replacement	Feasibility Assessment	Power	Challenging
Timberlake heating and hot water replacement	Feasibility Assessment	Power	Medium
West Wing heating and hot water replacement	Feasibility Assessment	Power	Medium
Uxbridge hot water system replacement	Feasibility Assessment	None	Medium
Windsor House hot water system replacement	Feasibility Assessment	Unknown	Medium
Aylesbury hot water system replacement	Feasibility Assessment	None	Medium
Brook Street lighting replacement	Feasibility Assessment	None	Simple
Hughenden Student Village lighting replacement	Feasibility Assessment	None	Simple
Missenden Abbey lighting replacement	Feasibility Assessment	None	Medium
Gateway air handling unit fan replacement - pilot	Efficiency	Feasibility assessment	Simple
Main campus air handling unit fan replacement	Efficiency	On hold	Simple
Aylesbury air handling unit fan replacement	Efficiency	On hold	Simple

Table 10. List of planned, but not yet scheduled decarbonisation and energy efficiency works

This list is subject to change as some projects are likely to involve multiple elements or may be merged into a smaller number of larger projects.

Project stages: Feasibility assessment, followed by Project brief, Outline cost & savings, Initial approval, Design development, Tender, In progress, and Completed.

Anticipated Projects

Our projects will focus on three aspects: Building insulation projects, heat decarbonisation and energy cost reduction projects.

By targeting these three areas, we will ensure that our buildings need less energy for heating and cooling. We only use low-carbon technologies to provide that heating and cooling, and we take proactive measures to reduce the energy used for purposes other than heating.

Building improvements

Our existing buildings range in age from 1960s-2010s. Due to substantial differences in materials and construction methods, the energy efficiency of these properties varies dramatically. As an example, the roof of a new building would lose only 10% of the heat lost from a 60's building, and the walls would lose only 14% of the heat. In practical terms, this is the difference between a building needing large radiators in each room to stay warm and almost no heating at all. Equally, a well-insulated building is less likely to be too hot during summer, if appropriately ventilated.

New roofs

Many of our roofs are the original roofs fitted when the properties were completed. Though we insulated many of the older roofs on the main campus, we still need to replace and insulate several roofs across our sites. These older roofs are thermally inefficient and approaching the end of their expected lives. Installation of new insulation can greatly reduce the heating and cooling demand of a building. It may be an opportunity to explore biodiversity improvement works such as green roofs. However, it does come at a considerable cost and can result in major disruption over several months.

Glazing

Some of our older buildings still have single-glazed windows and curtain walls. Replacement of these with high-performance double glazing will lead to a major reduction in heat demand, make the buildings more comfortable, and cut external noise. Any south-facing windows should include some form of solar control glazing to limit overheating during the summer months. We have tendered the works for Timberlake and West Wing and aim to complete these in the next year.

Airtightness

The Carbon Trust estimates that about 35% of heat loss from buildings is from ventilation and air leakage. Ventilation is vital to the well-being and comfort of occupants, but the uncontrolled infiltration of external air can drastically increase the need for heating and cooling and make it uncomfortable for occupants. Improving the air tightness of buildings is frequently a cost-effective and low-disruption project. It involves sealing minor cracks, holes and gaps in the walls, floors, roof and around windows. Improving the air tightness of a building is important before the installation of cavity wall insulation as it can prevent the insulation from forcing itself through a gap and spilling into the building.

Low-carbon heating systems

We previously commissioned building services engineers to carry out decarbonisation studies of each building across the BNU portfolio. This project determined that while centralised air source heat pumps that feed a traditional system of radiators would represent the best technical solution to decarbonising heat, such a system would require the installation of a large central plant that would be difficult to site on our current footprint. Though our current boilers are in a central plant room, these boilers produce excess heat which helps to reduce the heat demand of the surrounding building. Air source heat pumps work by absorbing heat from the surrounding air, this makes the air colder which generally means that the systems should be located outdoors to prevent ice formation.

After carrying out intrusive surveys of the buildings on the main campus we now know that several buildings are not suited to either cavity or external wall insulation due to the construction of the walls. The inability to easily or cost-effectively insulate these buildings limits our ability to limit heat gain in summer and heat loss in winter and would make them challenging to heat by either air or ground source heat pumps.

In recognition of these learnings, we have shifted our preference to the installation of air conditioning systems which are both simpler to install in a phased process and will help to limit the risk of overheating through the summer months. Air conditioning works on the same principles as other heat pumps but doesn't rely on radiators and can provide cooling in the summer months. Our approach of insulating first remains key to our strategy, by improving insulation we will limit the amount of heating and cooling required to keep our buildings comfortable.

Heat pumps for domestic hot water

An increasing number of hot water heat pumps are available. These systems are typically not as efficient as lower-temperature systems. Like their space heating equivalents, heat pumps for hot water cost multiple times the cost of conventional electric or gas water heaters and are often backed up by large storage tanks. Further feasibility assessments will assess the technical and economic feasibility of the technologies.

Anticipated Costs

Every organisation across the UK faces the same decarbonisation challenge. Buildings in the UK are amongst the worst insulated in Europe. Our historic building regulations reflect a time when the primary focus was to reduce the capital cost of construction rather than minimise lifetime CO₂ emissions. Retrospectively insulating the nation's buildings to a suitable standard will require major changes to all aspects of our buildings and substantial investment.

Improving the sustainability of our campuses, and operations will require substantial investment. These investments are difficult to quantify accurately as the needs and scale of each building will vary. The decarbonisation programme is likely to require multiple millions of investments in each campus between now and 2030. Further investigations will consider the scope and timescale of each project and develop a combined summary of impacts, investments, and project route map.

Financial prudence is essential, our long-term plan will include the use of BNU capital investment, externally financed projects, and, where available any public sector funding e.g., Salix.