Race to Zero Interim Report

2023

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Intro

Welcome to the Buckinghamshire New University (BNU) Race to Zero interim report. This report will outline our commitments to sustainability and decarbonisation; our attitudes towards decarbonisation; and our ambitions to play our part in tackling climate change. We will outline how we hope to achieve our aims as the first step in keeping our stakeholders informed about the progress we make against our goals.

Although the climate crisis requires urgent action, we must use our resources carefully, considering both the current and future needs of our staff, learners, and continuing to be a good neighbour in the community. We are making a significant capital investment, along with changes to our buildings and ways of working, that are unprecedented in BNU's proud 130-year history.

Achieving net zero by 2030 is a stretching target, but one that we believe is aligned with our wider ambitions. By reducing our impact on the environment, through our actions and the education we offer, BNU can transform lives and make a positive difference to society and our future climate. We aspire to become a leader in sustainable education, meeting and exceeding our ethical and social responsibilities by working with our learners, staff, communities, and our partners.

Climate change impacts the whole of society, and so BNU's efforts to decarbonise must adopt an interdisciplinary approach. Climate change adaptation and mitigation will include changes to how use our buildings; value the environment; and how we can change our campuses to better match the future needs of BNU and wider society.

BNU is a forward-thinking organisation where all members of our community are empowered and encouraged to challenge the status quo, champion progress, and take collective ownership of our impacts on the environment, biodiversity, and social mobility.

We are on a journey that will take time and require some substantial changes along the way. The challenges ahead are clear, but BNU is committed to working tirelessly to create a sustainable organisation that delivers social, environmental, and economic benefits across the University, and the wider community.

We are excited by the opportunities which lie ahead as we move towards our net zero target.

Sustainability Pillars

Sustainability is a broad concept that can be difficult to define. When pared back to a core concept, sustainability is having respect for others, be that for people, organisms, or the environment and having the integrity to do the right thing.

As an institution, Buckinghamshire New University (BNU) aims to grow and improve, and to reflect this we adopted the Brundtland Commission definition of Sustainable Development:

'Meeting the needs of the present without compromising the ability of future generations to meet their needs'.

There are three pillars of Sustainable Development: Social, Economic and Environmental. Our Decarbonisation projects are principally focused on improving Environmental Sustainability. We are developing a definition of what Environmental Sustainability means to us.

'Using resources ethically and fairly to ensure that we can develop as we need to but refraining from damaging the environment and biodiversity. Our actions should always have a positive impact and consider not only the immediate area and impacts but our wider impacts over the long-term.'

Our final definition of Environmental Sustainability as it means to us will form part of our Sustainability Strategy.

Though the focus of our decarbonisation projects will always be environmental sustainability, each project is an opportunity to improve social and economic sustainability, whether through procurement, education, or well-being improvements.

Our Commitments

Race to Zero

We joined the Race to Zero Pledge in 2020 in recognition of the need to take decisive action to cut CO2 emissions. By joining the pledge, BNU stands with more than 1,100 like-minded educational institutions that seek to reduce greenhouse gas emissions to net zero as soon as possible. We refer to this as 'Decarbonisation'.

We chose to set ourselves the ambitious target of reducing our Scope 1(direct consumption of fuels) and Scope 2 (electricity) to zero by the year 2030. We chose this date in recognition of the environmental and social damage caused by the emission of greenhouse gases, and the challenge of balancing global decarbonisation against the continuing need for development in the global south. It is therefore vital that we, as an institution in a developed nation achieve net zero as soon as possible.

Our Scope 3 commitments are equally ambitious. Though we know that it may not be possible to achieve a complete reduction by the year 2030, we aspire to reduce our emissions as far as possible by then. Our plan to achieve net-zero Scope 3 is still under development, we aspire to measure our Scope 3 emissions by the year 2024 and carry out a materiality assessment and develop our plans by 2025.

Nature Positive Universities Pledge

In recognition of the importance of reducing the negative impact of our actions on nature, BNU is a founding member of the Nature Positive Universities Pledge. Our commitment requires us to follow the principles of the Mitigation and Conservation Hierarchy, thereby reducing the harm that our operations have on life across our planet.

Through both our direct actions and those of our supply chain we will:

Refrain from harm

Reduce our impact

Restore our ecosystem

Renew environments

UN Sustainable Development Goals

BNU has signed up to the UN Sustainable Development Goal (SDG) Accord, a network of institutions and businesses that look to make the world a better, fairer place through supporting and contributing to the SDGs.

The United Nations Sustainable Development Goals were developed and adopted by all member states as part of the 2030 Agenda for Sustainable Development. The UN SDGs break the topics of Environmental, Social and Economic Sustainability down into 17 key areas, each of which includes its narrative and includes qualitative and quantitative targets for improvement.

Each of the SDGs responds to one of the pillars of sustainable development be that Environmental, Social, or Economic sustainability. Many goals will have a positive impact on multiple pillars.

The Goals

Decarbonisation contribution to SDGs

The reduction of direct and indirect greenhouse gas emissions through our activities and operations.

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

Interaction with Sustainability Strategy

We are adopting a hierarchical approach to our Sustainability policies. There will be multiple levels where each level becomes narrower in focus, but with a greater number of documents, each with a greater level of detail. Our Sustainability Strategy will be at the top of this hierarchy and will set out our overall attitudes, methods and ambitions and guide all subsequent 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 will set out our high-level ambitions, objectives and targets. Details of the process, projects and expected costs will be outlined within the Carbon Management Implementation Plan.

BNU is developing a new Sustainability Strategy which is due to be completed in the 2022-2023 academic year.

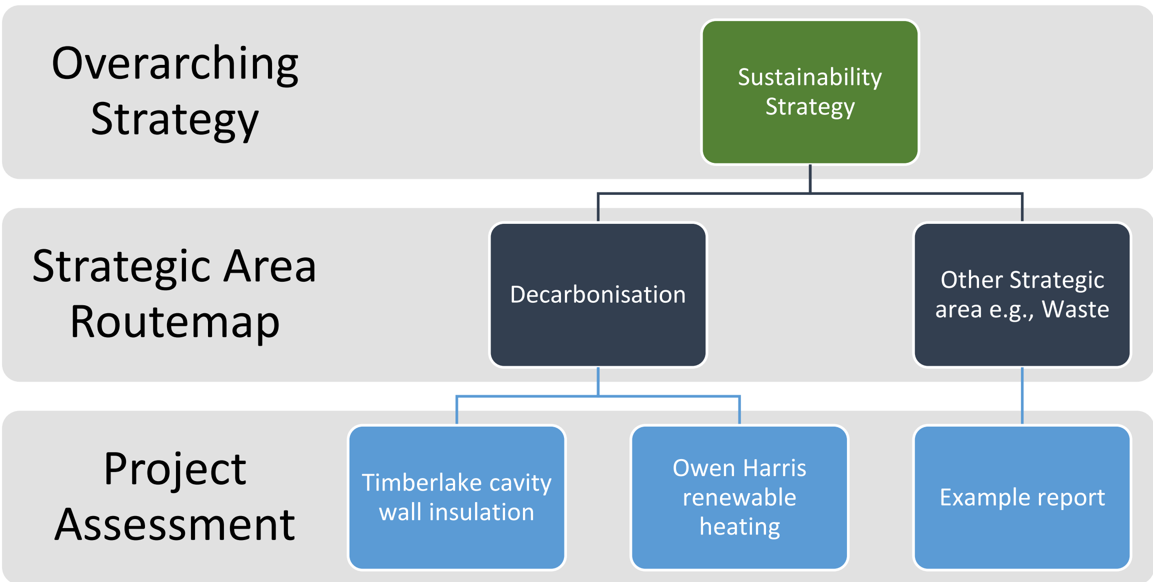

Figure 1. Hierarchy of Sustainability Governance

Our Historic Progress

The following image shows our Scope 1 and 2 CO2 emissions over the period 2005 to 2011, orange bars show our targets, and the grey line shows our actual performance. Over the period we have reduced our CO2 emissions by 65% against our 2005 baseline. There was no CO2 target for the 2021 year as this coincided with a review of our targets and commitments.

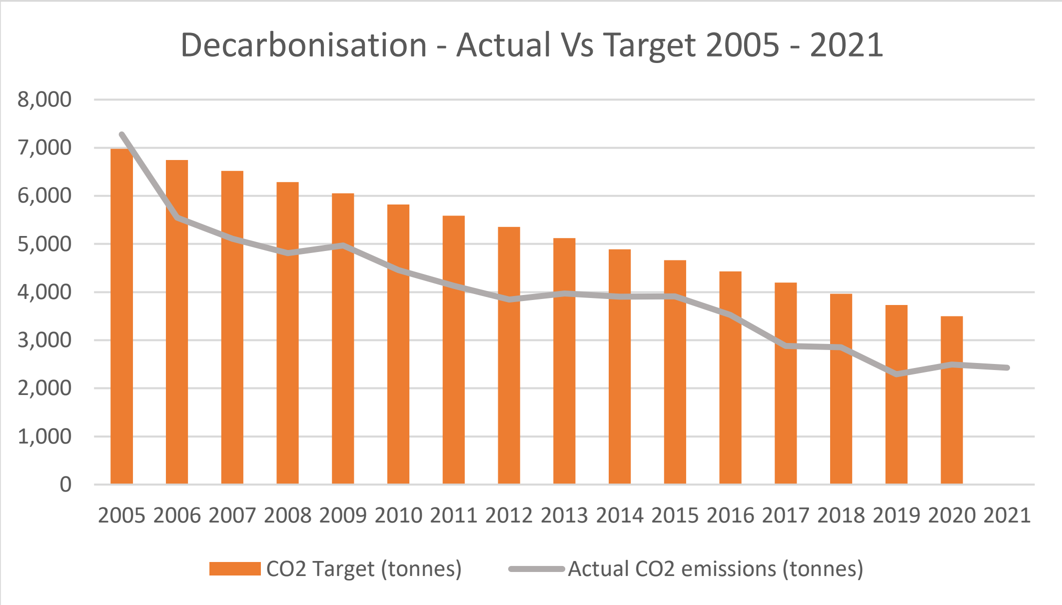

Figure 2. BNU CO2 emissions against targets 2005-2021

Our best CO2 reduction was a 67% reduction achieved in 2019. This was followed by an increase in energy due to the need to increase ventilation rates throughout the COVID-19 pandemic.

The following graph shows our Scope 1 and 2 energy consumption and CO2 emissions for the period 2015 to 2022, note that our academic year starts in August.

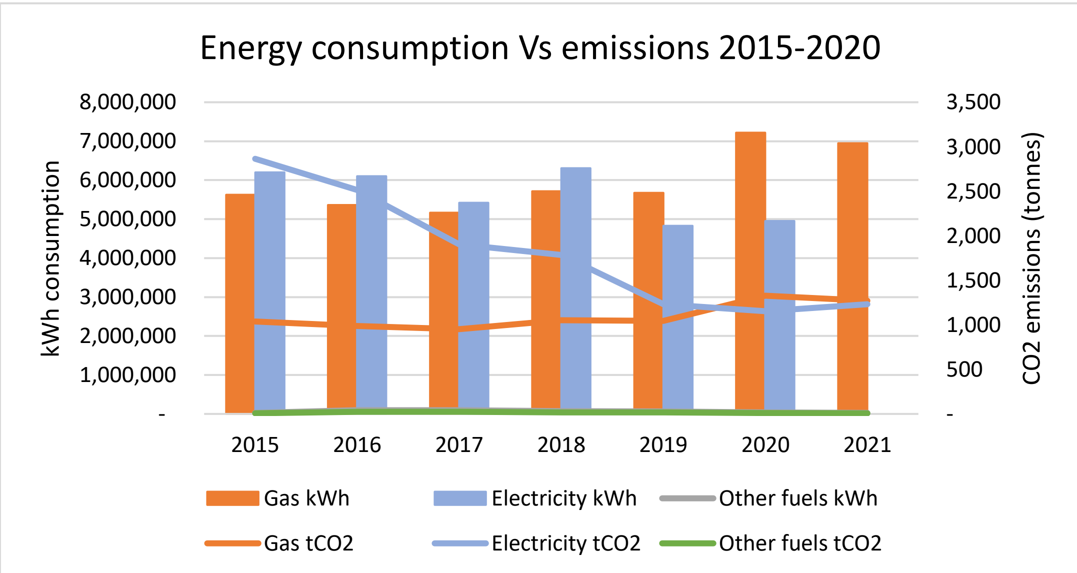

Figure 3. BNU energy consumption against CO2 emissions

BNU energy use and associated CO2 emissions. Conversion factors from the Department for Business Energy & Industrial Strategy (BEIS)

Electricity

We have reduced our electricity consumption by 6% between 2015 and 2021. We have also benefitted from the increase in renewable energy technologies and a reduction in the use of coal and oil generators. The total reduction in our Scope 2 electricity emissions over the period was 56% and was calculated using data from the Department for Business, Energy & Industrial Strategy (BEIS). Due to a government commitment to decarbonise the electricity system by 2035, this trend is expected to continue. In the meantime, we shall continue our efforts to reduce our electricity consumption across our sites.

For several years we have purchased zero-carbon electricity to minimise our CO2 emissions. However, due to a lack of evidenced tracking mechanisms, it has not been possible to prove that this energy is truly zero carbon. We will investigate the use of renewable electricity backed by Renewable Energy Guarantees of Origin (REGOs) when our energy contracts expire.

Natural Gas

An increase in ventilation rates to minimise COVID exposure risks has resulted in a 24% increase in natural gas consumption. As the Health and Safety Executive have withdrawn all ventilation guidance related to COVID-19 control, we are now able to reinstate the heat recovery systems in our air handling equipment and restore our building ventilation rates to those needed for general occupant comfort. We expect that this will result in a fall in our gas emissions back to 2019 levels, barring the impacts of any future COVID outbreaks.

The continued greening of the grid will shape our decarbonisation efforts.

How far is Zero? – Scopes 1and2

Table 1, below, shows our Scope1 and Scope 2 emissions for the period 2021-2022. Our electricity and gas emissions were almost equal and if our gas use wasn't elevated due to COVID-19 guidance our electricity emissions would likely be greater than our natural gas emissions.

	CO2 emissions (tonnes)	%
Electricity	1,231	49%
Natural gas	1,273	51%
Other fuels	7	0%
Total	**2,511**	**100%**

Table 1. BNU Scope1and2 CO2 emissions 2021-2022

To help shape our decarbonisation plan we have considered the UK Greenhouse Gas Conversion Factors, shown below in Table 2.

	Emission factor (kg CO2e per kWh)							
	2022	**2021**	**2020**	**2019**	**2018**	**2017**	**2016**	**2015**
Natural gas	0.18	0.184	0.184	0.184	0.184	0.184	0.184	0.185
Electricity	0.193	0.212	0.233	0.256	0.283	0.352	0.412	0.462

Table 2. CO2 conversion factors for electricity and natural gas, (Source: UK GHG conversion Factors 2015-2022)

Electricity use results in slightly greater CO2 emissions than natural gas. However, the conversion factors for electricity and gas have almost reached parity. Our approach to decarbonisation should therefore focus on the minimisation of gas.

We must identify the source of our CO2 emissions to allow us to prioritise our efforts. Table 3, below, shows the rounded total electricity and gas consumed by each site. The oil consumption of Missenden Abbey is not included within this as it comes to less than 1% of total emissions.

	Electricity (kWh)	Natural Gas (kWh)	Total (kWh)	%
Brook Street	372,000	1,142,000	1,515,000	11%
Uxbridge	589,000	119,000	709,000	6%
High Wycombe campus	3,639,000	3,662,000	7,301,000	56%
Hughenden	480,000	1,247,000	1,727,000	13%
Owen Harris	108,000	193,000	301,000	2%
Missenden Abbey	348,000	452,000	801,000	6%
Windsor House	173,000	115,000	288,000	2%
Aylesbury	389,000	20,000	409,000	3%
Total	**5,990,000**	**6,951,000**	**12,941,000***	

*Table 3 Energy consumption by each site. *Including c..120,000kWh generated from on-site renewables*

It was necessary to estimate consumption data for our Owen Harris building. This is due to a combination of a manual meter reading process and because Owen Harris has a dedicated gas supply, but power is received from the High Wycombe Campus buildings. The impact of these estimates is expected to be minimal (<1% of total energy).

The data in Table 3 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. Our High Wycombe Campus is responsible for 60% of our electricity consumption, followed by our Uxbridge site. It is expected that our Uxbridge site uses more electricity due to it being almost entirely electrically heated, and both more heavily utilised and somewhat older than our Aylesbury site.

Scope 3 Emissions

We have used procurement framework data on CO2 emissions on a £ per sector basis to estimate the CO2 emissions associated with 60% of our supply chain. These figures include the purchase of goods and services, but not construction, business travel, employee commuting, or other aspects. Our estimated Scope 3 emissions from the 60% that we can measure come to 7,250 tonnes of CO2 per year. If extrapolated to cover all our procurement, this comes to 12,083 tonnes per year. Therefore, our combined Scope 1, 2 and 3 emissions are expected to be at least 14,500 tonnes per year.

Achieving Zero

Our goals

To reduce our Scope 1 and Scope 2 CO_2 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.

Decarbonising Electricity

Our decarbonisation priority must be the reduction of natural gas. Nearly all of our natural gas is used to produce heat for space heating and the production of domestic hot water. We intend to reduce our gas consumption through insulation and energy efficiency improvements. It will not be possible to reduce our space heating and hot water demand to zero, therefore we will need to replace our natural gas heating systems with low-carbon heating systems. These systems will inevitably be powered by electricity; therefore, it may not be right to target an absolute reduction in electricity consumption.

We will make efforts to reduce our electricity demand through the replacement of older, inefficient systems and the continued improvement of the operation of our buildings. Our projects will incorporate renewable energy technologies wherever possible, and we will only purchase systems that go beyond basic energy efficiency requirements. Even with these measures, we will never be able to reduce our electricity consumption to zero.

If we are unable to reduce our electricity consumption to zero or generate all our electricity from renewable sources on-site, then we must ensure that the electricity we buy is renewable. To do this, we will buy electricity that is generated only from renewable sources and backed by traceable Renewable Energy Guarantees of Origin (REGO) certificates. REGOs allow us to prove that the power we buy comes only from renewable energy systems. Under the GHG Protocol, we will be able to report zero CO_2 emissions from REGO-backed electricity.

Decarbonising Heat

To decarbonise our buildings, we must insulate our buildings. This will make our buildings more comfortable and sustainable.

Heat pumps are championed as the low-carbon heating technology most likely to decarbonise heating in the UK. These systems use electricity to take energy from a heat source, be it the ambient air, soil or water and concentrate that heat into useful heat that can be used for space heating or hot water. Heat pump systems typically produce multiple units of heat from a single unit of electricity which makes them much more efficient than conventional heating systems. Despite the improved efficiency of heat pumps, there will be an increase in electricity consumption.

Heat pumps work at peak efficiency when producing water at 35-45°C. This is considerably colder than traditional heating systems in older buildings which have flow temperatures of 70-80°C. Water at a lower temperature does not hold as much heat as water at a higher temperature, so it takes a much higher volume of water to supply the same amount of heat. This, in turn, requires larger radiators, pipes and pumps, all of which result in considerable disruption. If we improve the energy efficiency of our buildings by making them more airtight and adding insulation, our buildings will need less heat. A lower heat demand means that we are more likely to be able to keep our existing space heating infrastructure, reduce capital expenditure, reduce operating costs, reduce CO_2 emissions and improve occupant comfort.

Our building improvement projects will be identified through the analysis of the condition of each building and the energy and carbon performance of each building. A preliminary analysis of performance is possible based on the age of each property and the building regulations at the time of construction, or refurbishment. Though this method is oversimplistic, it tells us which buildings should be inherently less, or more, insulated and therefore which are likely to require greater or lesser levels of investment.

Scope 3 Targets

We have begun the process of assessing our Scope 3 emissions. We are currently able to estimate only a few of the 15 distinct aspects of Scope 3 emissions. Due to the scale, and complex nature of Scope 3 emissions we expect that we won't be able to measure the others for some time. Scope 3 emissions are a global challenge, and we will actively monitor the development of Scope 3 assessment systems and methods.

The first step in our net zero Scope 3 journey will be to carry out a study to identify which areas of our Scope 3 emissions we will be able to measure. We will then develop monitoring and reporting methods for each of these areas. We intend to complete this first phase by the end of the year 2023 and carry out our baseline assessment of Scope 3 emissions by 2024.

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.

Decarbonisation Scenarios

We have developed two potential scenarios to allow us to explore how we could reach Scope 1 and 2 net zero by 2030. Further investigation is needed to develop detailed decarbonisation plans which will include the costs, timescales, and impact of each project.

Scenario A – Linear Emissions Reduction

Scenario A explores what our emissions and targets would be if we were to target a simple linear reduction in emissions between 2022 and 2030. Due to a review of our targets, we did not have a CO_2 emission target for 2021.

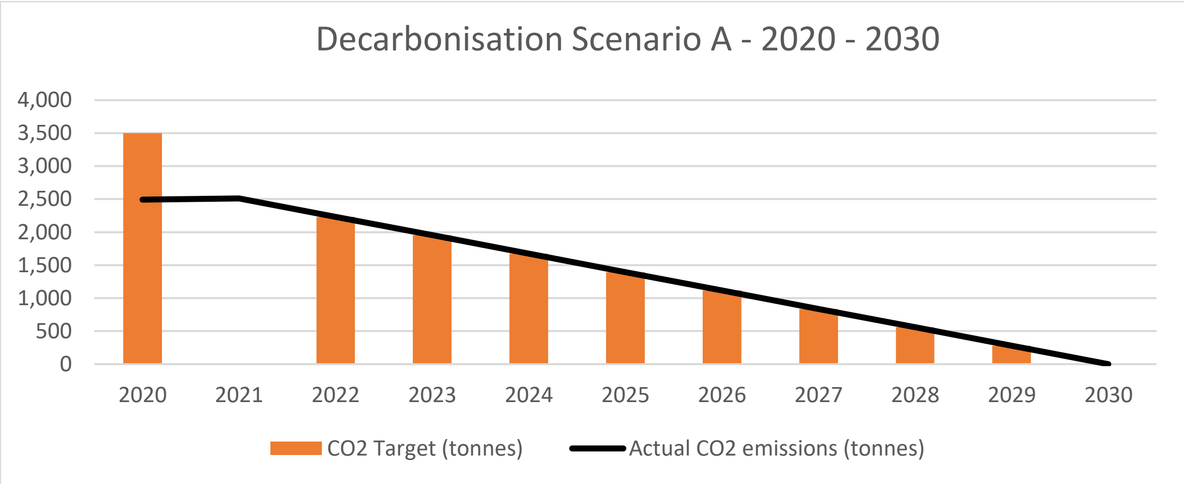

Figure 4. Decarbonisation Scenario A – Linear reduction

The average annual decarbonisation would require an annual emissions reduction of c.280 tonnes per year between 2022 and 2030.

Advantages:

- Conceptually simple
- Annual targets can be developed by aggregating projects to achieve 280 tonnes p.a.

Disadvantages:

- Equal treatment of gas and electricity
- Assumes reduction in electricity CO_2 each year
- Doesn't assess CO_2 impact of future electricity contracts correctly

Conclusion: Scenario A is not a suitable emissions reduction scenario

Scenario B – Stepped reduction

Our second scenario explores the impact of changing to REGO-backed renewable electricity in 2023 and a subsequent focus on heat decarbonisation through building energy-efficiency projects.

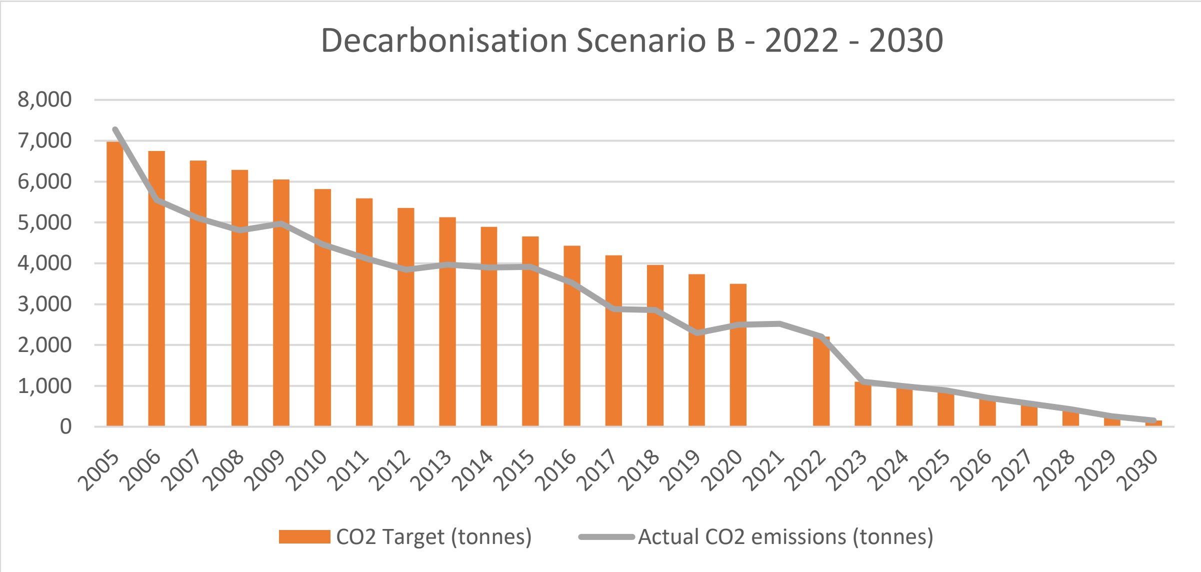

Figure 5. Decarbonisation Scenario B – Early renewables followed by heat decarbonisation

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:

- Further project investigation is needed
- Electricity emissions reduction requires the annual purchase of REGOs
- Limited purchase of carbon offsets likely for the foreseeable future

The purchase of REGO certificates must continue each year to keep the emissions reduction. However, the purchase of renewable electricity is still the most cost-effective means of reducing building CO2 emissions. Decarbonisation of our electricity supplies is expected to deliver a CO2 reduction of c.1,100 tonnes per year. REGO certificate costs fluctuate based on the energy supplier, market demand and whether they are included within the supply contract or purchased separately.

The preliminary programme includes three years of dedicated building improvement projects to improve the energy efficiency of our buildings. These enabling projects are expected to tackle some of the higher-priority building insulation projects that will deliver improvements to comfort and sustainability. After the 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.

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 predicted 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.

Future investigations will consider how best to prioritise sites and projects through detailed energy modelling, consideration of our existing Long-Term Maintenance Plan and the Property Condition Reports which were completed in 2022. It is proposed that these assessments will split decarbonisation into three strings: building insulation, decarbonising hot water, and decarbonising space heating.

Typical 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 make sure 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 Insulation 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 a tenth of the heat of a building from the 1960s, and the walls would lose only one-seventh 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 care is taken to make sure that it is appropriately ventilated.

New Roofs

Many of our roofs are the original roofs fitted when the properties were completed. The 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. However, it does come at a considerable cost and will result in major disruption over several months.

Cavity Wall Insulation

Between the 1930s and the mid-1980s, it was common for brick-built buildings to include two layers of bricks or blocks with nothing in between. It is possible to retrospectively fill these cavities with insulation in the form of insulating beads of shredded mineral wool. Though the buildings will not be as energy efficient as a new wall, it is possible to cut the heat loss down by 60%. The installation process is quick and comparatively cheap as it requires only the drilling of regular holes into the outer walls, injection of insulation material and then patching of the holes with a similar coloured mortar.

Cavity Wall Insulation (CWI) is not right for every property. It should not be installed to any property in an area prone to driving rain. Installation of cavity wall insulation in areas prone to driving rain led to a failure of the insulation systems as water became trapped within the wall cavity. The installation of CWI in right properties by disreputable installers damaged public confidence in the systems. In response, the CWI industry banded together and formed the Cavity Insulation Guarantee Agency which checks the suitability of a property before installation and supplies a 25-year guarantee for both domestic and non-domestic properties.

Internal and External Wall Insulation

Across our sites, we have multiple buildings that were not built using a cavity wall construction method. Instead, they were built either using concrete panels, or solid brick with no cavity. As it is not possible to inject insulation into a pre-existing cavity these buildings are more challenging to insulate. But the results can be more impactful. In these circumstances we can fit insulation on the inside of the walls, resulting in a loss of useful space. Alternatively, we can install insulated cladding to the outside of the building. In both cases, we must be careful to make sure that the proposed solution works alongside the existing building and is safe in the unlikely event of a fire Each building will need to be assessed independently based on the construction, usage, and location of the building. Both internal and external wall insulation require major capital investment and will result in major disruption.

Glazing

Some of our older buildings still have include single glazing. Replacement of these windows 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.

Airtightness

The Carbon Trust estimate 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 typically 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.

Heat Recovery

Whenever technically possible and economically feasible we will install Mechanical Ventilation Heat Recovery systems which are linked to a fully automated Building Management System. Automated ventilation systems can ensure that every person in a building gets enough fresh air to feel comfortable, but without wasting energy on unnecessary heating or cooling. The use of heat recovery systems allows us to recycle heating or cooling energy from the air and reuse it. BNU already makes use of mechanical ventilation heat recovery systems across some of our sites and buildings, but most of our buildings are ventilated only through openable windows or air leaks. Natural ventilation methods are simple but inefficient, and often result in uncomfortable conditions.

Low carbon heating systems

Heat pumps for space heating

Once a building has been well-insulated it is possible to use an air source heat pump to supply low-carbon heating. At first, it may be necessary to focus on buildings that have isolated heating systems such as Owen Harris. The size of the East Wing Energy Centre, and the complexity of replacing all the Brook Street boilers with a communal system, make these challenges that will require considerable planning. Heat pumps currently cost several times the cost of a traditional gas boiler, it is hoped by both the UK government and system manufacturers that the cost of heat pumps will decrease as manufacturers invest in R&D and manufacturing economies of scale.

To make sure that the heat pumps work as efficiently as possible, hot water flows will be kept as low as possible. Consequently, it is unlikely to be possible to use the same systems to provide both space heating and domestic hot water. Heat pumps are often combined with large hot water storage tanks to allow a smaller size of system to be installed and the systems to maximise the amount of time they run at peak efficiency.

Though heat pumps can be highly effective, they are not without their complications. Designs must be thorough and consider not only the heating demands of the building, but the operational impacts of the heat pumps. Typical design considerations include:

- Heat pumps are larger than traditional boiler systems, so it may be necessary to enlarge plant room facilities, or shift plant to external compounds
- As air-source heat pumps absorb heat from the outside air the operation of a heat pump for heating will actively cool the surrounding air. This requires careful consideration of ventilation requirements and frost-protection systems
- Careful consideration of the presence of multiple fans and compressor pumps, all of which will produce noise when operational

The heating, cooling and ventilation needs of each building will be assessed prior to any final choice of technology. It is our preference to minimise the need for mechanical cooling systems (air conditioning). However, if buildings overheat, and the problem cannot be solved through insulation and natural ventilation then it may be necessary to install some form of mechanical cooling. Careful consideration must be given to both current and future climates to make sure our buildings are comfortable both now, and in the future.

Heat pumps for domestic hot water

A limited number of heat pumps are available to supply domestic hot water at temperatures sufficient to destroy Legionella (60°C+). 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.

Energy-efficiency projects

The most sustainable energy is the energy that you don't use. We will look to reduce our energy consumption by upgrading older equipment, improving our awareness of energy consumption, and making sure that energy is only used when needed. Our energy-efficiency projects will help to reduce our exposure to further energy cost rises and reduce our overall energy consumption.

The following list of projects is not fixed and will vary depending on the condition of existing equipment, changes to the use of our buildings, or technological developments.

LED lighting, with improved lighting controls

The cheapest energy is the energy that you don't use. Our existing lighting systems are mainly controlled only through a simple light switch. If there is nobody in the room, then the lights will still be on. Similarly, the lights may still be on even if natural light is plentiful. Modern lighting controls allow lighting to be subtly controlled. The lighting will dim to nothing when the space is empty or dim if there is plenty of natural light. Occupants should not notice that the lights are being controlled, only know that they have enough light to work comfortably.

Modern lights have come on leaps and bounds since even the development of the first widely available LED lights. New fittings are far more energy efficient; these fittings help to reduce electricity consumption. Efficient lighting produces less heat which can help improve areas that overheat during the summer.

Replacement of equipment at end of life

Wherever possible, we should aim not to repair equipment that has reached the end of its useful life if modern systems are more energy efficient. Though this may appear to go against the principles of a circular economy and reducing our embodied carbon emissions, it is often the case that most emissions associated with building services systems arise from the operation of the system, not its manufacture.

General upgrade programme for energy-consuming equipment e.g., motors and pumps

Many of our heating, cooling and ventilation systems use motors and pumps to move air or water around our buildings. Though these systems would have been reasonably efficient when new, technological advances mean that these systems are unlikely to be as efficient as modern systems. It is not always cost-effective to replace these systems, but the benefits can sometimes by large.

Continue the rollout of smart building controls

Wherever possible, building controls will be improved to allow buildings to run as efficiently as possible without the need for occupants to act. Staff should be comfortable throughout the day, never noticing that the buildings are autonomously optimising heating, lighting and ventilation.

Enhanced energy monitoring

Data is the foundation on which all plans are built. We currently rely on manual readings of our energy and water sub-meters. Our team spend considerable time and energy taking and processing these readings, but as they are taken over a day they cannot be as precise, or as accurate as readings taken by an automated system. We aspire to have a fully automated that automatically takes meter readings, processes the data and records data via an online portal. By improving the granularity, accuracy and precision of our data we will be able to carry out more accurate assessments of energy and water usage. In turn, this will help improve the accuracy of our project assessments.

Renewable power projects

Though they won't improve energy efficiency, renewable energy projects can help us to reduce the amount of energy we purchase from the grid. Our existing solar power systems perform well and should continue to do so for at least another decade. We intend to increase the self-generation of power. We will consider the feasibility of installing more renewable power systems on any roof spaces we build or upgrade as part of our insulation programme.

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 any public sector funding e.g., Salix.

Next Steps

Decarbonisation study

We have commissioned decarbonisation surveys of each of our buildings. These surveys will consider the construction of our buildings, the systems used to operate our buildings, and the expected future demands on our property portfolio.

The energy modelling will be used to develop heat decarbonisation plans which will set out potential routes to achieving net zero carbon. Additional, project-specific investigations will be needed to build the investment case for each project.

It will be necessary to find a balance between capital investment and operational costs. A highly energy-efficient building will have lower operational energy costs; however, the cost of retrofitting energy-efficiency measures may not be affordable in all circumstances.

Scenarios

The decarbonisation assessments will lead to the development of several decarbonisation scenarios. These scenarios are likely to vary based on appetite for investment, disruption, and ongoing operational costs. Each scenario can be classified based on the level of sustainability intervention. The difference in capital investment needed is likely to be substantial, over £1m per building.

Deep Green

A scenario would be one in which buildings are insulated to a high standard and what little energy needed is supplied only through new low-zero carbon energy systems, supplemented by on-site renewable energy. In this scenario the capital investment would be high, but operational costs would be lower.

Light Green

Investment would focus on improving the worst aspects of our buildings and systems. We would look to minimise capital investment as far as possible whilst moving away from gas heating systems. Our buildings would need more energy for heating, cooling and ventilation, leading to higher operational costs.

Though a Deep Green approach would require higher levels of investment, the reduction in energy demand would help to insulate the university from any further increases in energy costs. By insulating buildings to a higher standard smaller heating systems would be needed which would have several benefits, such as reduced need to change our electrical supply infrastructure and less space needed for plant equipment.

Our final strategy is likely to be a blend of both options. Some buildings are likely to require more investment than others due to the condition or age of the building. Other buildings, may require less thorough retrofits, allowing lower levels of investment, but at the cost of higher running costs.

Funding

A Heat Decarbonisation Plans are an essential part of any application for Salix funding. Once we have developed these plans, we will be able to apply for funding to carry out decarbonisation works. Funding is far from guaranteed; every public sector body must compete for the same funding.

We have begun the process of exploring Energy as a Service offerings. These private funding solutions could help us to fund projects that whilst effective at cutting electricity demand may have limited impacts on our CO_2 emissions, e.g., lighting.

Overarching Strategy

We will produce a formal, long-term Carbon Management Implementation Plan to summarise our overall strategy. Our CMIP will outline decarbonisation plans, expected investment requirements, annual cost, consumption and CO_2 emissions targets and set out a timescale for action. This will be published on our website and our goals, and progress made, will be shared in formal reporting, such as the annual Financial Statements, and as part of BNU's strategic communications with its internal and external stakeholders.