Loughborough University

Energy Strategy 2024-2050

Reviewed: February 2024

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Executive Summary

The purpose of this Energy Strategy is to set out a development framework covering the period from 2024-2050 to provide a sustainable energy future for the University.

Energy is a critical resource for the University and this Strategy supports delivery of the University's 'Creating Better Futures. Together' Strategy. It has been developed alongside the refreshed Estates Strategy with academic colleagues from the School of Architecture, Building and Civil Engineering (ABCE), the Centre for Renewable Energy Systems Technology (CREST), the Loughborough University Net-Zero group (LUNZ) and the Sustainability sub-Committee.

This Energy Strategy and the associated Estates Strategy have been produced in-house by the E&FM department. Infrastructure Committee (IC) is the owner of the Strategy and the Director of Estates and Facilities Management is accountable for its future development and operational delivery. As with the Estates Strategy, it is important to stress that this Strategy is not a policy commitment endorsed by the University Council and IC.

Student choice is increasingly influenced by climate and environmental issues. There is a body of evidence that students are choosing their university based on its values and approach to carbon, fossil fuels and renewables. Loughborough University will be a progressive, environmentally conscious institution with resilient and sustainable campuses.

This strategy covers both the Loughborough and London Campuses, but the majority of opportunities relate to the Loughborough Campus. The London Campus occupies a relatively small area of the 2012 broadcasting centre building and the heating and cooling services are provided under contract by the Olympic Park District Heat network. It aims to set out the University's existing energy supply and consumption position and provide options for the future that balances the requirement of achieving net zero greenhouse gas emissions targets for scope 1 & 2 by 2035 and scope 3 by 2045, whilst supporting the operational demands and financial sustainability of a growing Estate. Key Objectives are to:

- Support the delivery of the University and Estates Strategy 2024-2050.
- Align with the Government target of achieving net zero greenhouse gas emissions by 2050, reaching a net-0 position on our Scope 1 and 2 emissions by 2035 and scope 3 by 2045.
- Provide resilience and meet the increased demand for electric power.
- Safeguard the University against escalating energy costs.
- Support business development opportunities to grow commercial income.

The Strategy is concerned with the reduction of the University's carbon footprint, which is related to but distinct from, the education and research activities of the University that pertain to climate change or greenhouse gas emission reduction. The Strategy is presented as a set of policies and approaches that we will take to reduce our emissions. These approaches are expected to remain rational, even if our targets change over time. There will be difficult choices to make now and, in the future, potentially leading us to forgo some opportunities. The Strategy does not seek to make those choices, rather it provides a framework and approach to minimise the number and magnitude of those difficult decisions, recognising that even over the next 26 years the landscape will change markedly.

Energy Strategy Vision

A modern, integrated, clean energy system, delivering reliable energy supplies in the right volumes, at affordable costs and meeting declared sustainability and net zero greenhouse gas emissions targets.

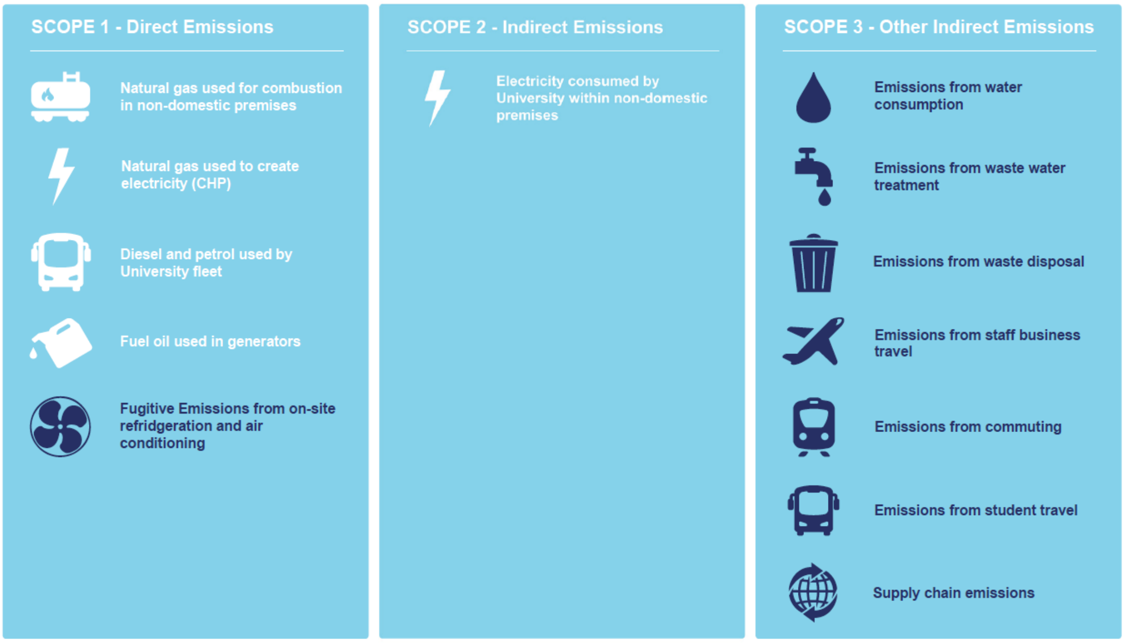
Estate Strategy 2024-2050

The Estate Strategy sets out a high-level capital plan road map covering the period from 2024 to 2050 focusing on providing the appropriate physical infrastructure to meet the University's "Creating Better Futures. Together" strategy. The strategy offers opportunities through new-build projects, redevelopment projects, infrastructure development requirements and building demolitions to positively impact on the University's energy and carbon reduction aspirations. The relationship between key initiatives in the Estates and Energy Strategies is set out in the high-level roadmap (See Appendix A). This will be updated as necessary to reflect the University's Capital Framework.

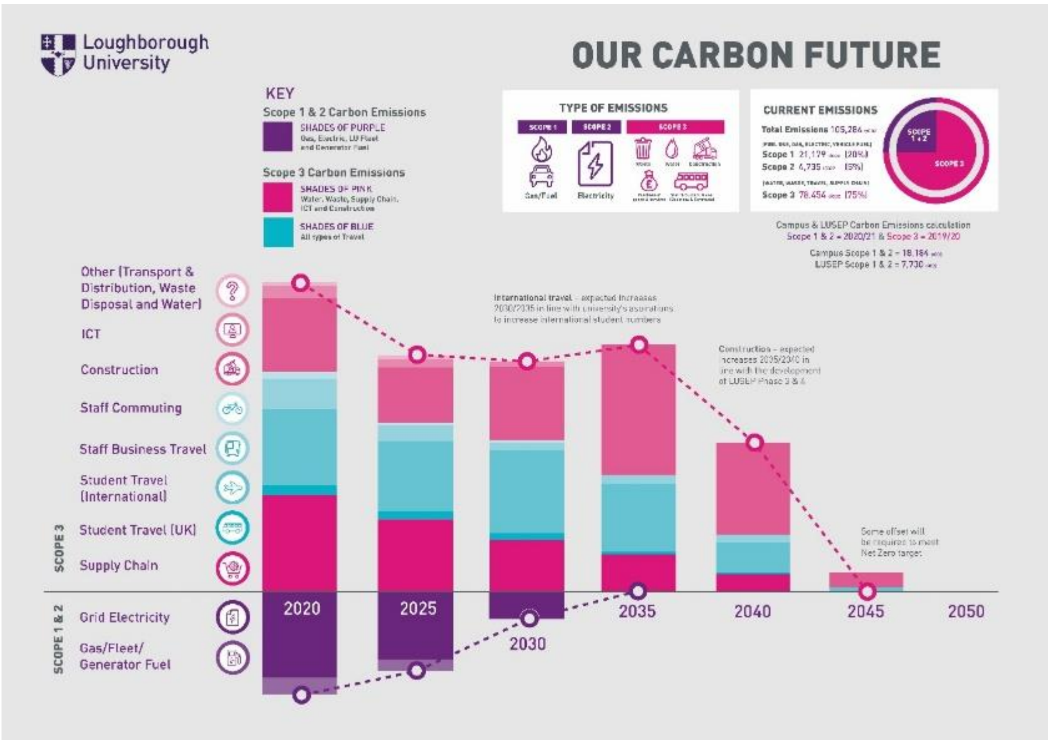
Strategic Objectives

Without an endorsed Energy Strategy, the university will not be able to achieve its net zero greenhouse gas emissions targets or be able to provide power and energy to meet the university's future needs. It should also be stressed that the University cannot achieve zero carbon status in isolation as it will be dependent on decarbonising of the national fuel supply to do this. The strategy should aim to identify what levels of de-carbonisation the University will need to deliver through local action. This means that the Energy Strategy should position the University to capitalise on government, industry and regional de-carbonisation initiatives. Successful delivery of the Strategy should facilitate: reduced energy costs, secure energy supply, reduced price volatility and reduced greenhouse gas emissions.
This strategy will address scope 1 and scope 2 emissions with scope 3 being addressed under the leadership of PVC (R&I) and the two APVC's for climate change and net zero.

- Scope 1: are the direct emissions that occur from sources that are owned or controlled by the University, for example emissions from gas used for combustion in boilers.
- Scope 2: are emissions from the generation of grid electricity consumed by the University.
- Scope 3: are other indirect emissions that occur upstream and downstream, associated with the university's activities, and include: waste, water consumption, staff/student commuting, business travel and procurement.



Current baseline



Energy Use and Procurement

A rapid global energy transition is taking place, driven by the undeniable impacts of human-caused climate change. Fossil fuels are being phased out to reduce carbon emissions and meet net zero targets, resulting in a seismic shift in the energy landscape. This shift brings an unprecedented period of technological innovation and opportunity for research and innovation projects.

The University is a major user of energy consuming 75 GWh of gas and 32 GWh of electricity on an annual basis at a cost approaching £14m per annum. There is no significant on-site renewable energy generation, although 21% of the current electricity demand is produced by the on-site Combined Heat and Power (CHP) units.

The energy supply market has historically been a volatile trading environment and the University will continue to work with appointed energy brokers and the LU procurement team to develop utility procurement strategies in a timely manner to ensure contracts can be secured at optimum rates to protect the University against escalating energy costs. Carbon pricing is expected to be applied to fossil fuels and may increase to nearly £150/t CO_2e by 2050. This could make fossil fuels materially more expensive. In parallel, taxes, levies and policies are being introduced to make sustainable technologies more financially attractive or mandatory. Even relatively modest reductions in energy use would generate substantial savings over the next 30 years, whilst also mitigating the impact of expected increases in future energy prices.

The costs of delivering this strategy are more difficult to quantify, as delivery is predominantly about integrating features throughout all areas of university business, rather than undertaking a series of separate activities. Where costs and benefits can be identified, they will be captured within other sub- strategies and plans and summarised in future versions of the strategy and supporting delivery plan.

University Net Zero Greenhouse Gas Emission Targets

The University's long-term ambition is to meet Government targets of achieving net zero greenhouse gas emissions by 2050, with a target for Scope 1 and 2 emissions of 2035 and Scope 3 by 2045. There are multiple benefits to achieving this target of net zero greenhouse gas emissions:

- Environmental.
- Financial.
- Comfort and Wellbeing.
- Reputational.

The University has adopted the UK Green Building Council's (UKGBC) Definition of zero carbon which sets out a five- stage hierarchy for achieving "net zero" carbon emissions: fabric efficiency, energy efficiency, on-site renewable, off-site renewables and offsets.

In 2021/22 the University's scope 1 and 2 emissions were 22,312 tonnes of carbon; 16,721 (75%) from gas consumption – scope 1 and 5,590 (25%) from grid electricity consumption – scope 2. The emissions associated with electricity consumption have seen a steady decline with the on- going decarbonisation of the National Grid and the increasing use of clean alternative energy sources. 81% of the University's greenhouse gas emissions are Scope 3 emissions.

With the decarbonisation of the National Grid the carbon benefits associated with the operation of the CHP's have demised over the years as electricity carbon emission factors approach parity with the gas carbon emission factors, as such CHP technology can no longer be considered a "low Carbon" technology.

Planning Horizons and Priority Actions

The uncertainties around the energy transition mean that the University does not yet have sufficient information to make fully informed operational energy choices into the future. This uncertainty relates to factors such as the global availability and cost of energy types and the energy types that will achieve wide-scale adoption by energy suppliers.

The Energy Strategy therefore does not provide firm direction on the energy types and technologies that should be adopted by the University. Instead, it will embed an energy decision-making cycle within the University Governance model to incrementally reduce and respond to these uncertainties. The University will continuously transition through an analytical cycle that requires it to gather evidence, assess the implications, take energy-informed decisions and review and learn from its choices.

The practical application of the energy decision cycle means the University must change the way that it operates and makes strategic decisions. Delivering these changes will be achieved through three "response phases":

- Now-2025 – Laying the foundations: The University will conduct analysis to develop energy insights and update relevant components of its operating model to ensure energy is considered in strategic decisions.
- 2025-2030 – Making bold and informed decisions: The University will fully embed energy options into decisions and make bold and informed energy choices in procurements.
- 2030-2050 – Advantage: The University will fully achieve the Energy Strategy vision, delivering consistent sustainability outcomes through its energy choices and its continuing response to the energy transition.

The University's near-term focus is to deliver the first response through six priority actions delivered by 2025. These will enable the University to deliver the outcomes required in the first response phase (laying the foundations) and enable energy-conscious decisions making to commence. These are:

1. Establish energy leadership and oversight within the University. The University will enable a coherent approach to energy and Net Zero Carbon by establishing a senior academic lead and a senior operational energy sponsor. Together, they will be responsible for enabling coherence in University operational energy decisions and overseeing the performance of the operational energy system and the delivery plan to deliver the Scope 1, 2 & 3 reductions.

2. Develop and distribute energy insights. The University will develop an integrated and strategic understanding of energy opportunities and risks. This will be done by gathering insights from across the HE sector, industry and academia. The University must understand properly the importance of delivering exemplar sustainability and carbon reduction practices to improve its sustainability, long term energy security, and advance the university's external status. The estates and energy strategies include several ambitions, objective and potential projects, and the University now needs external support to advance thinking to develop the strategy to the next level. This will include the creation of an implementation plan that can help steer and drive LU's policy for Scope 1 and 2 emissions reductions in its building stock. The 'implementation plan' should include an initial focus on:

(i) the activities that LU should be prioritising (the 'what' and 'why') and;

(ii) the steps that need to be taken and/or considered to help LU move towards implementation (the 'how').

3. Embed energy considerations into all procurement decisions. The University will embed operational energy and carbon considerations and make informed budget decisions, prioritising carbon and net zero emissions reductions at every stage.

4. Optimise energy management. The University will manage its operational energy needs to drive efficient energy use, make strategic decisions about energy consumption and to ensure it has the network connections and infrastructure to meet future operational energy needs, including research projects and LUSEP development.

5. Conduct innovation, research and experimentation to inform future energy choices. The University will act now to progress its understanding of most promising energy choices, building on existing programmes.

6. Manage the interdependency between operational and estate energy. The University will understand the likely interdependencies and interfaces between operational energy and estate energy consumption. It will set the direction for how these can be managed.

Leadership, Behaviours and Culture

Embedding an energy aware culture and a mindset of 'best for Loughborough' through the promotion of enhanced behaviours and culture will be vital. Communication will form a critical part of delivery of the Strategy with behavioural change required at all levels within the organisation to achieve the reduction in the emissions target. Senior level support will need to be visible and embedded with clear targeted actions provided to enable implementation.

We recognise the importance of leadership, behaviours, and culture in establishing a step change in scope 3 reductions. We will be able mostly to drive Scope 1 and 2 reductions through system and process changes but will require culture and behaviour changes to close the gap. Culture, behaviour and leadership will be significantly more influential in realising our Scope 3 targets.

The Values and Strategic Themes developed through the University Strategy will support the 'best for Loughborough' mindset. A key value is 'accountable' and the themes of climate change & net zero and vibrant & inclusive communities will include action on building a sustainable and healthy energy aware culture at the institution. We will ensure that any changes made to our energy provision take account of any EDI considerations, especially to ensure the campus is a welcoming and accessible physical environment.

Academic Partnerships

The University will seek to draw on its very considerable in-house research and teaching expertise on issues relating to climate change, energy efficiency and environmental sustainability. The aim is to contribute to national and international understanding of these issues, to educate current students, regardless of their discipline, and to inform and guide the University in its own international management of its environmental responsibilities.

Strategic relationships with key academic and tenant partners should be established to develop a "Living Lab" utilising the University estate and infrastructure to demonstrate LU's world class expertise in Energy and the Built Environment and accelerate our research and innovation activity. Relationships with academic partners will also be developed to utilise their expertise to inform and build on the energy strategy principals, as well as seeking to grow research expertise opportunities and valuable PhD student experience.

The opportunity to engage with academic schools and research partners to deliver the long-term aspirations of the Energy Strategy should be maximised. Allowing the Estate to be used as a living laboratory to install and evaluate the effectiveness and resilience of new technology will support the drive to reduce greenhouse gas emissions.

This section has been provided by Professor Kevin Lomas (previously Professor of Building Simulation – School of ABCE) and sets the context for this strategy and how new and refurbished building projects will be approached in the future. Rather than grasp at an established design driver – Passivhaus, BREEAM etc, it tries to examine the problem based on the key factors of interest to Loughborough University and the outcomes, levers and constraints under which these objectives are to be achieved.

There are six key objectives:

- reduced energy costs.
- secure energy supply.
- reduced price volatility.

- reduced greenhouse gas emissions.
- high-quality built environments.
- projection of the University's values through 'flagship' buildings.

The University cannot achieve zero greenhouse gas emissions in isolation. It will rely on the decarbonising of the national fuel supply to do this. Any energy strategy is thus about positioning the University to capitalise on such de-carbonisation. Gas is high-carbon so the UK will gradually curb gas-heating in buildings. The Government's proposed new building regulations (draft out for consultation) are driving in this direction. The University's emissions from burning gas are projected to be 79% of all University buildings' emissions by 2030. So, there must be a shift away from gas heating if the zero-carbon aim is being taken seriously.

This decrease in carbon intensity of the National Grid reflects the predicted increase in electricity generated from renewable sources and the switch away from burning coal in power stations.

In the future, zero-carbon hydrogen might materialise, but there is no realistic sign of this at present. If/when we have zero/low carbon gas available, the existing gas pipes will be used, and the University already has these. A shift to electrical heating now doesn't preclude a drift to zero-carbon gas in the future (should it exist).

Shifting to low carbon, centrally generated electricity, for heating is one possible route to achieve zero-carbon by 2035, but the whole country is likely to move in this direction putting pressure on the electricity network and on generating capacity. The consequence will be high electricity prices, especially at times of peak demand. Grid electricity needs to be utilised sparingly and not at times of peak demand. This implies having low electrical heating energy demand, and an ability to store heat (and perhaps electricity) to avoid peak tariffs.

Local generation of power can make a significant contribution to achieving the above objectives. As there is unlikely to be much incentive to export this to the grid, its distribution by private wire to the University is necessary. PV generation is at its maximum when the heat-load on the University buildings is at its lowest. One line of thought is thus to have a PV capacity and, possibly, any associated battery storage to meet the base electrical load of the University as it exists in e.g. in summer.

To reduce the amount of electricity used for heating, it is necessary to move to electrically driven heat pumps. The expertise in the delivery, installation and maintenance of these will increase significantly as the number of installations increases nationally

The University CHP system needs to be replaced by c2030, this is an excellent opportunity to move to a low carbon, flexible and resilient heating system. But what do these terms mean in practice. Firstly, we use heat pumps, they have a Coefficient of

Performance (COP) of 3.0 (one unit of electricity yields three units of heat), so they are 'ultra' efficient. To maximise the heat pump efficiency, the new campus wide system needs to be, at least, a (fourth generation) low temperature system. The proposed Building Regulation revision is pushing for a peak supply temperature of 55°C. Low temperature water also helps the overall system efficiency as there are far lower pipe-line losses. As with the current energy network, most of the critical plant is central where skilled operators and maintenance staff are based.

All new buildings should be capable of being heated by low temperature water. This implies, a well-insulated envelope, possibly large area heat sources (underfloor, or larger area emitters) and all mechanical ventilation must have very efficient heat recovery (we cannot heat large volumes of ambient air to comfort temperature with low temperature water). DHW is achieved by locally upgrading the district heat supply using a heat pump and storage and/or point of use electrical heating.

The minimum design standard outlined here is thus framed around the technical minimum needed to make a low temperature building 'work'. This could set the building envelope efficiency (heat loss) that the energy systems require. Over and above this, it really depends on a cost-benefit analysis and in this context what the University is prepared to pay today to avoid energy high costs tomorrow. In the context of rising energy prices, short term thinking might be unwise. Energy system components typically last 20 years, buildings 60+ years. There are numerous built exemplars that could inspire aspirations to higher energy efficiency standard; various PassivHaus buildings, the Elizabeth Fry Building at UEA, etc.

Whatever the design standard set, expert advice, expert design and M&E solutions by specialists capable of delivering to the brief is essential. Lowest cost contractors and officious 'value engineering' will kill any hope of achieving high quality design ambitions, even mild innovation will fail. Adopting a soft landings approach reduces risk. The design team need to work with the University FM team post-handover to help ensure that the new building performs as well as possible.

Setting an energy target is tricky; what is needed is a performance standard; i.e. what will happen in practice, not what is predicted to happen. A target might be framed around, say, an in-use energy demand of A-rating as would be shown in the Energy Performance Certification (EPC). The benefit of this is that the achievement, or otherwise, is visible for all to see (EPCs must be displayed prominently in the University Buildings).

As context, an A rating is 80kWh/m^2 per annum total delivered (electrical) energy demand. If this was all electricity, used in heat pumps (COP=c2.5) it would cost the University roughly c£48k pa to heat light and power a new building of 10,000m^2. By 2030 this might rise to £69k pa. Striving for a B-rating would double these costs. A standard, D-rated, building would cost c£276k pa by 2030.

There are many non-cost, experiential factors that are considered when building. Visual appearance, indoor air quality and natural light are just some. Such matters improve learning and staff productivity, and low energy buildings often have higher satisfaction ratings. Finally, the design of buildings reflects the values of an organisation. Loughborough might usefully project a forward looking, environmentally conscious image through its buildings.

Approach

- Develop a Decarbonisation Plan to bring power and heat to both campuses that is: low carbon, affordable, resilient and sustainable.

- In the short-term, increase the capacity of the electric power network on West Park and LUSEP to power green energy research initiatives and projects.
- In the mid-longer timeframe, construction of a renewable solar PV energy array to supply >10 MVA to the University and sell excess capacity to the grid.
- The two campus Combined Heat & Power Plants (CHP) are approaching the end of their life. A strategic balance of investment decision will be required to replace the CHP's with green sustainable technologies or to seek alternative heat and power sources by 2027.
- On campus renewables – consideration of solar PV array, geo-thermal, energy from waste, ground source heat pumps and wind generation will be considered within the University Decarbonisation Plan.
- Identify energy and carbon hotspots and produce mitigation plans.
- Incentivise schools and professional services to realise energy savings.
- Incremental roll out of additional charging points for electric/hybrid vehicles to meet future demand.

1.0 Introduction

1.0 Aims

- Supports the delivery of the University, Estates Strategy 2024-2050 and the Sustainability Strategy.
- Aligns with the Government target of achieving "net zero" greenhouse gas emissions by 2050.
- Safeguards the University against escalating energy costs.
- Provides resilience and supports business continuity.
- Supports business development opportunities.

1.1 Performance Ambition

ABCE Subject Matter Experts (SME's) advise that setting an energy target is unlikely to succeed, what is required is a performance standard. The Energy Strategy performance ambition requires the University to balance three competing priorities: effectiveness, affordability and resilience. The University must define the quantifiable targets that it wishes to achieve in each of these in-tension performance dimensions. This would typically be summarised in a high-level statement and then be broken down into supporting detail. The three components of the energy performance ambition are set out below:

Effectiveness Comprises:

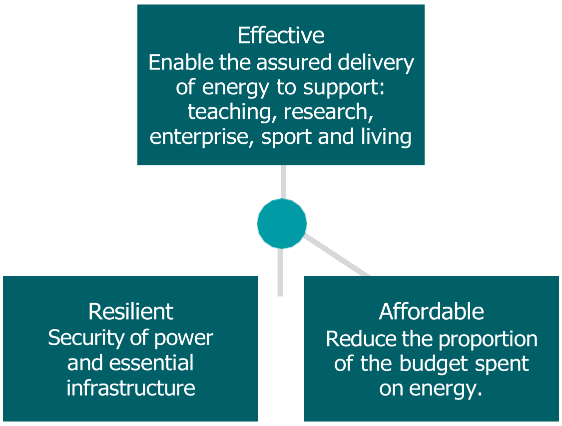
- Meeting the energy needs of students, staff, tenants and visitors now and in the future.
- Complying with or exceeding legislative and environmental standards.
- Meeting, or exceeding carbon reduction targets.

Affordability Comprises:

- Adherence to energy budgets and recognising the true through-life cost of energy delivery and consumption.
- Driving efficiency by optimising output from current and future assets and resources.

Resilience Comprises:

- Risk taken against the security of power and essential infrastructure to sustain business continuity assets whilst enabling an environmentally compliant and sustainable estate and maintaining a trajectory to achieve net zero scope 1 and 2 greenhouse gas emissions by 2035 and scope 3 by 2045.



1.2 Assumptions

- The energy budget will remain a significant element within the University budget.
- The unit energy costs for gas and electricity will continue to increase.
- The non-commodity costs associated with electricity supply will continue to increase.
- 'Operational Energy' is the energy required to operate and sustain the University campuses. In practice, this means that operational energy comprises energy used to power all buildings and facilities, laboratories and technical equipment, sporting facilities, commercial activities and tenant operations.
- The capacity of the existing four main High Voltage networks are limited to the existing Authorised Supply Capacity Agreements with National Grid Electricity Distribution (NGED) who manage the electrical distribution network throughout the East Midlands. The HV supply capacity to the university will need to be upgraded by 2025 meet growth targets, primarily in research and for the development of LUSEP.
- The de-carbonisation of the national grid will continue in line with government targets.
- Gas is high in carbon and government will gradually curb gas-heating in buildings.
- By 2030 it is forecast that gas consumption will account for 79% of the total University scope 1 and 2 emissions, there must

be a shift away from gas heating if the Scope 1&2 net zero greenhouse gas emissions target is to be met.
- Local generation and storage of power could make a significant contribution to reducing University energy costs.
- In the mid-term PV arrays and battery storage facilities and ground source heat pumps could meet base load requirements.
- Major projects will contribute to the realisation of the University's net zero greenhouse gas emissions.
- New build and refurbishment projects will offer opportunities to optimise energy performance.
- The Long-Term Maintenance (LTM) programme will continue to be utilised as a funding route to implement carbon reduction projects.
- The CHP plants will be de-commissioned at the end of their economic life.
- Academic, research and tenant partnerships will be developed to support the development of low carbon infrastructure and smart energy networks.
- There will be a requirement to assess cost effective renewable energy opportunities and the estate and infrastructure will be offered as a living lab to develop and assess smart energy networks and low carbon technology opportunities
- Whole life cycle costing models will be developed to assess mid to long-term benefits and implementation priorities for energy related projects.
- Internal and external funding opportunities will be assessed to support the implementation of low carbon technology.
- The University will adopt a low-risk strategy to adopting new technology.
- Energy performance data and Building Management System (BMS) data will be utilised to support academic research to develop smart building controls.
- There will be increased engagement with staff and students to increase the level of energy awareness and information dissemination.
- Hybrid/zero emission vehicles will have replaced most petrol/diesel vehicles by 2030 – a sufficient charging infrastructure will be required.

1.3 Principles

Energy Procurement

- The University Energy, Procurement and Finance teams will work with the appointed energy brokers to develop utility procurement strategies in a timely manner to ensure contracts can be secured at optimum rates.
- The University will adopt a low-risk strategy towards future energy procurement strategies.

Building Standards

- The University estate and infrastructure will be used to develop a "Living Lab" to implement and assess low carbon technology solutions and demonstrate the University's world class expertise in energy and the built environment.
- The Building Research Establishment Environmental Assessment Method (BREEAM) excellent standard, this can include Passivhaus, and Energy Performance Certification (EPC) A rating to be applied in all future new build and refurbishment projects.
- Operational energy performance data and BMS data should be utilised to support academic research to develop smart building controls.

Whole Life Costs

- Whole life cost assessments will be included as part of the project approval process to consider whole life costs in order to understand the full costs of a building across its life cycle, particularly the use of energy.
- The requirement for whole life cost assessment will form part of the project design brief.

Energy Supply

- Implement low energy/carbon project as part of the LTM programme.
- The planned review of the condition of the mechanical and electrical services will assist in strategically planning future infrastructure upgrades on a risk-based basis.
- The two main CHP units will operate until they are life-expired at which point the technical options for low carbon generation to support the de-carbonisation of the thermal infrastructure will be reviewed.
- On site renewable energy technology – consideration of renewable energy opportunities for both new and refurbishment projects across the existing estate.
- Energy consumption data will be utilised to identify energy and carbon hotspots, allowing mitigation plans to be developed.
- Increase the dissemination of energy performance data to staff, students and tenants.
- Incentivise schools and professional services to realise energy savings.
- Charging for electric/hybrid vehicles to meet projected demand.

Carbon Offsetting

- Carbon offsets should represent the final step to achieving "net zero" greenhouse gas emissions.
- Any purchased offsets should be commensurate with any
- outstanding carbon to achieve a net zero carbon balance.

Net Zero Greenhouse Gas Emissions

- The University will adopt the UK Green Building Council's (UKGBC) hierarchy and definitions for net zero carbon building, covering net zero carbon - construction and net zero carbon – operational energy.
- With the on-going de-carbonisation of the National Grid electrical network, significant progress could be made in reducing the carbon emissions through the transition from gas fired heating to electric solutions utilising the latest technology developments.
- Opportunities to develop a range of renewable energy and low carbon technologies on the campus to support the existing infrastructure should be fully explored, including solar and battery storage, wind generation, ground source heat pumps, use of hydrogen fuelled technology and de-carbonisation of the National Grid gas supply network.

1.4 Leadership, Behaviours and Culture

Alongside the infrastructure changes required and the high-level roadmap outlined in this Strategy, a programme to encourage behaviourally based changes in individuals will be required to support a reduction in emissions on the scale envisaged. Changes in individual behaviour, culture, and leadership will be especially important in meeting the Scope 3 net-zero emissions target.

Whilst infrastructure changes can and will take many years to implement the benefits of behavioural change can be high impact and cost effective in the short-term, providing savings and benefits both directly and indirectly to the individual and the University. People are generally influenced by social norms and influenced by what those around them are doing. Providing easily accessible information that is relevant and applicable to individuals and their areas or work will be important in any communications.

Senior level support for the delivery of a reduction in energy usage will need to be visible and embedded. The provision of area specific data and targets will encourage ownership across Schools and Departments. Governance will be required to monitor and check impacts from decision making at individual and department/school levels. Targeted actions will be provided along with succinct guidance on expectations for Deans, Heads and Operations Managers. Key areas of impact will be established and plans of how to deliver change in policy created. Focus will initially be on Procurement, IT, Business Travel and Buildings.

COVID-19 presented opportunities to review operational activity and methods of working and teaching in more flexible and efficient ways in the future. Building occupancy has fallen following the advent of dynamic working, allowing for opportunities to reduce heating and lighting.

Carbon Literacy Training will be explored as the overarching solution to getting all stakeholders on board and Carbon Literate. This would be delivered via the Staff Development team within HROD and tailored to the different stakeholder groups within the organisation. This type of training will provide an awareness of the carbon dioxide costs and impacts of everyday activities, and the ability and motivation to reduce emissions, on an individual, community and organisational basis.

Current media platforms and channels will be employed to communicate with all stakeholders and in partnership with the central Marketing Team. Re-engagement with Environmental Champions and Enthusiasts will support wider buy-in and localised communication.

1.5 Governance

University committees are a core component of the University's governance structure and decision-making process. In addition to ensuring decisions are fully considered and formally recorded, they are used for consultation and communication. It will be important to work closely with the local planning authority and Charnwood Borough Council to prepare masterplans and development frameworks, particularly for options appraisals, feasibility studies and individual project implementation.

There are a number of university committees and project management boards (PMB's) that provide governance and policy direction for all estates matters.

- Infrastructure Committee is chaired by the COO and supported by lay members. It provides expert estates advice relating to estate management strategy and long-term strategic planning. This Committee is the sponsor of the Energy Strategy. Responsibility for the delivery of the strategy is delegated to the Director of Estates and Facilities Management.
- Strategic Portfolio and Resources Committee SPaRC (formerly Operations Committee until March 2024) approves the relevant stages of major and minor projects and provides appropriate management and independent review.
- Long-Term Maintenance Sub-Committee is chaired by the Director of Finance. The LTM Sub-Committee approves the prioritised rolling 5-year maintenance programme and submits this to SPaRC and IC for approval.
- The University Executive Board (UEB) exercises the collective executive authority of the University's senior staff and will be consulted when major decisions which change the proposed direction of travel are considered. The UEB also prioritise major capital projects annually.
- A final group which will be consulted and engaged to achieve the Energy Strategy is the Loughborough University Net-Zero group (LUNZ). LUNZ provides oversight to the institution's journey to net-zero and will advise and support the Estates & Facilities Management directorate as they progress this strategy.

1.6 The University's Reduction Target

Loughborough University aims to achieve Net Zero Greenhouse Gas Emissions for scope 1 and 2 emissions. by 2035. The University will need to establish what levels of decarbonisation will be achieved through the decarbonisation of the National Grid and what levels will be needed through local action.

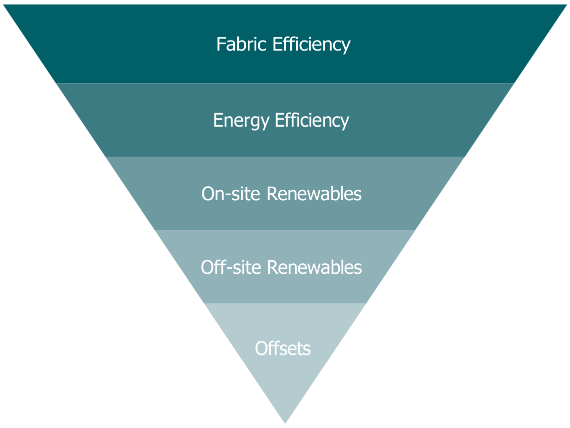
1.7 Net Zero Carbon Definitions

Loughborough University has adopted the UK Green Building Council's (UKGBC) definitions for net zero carbon buildings:

- Net Zero Carbon-Construction (for new buildings and major renovations) - "When the amount of carbon emissions associated with a building's product and construction stages up to practical completion is zero or negative, through the use of offsets or the net export of on-site renewable energy".
- Net Zero Carbon – Operational Energy (for all buildings in operation) - "When the amount of carbon emission associated with the building's operational energy on an annual basis is zero or negative. A net zero carbon building is

highly energy efficient and powered from on-site and/or off-site renewable energy sources, with the remaining carbon balance offset".

Carbon Reduction Hierarchy (UKGBC)



This means that by 2035, all the University buildings should create zero greenhouse gas emissions on an annual basis from their lighting, ventilation, hot water, appliances, heating and cooling. This should be achieved in line with the hierarchy shown, promoting fabric and energy efficiency and only minimal offsets once all means on-site and off-site renewable energy production have been exhausted.

The Carbon Reduction Hierarchy demonstrates where interventions should be focused for the most impact. We are committed to taking a holistic, whole building approach so will follow the hierarchy when planning new build projects and refurbishments.

1.8 Emissions Scope

This strategy focuses solely on the University's scope one and two carbon emissions. For information on the University's Scope 3 intentions, see the University Decarbonisation Plan. As the 'Our Carbon Future graphic' shows the institution's top-level intended road map to next zero takes account for fluctuations and increases in our Scope 3 emissions as we drive forward the new University strategy, but our Scope 1&2 emissions will fall to net zero by 2035.

Figure X shows the breakdown of embodied and whole carbon emissions associated with building construction, maintenance, usage, and disposal. It demonstrates the different emissions associated with each scope, operational carbon is scope 1&2, all other costs are scope 3.

The University's baseline and annual footprint have been calculated using University data and government guidance. As the data and guidance improve in quality and accuracy, we will review both the baselines and the annual footprints to ensure appropriate action is taken.

The University has not included scope three emissions within this strategy as they cover a much wider range of activity driven/accountable to a range of teams and structures within the institution. However, as scope three emissions are considerably larger than the organisation's scope one and two emissions, the University recognises the importance of reducing them. Therefore, the University will conduct further work to understand its Scope three emissions and approve a decarbonization plan for this type of emissions. The University will adopt best practice in reporting, recognising the need to move beyond merely operational carbon reporting to quantify broader benefits from our activities. The University's Decarbonisation plan will outline, in detail, how the institution will reach net-zero across all three scopes.

2.0 Energy Consumption and Expenditure

2.1 Current Consumption and Financial Expenditure

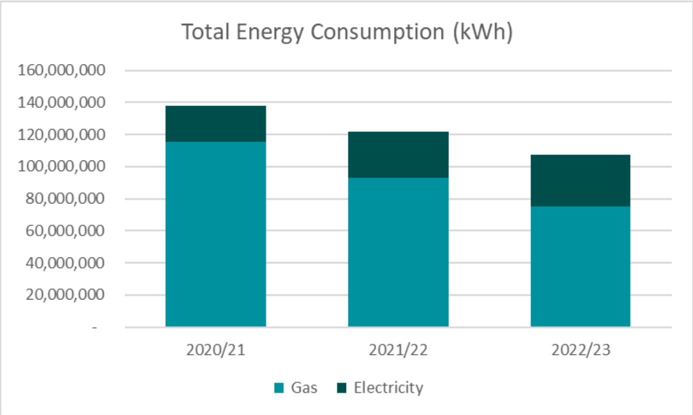
Increased energy consumption occurred during the Covid pandemic resulting from the heating and ventilation requirements to keep students and colleagues safe. In 2022 the Russian invasion of Ukraine and the imposition of economic sanctions on Russia resulted in massive, unprecedented increases in energy costs. In 2019 the university's energy costs were around £6m annually; however, in 2022/23 this increased to £13m. The university is part of the Energy Consortium (TEC) who provide energy solutions to public sector organisations, particularly to universities and colleges. With the increase in energy prices, membership of TEC has helped to reduce exposure to the volatility of energy markets by hedging and purchasing energy in bulk in advance. Without this approach the increased costs in 22/23 would have been £27m instead of the £13m. Maintaining a forensic focus on energy consumption and forecasting future requirements which is unlikely to abate anytime soon is vital to ensure the financial health of the university. In the future the University must reduce its dependence on energy suppliers and drive down energy costs and carbon emissions.

The cost of energy is likely to increase over the coming decades, as new energy types are expected to cost more than cheap primary energy sources today (such as coal and gas) and as governments implement carbon pricing mechanisms on fossil fuels. The University is a major user of energy and currently spends around 3.5% of the budget on energy and utilities. The gas consumption represents 70% of the total annual energy consumption and the grid electricity represents 30% of the total annual energy consumption. The gas consumption represents 37% of the total annual energy expenditure and the grid electricity represents 63% of the total annual energy expenditure.

The graphs show that whilst energy consumption is declining steadily, the financial costs have increased exponentially. In the future the University must reduce its dependence on energy suppliers and drive down energy costs and carbon emissions.

- Figure 1 illustrates that whilst the consumption of gas and grid electricity has declined over the past three years on a developing estate, the costs have increased significantly reflecting increases in the wholesale energy markets costs. In the future the University must reduce its dependence on fossil fuels energy supplies and drive down energy costs and carbon emissions.
- Figure 2 illustrates the current energy mix and the breakdown in energy expenditure.

Figure 1



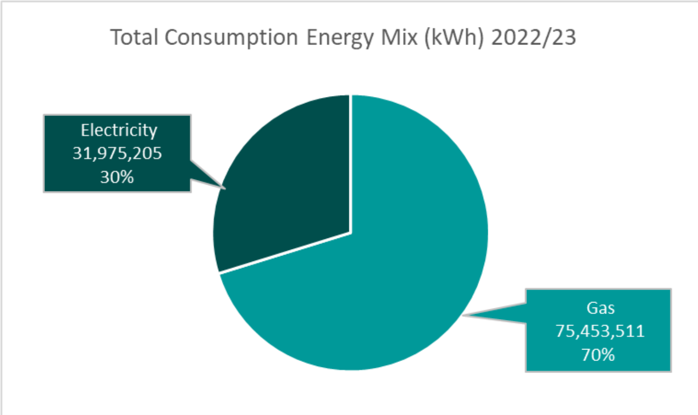
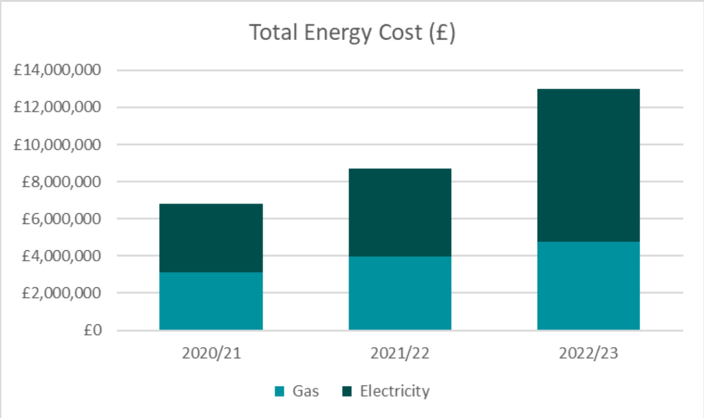
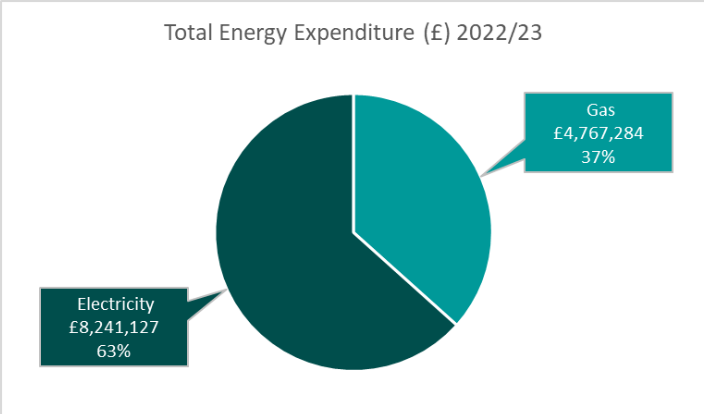


Figure 2





3.0 Campus Infrastructure

3.1 Estates Strategy

The Estate Strategy sets out a development framework for Loughborough University covering a twenty-year period from 2024 to 2050 focusing on providing the appropriate physical infrastructure to meet the University's 'Creating Better Futures. Together' strategy. It includes a high-level capital plan roadmap for the development of the estate and offers opportunities through new build projects, redevelopment projects, infrastructure development requirements and building demolitions to positively impact on the energy and carbon reduction aspirations of the University. Key aspects of the high-level Estates Strategy roadmap and opportunities to influence the future energy strategy are summarised in Appendix A. The first two tranches of the Estates Strategy set out the high-level road map to 2050, areas of the strategy that could support the aspirations within the Energy Strategy include:

- New Build – SSEHD & DCA Buildings – with opportunities to minimise the life cycle carbon impact of the new build projects through the application of Passivhaus/BREEAM/ Low Energy/Low Carbon design techniques at the design stage and throughout the construction phase of the project.

- Redevelopment of Student Accommodation - opportunities to reduce the impact of the Student village redevelopment thorough the application of Low Energy/ Low Carbon and renewable energy opportunities through redevelopment phases.

- LUSEP Infrastructure and its Phased Development. There is a requirement to secure additional power and deliver the basic infrastructure to facilitate the long-term development aspirations of the LUSEP.

- Demolition Projects/Space Management. Planned demolitions and associated reduction in carbon emissions.

3.2 Off-Campus Electricity Network

The development of the campus is making ever increasing demand on the utilities across the campus, of particular concern is the increasing demand for electricity. A number of local developments have triggered the upgrade of the Loughborough Bulk Supply Point by NGED. This will allow the University to apply for additional supply capacity to support the wider development plans within the Estates Strategy. The development of LUSEP and the transition away from gas fired heating will require significant investment in the planning and development of the electrical infrastructure. The development of LUSEP has not been scoped however this strategy must address this issue as without the additional power the mid to long-term resilience of LUSEP will be jeopardised. The University have continued involvement in the wider group including Charnwood Borough Council, Leicestershire County Council, Leicester and Leicestershire Enterprise Partnership (LLEP), and National Grid Electricity Distribution who are meeting on a regular basis to discuss the issues surrounding the power issues in the Loughborough and wider Charnwood Borough Council area.

3.3 On-Campus Electricity Infrastructure

The main University Campus and LUSEP are served by four dedicated High Voltage (HV) networks supplied by National Grid Electricity Distribution (NGED), formerly known as Western Power Distribution (WPD):

HV Network	Areas Served
Sir Richard Morris	Central Park, West Park and Village Park (excluding Falkner and Eggington)
Towers	East Park (excluding Swimming Pool, Security and Students Union)
Holywell Park	Holywell Park and Sports Park (excluding Michael Pearson East and West)
LUSEP	LUSEP Phase 2 (excluding New Access Development)

3.4 Gas Infrastructure

The main University Campus gas network is supplied by Cadent. The campus is served by 70 individual metered accounts, of which six meters account for 80.6 % of the annual University gas consumption and associated scope 1 emissions. Conventional gas fired boiler plant supplemented by gas fired CHP's are the primary source for the provision of heating and hot water services across the campus. The total installed thermal capacity is circa 50MW. The consumption and capacity data are summarised in the following table:

	Metered Supply	Boiler Thermal Capacity (MW)	Area Served	Consumption (%)
1	Main Boiler House	12 (+1.6 MWth CHP)	Central Park Energy Centre and CHP	40.8
2	Holywell Park	7 (+1MWth CHP)	Holywell Park Energy Centre	23.7
3	Pilkington Library	1.4	Pilkington Library	6.5
4	S Building	6	West Park Energy Centre	4.0
5	Claudia Parsons	2 (+0.23 MWth CHP)	Claudia Parsons energy Centre	3.2
6	Swimming Pool	1.6	Swimming Pool	2.4
remaining 64 meters		20	Various Building Across the Campus	19.4

3.5 Thermal Infrastructure

The majority of the heating and hot water services across the campus are provided by four main district heating networks, with a number of buildings supplied by individual boiler plants.

- Central Park Energy Centre: Central Park, Village Park and East Park.
- S Building Energy Centre: West Park.
- Holywell Park Energy Centre: Holywell Park Complex.
- Claudia Parsons Energy Centre – Claudia Parsons Student Accommodation and Elite Athletes Centre.

In the short term the gas fired plant will remain the primary method of providing heating and hot water services across the campus.

3.6 Combined Heat and Power

The University has installed three CHP Units:

- Central Park Energy Centre.
- Holywell Park Energy Centre.
- Claudia Parsons/ EAC Energy Centre.

The CHP units continue to form an integral part of the University thermal and electrical infrastructure providing 3MW of electrical capacity and producing approximately 21% of the annual University electrical demand in 2022/23. The investment in CHP technology has historically produced both carbon and financial benefits for the University and the units continue to provide significant financial savings due the difference in the unit cost of electricity to gas (currently 4:1) and in 2022/23, the financial saving were £1.1 million.

With the de-carbonisation of the National Grid the carbon benefits associated with CHP operation have decreased over the years as the electricity carbon emission factors approach parity with the gas carbon emission factors and as such CHP technology can no longer be considered a "low Carbon" technology.

The CHP plants will continue to operate to support the University infrastructure until the units are life expired (2.6 MWe of plant will be decommissioned by 2030), at which point the available options for low carbon energy generation to support the University thermal and electrical infrastructure will be reviewed and the most appropriate technology to produce a resilient and low carbon infrastructure will be developed.

3.7 Energy Monitoring

The University has an energy monitoring system that provides high level energy consumption data at an operational level, the data is typically used for:

- Establishing annual consumption and energy trend for individual buildings.
- Establishing league tables of consumption.
- Identifying anomalies is consumption.
- Provision of data for tenant billing.
- Provision of data for monthly LU financial management reporting.
- Provision of data for periodic reporting of school energy performance.
- Provision of data for statutory energy and carbon reporting requirements.

The opportunity exists to utilise existing media platforms to increase the dissemination of the performance data to a wider audience to increase awareness relating to both global campus performance and performance at individual building level. The data should be utilised to identify energy and carbon hot- spots which should be targeted to identify mitigation plans through a combination of technical and people solutions. The data is not generally used for school or professional services billing, but the potential exists to use the data as a basis to set energy reduction targets for incentivise the schools and professional services that realise energy savings. The data is used at an operational level but the opportunity exists to open up the data access to a wider academic audience to assist with more detailed and granular modelling of building operation and energy performance.

3.8 Building Management Systems

University buildings consume a great deal of energy giving rise to high levels of carbon emissions. The potential exists to create and operate buildings using materials that use heat and light to make and store energy that can be released through 'smart energy systems.' New technologies and methods of construction will enable the cost-effective production of highly energy efficient walls, roofs and windows. Active buildings can reduce energy costs by combining the use of solar cells and battery storage to draw solar heated air into buildings as well as ground source heating to provide warmth in the winter. A balance must be achieved between the benefits of active measures vs the capital and ongoing support costs of the technologies.

The University has a site wide BMS that controls the operation of the primary building services on a day-to-day basis across the campus. The opportunity exists to upgrade and expand the current BMS systems to provide a greater degree of smart building control through additional monitoring and intelligence. Academic partners within ABCE are embarking on a project to increase the level of monitoring and control within the BMS system to assess the real time energy and carbon benefits that could potentially be realised across the campus.

The Loughborough University Estates Strategy 2024-2050 states that the ambition is to use the estate as a living laboratory. One of the goals is that" by 2030, a decision support centre should be established, fed by predictive analytics, drawing on the data from the University's 'Living Laboratory', to enable evidence-based decision making to manage and improve the performance of the estate". To develop predictive analytics significant amounts of data is required to inform the underlying models, therefore the first step in creating a living laboratory is collecting data about the current state of the campus, aligning the data collection with the long-term estate ambition. Understanding the current energy demands and what is driving them can aid in better energy management.

Staff within Estates and Facilities Management with responsibility for the operation of the BMS will work closely with the academic partners to assess the potential benefits whilst also ensuring that existing systems are still controlling the building services effectively to ensure satisfactory environmental conditions for building users and university tenants.

3.9 Electrical Infrastructure Resilience

The University Infrastructure has been developed on a "project by project" basis over time to meet the continued development of the estate. There is a continued risk of the failure of aging underground mechanical and electrical services with the associated disruption to students, staff and University tenants. A detailed site infrastructure report was produced in 2020 by Axis Consulting Engineers which covered a review of the campus wide electrical, mechanical and IT infrastructure. This survey has been utilised to prioritise on a risk-based basis projects for implementation under the LTM programme to minimise as far as is practically possible the risk of infrastructure failure. It is recommended that a full review of the 2020 report is undertaken. This will provide an up to date set of reports and record drawings for the infrastructure across campus that will assist the University in strategically planning infrastructure upgrade works over forthcoming years.

The Sir Richard Morris Ring (SRM) has been developed and continually expanded over time to meet the development of the estate and currently feeds twenty-seven substations. The size of the ring is significant in terms of the buildings and areas of the campus served and considerable disruption results in the event of unplanned power outages. To improve reliability and minimise disruption, downtime and areas of the campus affected when a power failure occurs there are several viable engineering options that could be explored:

- Split the SRM ring main into two smaller HV ring mains.
- Increase the size of the Towers HV ring main to include Central Park buildings that are currently served by the SRM ring main.
- The options would need to be fully evaluated in conjunction with NGED and may result in the requirement to increase the availability of the existing Towers HV supply capacity.

4.0 Carbon Emissions

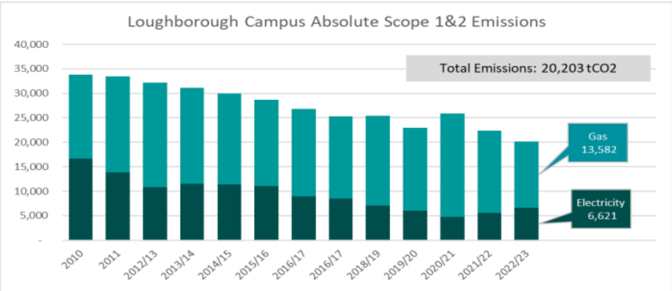
4.1 Baseline Emissions

The baseline figure for Scope 1 & 2 has been provided by HEFCE who commissioned consultants; SQW to undertake the work using, primarily, data return from the Estates Management Record (EMR). University data prior to 2010 is poor and therefore the datum point used in this decarbonisation plan is 2010. Data after this date is reliable and the Loughborough Campus and LUSEP Scope 1 & 2 carbon emissions are shown below. The Loughborough Campus baseline emissions are from the 2010/11 academic year. The Loughborough London Campus baseline emissions are from the 2016/17 academic year, this was selected as it was the first year that reliable accurate energy consumption data was available. The consumption data for both campuses is collated on a monthly basis from actual metered energy consumption data that in managed by the energy team in Loughborough and the LU Facility Manager at the London Campus.

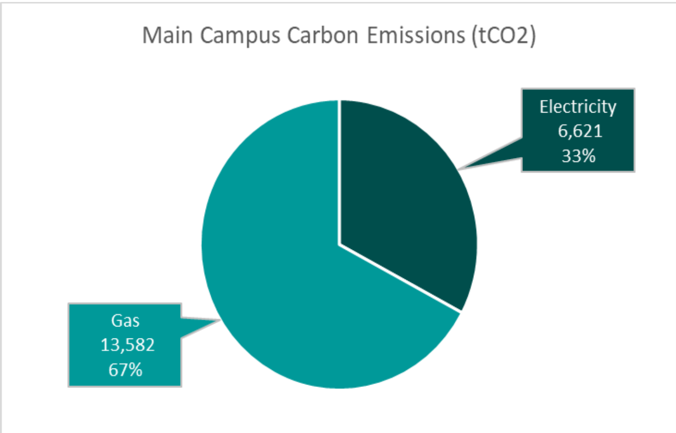
4.2 The University's Progress to Date

Loughborough Campus

Absolute Scope 1 and 2 Carbon Emissions – 2010 Baseline



Main Campus Breakdown of Carbon Emissions



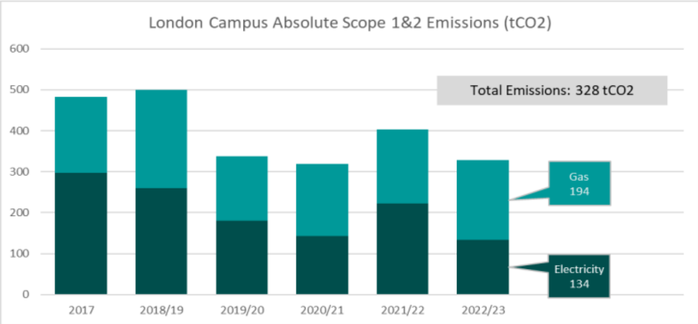
The Loughborough Campus has achieved a 40% reduction in absolute emissions against the 2010/11 baseline, this has reduced the annual CO2 emissions to 20,203 tonnes. This has been achieved on a developing estate and an 15% increase in student numbers. The gas consumption represents 67% and the electricity consumption represents 33% of the current emissions respectively. (In 2010/11 electricity represented 49% of the emissions and gas represented 51% of the emissions).

The decarbonisation of the National Grid has had a significant impact on reducing the emissions associated with electricity consumption. The Department for Energy Security and Net Zero (DESNZ) published carbon emission factors for electricity in 2022/23 are 60% lower than those published in 2010/11.

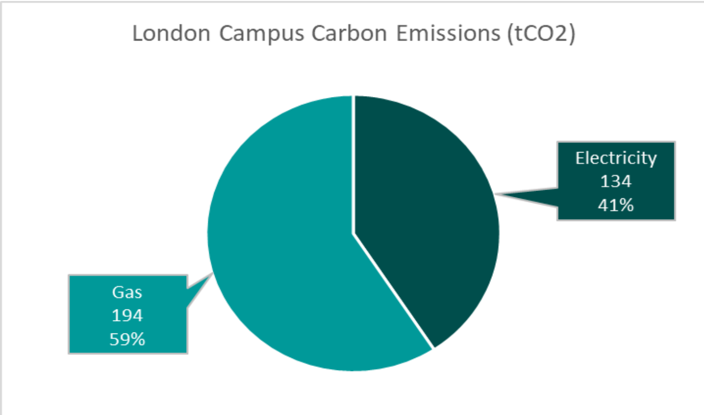
The installation of low energy lighting and controls, installation of new high efficiency boilers and BMS upgrades together with behavioural change through staff and student awareness campaigns have contributed towards reducing the energy consumption and associated carbon emissions.

London Campus

Absolute Scope 1 and 2 Carbon Emissions – 2010 Baseline



London Campus Breakdown of Carbon Emissions



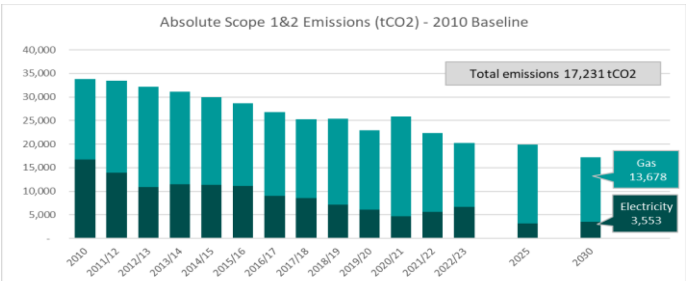
The London campus emissions have decreased by 22% compared to the 2016/17 baseline. The annual CO2 emissions are 328 tonnes. There has been a 38% increase in student numbers compared to the baseline year. The gas consumption (heating and cooling) represents 42% and the electricity 58% of the current emissions respectively.

4.3 Emissions Projections – Business as Usual

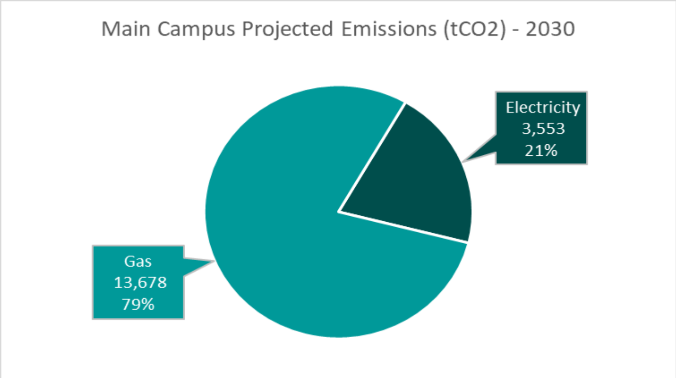
Loughborough Campus

This scenario assumes a static consumption for both electricity and gas consumption, with the reduction in carbon emission being achieved through the decarbonisation of the national grid.

Absolute Scope 1 and 2 Carbon Emissions – 2010 Baseline



Main Campus Projected Carbon Emissions – 2030

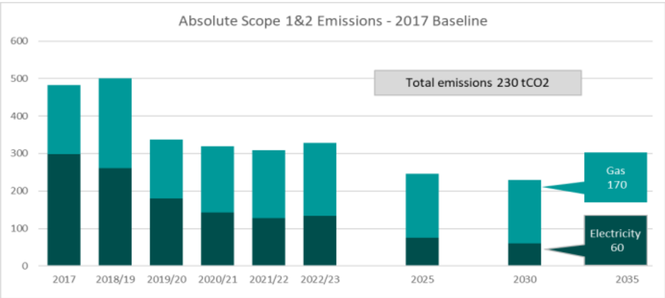


Under this scenario, the predicted CO2 emissions in 2030 are 17,231 tonnes, this represents a 49% reduction compared to the baseline year with the gas consumption accounting for 79% and grid electricity consumption accounting for 21% of the emissions.

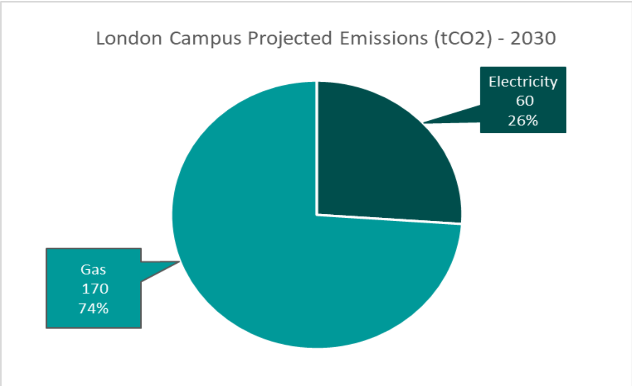
London Campus

This scenario assumes a static consumption for both electricity and gas consumption, with the reduction in carbon emission being achieved through the decarbonisation of the national grid. Other than implementing LTM improvements to lighting, heating and ventilation services and behavioural change improvements in areas under the direct control of the university there is limited scope for any significant improvement in the energy performance of the London Campus.

Absolute Scope 1 and 2 Carbon Emissions – 2017 Baseline



London Campus Projected Carbon Emissions – 2030



Under this scenario, the predicted CO2 emissions in 2030 are 230 tonnes, this represents a 52% reduction compared to the baseline year with the gas consumption accounting for 74% and grid electricity consumption 26% of the emissions.

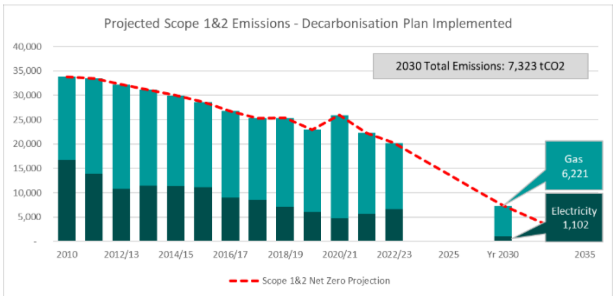
4.4 Emissions Projections – Zero/Low carbon Approach to the Estates Strategy

This scenario assumes the following will be adopted as part of the delivery of the Estates Strategy masterplan:

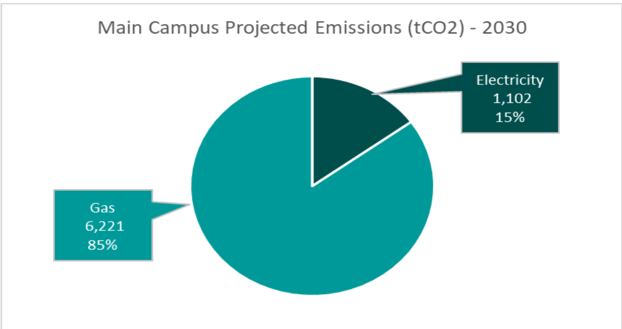
- Assumption that all electricity supply to the campus is zero carbon by 2030.
- Continued de-carbonisation of the National Grid in line with DESNZ forecasts.
- Development of a District Heating Network from Newhurst Energy from Waste Plant.
- De-commissioning of the Central Park and Holywell Park CHP units.
- Implementation of carbon energy/ carbon reduction projects within the LTM plan.
- Development of On-Site 12MVA Solar Farm.
- Building demolitions in line with the Estates Strategy.
- A zero/low carbon approach will be adopted for the new build projects.
- A zero/low carbon approach will be adopted for refurbishment projects.

Loughborough Campus

Absolute Scope 1 and 2 Carbon Emissions – 2010 Baseline



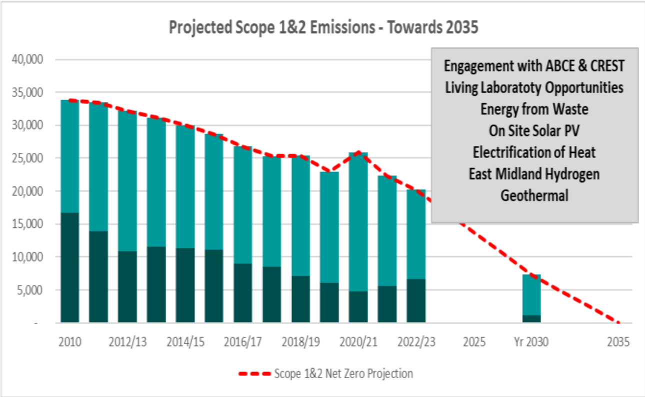
Main Campus Projected Carbon Emissions – 2030



Under this scenario, the predicted CO2 emissions in 2030 are 7,323 tonnes, this represents an 78% reduction compared to the baseline year.

4.5 Emissions Projections – Towards 2035

The de-carbonisation of the heating network will be the main challenge in moving towards "net zero" scope 1 and 2 greenhouse gas emissions by 2035 and it is here that support and relationships with key academic and research partners will need to be developed to ascertain the next generation of "low carbon" technology that could be utilised to meet the thermal demands of an operational estate. The opportunity exists to offer the estate as a living laboratory and allow the development of a smart energy network through the introduction of new technology in a phased 'low risk' approach to allow full evaluation of the specific technologies whilst ensuring the estate continues to function and business continuity is not compromised.


Projected Scope 1&2 Emissions - Towards 2035
Engagement with ABCE & CREST
Living Laboratoty Opportunities
Energy from Waste
On Site Solar PV
Electrification of Heat
East Midland Hydrogen
Geothermal
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
-
2010
2012/13
2014/15
2016/17
2018/19
2020/21
2022/23
2025
Yr 2030
2035
Scope 1&2 Net Zero Projection

5.0 Future Energy Requirements

5.1 Overview

The imperative to reduce energy consumption, carbon emissions and create healthier buildings represents a major challenge for the university. The reliance on fossil fuel must be reduced in favour of meeting heating, lighting and other power requirements through environmentally sustainable options. Alternative ways of procuring energy to supply the campus will be pursued to reflect best practice and future infrastructure investments should be based on low carbon solutions. This will be supported by the Energy Strategy developed by the Energy and Sustainability Working Group drawing on expertise from ABCE and CREST. The demand for energy, particularly on the west of the campus and on LUSEP will grow exponentially and further development on these sites will require additional clean energy supplies to be provided.

5.2 Current and Predicted Electrical Loads

The University has a Capital Framework programme that runs to 2028, several projects included within the programme will have a direct impact on the energy demand across the campus and LUSEP. An assessment of the current load across the four main HV rings and the future electrical demand has been mapped against known requirements summarised in the chart below. This has identified a requirement for very large amounts of additional energy for hydrogen research projects and from LUSEP tenants. A requirement for an additional 8MVA of power on the campus was identified in late 2023 driven by research projects prioritised by UEB and LUSEWP tenants. It should be noted that there are many unknowns in terms of what future buildings will be used for and loads required for manufacturing on LUSEP.

The University have agreements in place with WPD for the supply of electricity to the University Campus and LUSEP. The Authorised Supply Capacity (ASC) is the maximum load available from the NGED for each of the networks. The Maximum Demand (MD) is the maximum hourly load that has been recorded for each HV network over a 24-month period. The following table summarises the current capacity and demands with the four main HV networks:

Summary of Projected Loads

HV Supply	Area of Campus Served	2024			2030		
		Authorised Supply Capacity (MVA)	Maximum Demand (MVA)	Spare Capacity (MVA	Authorised Supply Capacity (MVA)	Maximum Demand (MVA)	Spare Capacity (MVA)
Sir Richard Morris	East Park	5.0	3.8	1.2	5.0	4.8	0.2
Towers	Central Park, West Park and Village Park	2.0	1.1	0.9	2.0	1.8	0.2
Holywell Park	Holywell Park, Sports Park and NCCAT	4.4	12.4	-8.0	13.0	12.4	0.6
LUSEP Phase 2b	ATIC and LUSEP Phase 2 Development	2.0	1.5	0.5	2.0	2.0	0.0
LUSEP Phase 3	LUSEP Development	0	0	0	15.0	15.0	0.0
LUSEP Phase 4	LUSEP Development	0	0	0	15.0	15.0	0.0

There are plans to develop hydrogen research and attract new campus partners to LUSEP – all these will require power. There are several areas that present a risk in terms of having sufficient capacity to further develop the campus or attract tenants that require high power demands.

- Sir Richard Morris. The redevelopment of the Student Village will result in the Sir Richard Morris HV network nearing capacity with only limited spare capacity to accommodate any new developments. Therefore in order accommodate any further significant developments on this network there will be a requirement for, upgrades to the both the campus HV infrastructure and the wider National Grid infrastructure or the installation of 'local' on-site generation.

- Towers. The Towers HV network has sufficient spare capacity to allow further developments to be implemented without the need for significant infrastructure upgrades. To give an order of magnitude of the potential spare capacity to support further development the Loughborough Design School has a maximum demand of 0.16MVA, therefore the spare capacity could support 5 building of this size and capacity.

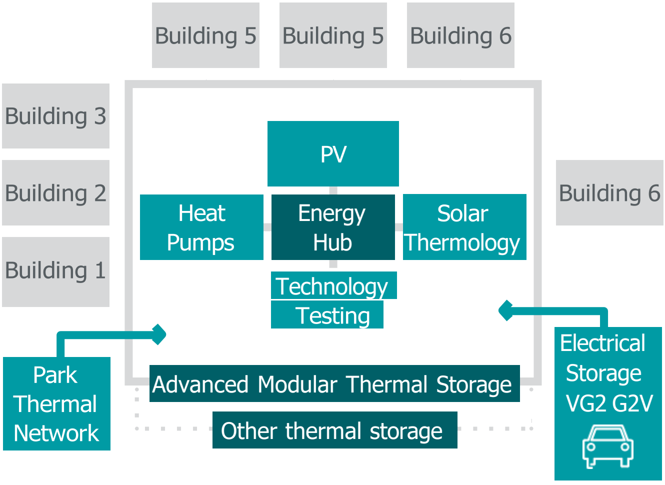
- Holywell Park. The spare capacity at Holywell Park is largely dependent on the energy intensity of any new tenant operations or research activities. NCCAT have plans to expand their research operations and have indicated that this will result in a significant increase in electrical demand.

- LUSEP Phase 2. The LUSEP HV network has sufficient capacity to meet the current aspirations of the LUSEP phase 2 developments. The potential spare capacity would allow the development of 22 (67,000 m2) ATIC style buildings or 9 (47,000 m2) STEM style buildings.

- LUSEP Phase 3&4. The development of LUSEP will require a significant new electrical capacity to support energy intensive research and operations and to support the transition away from fossil fuels derived thermal infrastructure. Accurate assessments of future power requirements for LUSEP Phase 3 and 4 can only be established once detailed plans for the development of LUSEP are known. Initial projected peak loads of 30MVA across LUSEP phase 3 and 4 have been used to facilitate discussions with NGED on the future development of the local electrical infrastructure. The university will need to engage with NGED at an early stage of development to establish the technical feasibility, costs and lead times of developing a high voltage network that can support the development of LUSEP over the mid to long-term.

5.3 Future Low Carbon Thermal Infrastructure

Under Business as Usual by 2030 it is forecast that gas consumption will account for 79% of the total University scope 1 and 2 emissions. The long-term use of gas for heating the campus will therefore be the main challenge post 2030 in moving towards the target "net zero" emissions by 2035 and it is here that support and relationships with key academic and research partners (ABCE and CREST) will need to be developed to ascertain the types of "low carbon" technology that could be utilised to support the existing infrastructure and development of smart energy networks.



Due to the nature and layout of the campus the opportunity exists to introduce new technology in a phased "low risk" approach to allow full evaluation of the resilience and long- term benefits of the specific technologies whilst ensuring the estate continues to function and business continuity is not compromised.

5.4 Carbon Reduction Projects

The annual energy performance data for individual buildings will be used to identify and target the areas to implement cost effective energy and carbon reduction projects. The energy consumption relative to building area for top energy consuming buildings is presented in the following table:

Buiding	DEC Rating	Electricity	Gas	Total
		kWh/m2	kWh/m2	kWh/m2
Swimming Pool	D	238	750	988
NCSEM	E	137	184	321
Clyde Williams	E	182	137	319
EHB	D	53	250	303
James France	D	90	184	274
Frank Gibb Labs	C	34	231	265
Stewart Mason	D	74	184	258
Burleigh Court	C	62	189	251
PEC/Powerbase	C	108	141	249
Martin Hall	D	84	156	240
STEM Lab	C	60	172	232
Wavy Top/GG Block	B	34	184	218
S Building	C	71	146	217
Stewart Miller	C	65	148	213
Pilkington Library	C	54	126	180

The 2030 emissions projections have been modelled based on developing a district heat network from the Newhurst Energy from Waste plant that serves the main University Energy Centres which currently account for 80% of the scope 1 emissions. Other potential technologies that could be considered to replace the current scope 1 emissions include: engagement with East Midlands Hydrogen Network, electrification of Thermal Infrastructure and geothermal Heating.

The implementation of energy and carbon reduction projects will continue to be included within the funding submissions to the LTM Sub

Committee. Projects will be considered for implementation that are proven technology, provide a payback in terms of energy and maintenance savings and reduce carbon emissions and could include:

- Heat Pump and Low Carbon Technology.
- LED lighting Improvements across the campus. LED luminaires will reduce lighting loads by 50-60% whilst improving the lighting quality and reducing maintenance costs.
- BMS – Upgrade of BMS systems and installation of new smart campus technologies to optimise existing systems.
- Air Handling Plant Controls – Replacement of aging plant with high efficiency units.
- Fabric Improvements – Upgrade of building fabric to current standards.
- District Heating Controls – Upgrade of pumps and 2-port control valves.
- District Cooling Controls (Holywell Park) – Optimise district cooling opportunities at Holywell Park.
- Double/triple glazing.

6.0 The Path to Resilient Net Zero and Reduced Energy Costs

6.1 Drivers for Reducing Greenhouse Gas Emissions

Whilst the environmental benefits of achieving net zero greenhouse gas emissions are clear, there are multiple co- benefits to achieving this target. The university's key drivers in setting this ambitious aim are as follows:

- **Environmental**: By reducing greenhouse gas emissions, the University will play its part in averting or reducing the worst effects of climate change.
- Comfort and Wellbeing: If approached correctly, low carbon buildings achieve very high comfort levels, which have been proven to improve the wellbeing of their occupants.
- Financial: The reduction in greenhouse gas emissions will be achieved through reducing the University's energy consumption. This reduction in consumption will in turn reduce the University's annual gas and electricity expenditure.
- Reputational: With students becoming increasingly guided by their environmental principals and many other Universities working to reduce their emissions, the reputational risk of not reducing carbon emissions at the University is great. Conversely, the potential reputational benefit of leading the way and sharing best practice on achieving net zero greenhouse gas emissions in the HE sector is immense.

The imperative to reduce energy consumption, carbon emissions and create healthier buildings represents a major challenge for the university. The reliance on fossil fuel must be reduced in favour of meeting heating, lighting and other power requirements through environmentally sustainable options. Alternative ways of procuring energy to supply the campus will be pursued to reflect best practice and future infrastructure investments should be based on low carbon solutions. This will be supported by the Energy Strategy developed by the Energy and Sustainability Working Group drawing on expertise from ABCE and CREST. The demand for energy, particularly on the west of the campus and on LUSEP will grow exponentially and further development on these sites will require additional clean energy supplies to be provided.

6.0 Renewable Energy Opportunities

The opportunity to develop a range of renewable energy technologies including solar and battery storage, wind generation, ground source heat pumps, hydrogen fuelled technology and de-carbonisation of the National Grid gas supply network to support the existing infrastructure low carbon aspirations and protect against exposure to escalating energy costs should be fully explored in conjunction with our academic and tenant partners.

Low Carbon Technology that should be investigated and fully evaluated to support the decarbonisation of the campus that have been identified and will need to be developed include:

- Engagement with National Grid: to increase demand locally and investigate the cost and technical feasibility of installing a 33 KV primary substation on university land to guarantee future demand. Increasing the supply will take around 30 months from the point at which the order is placed.

- Energy from Waste: Investigate the feasibility of installing a "private wire" power feed onto the campus from the Newhurst Energy from Waste (EfW) plant located close to M1 junction 23.

- Solar Farm – University Land: Investigate the technical and financial feasibility of installing a significant capacity (min 10MVA) solar farm on university land. To support the University electrical infrastructure, the possibility exists for the University to develop a solar farm on existing University land. There are several potential opportunities in terms of technology, location of solar farm and funding opportunities that would require fully investigating to assess the technical and economic feasibility of the project. This may be a standalone system away from campus or connected if located locally. (Approx. area required would be 50 acres for 10MW). The primary benefits could include:

    - On site renewable energy generation.
    - On site generation capacity to support the University demand requirements.
    - Safeguard against escalating energy costs and volatile energy markets.
    - Clear demonstration of the University's environmental commitments.
    - Possibility to link to battery storage/smart energy networks.
    - Potential links to future electric vehicle charging network.
    - Provide a "live" research and teaching facility for academic departments.

- Electrification of Heat – Heat Pump Technology.

- Development of the local Hydrogen Network.

- Deep Geothermal Technology.

- Car Parking and Electric Vehicle (EV) Charging: The development of additional car parking facilities offers the opportunity to incorporate multifunctional solar car parks in line with the BRE National Solar Centre – Multifunctional Solar Car Parks – a good practice guide for owner and developers. There are currently around 230,000 registered EV's in the UK and this is estimated to rise to between 1-1.2 million by 2023 and it is predicted there could be as many as 32 million EV's on the road by 2038. There will be a requirement to incorporate additional charging capacity to meet future demand, placing increased demand on existing infrastructure, but offering the opportunity to utilise renewable energy technology to support the transition to EV's.

6.1 Funding

There are several funding models to support the implementation of energy projects:

- Full University Funding.
- Government Grants.
- 3rd Party Funding – Power Purchase Agreements (PPA).
- Joint Venture between the University and 3rd Party Funding.
- Joint Venture between the University, 3rd Party Funding with community co-op investment scheme.

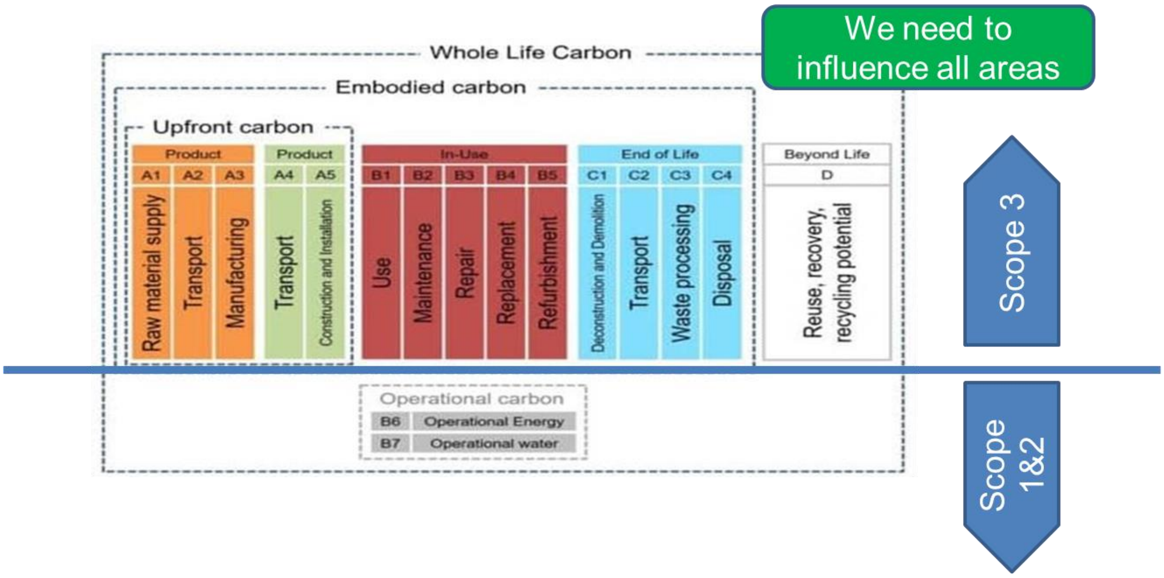
The capital approval process requires a business case for each project including a section on carbon impact/reduction benefits. The amount of energy/carbon consumed/saved will be a primary driver in considering whether a project can proceed. All future approvals should seek climate modelling and risk assessments and net zero carbon projects/proposals as these will all have a critical impact on the University's ability to meet the 2045 net zero carbon target.

The European energy market has been extremely volatile in recent years and a different approach to procurement has been adopted. Electricity and gas supply contracts are procured through a flexible purchasing product, rather than the more traditional fixed price contract arrangement, allowing direct purchases from the wholesale markets, daily, weekly or several months in advance during the contract period thereby spreading the risk.

6.1 Whole Life Carbon Assessment Model

A whole life carbon assessment addresses a building's entire carbon impact throughout its lifecycle. Moving towards a net zero carbon-built environment will require measurement and mitigation of carbon impacts across all stages of the building's lifecycle. The reporting of in-use embodied carbon impacts in a building's lifecycle is currently challenging, however a modelled assessment of impacts should still be carried out. This assessment is valuable to inform early design decisions which aim to minimise the building's whole life carbon impacts. The whole life carbon assessment should be undertaken in line with the RICS Professional Statement "Whole Life Carbon Assessment for the Built Environment".

The capital projects covered in this strategy comprise 'New Construction, In-Use, and Refurbishment and Fit-Out schemes with a focus on reducing the carbon footprint of the estate to meet Net Zero targets. The previous version of the Estates Strategy contained a principle that the Building Research Establishment Environmental Assessment Method (BREEAM) excellent standard and EPC A rating was to be considered in all future designs and, where possible, Passivhaus EnerPHit to be the standard for all future major capital projects. More is known about the Whole Life Carbon approach now and Passivhaus only addresses operational carbon 'B6' (see table below). The Low Energy Transformation Initiative (LETI) has included operational energy targets that must be met. By 2030 all new buildings must operate at or near to net zero to meet climate change targets that the Government is expected to adopt. This means that by 2025 all new buildings will need to be designed to meet these targets.



6.2 Building Standards

The construction of new buildings and the refurbishment of the existing buildings offer opportunities to support the aspiration to achieve net zero carbon emissions by 2050. All modern building refurbishments should consider adopting retrofit technologies during project evaluation and must aim to achieve a relevant and appropriate level of certification, this could be: BREEAM, Passivhaus, EnerPHIT or a bespoke standard. Where this is not possible, it must be demonstrated that this approach has been considered, explain why it is not possible and incorporate the best standard possible. These standards focus on Scopes 1 and 2 enabling substantial reductions in the energy usage of buildings built or retrofitted using their principles.

BREEAM Standard

The BREEAM Standard provides a holistic approach to achieving ESG, health, and net-zero goals. It is the UK's most recognized accreditation, and the standards are optimized for efficient use in the UK. Since BREEAM takes a holistic approach, there are resources and audits on emissions caused and considerations to be make linked to activities throughout the planning, construction, procurement, maintenance, and disposal processes of both new builds and retrofits. The BREEAM schemes require a licensed, independent assessor. The assessor manages the assessment process and validates project's compliance against BREEAM. Once the Assessor completes an assessment, they submit an assessment report (with reference to an auditable trail of evidence) to BRE Global for a certification decision.

Passivhaus Standard

The definition of Passivhaus is driven by air quality and comfort: "A Passivhaus building is a building in which thermal comfort can be achieved solely by post-heating or post-cooling the fresh air flow required for a good indoor air quality, without the need for additional recirculation of air" – Passivhaus EnerPHit is a slightly relaxed standard for retrofit projects, where the existing architecture and conservation issues means that meeting the Passivhaus standard is not feasible. Where the Passivhaus standard is not possible, each project must show that the possibility of taking the Passivhaus approach has been robustly explored and prove why it is not achievable. To achieve the Passivhaus standard in the UK typically involves:

- Accurate design modelling using the Passivhaus House Planning Package.
- Very high levels of insulation.
- Extremely high-performance windows with insulated frames.
- Airtight building fabric.
- 'Thermal bridge free' construction.
- A mechanical ventilation system with highly efficient heat recovery.

Whole Life Costing

The University's project approval process for major capital projects greater than £3m have been changed from consideration of acquisition/build costs only to include whole life costs, in order to understand the full costs of a building across its life cycle, particularly its use of energy. The BREEAM assessment method uses recognised measures of performance, which are set against established benchmarks, to evaluate a building's specification, design, construction and use and the measures used cover the whole life including: embodied carbon, operational carbon and beyond life carbon. As the leading sustainable certification methodology for the built environment, BREEAM provides robust measurement and helps minimise carbon emissions at the asset level which if adopted will provide the foundation to decarbonise the University's existing and future estate. The different award levels of BREEAM are listed in the table below.

Assessment score (%)	Assessment rating	Star rating
< 10	Unclassified	-
≥ 10 to < 25	Acceptable	★
≥ 25 to < 40	Pass	★★
≥ 40 to < 55	Good	★★★
≥ 55 to < 70	Very Good	★★★★
≥ 70 to < 85	Excellent	★★★★★
≥85	Outstanding	★★★★★★

The different cost to benefit ratios show that for a modest increase in capital costs, significant through life carbon emission savings can be achieved.

Certification Level	Increase in capital costs	Average CO2 emissions savings
Outstanding	5.8%	66%
Excellent	0.7%	32%
Very Good	0.2%	15%

Depending on the building type different cost-benefit outcomes will be realised as shown in the table below:

Increase in capital costs for different building types and certification levels

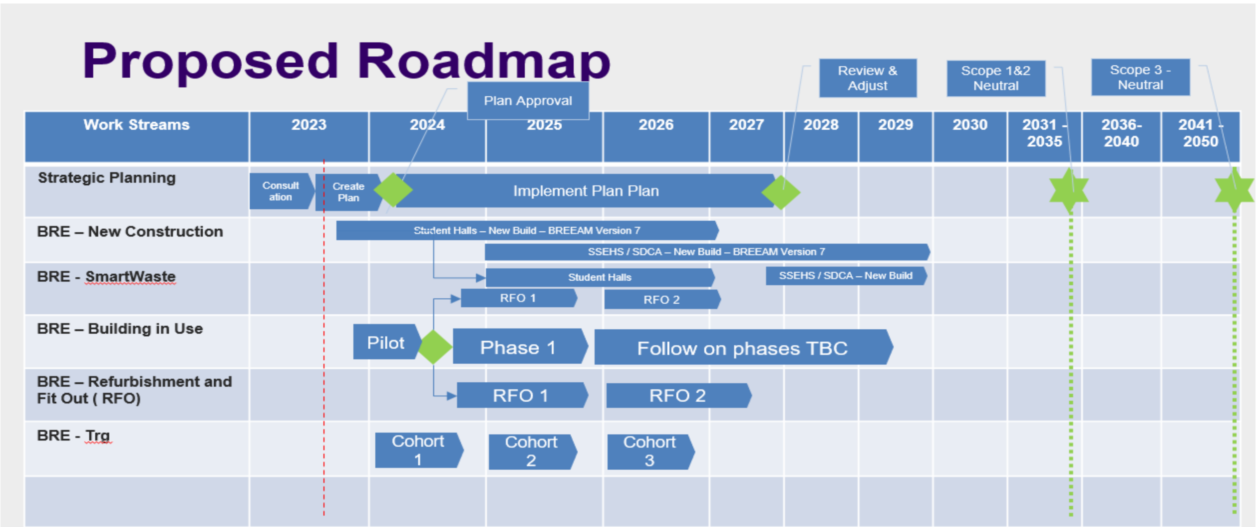
Rating	School	Industrial	Retail	Office	Mixed Use
Very Good	0.2%	0.1%	0.2%	0.2%	0.15
Excellent	0.7%	0.4%	1.8%	0.8%	1.5%
Outstanding	5.8%	4.8%	10.1%	9.8%	4.8%

Source: Tata Steel, British Constructional Steelwork Association Limited, AECOM, Cyril Sweett, The Steel Construction Institute, Development Securities PLC, 2012.

The university will adopt the BREEAM Outstanding standard wherever possible and use the proposed LETI ratings following schemes to upgrade and decarbonise the University estate:

Phase		Purpose
Campus Mapping	Engage with Building Research Establishment Strategic Advisory Services	Develop the estates decarbonisation plan.
Construction	• Adopt BREEAM New Construction methodology for all newbuild and projects. • Adopt BREEAM Smartwaste to capture data and evidence to support certification.	Produces evidence-based reports, alongside targets set by the university and indicates the number of credits that will be achieved based on project performance.
Refurbishment	• Adopt BREEAM RFO methodology for all refurbishment projects.	
Operational	Adopt BREEAM In-Use	An assessment and certification scheme to reduce and improve the environmental performance of existing buildings.

6.3 BREEAM Roadmap



The Active Building Centre (ABC) will be a national centre of excellence working with supply chains from energy and construction supported by 10 universities, including Loughborough. The ABC vision is to transform the UK construction and energy sectors, through the deployment of buildings powered by the sun to create energy resilient communities and to contribute to electric vehicle and decarbonisation targets.

7.0 Decarbonisation Plans

There is a growing urgency to reduce Green House Gas emissions wherever possible and this includes reducing scope1, 2 and 3 emissions. Through Universities UK, the higher education sector has committed to "setting a target for Scope 3 emission reductions and other environmental targets beyond emissions" as well as "setting out how progress against these targets will be reported in a transparent, consistent, and understandable way". The University recognises that its teaching and research ambitions may increase our carbon footprint over the next decade as we deliver the university strategy and we are working to minimise this impact. The Loughborough University Net Zero Group (LUNZ) will provide the governance for the net zero carbon.

Climate change presents challenges that will be with us for generations to come. While individuals can and must act to reduce carbon emissions, it is societal and institutional action, sustained through the decades, which must lie at the heart of meeting these challenges. The University is in a strong position to provide such sustained leadership based on actions that are well documented and rigorously evaluated. Our consultations of staff and students indicate that there is considerable appetite to provide this leadership and to exploit the expertise and research activities of the University.

The need for action to tackle climate change and address Net Zero challenges are now greater than ever. The HE sector is responsible for a considerable proportion of total national emissions and as such has a key role to play in not only reducing those emissions, but also in setting an example that other sectors can follow and in acting as a role model for the future leaders that we educate.

Loughborough University intends to be at the forefront of the fight to combat climate change. We will be bold, ambitious and outwardly focused, with an emphasis on a sustainable future. The University Strategy contains a commitment to develop the estate and change working practices with a plan to reduce the University's scope 1 & 2 carbon emissions to Net-Zero by 2035 and scope 3 emissions by 2045. Through this theme LU will endeavour to make a significant positive contribution towards helping the UK meet its 2050 net zero emissions target.

7.1 Scope 1 & 2 Carbon Emissions

The University has a clear long-term target and interim KPI's in place for achieving resilient Net Zero for scope 1 and 2 emissions. Electricity purchased from the grid is decarbonising rapidly, which continues to help the university reduce its emissions. Natural gas purchased from the grid is not expected to decarbonise materially by 2030.

Since most CO2 energy emissions are from gas, and since gas is not expected to decarbonise, this means that the decarbonisation efforts in this operational area of E&FM are mainly centred on scope 1 (gas). In addition, more recently, world events including COP26, and Eastern European War have made any future reliance on natural gas very challenging.
The university's roadmap to resilient net zero for scopes 1 and 2 has been crystallised from a range of completed feasibility studies on options and alternatives. The most feasible options with today's technology are:

- Replacement of the CHPs with Electric Resilience Energy Centres.
- Electrification of Heat Demand, ie Heat Pumps.
- Energy efficiency improvements: ie LED replacement programme.
- Increased renewable energy generation: ie solar PV arrays.
- Improved thermal efficiency of buildings.

Risks

A government report has calculated that the cost to decarbonise the HE Sector is £37bn. All universities are experiencing financial headwinds and the ability and willingness to commit an increasing % of a declining budget to achieve resilient Net Zero targets is assessed to be the highest risk.

Approach

Director E&FM should be responsible and accountable to Infrastructure Committee for the delivery of Scope 1 and 2 decarbonisation. A Decarbonisation Plan will be developed and will support delivery of this strategy. The Plan will include these key elements:

- Monitoring and Reporting
  - Key Performance Indicators (KPIs): Define KPIs to track progress toward Decarbonisation goals and regularly assess performance.
  - Reporting Mechanisms: Establish a transparent reporting process to communicate achievements, challenges, and future plans to the university community and external stakeholders.
- Budget and Funding
  - Budget Allocation: Determine the financial resources required to implement the Decarbonisation plan, including funding sources and allocation strategies.
  - Grants and Incentives: Explore opportunities for securing grants, incentives, and partnerships to support the plan's implementation.
- Implementation Timeline

- Phased Approach: Develop a phased timeline that outlines the sequence of activities, milestones, and deadlines for the plan's execution.

- Accountability: Assign responsibilities to specific departments, teams, or individuals to ensure accountability for plan implementation.

7.2 Scope 3 Carbon Emissions

To date, the university has focussed on reducing emissions under our direct ownership or operational control (scope 1) and from their purchase of electricity, heat and steam (scope 2). But scope 3 (indirect) emissions are 4 times the combined scope 1 and 2 carbon emissions. The lack of direct control and difficulty collecting high quality data makes addressing scope 3 emissions especially challenging. Despite the challenges of addressing indirect emissions, scope 3 not only has huge potential to prevent the worst impacts of climate change, it can also lead to substantial operational benefits.

The University set a Scope 3 emissions (which are emitted as an indirect result of our activities) target of net zero by 2045. We are currently developing our plans on how to meet this aspiration and the next phase of work as part of the Decarbonisation Plan will be to develop targets, assign leads and KPI's for:

- Procurement.
- Student Travel.
- Construction.
- Staff Business Travel.
- Staff Commuting.
- ICT.
- Transport & Distribution.
- Waste Dispoal.
- Water Consumption.
- Wastewater Treatment.
- Laboratories.

This will require behavioural change from our students, staff and supply chain and we will work with them and professional services within the University to develop training packages which allow them to make informed and responsible decisions about activities which add to our carbon footprint.

Risks

Without clearly defined targets, quantitative Scope 3 carbon emissions data may not regularly be collected and/or reported to inform progress against the strategy. Effective data collection and monitoring procedures must be clearly communicated with all operational staff across all relevant departments and regular progress reported against the Plan to inform progress against the strategy.

Approach

PVC (R&I) as chair of LUNZ should be responsible and accountable to Council for the delivery of Scope 3 decarbonisation. In line with good practice observed across the sector, mid and long-term and interim targets should be in place to achieve Resilient Net Zero for scope 3 emissions.

- A target for reaching stage gates for resilient Net Zero on scope 3 emissions, and interim KPIs to be developed and endorsed by Council.
- Sub-groups should be mobilised and the methodology for data collection, monitoring and reporting to be agreed.
- Responsibilities for the scope 3 sub-groups including agreeing a feasible methodology for data collection, monitoring and reporting of emissions to be developed.
- Once established, the scope 3 working groups will routinely report on progress to LUNZ and on to SPaRC for oversight and reporting to Senate and Council.

7.3 Carbon Offsetting

Carbon offsets represent the final step to achieving a "net zero" carbon building. Where all feasible measures for reducing the carbon impacts have been reasonably exhausted, offsets can be utilised to cover any residual carbon. The offsets purchased should be commensurate with any outstanding carbon to achieve a net zero carbon balance and should be procured directly or via recognised existing offsetting frameworks.

- Net Zero Carbon – Construction: Offsets should be commensurate with the carbon impacts determined at practical completion.

- Net Zero Carbon – Operational Energy: Offsets should be commensurate with the carbon impacts determined annually.

8.0 Funding Opportunities

There are several current funding models that could potentially support the implementation of low carbon technology across the campus.

Internal Opportunities

- Capital Framework.
- Long Term Maintenance (LTM) programme.
- Research and Enterprise Office Academic Bids.
- Individual Academic Bids.

The capital approval process requires a business case for each project including a section on carbon impact/reduction benefits. The amount of energy/carbon consumed/saved will be a primary driver in considering whether a project can proceed. All future approvals should seek climate modelling and risk assessments and zero carbon projects/proposals as these will have a critical impact on the University's ability to meet the 2050 zero greenhouse gas emissions target. Commitment and support from senior management and senior project sponsors is essential in delivering the low carbon aspirations and a low carbon champion should be appointed to each PMB.

External Opportunities

There are various funding models to support the implementation of low carbon projects utilising both internal and external funding. The funding opportunities should be assessed on a project-by-project basis and the potential for accessing external funding to implement research and technical projects should be maximised.

- Salix Public Sector Decarbonisation Scheme (PSDS). The PSDS is supported by the Department for Energy Security and Net Zero and provides grants for public bodies to fund heat decarbonisation projects and energy efficiency measures. Phase 3 of the PSDS, worth £1.425 billion, was announced in 2021 and phase 3c will provide £230 million of grant funding for projects between 2024 and 2026.

- Green Heat Network Fund (GHNF). The GHNF is supported by the Department for Energy Security and Net Zero and is a £288 million capital grant fund to support both the commercialisation and construction of new low and zero carbon (LZC) heat networks.

- Labour Party Green Prosperity Fund. Labour's green plan involves borrowing to invest in low-carbon energy projects, the decarbonisation of heavy industry and a mass home insulation programme. It has been loosely modelled on Joe Biden's Inflation Reduction Act.

- Energy Service Agreement (ESA). This ESA enables the installation of single or multi technology services solutions funded by 3rd party finance. The University benefits from the efficiency savings and pays a unit rate or tariff across the assets lifetime.

- Solar Power Purchase Agreements (SPPA). The SPPA helps organisations access immediate cost and carbon savings using solar on-site generation. The design, development, installation, operation and maintenance are delivered in a single contract. The University gets cost stability over the life of the asset via a fixed priced (p/kWh) for the electricity generated.

Appendices

A High Level Roadmap.

B Electrical HV Infrastructure.

C Energy from Waste Grid Connection.

High Level Roadmap

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<tr><th></th><th>2024</th><th>2026</th><th>2028</th><th>2030</th><th>2030-2035</th><th>2035-2040</th><th>2040-2045</th><th>2045-2050</th></tr>
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<tr><td colspan="3">DCA Newbuild</td><td></td></tr>
<tr><td colspan="3">2 x 500 bed Student halls</td><td></td><td colspan="2">Complete SV Refurbishment/Newbuild programme</td><td>UPP Halls Tx to LU ownership</td><td></td></tr>
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<tr><td colspan="2">Demolitions</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="4">Scope 1 & 2 Net Zero projects</td><td>Scope 1 & 2 Net Zero projects</td><td></td><td></td><td></td></tr>
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<tr><th></th><th>2024</th><th>2026</th><th>2028</th><th>2030</th><th>2030-2035</th><th>2035-2040</th><th>2040-2045</th><th>2045-2050</th></tr>
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<tr><td colspan="4">Demolitions</td><td></td><td></td><td></td><td></td></tr>
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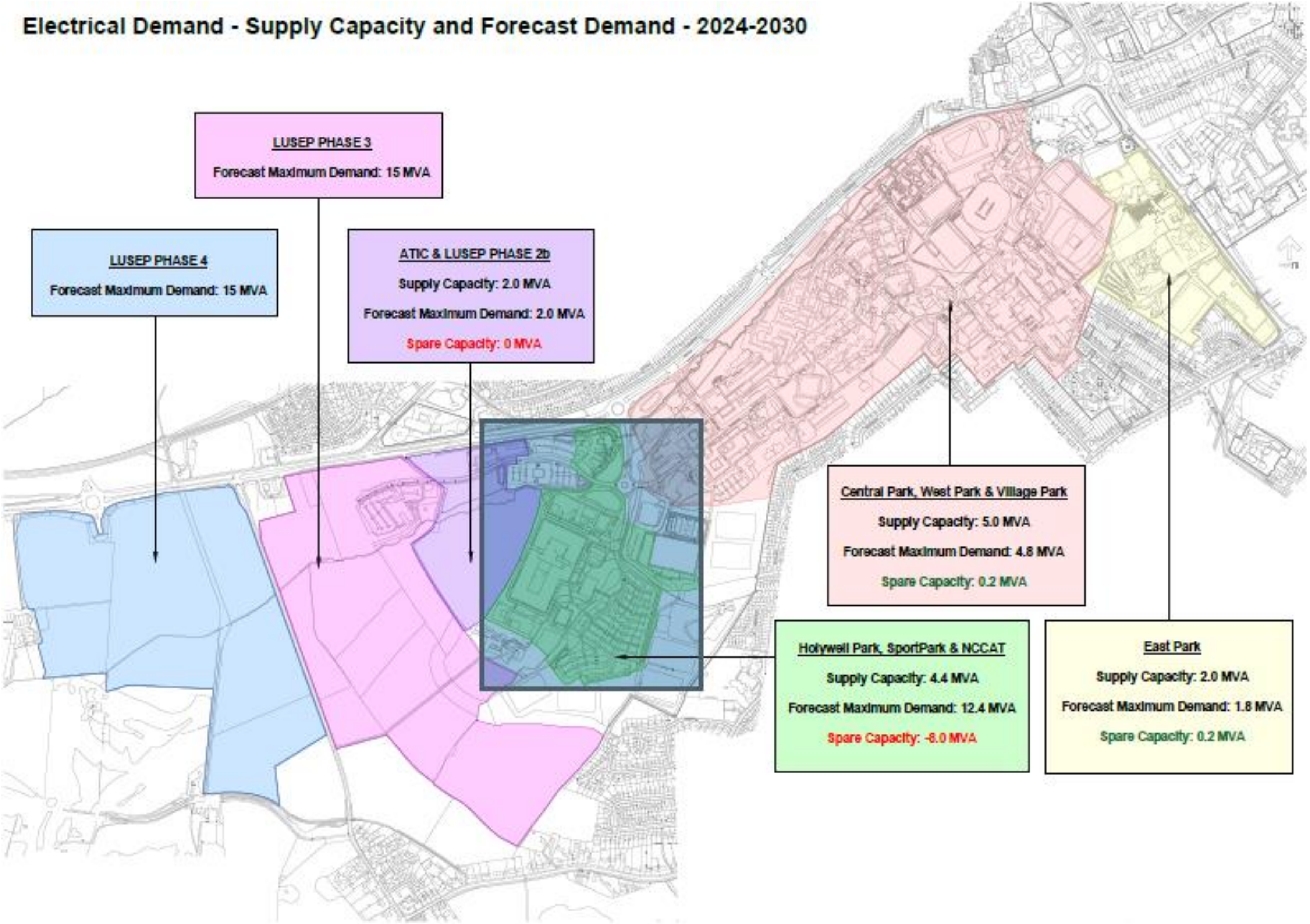
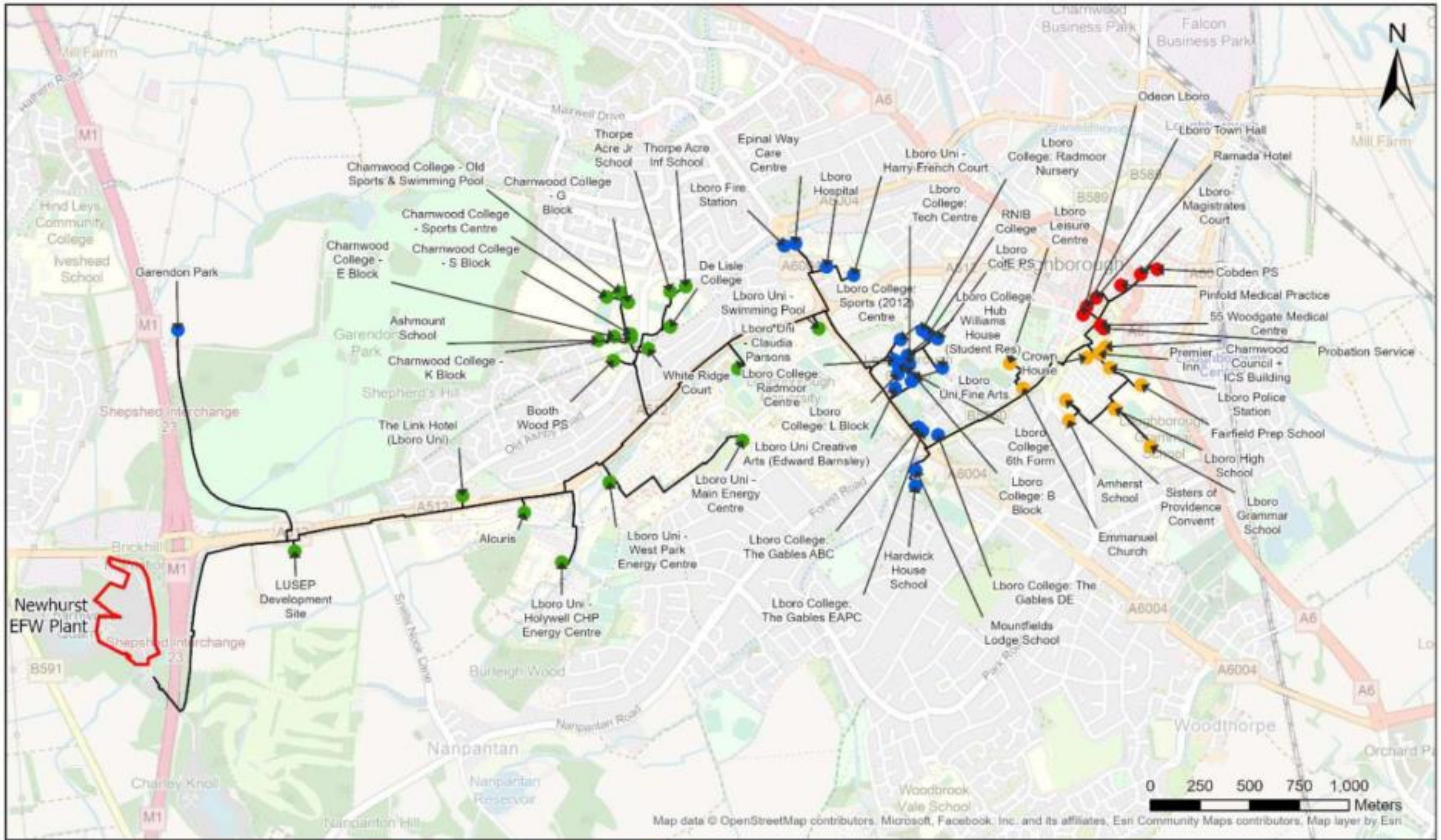

Electrical Demand - Supply Capacity and Forecast Demand - 2024-2030
LUSEP PHASE 3
Forecast Maximum Demand: 15 MVA
LUSEP PHASE 4
Forecast Maximum Demand: 15 MVA
ATIC & LUSEP PHASE 2b
Supply Capacity: 2.0 MVA
Forecast Maximum Demand: 2.0 MVA
Spare Capacity: 0 MVA
Central Park, West Park & Village Park
Supply Capacity: 5.0 MVA
Forecast Maximum Demand: 4.8 MVA
Spare Capacity: 0.2 MVA
Holywell Park, SportPark & NCCAT
Supply Capacity: 4.4 MVA
Forecast Maximum Demand: 12.4 MVA
Spare Capacity: -8.0 MVA
East Park
Supply Capacity: 2.0 MVA
Forecast Maximum Demand: 1.8 MVA
Spare Capacity: 0.2 MVA

Energy from Waste Grid Connection



Proposed Newhurst EFW District Heat Network Phase 1,2,3 and 4

- Newhurst EFW Plant Boundary
- Phase 1 consumer
- Phase 2 consumer
- Phase 3 consumer
- Phase 4 consumer

SWECO

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