The University of Leeds

Pathway to Net Zero Emissions by 2030

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Pathway to Net Zero Emissions

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Contents

The University of Leeds has committed to reach net zero emissions by 2030. It is now time to deliver on this commitment.

Foreword

Professor Simone Buitendijk

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The climate crisis is the most significant challenge the world faces. It is a challenge that needs universities.

As a group of highly networked international institutions, we can play a pivotal role in effecting the global change needed to chart a route out of our current existential predicament. At Leeds, our world-leading research and education will continue to play an essential part in finding the path to a fairer and more sustainable future.

But we need to do more. We need to get our own house in order. In 2019 the University agreed seven principles to address the crisis, including setting an ambitious 2030 net zero greenhouse gas target. Even in the midst of the COVID crisis, we have been thinking hard about how to take these principles off the page and transform them into a full, deliverable Climate Plan, one that is consistent with the values-driven university articulated through our new 10 year strategy, Universal Values, Global Change. Presented here is the central pillar of our overall Climate Plan – our pathway to net zero.

The pathway is challenging. We need to move swiftly and make important decisions on direction, as well as making the single biggest investment we have ever made.

It will also require agility, ingenuity, and new ways of working, and collaboration across our entire community. We have done this before, and we can do it again. The rapid development of our digital learning portfolio at the start of the pandemic shows this. So, we need to harness this same agility, communicate well, and adopt our community knowledge to make the necessary rapid progress. Above all else, we need to create and own a shared vision of the direction we want to take.

The plan itself is the unique product of collaboration between our facilities directorate, academic staff, and students. It has been externally reviewed by academics, and also by the same team that delivered the ambitious decarbonisation plan for the National Health Service. It sets an example for a new way of working, which is how we build a stronger community, share best practice, and hold ourselves to the values we expect of others.

Since moving to Yorkshire I have taken huge pleasure in walking its many varied public footpaths. Often, I have a clear destination but, arriving in a Yorkshire village to start my walk, I sometimes struggle to find where the path starts. The path out of the climate crisis often seems to be lost in the mud and brambles. But by working with communities to inform climate actions, helping to conserve natural systems, and innovating on societal and technological solutions at a global level, we can help humanity find that path.

And, at a local level, by taking the steps set out here, I am confident we can find our own path to net zero. It will be challenging, but we can complete it if we walk it together. I look forward to your company on this most vital journey.

Executive summary

The University of Leeds has committed to reach net zero greenhouse gas (GHG) emissions by 2030. It is now time to deliver on this commitment. This document lays out an ambitious yet realistic and achievable pathway to reach that target, which makes minimal use of carbon offsetting, improves our resilience and is fully aligned with University values. It also presents a preliminary post-2030 'net zero plus' strategy to bring a wider set of emissions into scope, and to achieve an overall zero emission target.

Delivering our Pathway to Net Zero requires an integrated approach across the University, underpinned by cooperation, empowerment and widespread communication across all staff and students. Delivery also requires significant capital expenditure of £152.8m over the next decade and a short-term increase in operating costs of up to £2m per year at 2030.

These investments, combined with focused strategy, can deliver a sector-leading, rapid and just transition to net zero that enhances the student experience, community wellbeing and our international reputation. By trialling solutions and undertaking new research, our University can have an impact far beyond our campus – to the region, country and world. And our campus will be operating as a net zero living laboratory so we can learn-by-doing and share knowledge worldwide.

In line with the UK government strategy to decarbonise electricity generation by 2035, our recommended pathway focuses on electrification. This means we can be ambitious with our level of planned emissions reductions possible by 2030, while at the same time minimising risk. Our commitment to net zero includes scope 1 (direct emissions from owned or controlled sources), scope 2 (indirect emissions from the generation of purchased energy) and business travel and commuting.

The next few years will lay the groundwork to achieve rapid decarbonisation rates after 2025. The move away from natural gas to electricity will require extensive works that, in the short-term, might raise emissions but will ultimately deliver an ambitious and cost-effective pathway to net zero.

Our 2020 baseline for emissions covered by the net zero target is 71,546 tCO2e[1] and our pathway will reduce this by 48,101 tCO2e by 2030. This will leave 23,445 tCO2e that will need to be offset in a credible way. An annual review by the Priestley International Centre for Climate will look to heighten ambition to further reduce this 2030 offset figure and make sure future offsets are academically verified as net zero compatible.

1 Due to the impact of COVID-19 on scope 3 emissions in 2019/20, this 2020 baseline is made up of scope 1 and 2 emissions from 2019/20, and scope 3 (business travel and commuting) emissions from 2018/19

Energy demand reduction is achieved through targeted refurbishment, LED light installations, energy efficiency and the deployment of low carbon technologies across the estate. Additional infrastructure works will allow the shift to electrical heat. Finally, our increased electricity consumption will be balanced by a new off-site renewable energy facility. There will be a need to reduce electricity use by behaviour change across the estate. To do this, active engagement and support from the University community will be essential.

For robustness we also carefully considered two further pathways. A 'light retrofit and waste to energy' pathway, aimed to reduce heating demand through connection to the Leeds waste to energy heat network. Another, 'expanded retrofit and full electrification of heat' went beyond our recommended pathway by additional investment in building retrofit.

Scenario A 'light retrofit + waste to energy' reduces emissions to 24,674 tCO2e emissions by 2030, with a total capital investment of £150m.

Scenario C 'expanded retrofit and full electrification of heat' reduces emissions to 23,408 tCO2e emissions by 2030, with total capital investment of £219m.

The recommended pathway - scenario B 'light retrofit and full electrification of heat' - reduces emissions to 23,445 tCO2e emissions by 2030, with a total capital investment of £152.8m.

Executive summary
Continued

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The recommended pathway – 'light retrofit and full electrification of heat' – is only slightly less ambitious than the expanded retrofit pathway but is considerably more cost-effective and offers far less disruption to the educational experience. We feel this is a more equitable approach, which allows investment in important research, teaching and communication aspects such as campus-wide carbon literacy courses and student engagement.

For all three pathways we are assuming the same level of demand reduction linked to business travel and commuting. For business travel, our digital transformation strategy, behaviour and technology change linked to COVID-19, and a Higher Education push to reduce business travel emissions will all aid reduction. For commuting, we aim to take advantage of a shift to electric cars and city-wide sustainable travel initiatives.

Living laboratories will be an important element of delivery. The University Farm is a good example – it represents a high emission source that is difficult to decarbonise and as such it presents an important living laboratory where staff and students can trial alternative solutions and learn-by-doing. At a time when many organisations are shedding high-carbon assets, it is important that we explore credible pathways for all sectors of the UK economy.

We also have some influence on wider emissions reductions through an additional focus on our supply chain and student travel. We are calling this 'net zero plus'. Achieving these wider emissions reductions will require a true collaboration across research, education and operations to explore interventions that are measurable and deliverable, but will also maximise potential within our community.

The University needs to be agile and learn-by-doing so that we can embrace new approaches and technologies to heighten our ambition over time to reduce our reliance on offsetting. A review mechanism will keep track of our progress and optimise delivery. Alongside the annual review of our general progress and our offsetting targets, there will be an external review of our net zero delivery every three years. This will ensure our actions and progress continue to lead the sector.

Our students and staff are anxious about the threat from climate change and global society's lack of progress. These plans are specifically tailored for rapid deployment of meaningful mitigation and adaptation measures.

The net zero plans also sits alongside plans for the remaining six principles for climate action which include decision making, research and education, net-zero carbon city, sustainable travel and responsible investment. Together they support climate change mitigation and adaptation locally and globally whilst also contributing to a healthier, greener, fairer and more attractive place to live, work and study.

We will involve the University community from the outset to learn from each other and create a climate-resilient university that is an exemplar for the sector both nationally and internationally.

Every bit of warming matters, every year matters and every choice matters. The time to act is now.

Timeline to net zero

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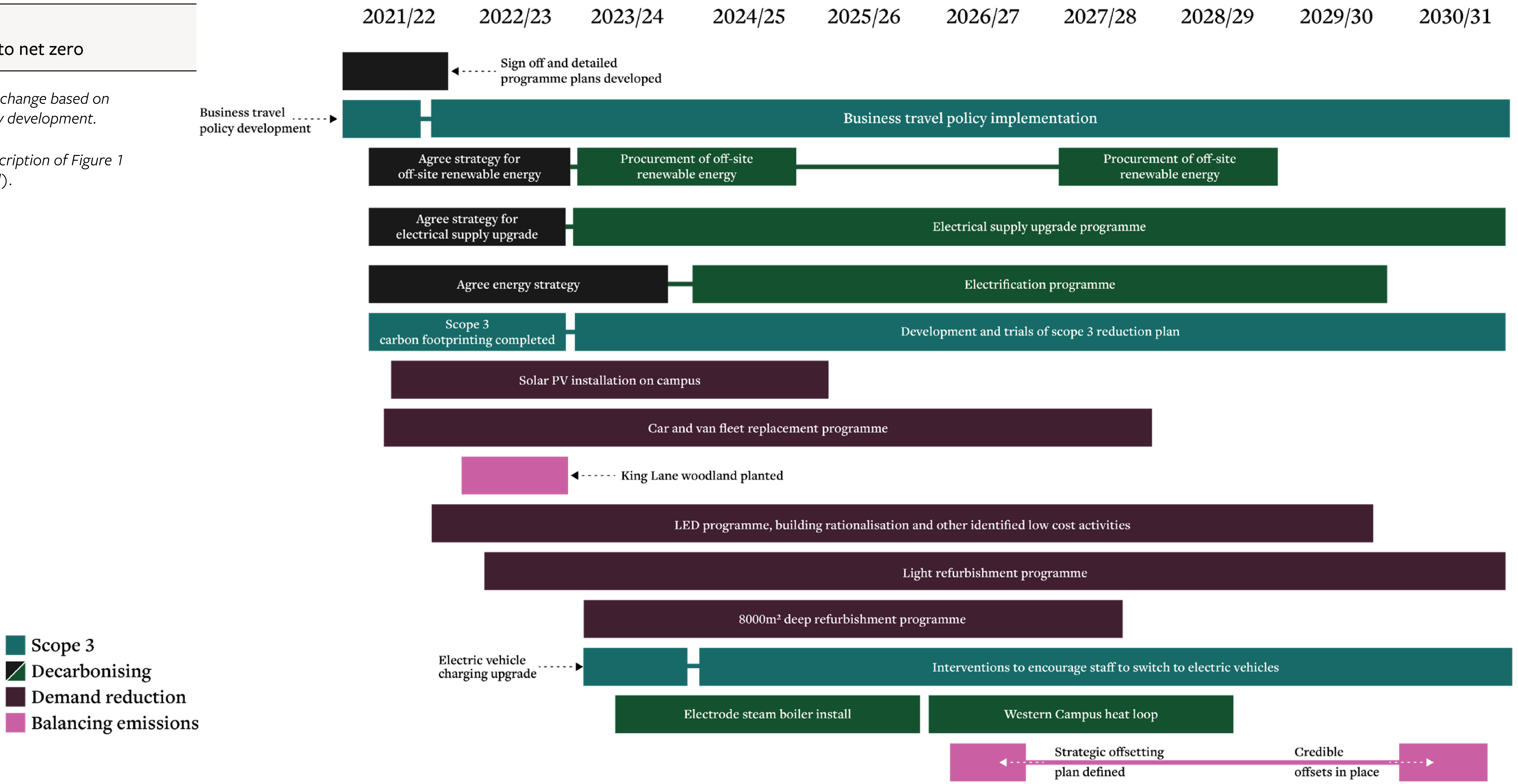
Figure 1 ⟶
University of Leeds timeline to net zero

Programme of delivery is subject to change based on year 1 feasibility studies and strategy development.

Accessibility: Read an accessible description of Figure 1 in our companion document (Word).



Introduction

The next 10 years are critical for international progress in reducing emissions. Our individual impact is small, yet our role in society means we need to treat our emissions with the seriousness that we expect from others. By making rapid progress towards net zero we can help deliver our strategic commitment to community, culture and impact and the move to a values-driven University. One that harnesses its expertise in research and education to help shape a better future for humanity, working through collaboration to tackle inequalities, achieve societal impact and drive change.

It is important to recognise that our climate has already changed and will continue to do so. In 2020, we witnessed the wettest February on record followed by a prolonged heat wave. Our existing and future operations need to be resilient to these continuing – and ever-changing – threats.

We also recognise the climate crisis as a social justice issue, which can only be resolved through reducing inequality.

In delivering net zero we will work with our University and local community to ensure equality is accounted for in our plans and that we support a just transition. We want to be transparent in our approach to delivering a resilient net zero and share our successes, failures and learnings. How we achieve net zero is flexible, but we will determine fixed milestones and interim targets as soon as possible.

Emission sources

As part of understanding our carbon footprint we completed a review of emissions sources following the Greenhouse Gas Protocol. Emission sources are divided up into scopes and these will be referred to throughout the plan:

Scope 1
Direct emissions from owned or controlled sources e.g. natural gas used in boilers.
Scope 2
Indirect emissions from the generation of purchased energy consumed by the reporting company e.g. purchased electricity.
Scope 3
All other indirect emissions that occur in a company's value chain e.g. business travel or purchased goods and services.

Building on the work established by Higher Education Funding Council for England (HEFCE) in 2012, all scope 1 and scope 2 emissions, plus business travel and commuting emissions have been defined as our core carbon footprint. We have been measuring these as part of greenhouse gas reporting (GHG) since 2012/13. As a university, the movement of staff and students, locally and globally, is integral to how we deliver our key strategic objectives of research and innovation and student education. All of these emissions will form our net zero by 2030 target.

In addition to business travel and commuting we have also identified scope 3 emissions covering waste and recycling; water use and treatment; supply chain; travel linked to supply chain; student travel (linked to University activity); student travel (home to University); and home working. These are not necessarily all our responsibility. Nevertheless, for all these we will work towards net zero and set targets, as appropriate, over the next few years. Within the plan these emissions will be referred to as net zero plus.

There are some emission sources with links to the University that fall out of the scope of our commitments. These will be monitored for opportunities to influence reductions in the future.

Our role in society means we need to treat our emissions with the seriousness that we expect from others.

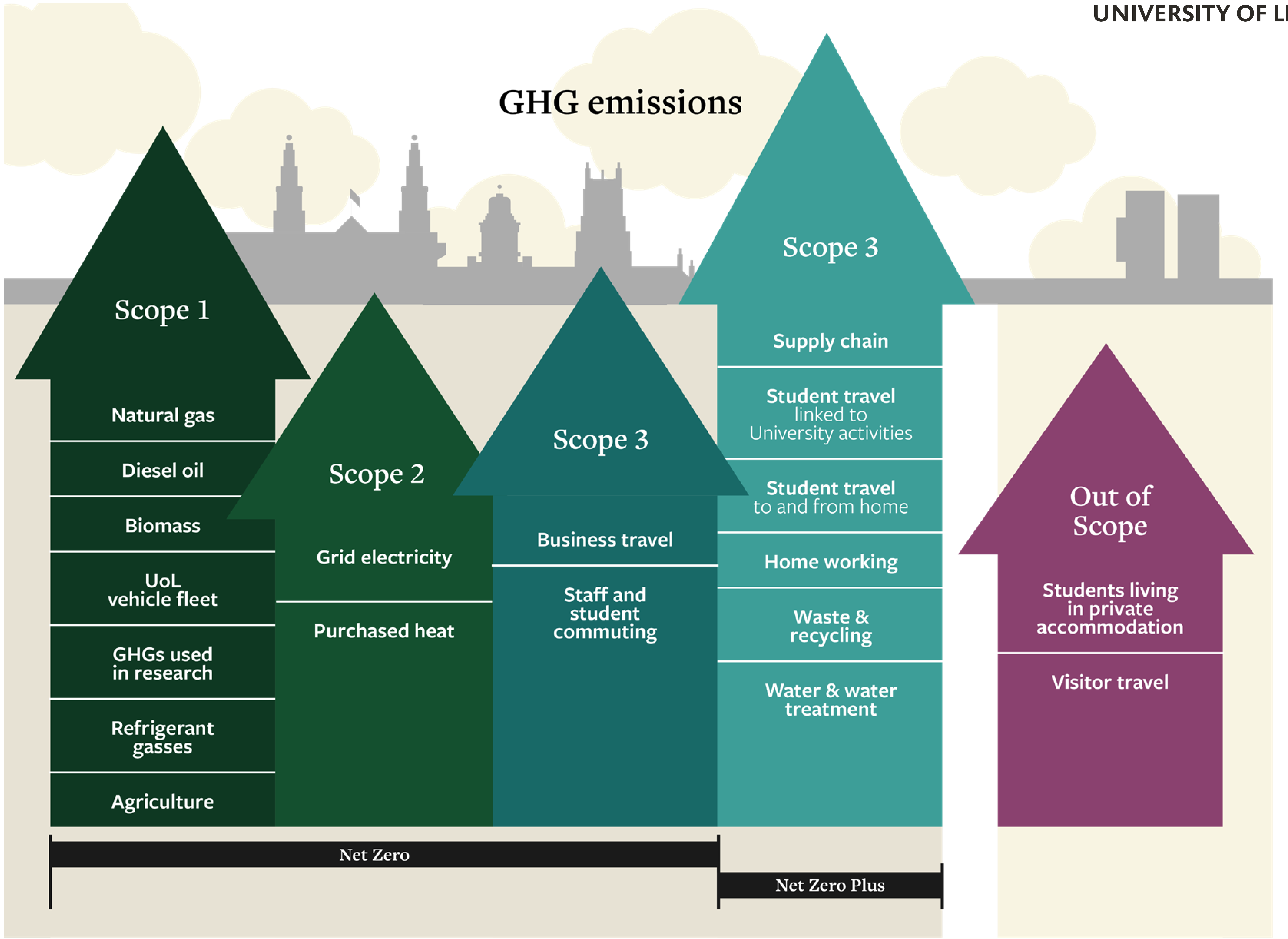


Figure 2 ⟶
University of Leeds GHG emissions sources and net zero/net zero plus definitions

Accessibility: Read an accessible description of Figure 2 in our companion document (Word).

Our commitments

To support the delivery of our net zero plan we have four commitments. These will be supported by an action plan that will be reviewed and refined on annual basis. The commitments are as follows:

Net zero by 2030: We will achieve net zero greenhouse gas emissions for scope 1, scope 2 and some scope 3 emissions (business travel and commuting) by 2030.

Net zero plus: We will work towards net zero for GHG emission sources included in net zero plus.

A resilient net zero: We will build resilience to the impacts of climate change across our estate, operations, teaching and research.

Just transition: We will ensure our transition to net zero is equitable and just, making sure it is fair to all and does not happen at the expense of others. It will help build a community led by the University values.

Future reporting

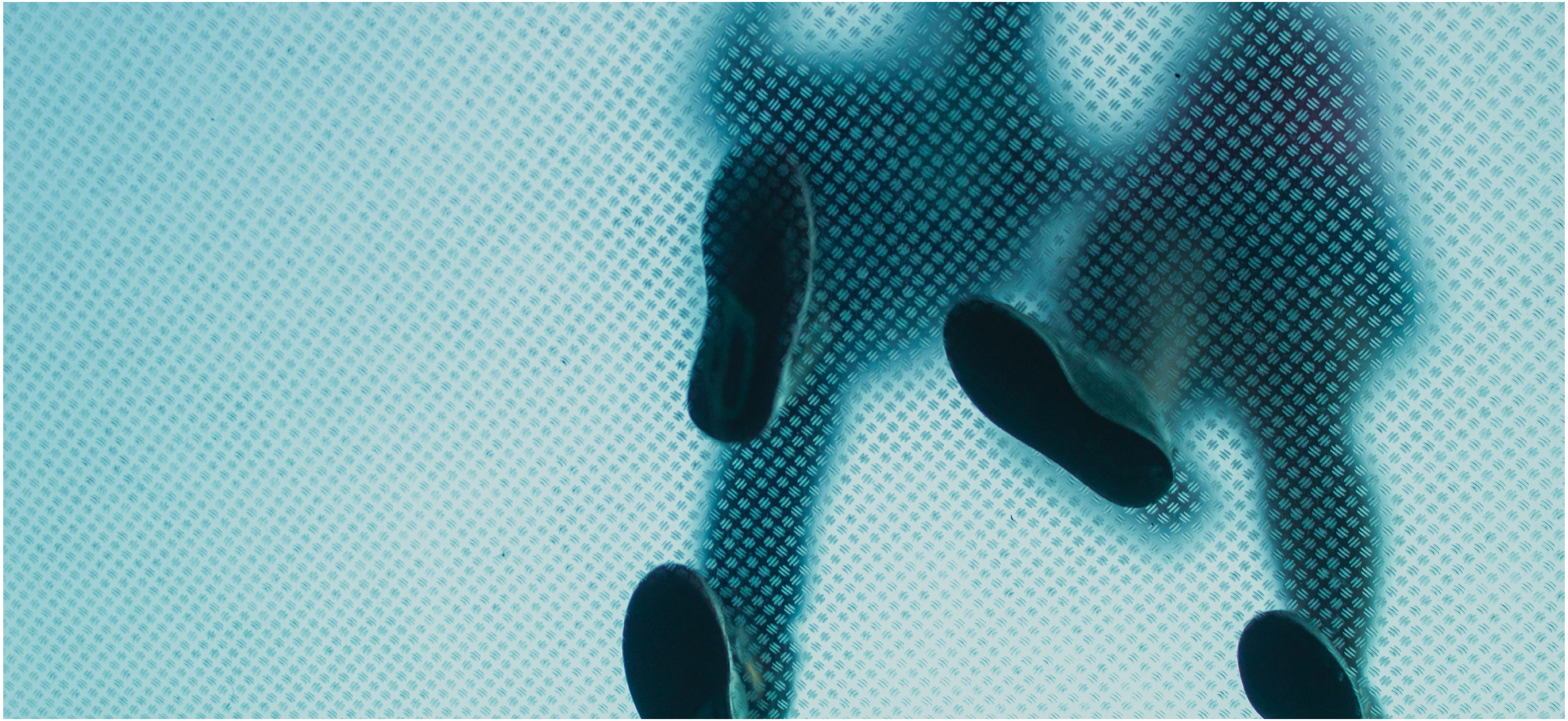
We will report our emissions in line with the GHG Protocol Corporate Standard. To support transparency, we will report our emissions as both location-based (reporting electricity emissions at current UK grid emission intensity) and market-based (including electricity consumption balanced by off-site renewable energy generation and emissions that have been balanced by other methods).

Progress will be reported on an annual basis, but we will also track GHG emissions on a quarterly basis allowing us to respond with more agility to emerging problems. An annual review cycle run through the Priestley International Centre for Climate is designed to heighten ambition to reduce emissions further. This review will also make sure future offsets are academically verified as net zero compatible and ensure a sector leading approach.

An annual review cycle run through the Priestley International Centre for Climate is designed to heighten ambition

Chapter 1

The Carbon Footprint of the University of Leeds



Scope 1 and 2 emissions

Figure 3 ⟶
University of Leeds historical emissions —
Scope 1 and 2 only

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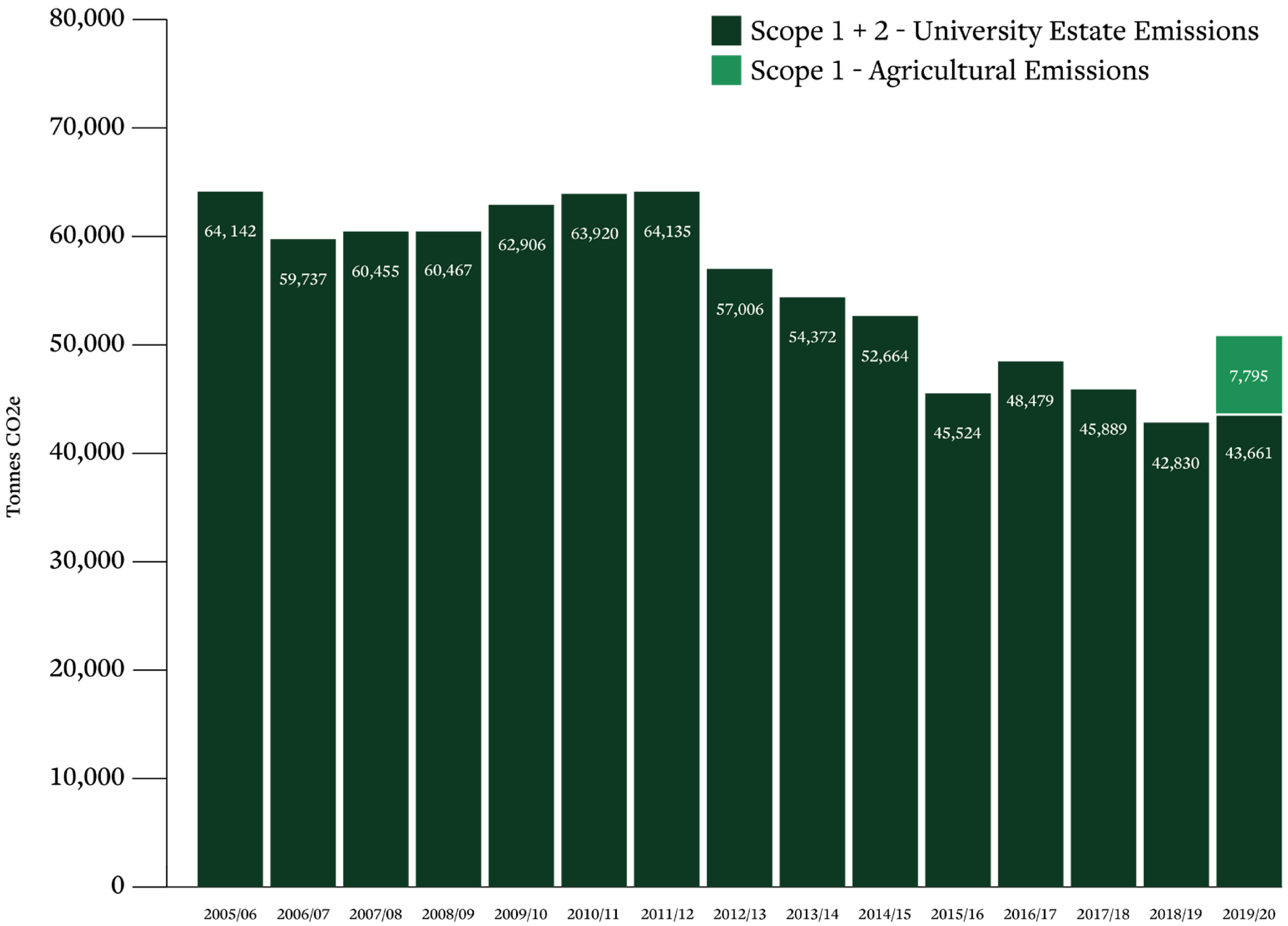

The University Farm came under University of Leeds ownership in 2019/20, and estimated emissions are included for this year.

In 2016/17 we changed our reporting methodology to more accurately account for energy losses (and their associated GHG emissions) for supplied heat and electricity

Scope 3 historical emissions

Figure 4 ⟶
University of Leeds historical emissions including Scope 3 from 2012/13 onwards

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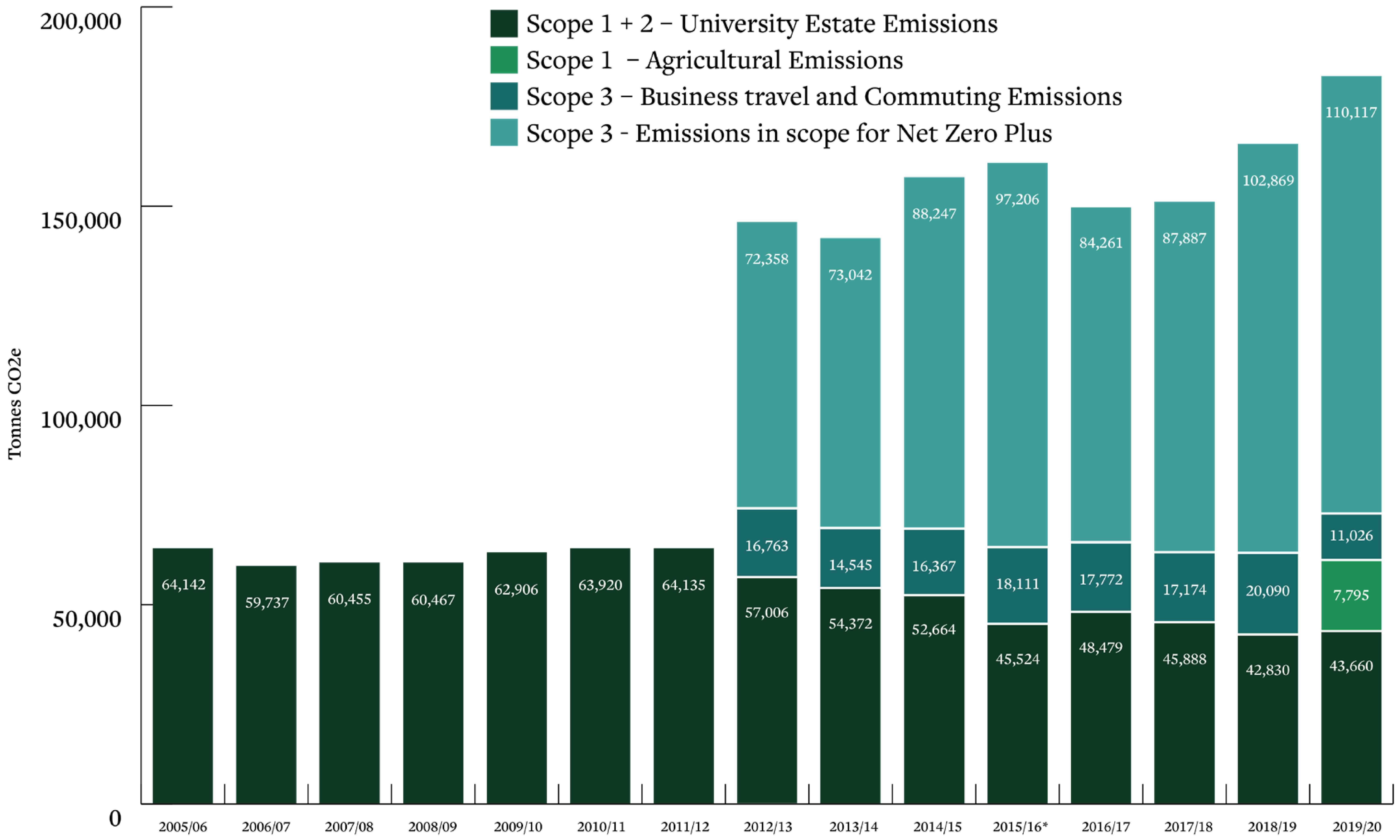

The University Farm came under University of Leeds ownership in 2019/20, and estimated emissions are included for this year.

Scope 3 emissions have been reported since 2012/2013 and are not available prior to this period.

In 2016/17 we changed our reporting methodology to more accurately account for energy losses (and their associated GHG emissions) for supplied heat and electricity

Scope 1 and 2 emissions
Progress to date

Over the last 10 years the University has been working to a sector target of reducing scope 1 and 2 emissions by 34% by 2020, based on a 1990 baseline. The target was set by HEFCE in 2010 and performance against it initially linked to funding. In 2011 a University of Leeds Carbon Management Plan was finalised with an agreed reduction target of 35%, based on a 2005/6 baseline[1].

In the period since 2011 there has been substantial growth of the estate and its associated energy consumption. A combination of an active carbon management programme, property disposal and building refurbishments helped balance this growth. The majority of emissions reductions were achieved through a rapid drop in the carbon intensity of grid electricity, which meant we had achieved a 32% reduction by 2020, when compared to our 35% target (2005/6 baseline).

- Disposed of Bodington Hall, Oxley and Clarence Dock (2,200 beds) – replaced by Central Village (1,100 beds).
- Installation of variable speed drives across the estate air handling units.
- Building energy management system upgrades across the estate.
- Significant upgrade of internal and external lighting to LEDs.
- Rationalisation and re-design of fume cupboard extraction systems across the estate.
- Introduction of sustainable construction standards.
- Enhanced insulation of buildings and associated infrastructure beyond Building Regulations standards.
- Conversion of parts of steam network to low temperature hot water.
- Works to allow summer shutdown of steam network.
- Upgrade of radiators to include thermostatic radiator valves.
- Started upgrade of University fleet.

Scope 3 emissions
Progress to date

For scope 3 emissions we have been reporting on business travel, commuting, water, waste, and supply chain emissions since 2012/13. Progress has been made against commuting, with specific emphasis on encouraging active travel, but business travel and supply chain emissions have continued to grow. In 2021/22 we will increase the scope of reporting to include all emission sources identified as part of our footprint.

- University cycle hire scheme and bike hub set up and managed in partnership with Leeds Beckett University.
- Collaborated with Leeds City Council and other stakeholders to develop University to Schools cycle route from Lawnswood School to the University.
- Installation of 2600 cycle stands across the estate.
- Cycle to work scheme limit increased to £3,000 to allow purchase of electric bikes.
- Specific car-sharing bays in multi-storey car park alongside reduction in overall car parking.
- Car parking permit cost reduction given to low emission vehicles.
- Established travel planning process to enable Metro card discounts.
- Installation of 28 electric car charging points across the estate.

1 This was our earliest available scope 1 & 2 data

The Carbon Footprint of the University of Leeds

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Our carbon footprint

In 2021 we evaluated our carbon footprint to act as a baseline to measure progress against commitments to net zero and net zero plus. Due to the impact of COVID-19 on scope 3 emissions in 2019/20, our 2020 baseline is made up of scope 1 and 2 emissions from 2019/20, and scope 3 emissions from 2018/19.

Some known emission sources – such as those associated with students at home – are not currently calculated and therefore not included in this footprint. We will work to increase the scope of reporting to include these additional sources.

The majority of emissions savings from the period up to 2018/19 have come from the decarbonisation of grid electricity. Despite a carbon management programme, behavioural change measures and good refurbishment standards, University growth would have balanced out most savings without reductions achieved in UK electrical generation. Over the same period business travel emissions have grown, but we have seen some reduction in commuting emissions, largely due to investment in halls of residence closer to the University. This shows the inherent risks in delivering emissions reductions, especially in a period of active growth.

Our wider scope 3 emissions, covered by net zero plus, have grown in line with increased expenditure and it is likely the increase in student numbers over this period will have had a large impact on student to home emissions.

It is for this reason that, as well as reducing demand where we can, we have emphasised utilising UK-wide plans for decarbonisation, taking inspiration and advice via the Committee on Climate Change 6th Carbon Budget. This should not underestimate the scale of the challenge. We are moving at a faster pace than the UK and we will need to invest to bridge this gap, but it does reduce the risk in delivering an ambitious target and increase the relevance and replicability of our chosen pathway.

Figure 5 ⟶
University of Leeds Carbon Footprint 2020 Baseline

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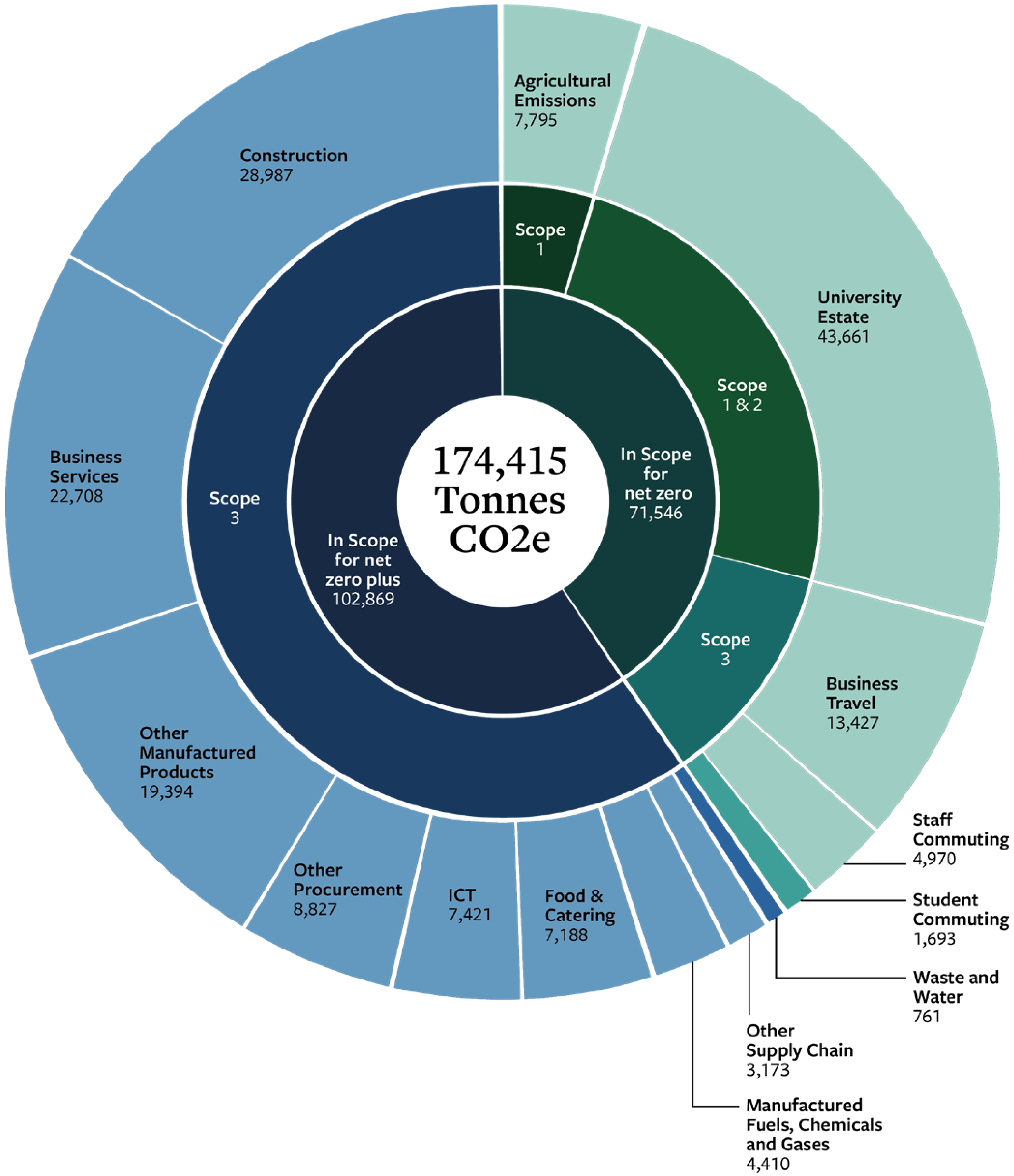

Chapter 2

The Pathways to Net Zero Emissions

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Developing the net zero pathways

Over 20 different scenarios have been modelled to find the right balance between demand reduction, decarbonising energy supply, capital investment and ongoing operational costs. Initial plans, developed by engineering consultancy firm Buro Happold, modelled 'wholesale retrofit' and 'targeted retrofit'. However, when plans were reviewed against real world costs of delivering University projects, predicted costs were considered unfeasible (wholesale retrofit – c.£1bn; targeted retrofit – c.£500m). In addition, the majority of emissions savings came from the move from natural gas to electricity.

Other modelled pathways focused on reducing capital cost, but with enough interventions to allow the University to move away from natural gas. As electricity is currently more expensive than gas this means an increase in operating costs and we will review ways to reduce this cost as part of year 1 net zero delivery. However, in the medium term we expect the Government to address the price disparity through the tax regime. These operating costs would also be less volatile using a renewable electricity market.

In this plan we have proposed three different pathways to deliver net zero by 2030. All are made up of interventions that ensure the pathway is deliverable. Although pathway development has involved extensive work, the chosen pathway will need to be supported by additional feasibility work in the early years of the plan to develop cost per intervention and to refine the phasing of the plan in line with other University strategic priorities.

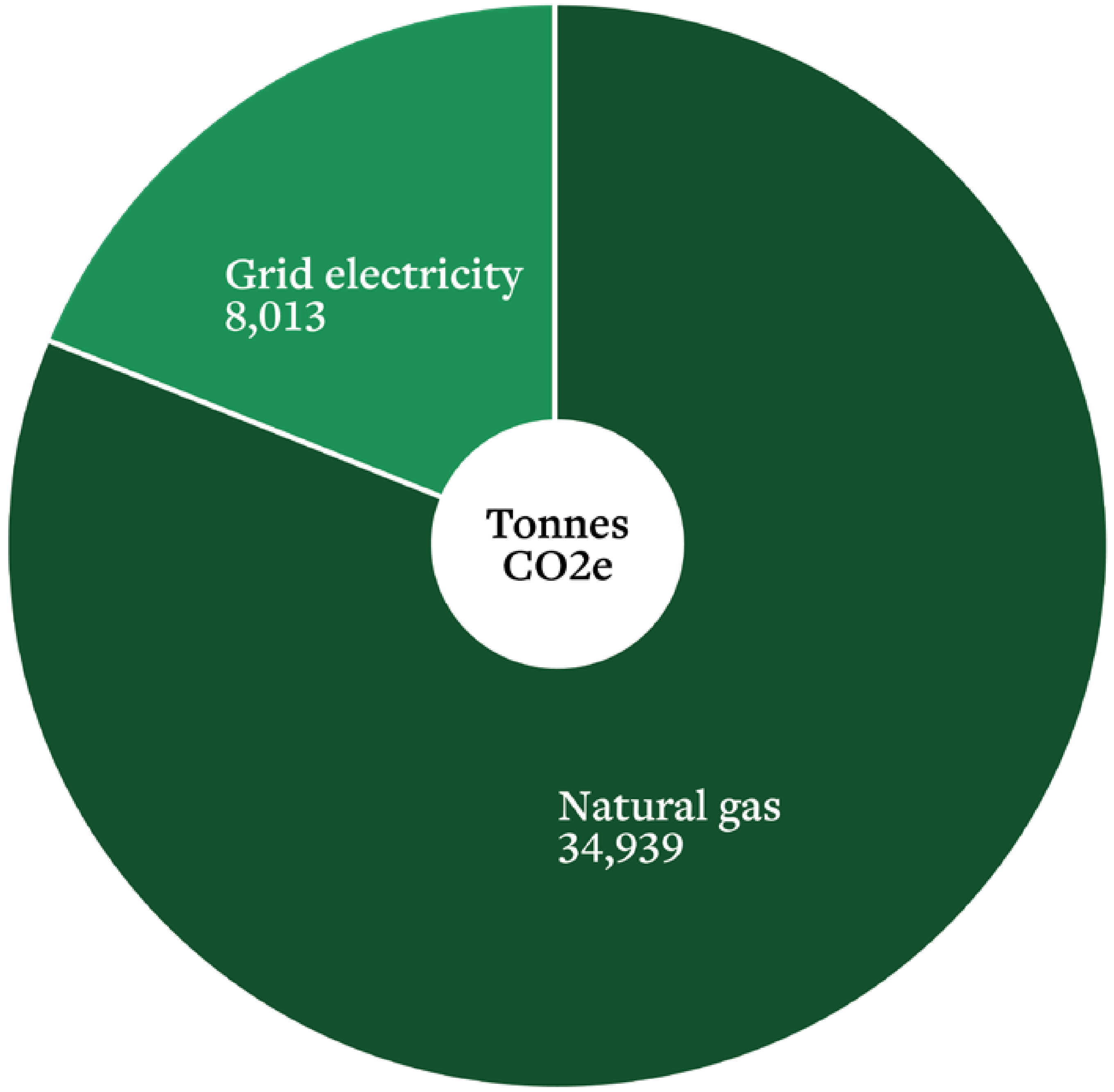
The University is a major energy user and our scope 1 and 2 emissions come largely from heating and powering our buildings. Approximately 80% of these emissions are linked to natural gas consumption.

Given that this cannot be effectively decarbonised, it is clear that a move away from natural gas will be critical to any credible net-zero pathway.

Development of the Pathway to Net Zero began in late 2019. Engineering consultancy firm ARUP was commissioned to develop a series of options, with a set of high-level recommendations to reduce demand on fossil fuel derived heat both through building level and system level interventions. Buro Happold was then commissioned to carry out more detailed analysis of the required demand reduction and set out a programme of works to deliver net zero. As part of this they developed a series of models that allowed an ongoing review of the programme, interventions and costs.

Finally we worked with the Place Based Climate Action Network[1] to review our plan and provide an independent assessment of the proposals. The scenarios put forward in this plan aim to utilise wider system changes, such as decarbonisation of grid electricity, in order to deliver net zero in an efficient way.

Figure 6 ⟶
Baseline University building emissions by energy source (2019/20 data)



Accessibility: Read an accessible description of Figure 6 in our companion document (Word).

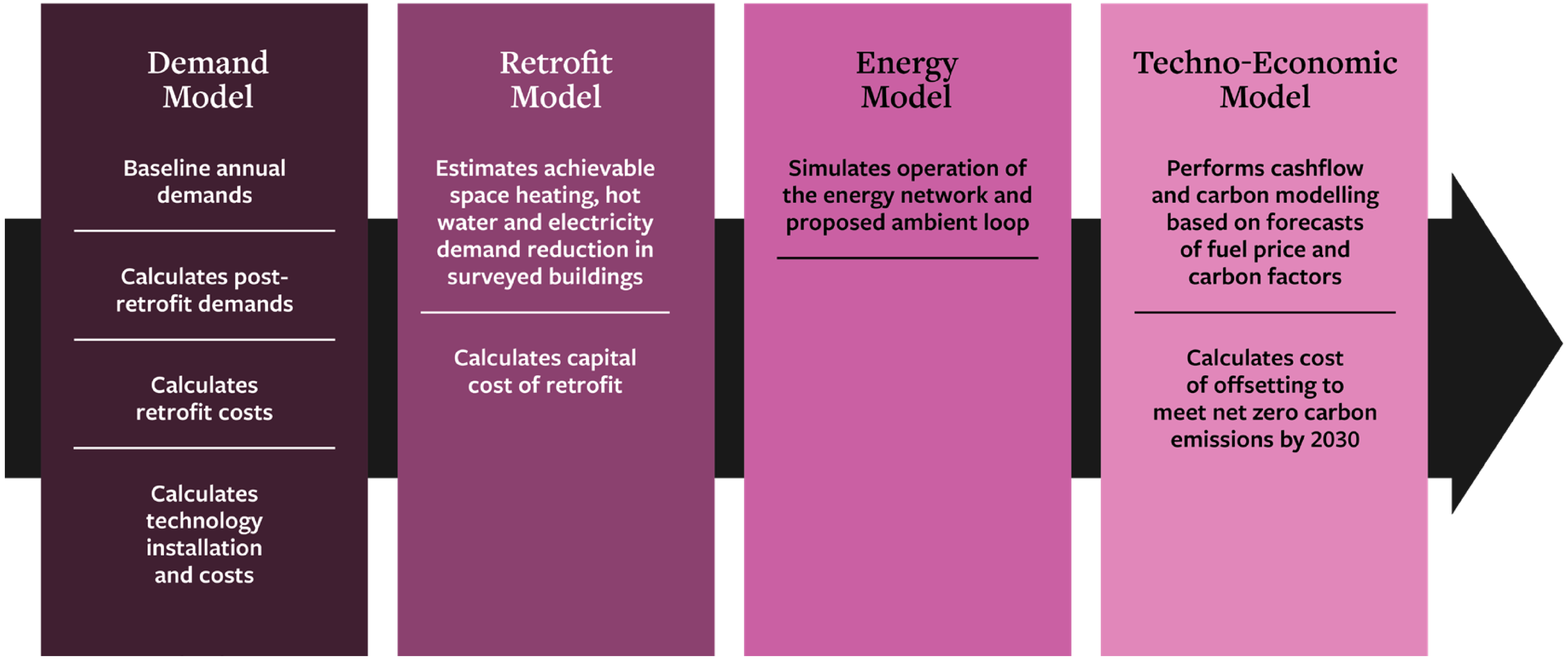
1 https://pcancities.org.uk/energy-and-caron/leeds

Net zero carbon – Buro Happold methodology

Buro Happold ran a series of simulations which used University baseline energy consumption data and the results of on-site surveys to model the impact of proposed interventions. Four models were used to calculate the energy demand of the portfolio in differing scenarios, estimate the cost of the proposed interventions, model the impact of the works on our energy systems, and calculate the carbon emissions and operating costs.

Two estate retrofit scenarios were simulated by Buro Happold - “wholesale retrofit” where a deep retrofit was delivered all buildings that are part of the University estate prior to 2030 to maximise the energy savings associated with the lean element of the emissions hierarchy, and “targeted retrofit” where a still ambitious but more achievable programme of retrofit was delivered. In March 2020 the models were handed to the University of Leeds and a number of variants were modelled to represent differing levels of capital availability, resulting in the current iteration.

Figure 7 →
Buro Happold Methodology



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Strategic design principles

The following Strategic Design Principles underpin the Pathway to Net Zero. They are aligned with the Committee on Climate Change 6th Carbon Budget and recent government commitments to achieve zero carbon electricity by 2035. This fit with national, regional and City strategy is important to minimise the cost of delivering net zero. The implications have been assessed via a risk matrix and will be investigated further in more detailed feasibility studies starting in year 1.

- Demand reduction activity is fundamental to delivering a credible Pathway to Net Zero Carbon. However it is recognised that capital availability and deliverability constrain this activity.
- Decarbonisation of heat and power consumed by the University of Leeds is required, by moving away from direct consumption of fossil fuels on site and reducing the use of fossil fuel derived electricity.
- Based on available evidence, hydrogen is not considered a viable option before 2030, but potentially has a role by 2050. Biogas is discounted for the same reason.
- Electrification of heat within the heat network allows decarbonisation to occur.
- Electrification of heat load at a building level and using heat pump technology reduces overall consumption.
- Procuring electricity from off-site renewables, either directly owned by the University of Leeds or from a Power Purchase Agreement, delivers decarbonisation.
- Offsetting to meet net zero by 2030 is allowable, via credible programmes, but reduction in emissions will be prioritised.
- On and off-site renewable generation opportunities should be maximised.
- On-site generation (likely through solar photovoltaics) is favourable.
- Off-site generation, with electricity transmitted via the national grid, is allowable and required to meet the scale of generation required.
- Our use of buildings must be reviewed, with rationalisation of the estate and better control of buildings within the portfolio.
- Retrofit led by net zero carbon must be coordinated with the investment planned in the Estates Strategy.
- Some disposal activity, and conversion of buildings to residential should occur.
- Better building control should be achieved through investment in Building Energy Management Systems (BEMS).

Our Strategic Design Principles are aligned with the Committee on Climate Change 6th Carbon Budget and recent government commitments to zero carbon electricity by 2035.

The scenarios

The following section summarises three different pathways to deliver net zero that have been modelled at a portfolio level. All are responding to a constrained capital environment caused by COVID-19 and represent significantly reduced demand reduction (retrofit) activity against the models proposed by Buro Happold.

Scenario A

'Light retrofit and waste to energy' focuses on light retrofit to enable decarbonisation, via electrification of heat at a number of University buildings and the creation of an ambient loop heat network at Western Campus. The district heat network is decarbonised with the expansion of the low temperature hot water (LTHW) network and the addition of Leeds waste to energy derived heat. Electrification of heat is pursued and natural gas use reduced.

Scenario B

'Light retrofit and full electrification of heat' is a repeat of this but with no connection to the Leeds heat network, instead decarbonising it through electrification of heat.

Scenario C

'Expanded retrofit and full electrification of heat' is a development of the second pathway, with additional investment in building retrofit.

Scenario A:
Light retrofit and waste to energy

In this scenario the retrofit activity is focused on 'light' packages, which enable the installation of building level air source heat pumps (ASHP) to eight buildings on the main campus, and the light retrofit of six buildings and creation of an ambient heat loop at the Western Campus. A 'deep' retrofit, which delivers significant demand reduction, is proposed for one of our large and inefficient buildings (c.8,000m2) with ASHP derived heat reducing demand on the main campus distributed heat network. A programme of lighting upgrades occurs across the rest of the portfolio ensuring there is no inefficient lighting by 2030. An assumed level of disposal occurs linked to estate rationalisation.

The district heat network is decarbonised with the expansion of the low temperature hot water (LTHW) network and the addition of Leeds waste to energy derived heat. Electrification of heat is pursued and natural gas use reduced.

Electricity is decarbonised through investment in a new off-site renewable generating facility. One megawatt of on-roof solar photovoltaics are added to the main campus buildings and further investment in building management systems delivers more efficient use of energy across the built environment.

The total capital expenditure associated with the interventions is in the region of £149m, allowing for inflation.

The modelled operating cost for heat and power in 2030 (inclusive of incoming utilities, operating charges and offsetting but excluding water consumption) is in the region of £19m per annum. This balances with the projected operating costs at 2030 if no interventions were carried out and net zero carbon not pursued.

It should be noted that the modelled operating expenditure is based on long term projections, which are by nature inexact. However the same assumptions underpin each of the scenarios so provide useful comparisons.

The value[1] of avoided carbon emissions from scope 1 and 2 alone is £9.5m in 2030 and £47m over the period to 2030. Inclusive of commuting and business travel, the value of avoided emissions is £66m.

Risks:

- Available heat in the Leeds heat network is already utilised.
- There is a high risk that the carbon intensity factor provided does not reflect actual emissions.
- Diverts pathway from moving towards no direct emissions by 2050.
- Disruption to building occupants with no visible benefit or discernable improvement to the internal building environment.
- COVID-19 ventilation requirements increase energy use across estate and associated GHG emissions.

Critical assumptions:

- There will be an expansion of the University low temperature hot water network (costs included for this).
- A certain level of disposal/estate rationalisation is assumed.
- We can secure investment in a new off-site renewable energy generation facility and that currently this is assumed to be via a Power Purchase Agreement with no capital investment impact.
- The capital development programme will provide additional savings through building refurbishment.
- Decant space will be available if required.
- The Leeds heat network has available capacity.

1 Carbon value calculations have used latest UK government estimates - Valuation of greenhouse gas emissions: for policy appraisal and evaluation - GOV.UK (www.gov.uk). They will not necessarily reflect the carbon price in 2030, it is likely that a mix of carbon pricing (through tax and trading), regulation, innovation and policy will be required to address market failures and barriers to net zero.

Scenario A:
Light retrofit and waste to energy

Intervention	Emissions reduction (Tonnes Co2e)
Grid Decarbonisation	3,527
Solar PV	178
Retrofit & ASHP (inc western heat loop)	5,840
Leeds Heat Network	8,180
Electrification of heat	763
Off-site renewable energy	18,713
Commuting	2,963
Business travel	6,627
Behaviour change	95
Offset	24,674

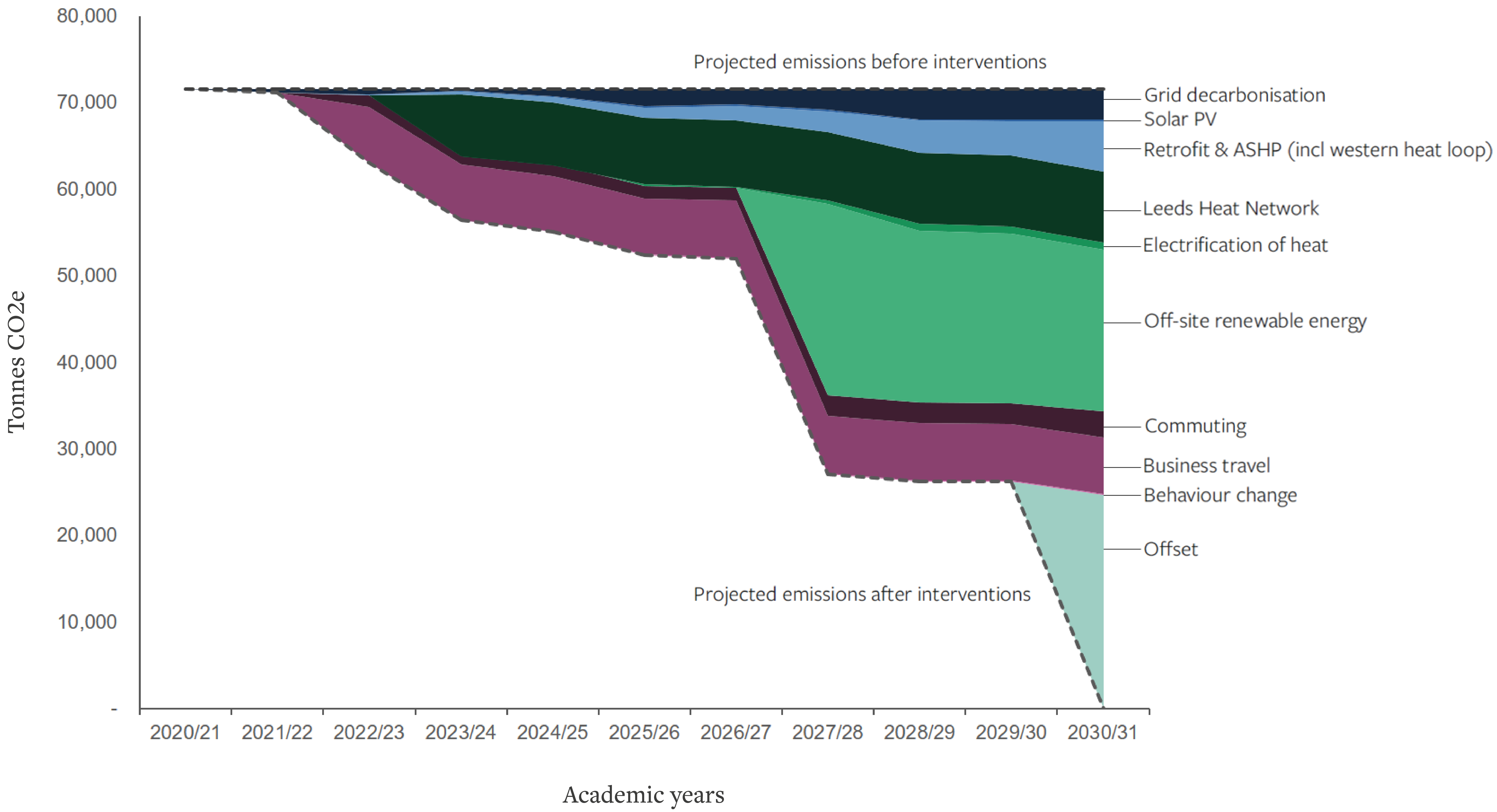

Figure 8 ⟶
Emissions reductions by intervention – Light retrofit and waste to energy

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Scenario B: Light retrofit and full electrification of heat

In this scenario the retrofit activity is as scenario A – focused on 'light' packages that enable the installation of building level air source heat pumps (ASHP) to eight buildings on the main campus, the light retrofit of six buildings and creation of an ambient heat loop at the Western Campus and the same 'deep' retrofit as per the previous pathway. The programme of lighting upgrades and disposals is also unchanged.

The change occurs in the decarbonisation of the district heat network through electrification. There is no expansion of the low temperature hot water (LTHW) network – the existing distribution infrastructure is retained. The additional electrification of heat is likely to require electrical upgrades.

Electricity is decarbonised through investment in a new off-site renewable generating facility. One megawatt of on-roof solar photovoltaics are added to the main campus buildings and further investment in building management systems delivers more efficient use of energy across the built environment.

The total capital expenditure associated with the interventions is £152.8m.

The modelled operating cost for heat and power in 2030 (inclusive of incoming utilities, operating charges and offsetting but excluding water consumption) is in the region of £20m per annum. This is an increase of approximately £1m on the projected operating costs at 2030 if no interventions were carried out and net zero carbon not pursued.

The value of avoided carbon emissions from scope 1 and 2 alone is £10m in 2030 and £43m over the period to 2030. Inclusive of commuting and business travel, the value of avoided emissions is £62m – lower than scenario A due to decarbonisation occurring later in the programme.

Risks:

- Increased operating cost due to the current gaps in cost between gas and electricity.
- There is not enough electrical capacity in the local grid to support plans.
- Disruption to building occupants with no visible benefit or discernable improvement to the internal building environment.
- COVID-19 ventilation requirements increase energy use across estate and associated GHG emissions.

Critical assumptions:

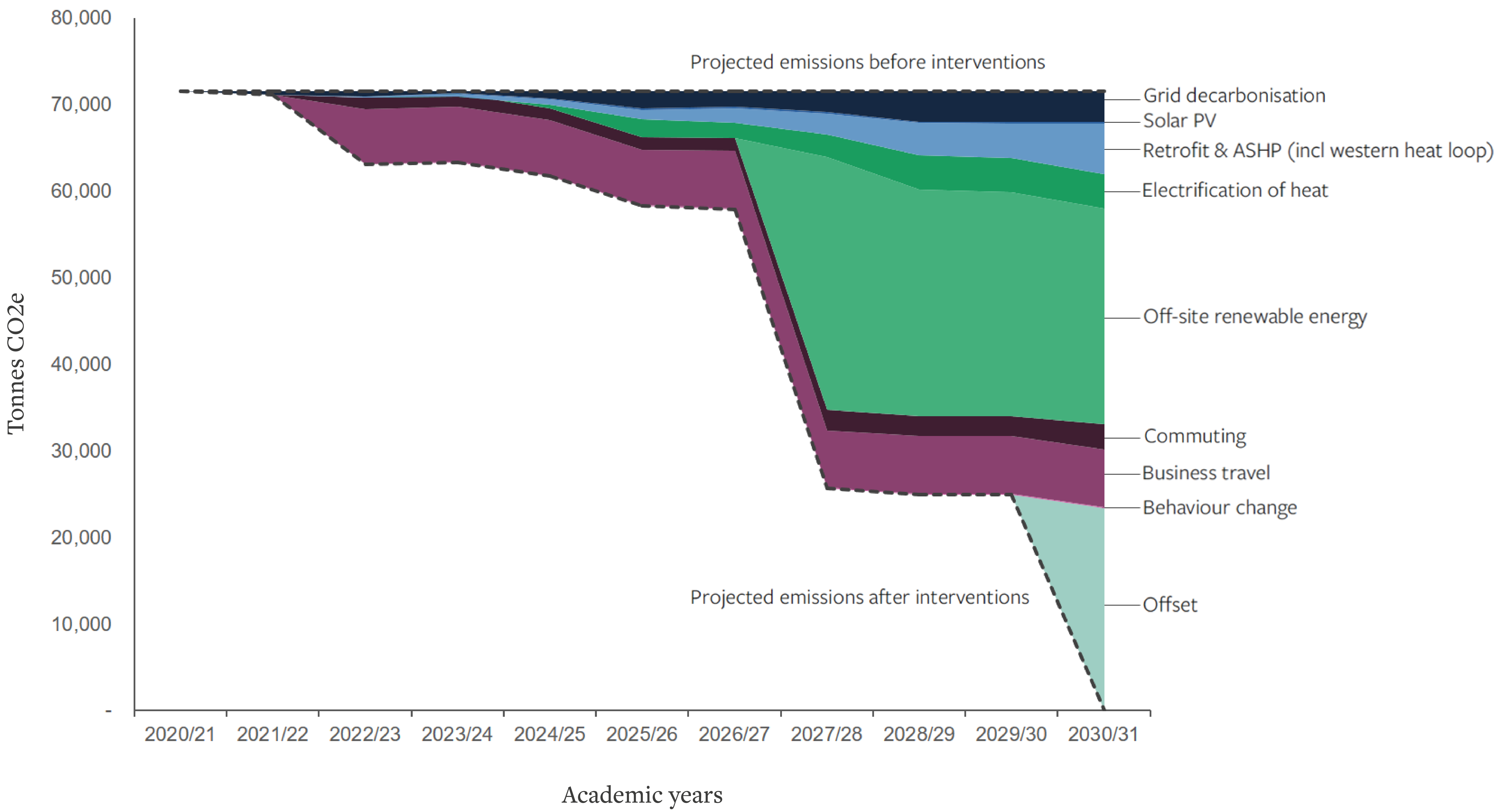
- We can manage capacity constraints (e.g. via early investment in upgrades).
- A certain level of disposal/estate rationalisation is assumed.
- We can secure investment in a new off-site renewable energy generation facility and that currently this is assumed to be via a Power Purchase agreement.
- The capital investment programme will target some large buildings for refurbishment.
- Decant space will be available if required.

Scenario B:
Light retrofit and full electrification of heat

Intervention	Emissions reduction (Tonnes Co2e)
Grid Decarbonisation	3,527
Solar PV	178
Retrofit & ASHP (inc western heat loop)	5,840
Electrification of heat	3,985
Off-site renewable energy	24,901
Commuting	2,963
Business travel	6,627
Behaviour change	95
Offset	23,444

Figure 9 ⟶
Emissions reductions by intervention –
Light retrofitand full electrification of heat

Accessibility: Read an accessible description of Figure 9 in our companion document (Word).



Scenario C: Expanded retrofit and full electrification of heat

In this scenario the retrofit activity is increased compared with scenarios A and B, with the additional deep retrofit of a high energy using building and light retrofits of three buildings to allow connection to ASHPs (c.25,000 m2)[1]. The creation of an ambient heat loop at the Western Campus occurs as in scenario B and the programme of lighting upgrades and disposals is also unchanged.

Aligned with Scenario B, there is no expansion of the LTHW network – the existing distribution infrastructure is retained and the heat network is decarbonised through electrification. The additional electrification of heat is likely to require electrical upgrades.

Electricity is decarbonised through investment in a new off-site renewable generating facility. One megawatt of on-roof solar photovoltaics are added to the main campus buildings and further investment in building management systems delivers more efficient use of energy across the built environment.

The total capital expenditure associated with the interventions is £219m.

The modelled operating cost for heat and power in 2030 (inclusive of incoming utilities, operating charges and offsetting but excluding water consumption) is in the region of £16m per annum, a decrease of approximately £2.5m on the projected operating costs at 2030 if no interventions were carried out and net zero carbon not pursued.

The value of avoided carbon emissions from scope 1 and 2 alone is £10m in 2030 and £42m over the period to 2030. Inclusive of commuting and business travel, the value of avoided emissions is £61m.

Risks:
• Increased operating cost due to the current gaps in cost between gas and electricity.
• There is not enough electrical capacity in the local grid to support plans.
• Disruption to building occupants with no visible benefit
• COVID-19 ventilation requirements increase energy use across estate and associated GHG emissions.

Critical assumptions:
• We can manage capacity constraints (e.g. via early investment in upgrades).
• A certain level of disposal/estate rationalisation is assumed.
• We can secure investment in a new off-site renewable energy generation facility and that currently this is assumed to be via a Power Purchase Agreement.
• The capital investment programme will target some large buildings for refurbishment.
• Decant space will be available if required.

1 Where building size is referenced in m² we are using Gross Internal Floor Area measurements.

Scenario C: Expanded retrofit and full electrification of heat

Intervention	Emissions reduction (Tonnes Co2e)
Grid Decarbonisation	3,527
Solar PV	178
Retrofit & ASHP (inc western heat loop)	6,873
Electrification of heat	3,842
Off-site renewable energy	24,049
Commuting	2,963
Business travel	6,627
Behaviour change	95
Offset	23,408

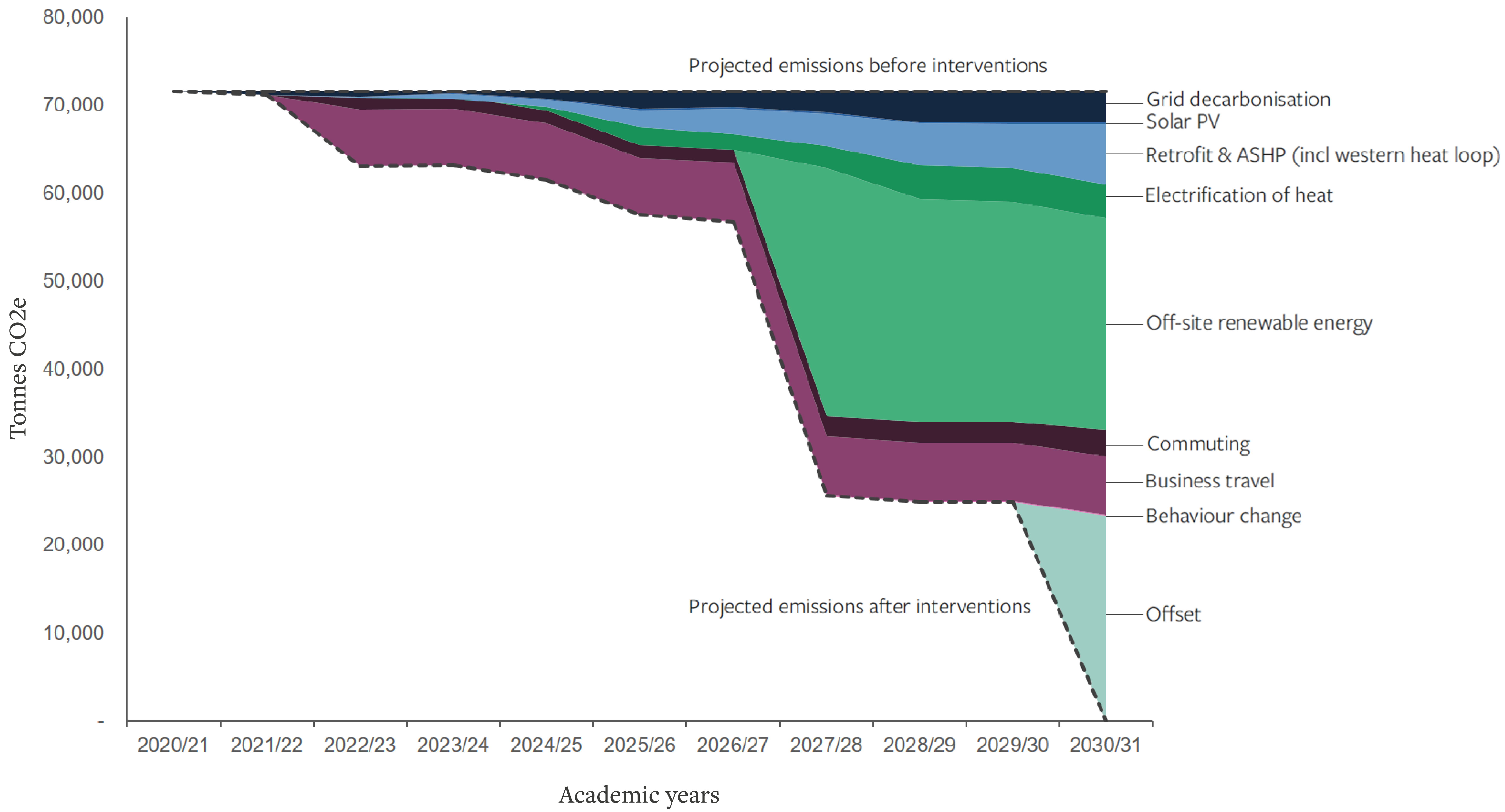


Figure 10 ⟶
Emissions reductions by intervention – Expanded retrofit and full electrification of heat

Accessibility: Read an accessible description of Figure 10 in our companion document (Word).

Chapter 3

Our Pathway to Net Zero

Our pathway to net zero by 2030

For the rest of this plan we will focus on scenario B 'Light retrofit and full electrification of heat'.

The scenario A 'Light retrofit and waste to energy' pathway was appealing from an operational cost perspective, but posed significant risk from a net zero perspective. The provided emission intensity factor did not account for the emissions created from burning the waste, nor could these emissions be balanced by off-site renewable energy generation. In addition, with restricted availability of heat in the network there is a risk of taking a cheap source of heat from the City, which would better serve the wider community.

For the scenario C 'Expanded retrofit and full electrification of heat' pathway, the additional capital investment in retrofit doesn't deliver high enough carbon or operating cost savings.

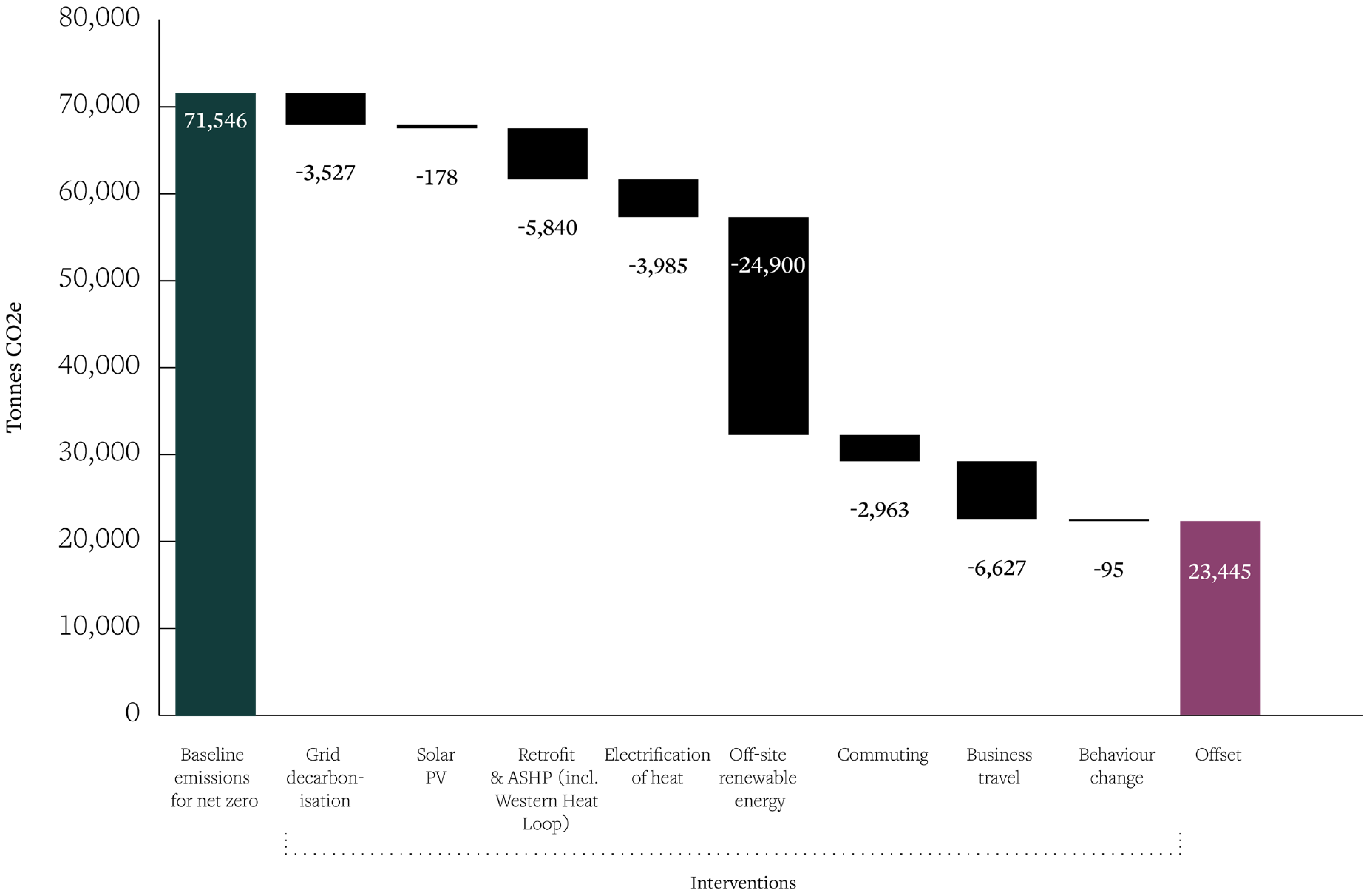


Figure 11 ⟶
Impact of interventions on CO2e emissions – Light retrofit and full electrification of heat

Accessibility: Read an accessible description of Figure 11 in our companion document (Word).

Demand reduction

The most obvious and enduring way to achieve lower carbon emissions is to reduce the primary energy demand of our buildings. Demand reduction in our Pathway to Net Zero is largely achieved through building retrofit (including fabric measures), energy efficient lighting, enhanced building control, and estate rationalisation.

Retrofit activity is required to install heat pumps locally and enable the other interventions to operate successfully, but is both capital intensive and disruptive. The level of net zero led refurbishment activity now proposed (8,000m^2 deep refurbishment, c.67,000m^2 light refurbishment) is considered to be a minimum requirement to enable this decarbonisation pathway.

Planned interventions:

- Building refurbishment standards will be updated to define Deep and Light retrofit packages, to focus on the 'performance gap' and ensure demand reduction is achieved as part of all refurbishment works.
- Deep Retrofit to approximately 8,000m^2 of space led by net zero, installing ASHPs and potentially enabling isolation of a section of steam main in the future to save standing losses.
- Light Retrofit to approx. 67,000m^2 of other buildings led by net zero, including all of Western Campus in anticipation of the installation of a GSHP ambient heat loop, and enabling installation of ASHP in other buildings. The initial proposal removes seven buildings (42,000m^2) from the heat network.
- Capital development programme is assumed to target a number of large buildings across the Estate and that these will be completed to meet our sustainable construction standards. The capital development programme is dynamic in nature and we have used current assumptions to inform our pathway.
- LED programme across remaining estate – all buildings to have efficient lighting by 2030, reducing pressure on electrical distribution infrastructure.
- Better Building Management through increased control in building energy management systems (BEMS), introduction of Smart Building principles, and good energy management hygiene delivered as a core activity across the entire estate, supported by an updated system and change of approach to BEMS delivery.
- Disposal of a small number of peripheral buildings and further rationalisation of the estate has been assumed.
- New buildings to be developed to net zero standards, or any acquisition of existing buildings in the future is to be accompanied by a budgeted plan for ensuring compliance with net zero standards.
- Engagement with building users as there are still opportunities for more efficient use of electricity and energy across the estate. The commitment to net zero should be used as a driver to make sure these opportunities are maximised.
- Fume cupboards rationalisation and heat recovery installed across our laboratories.

Decarbonising energy

Investment in demand reduction is enduring and 'low regret'. It does not lock us in to a technological pathway that is high risk – but is capital intensive and disruptive. Decarbonisation of supplies requires less investment in building fabric, though it often requires investment in building level mechanical and electrical systems and infrastructure to enable it – and can be less disruptive to building occupants.

Our decarbonisation approach is based on the following fundamentals:

- Natural gas cannot be meaningfully decarbonised, and therefore the University of Leeds must reduce our use of gas significantly by 2030 and completely by 2050.
- Electrifying heat is key to decarbonisation as it takes advantage of reductions in the carbon intensity of grid electricity and electricity can be balanced with renewable energy generation.
- Hydrogen, currently, is not seen as an appropriate fuel with which to heat buildings and is highly unlikely to be so by 2030. However, we are committed to developing technologies in this area with a view to it having a role ahead of 2050.

University utility supplies

The University has a number of different supply arrangements across our building portfolio. These include grid connected properties, and buildings connected to our distributed heat and power networks. The route to decarbonisation for each of our sites differs and detailed plans are required which will identify the opportunities for reducing the consumption of natural gas derived heat and power in each of the situations. Broadly, this means electrification of heat load where this is possible, along with efficient operation of the buildings themselves. This electricity can then be supplied as zero GHG emissions, via a Power Purchase Agreement or by up-front investment in renewable supply technologies such as a wind farm.

Achieving this electrification of heat will require investment in distribution infrastructure both within our buildings and across our network.

Planned interventions:

- Some heat load is removed from the heat network, reducing the requirement for gas generated heat. This is to be achieved through retrofit of buildings and installation of building level ASHPs, initially proposed in seven academic buildings and one large residence.
- Engagement with key stakeholders such as Leeds Teaching Hospital Trust - it is essential to collaborate on our net zero plans and recognise that there may be benefits to coordinating our respective plans.
- Reinforcement of electrical infrastructure and electrification of heat load across our portfolio.
- Onsite generation of renewable energy – we will maximise the potential for onsite renewable energy generation, helping to balance increased electrical demand from heat.
- Off-site renewable energy generation – we will investigate the options and timing of new off-site energy generation to provide a flexible and balanced approach to meeting electricity demand through the investment period. Once this has been finalised our emissions reduction pathway will be updated.

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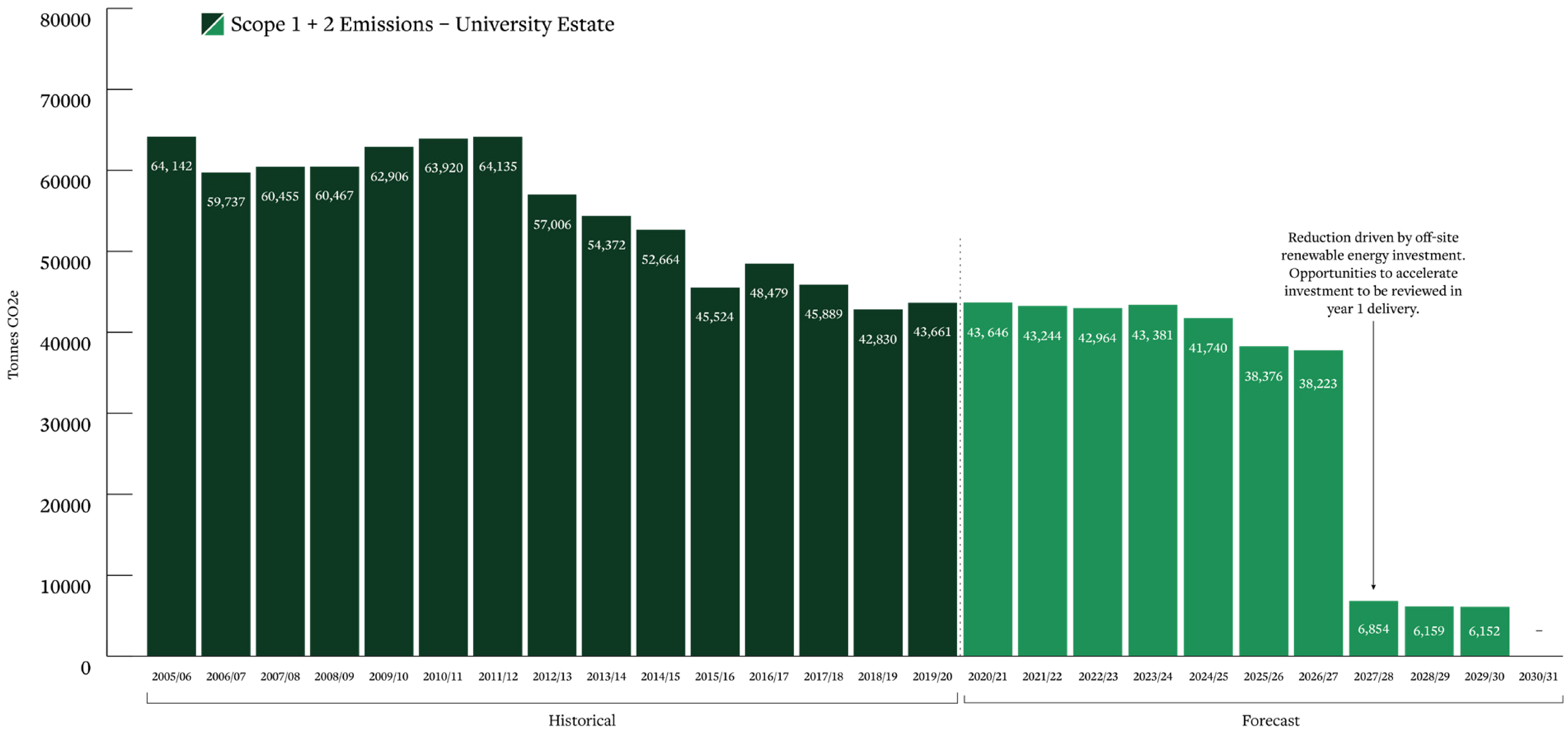
Our Pathway to Net Zero by 2030

Figure 12 ⟶
Forecast Scope 1 and 2 University estate emissions by year after interventions – Scenario B: Light retrofit and full electrification of heat

Programme of delivery is subject to change based on year 1 feasibility studies and strategy development. This will impact on emissions reductions per year.

Accessibility: Read an accessible description of Figure 12 in our companion document (Word).



Note in 2016/17 we changed our reporting methodology to more accurately account for energy losses (and their associated GHG emissions) for supplied heat and electricity

The University of Leeds Farm

Living laboratories will be an important element of delivering our net-zero plan, with the University Farm providing a unique test bed to explore and implement sustainable pathways. The Farm represents a high emission source that is characteristic of the large mainstream farming sector in the UK that delivers £2.4 billion annually in farm product value from within the Yorkshire and Humber region alone. Farming is a lifeblood of the region, but agriculture alongside manufacturing and transport are the most challenging sectors to decarbonise. As such, the farm presents an important living laboratory where staff and students can work with agribusinesses to trial alternative, scalable solutions that are needed regionally, nationally and worldwide.

At a time when many organisations are shedding high-carbon assets, it is important that we explore credible decarbonisation pathways for essential sectors of the regional and UK economy such as agriculture, noting the geopolitical pressures to sustain and expand UK food production, particularly in a post-Brexit world.

Energy usage for the infrastructure at the University Farm will be managed following a similar strategy to the main campus. However, it is the production practices that pose the greatest challenge. Although GHG emission per kg of protein is much lower for pig production than for ruminant animals, total emissions are nevertheless high when compared to other University scope 1 emissions. Our approach will balance reductions in scope 1 emissions against savings made through scope 3 emissions reduction and resource recovery from agricultural waste streams including manure.

Active Research and Innovation at the University provides significant opportunities to re-use pig manure as a high-quality fertiliser, or as feedstock for other industrial purposes including energy production. For example, recovery of energy, nitrogen and phosphorous for re-use in manufacturing feed stocks for organic fertiliser products offers a pathway to avoid emissions from high emission manufacturing of mineral nitrogen fertiliser and mining of phosphate rock.

A current research project is looking at converting pig urine into hydrogen fuel for vehicles to reduce emissions from farm operations and supply chain transport. Recovery of carbon through anaerobic digestion or other treatment processes offers feedstocks for production of biochar or other forms of organic carbon amendments for soil that both improve soil and sequester carbon as a proposed negative emissions pathway.

Slurry management poses the most significant proportion of scope 1 emissions (estimated at 89% of total) for pig rearing so it is also suggested this is another focus of research, particularly through collaboration with farm operations.

Planned interventions:

- **Start calculating GHG pig emissions.** This would include scope 1, scope 2 and scope 3 emissions related to the Pig Research Facility.
- **Review reduction target.** As part of year 1 net zero delivery we will determine our baseline emissions and estimate scope 3 emissions for the farm operation. A target for reduction in scope 1 emissions will be set at the end of year 1, through joint working with Facilities Directorate and the commercial farm management and operations team. This planning will take place following review of baseline data. Potential living laboratory projects and operational changes (e.g. change in feed, change in slurry management) will be assessed for feasibility to deliver GHG emissions reduction, and to increase profitability of the commercial operation through reduction in energy use and development of income streams from resource recovery from waste streams. The potential to 'balance' scope 1 emissions with scope 3 savings will also be reviewed.
- **Calculate whole life GHG impact of N2 Applied Plasma Technology.** The N2 Applied research project recently been installed and is at the commissioning stage. The system separates solids and treats the liquid with plasma to reduce the emissions of the slurry and to increase its nitrate quality. Calculating whole life emissions, to account for wider societal benefits, should be carried out as part of evaluation and to assess suitability for long-term farm operations.
- **Explore alternative pathways to net zero,** linking to research projects on circular farming systems incorporating and integrating the outputs of the N2 Applied Plasma Technology and other resource recovery technology into the arable farm, and regenerative agriculture methods such as no tillage, cover cropping, and mob grazing to improve soil health and increase its potential to act as a carbon sink.

Business travel and commuting

Reducing emissions from business travel

There is an underlying assumption that we can substantially reduce international travel compared with pre COVID-19 levels. This is partially due to the rapid adoption of technology that has replaced face-to-face to contact, but also the growing recognition that some elements of collaboration, meetings, guest lectures and research can be carried out without travel.

For the purpose of forecasting, we have assumed a 50% reduction should be feasible, but it is recognised that this needs to be reviewed alongside wider University strategic priorities and as part of the Climate Plan Sustainable Travel working group.

Planned interventions:

- An academic led approach to reducing business travel is developed, including defining climate conscious travel and ways to achieve it.
- The digital transformation strategy will support high quality digital collaboration, helping to avoid business travel and providing new online only degrees.
- The University approved travel operator will provide the majority of travel bookings. Some exceptional circumstances would allow alternatives, but these would need to be pre-approved.
- Offsetting or insetting (cost to save carbon at University) costs are included as part of research grant proposals.
- On renewal of the car hire contract, we will set a limit on types of cars available to hire, aiming for electric vehicles only by the mid-2020s.

Reducing emissions from commuting

It is assumed there is potential to maintain a degree of homeworking, which combined with estate rationalisation could lead to additional emissions reductions. There are risks to these assumptions. It is likely that many will crave a return to normality and it is difficult to predict how long-term working practices will evolve after the pandemic ends. The shift from public transport to car use, created by COVID-19, will potentially increase emissions and has to be managed. We believe this increases the need to incentivise the switch to electric vehicles.

Planned interventions:

- Hybrid working is maintained beyond the pandemic. To maximise associated savings there will need to be reductions in the size of the University estate. In addition we will estimate home working emissions via the travel survey.
- Increase the pace of conversion to electric cars for staff. It is assumed that staff and students commuting to the University by car will increase (in % terms) due to concerns with using public transport. For staff we will use measures such as car-parking discounts for electric vehicles; good charging availability; electric car lease salary sacrifice; and restricting car-park availability for ICE (internal combustion engine) cars by 2030.[1]
- Encourage electric bike use for commutes. The purchase limit for bikes has been increased from £1,000 to £3,000. Increasing the hire term (currently twelve months) would allow lower income staff to take advantage of this increase to purchase e-bikes.
- Better active travel infrastructure. We will increase shower provision on campus and will work with Leeds City Council to improve walking and cycling links to the University.

1 This will be a central part of the commuting emissions reductions plan. We reviewed the Balanced Net Zero Pathway in the Sixth Carbon budget and believe with additional incentives we can increase uptake of electric vehicles.

Offsetting

Offsetting

We will follow the guidance of the COP26 Universities Network Offsetting briefing when offsetting activity and emissions by 2030. Our focus will be on reducing emissions, but when offsetting emissions in 2030 we will use the following principles.

Offsetting principles:

- We will prioritise reduction in emissions over offsetting. However, where emissions are unavoidable (e.g. unavoidable air travel) we may choose to offset before 2030.
- We will prioritise University land or local projects. As an example we are currently designing new woodland on around 90 acres of University land at King Lane. This will provide some balancing of University emissions, but also research, education, community engagement and biodiversity benefits.
- We will look for partnership opportunities withi the HE sector to provide further off-setting projects.
- Offsetting policies and projects will go through an academic led annual review cycle. An academic board hosted by the Priestley Centre of both internal and external academics will conduct an annual review. This will minimise our reliance on offsets and help us choose only high quality offsets to minimise risk.

Zero direct emissions by 2050

Although the focus of this plan is on achieving net zero by 2030 and making progress against net zero plus, it is important that we maintain a trajectory towards zero direct emissions by 2050. Full electrification of the estate's energy usage, perhaps supported via 'green' hydrogen in the 2030s will form a significant proportion of this plan. Direct emissions from agriculture will remain problematic and must be reviewed in line with industry. There is also currently no solution for direct emissions linked to refrigerants and this problem will increase with increased use of GSHPs or ASHPs.

Planned interventions:

- Ensure decision making processes, designed to account for sustainability, factor in no direct carbon emissions by 2050.
- Ensure the commitment to having no direct emissions by 2050 is considered within net zero decision making. education, community engagement and biodiversity benefits.
- We will look for partnership opportunities within the HE sector to provide further off-setting projects.

Chapter 4

The Pathway to Net Zero Plus

Based on our current measured footprint, net zero plus covers 59% of current emissions. The potential impact we can have on these is high, but it is important to caveat that our influence is much lower and will often be based on contract renewal, more expensive purchasing standards and the ability of our supply chain to match our ambition. Achieving these wider emissions reductions will require true collaboration with research, education and operations to explore interventions that are measurable and deliverable, but will also maximise potential within our community.

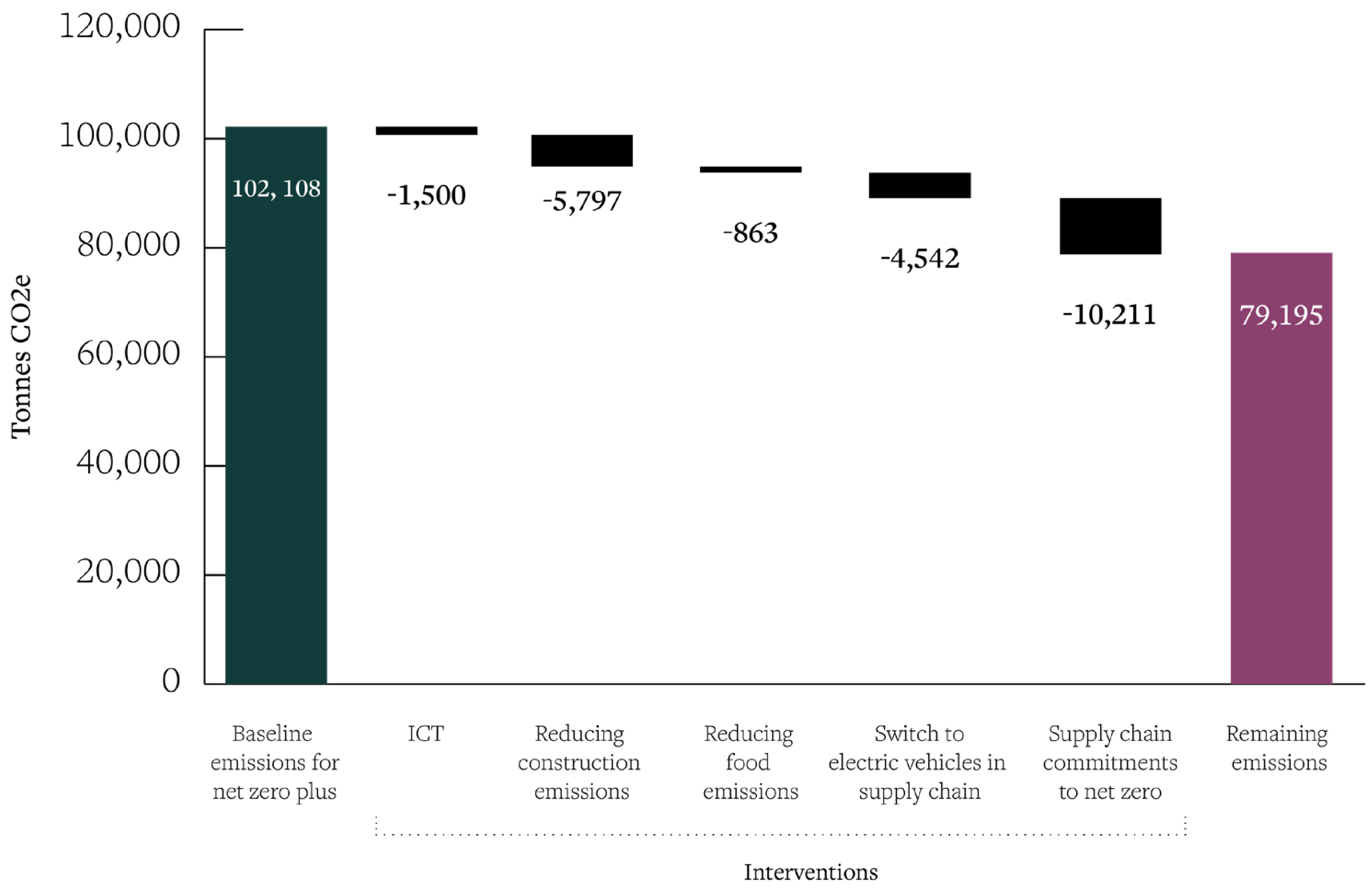
There are strong links here with other University Climate Plan principles, 'Net Zero Carbon City' and 'Sustainable Travel'. Collaboration with City partners, with a focus on creating shared net zero supply chains and reducing travel-based supply chain emissions could lead to further emissions savings.

Further work is needed to refine methodologies for calculating scope 3 emissions and identifying further reduction pathways.

The interventions suggested in this section have been informed by a series of workshops, a review of supplier targets and carbon footprints and existing knowledge of our supply chain, developed through operational sustainable procurement activity. Emissions reduction potential has been treated conservatively and it is believed that more detailed footprint work and research, ideally completed using a living laboratory process, will reveal greater potential reduction.

Figure 13 ⟶
Impact of interventions on scope 3 CO2e emissions for net zero plus

Accessibility: Read an accessible description of Figure 13 in our companion document (Word).



Methodology for estimating GHG emissions

Currently scope 3 procurement emissions are estimated using an environmentally extended input-output analysis. This gives a high-level estimate of carbon footprints for HE procurement categories mapped against financial flows. It gives an emission intensity per £ spent on a particular product, which allows universities (via their purchasing consortium) to estimate their supply chain emissions.

We have identified particular activities within our supply chain where we believe there are opportunities to reduce emissions. We recommend tracking expenditure and life-cycle emission data on these to measure the effectiveness of planned interventions. Performance will be measured against the Environmentally Extended Input Output (EEIO) baseline and supplier specific footprint data that will be established in the first two years of net zero delivery.

Interventions to reduce emissions

Suppliers committing to net zero

Once our Pathway to Net Zero has been signed off we will communicate our intention to become net zero by 2030 to our suppliers and ask them to join us on our journey. It is assumed that a proportion of our supply chain will be making commitments independently to us and that service-based suppliers will have easier pathways to net zero than suppliers dependant on resource use.

In the first two years of net zero delivery we will review when net zero terms and conditions can be added to future contracts (e.g. minimum commitment to emissions reductions) and will update emissions projections accordingly.

Low emission vehicles by contract

For service companies based regularly at the University (e.g. maintenance contracts, cleaning contracts etc.) it is likely that the majority of their scope 1 and 2 emissions are linked to vehicle use. As an example, for Mitie[1], a leading facilities management and professional services company, 94% of their 2019/20 scope 1 and 2 emissions were caused by transport.

By focusing on these contracts and working with suppliers to gradually bring in minimum requirements for fleet used for University services, there is high potential to reduce associated emissions.

Focus on high impact areas

We have identified three high impact areas, with particular focus on reducing embodied carbon in relation to purchased goods and services:

- **Construction.** A focus on high impact materials (such as cement use), good design practice and increased investment in refurbishment will all lead to reductions. By 2025 maximum carbon intensity values should be set for new build projects.
- **IT hardware.** Global technology companies are increasingly setting science-based emissions reduction targets, including product-based emissions[2]. It is recommended that procurement guidance is updated to include minimum standards for IT hardware that tracks industry best practice.
- **Food and catering.** A large proportion of catering emissions are related to meat and dairy consumption. Careful menu planning across catering outlets, delivered food, conference and event catering can help to reduce this.

There is potential across all other categories, including 'other manufactured products', but this requires further investigation.

1 https://www.mitie.com/esg/

2 As an example, as part of Dell's Climate Policy Principles they commit to partnering "with our direct material suppliers to meet a science-based greenhouse gas emissions reduction target of 60% per unit revenue by 2030." We are assuming that reductions might be limited for more specialist equipment and have therefore adjusted potential reduction to 50%.

Interventions to reduce emissions

Student travel

There are a number of areas of student travel that are not currently captured in emissions calculations. These include:

- **Travel from non-University home to University** throughout the academic year.
- **Course related travel** (e.g. medical and teaching placements).
- **Co-curricular travel** (e.g. sports, societies etc).

It is currently assumed that formal curriculum-based travel (e.g. field trips) are booked through University travel providers and are therefore already captured under business travel emissions.

The impact of student travel was estimated at 18% of Higher Education footprint in the COP26 offsetting briefing. Using this percentage, student travel would account for 38,011 tonnes of CO_2e when compared with our updated carbon footprint. As a first priority this estimate will be checked in the 2022 travel survey before deciding on an approach to manage the associated impact.

Chapter 5

A Resilient Net Zero

Impact of climate change on Leeds

As part of the net zero consultation a review of UK Climate Projections 2018 UKCP18 was completed, with a focus on projections for the Leeds region.

Over the following decade the likelihood of warmer and wetter winters and hotter and drier summers will increase.

The following potential impacts were highlighted:

- Hotter extreme temperatures
- More rainfall in winter season
- A greater range of rainfall amounts
- Potential for flash flooding increases

From a University perspective, this poses risks across the estate. Three of these are highlighted in this report, but a full review will be commissioned within year one of net zero delivery.

The identified risks are:

- Damage to the estate through an increase in heavy convective storms. An increase in heavy rainfall and high summer winds could increase burden on infrastructure (such as drainage), increase storm related building damage and delay delivery programmes for capital projects.
- **Overheating of buildings.** The majority of the built estate has not been designed to account for future warming. There is a high risk that this could lead to parts of the estate becoming unusable in summer heat waves and leading to heat related health impacts.
- **Impact on the natural capital of the University.** There has been significant investment over the last 10 years to improve eco-system service provision on campus, with a particular focus on biodiversity; the well-being value of amenity space; air-quality and carbon storage. Despite this there has been increasing pressure through heat waves and tree diseases that have reduced this potential value. This pressure will only increase and will need to be actively managed.

Interventions to support a resilient net zero

As a first step we need to carry out a review to identify potential risks caused from existing and locked in climate change; understand how these interact with University operations and ensure we account for climate resilience in net zero delivery. The review will also include recommendations of how we adapt to these risks and embed mitigation of them into planning and delivery processes. Running concurrently to this we will raise awareness of the risks posed by climate change, with an initial focus on Estate Services staff.

There will also be a need to align the climate resilience review findings with University processes developed to embed sustainability into decision making.

Chapter 6

Just Transition

Just Transition

UNIVERSITY OF LEEDS

The impact of climate change will be felt most by those who lack the resources or capacity to adapt. In addition there is a risk that the costs of net zero solutions are unfairly distributed throughout society, or that these solutions are unaffordable.

We have identified the following areas that we feel are particularly sensitive, but will develop a method for reviewing social justice when developing and implementing our plans that aligns with regional and national strategies.

- Home working and increased energy costs.

As energy prices spike this winter due to natural gas supply issues, energy bills are likely to become problematic for more staff in the short term and potentially longer term. The opening up of campus and encouraging staff to return should help alleviate these issues.

- Cost of electric vehicles.

The upfront investment or leasing cost for electric cars is still too high for a majority for University staff. It is expected that this cost will reduce and second-hand availability will increase by the end of the decade. These costs will be monitored as part of future plans and used to inform policy decisions.

- Unequal access to career benefits of international travel.

Pre COVID-19, a strong international network, often built through regular travel was seen as a key part of academic career development. There is a risk that this maintained existing inequalities as the ability to travel regularly can be difficult for staff with young families, for health reasons and due to disabilities. There is therefore an opportunity to address these issues through designing new approaches for collaboration that focus on alternatives to travel.

- Using a fair proportion of electricity.

The pathway for reducing University scope 1 and 2 emissions is largely built on increased electrification. Although the national electrical grid is being upgraded to support a shift towards electrification, the level of investment required will be informed by the level of energy efficiency organisations take on. Simply put, the greater the demand on the grid the greater the cost of upgrade will be, which ultimately will be spread through society. Demand reduction in the University plan must continue beyond 2030 and look at opportunities to reduce electrical demand through low-cost options such estate/equipment rationalisation and behaviour change.

- Recognising and considering the wider community impact.

Although many aspects of net zero delivery should create wider benefits for Leeds, including cleaner air, it is important to review the implications of any plans. Problems are more likely to occur when investing in off-site renewable energy and land-based off-setting activity.

Chapter 7

Net Zero Outline Budget

Net Zero Outline Budget

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Outline cost of delivery

The following table outlines the total cost involved in delivering scenario B 'light retrofit and full electrification of heat' up until 2030.

The year 1 budget requirement is c.£7m.

- Demand reduction: £112m
- Decarbonisation of energy supply: £34.2m
- Onsite renewable energy: £1m
- Better building use: £4.6m
- Zero carbon fleet: £0.5m
- Sustainable travel infrastructure: £0.5m
- **Total: £152.8m**

Reducing operating costs

The focus of this plan and the Pathway to Net Zero has been on delivering net zero, while minimising capital investment cost.

Currently there is a substantial uplift in operating cost over the period up to 2030 due to the high cost of electricity and relatively low cost of natural gas. It is expected that this gap between the cost of electricity and gas will reduce through the following decade as the UK takes a strategic decision to move away from natural gas electricity generation. However, we have not modelled this into cost estimates due to a lack of robust predictions.

Clearly, reducing these operating costs must be a priority. This will form part of year 1 feasibility, but for now the following have been identified as requiring further investigation. They have the potential to substantially reduce operating cost, but some would require additional capital investment.

- Direct investment in off-site renewable energy generation and considering a phased approach, with some investment early on in the 2020s.
- Using high temperature air source heat pumps for additional buildings across campus.
- Offering grid balancing services, therefore generating a source of income.
- Start forecasting potential increases in gas costs and impact on business as usual (BAU) emissions versus planned reductions
- Future technology improvements or new approaches to balancing emissions could reduce emissions further or reduce offsetting costs by 2030.
- Monitor availability of appropriate central government funding for net zero delivery.

Managing risk

In the process of moving from the planning phase to the delivery of net-zero we have a risk matrix that has been used to inform the delivery of the plan. The risk matrix will be reviewed and updated on an ongoing basis. The most recent risk matrix can be supplied on request.

The University of Leeds
Pathway to Net Zero Emissions by 2030

Published December 2021

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