

# UNIVERSITY OF READING

## CARBON & WATER MANAGEMENT PLAN



**2016-2021**

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**Note:** The standard UK unit for the measurement of greenhouse gas emissions is tCO<sub>2</sub>e; tonnes of carbon dioxide equivalent. This converts the various types of greenhouse gas to the equivalent tonnes of carbon dioxide. Throughout this document, tCO<sub>2</sub> is used as shorthand for tCO<sub>2</sub>e.

## FOREWARD

The University is rightly proud of hitting its 35% carbon reduction target in 2016. As a leader in researching and teaching in the field of global climate change, we understand the importance of showing leadership in reducing our own environmental impact. At the same time, we have demonstrated that reducing our carbon emissions makes good business – as well as good environmental – sense.

We are committed to building on this success as we work to embed a culture of sustainability throughout our operations. At a time of growth for the University, we are committed to reducing our emissions on an absolute basis, to 45% below our 2008/09 baseline by 2021.

Undoubtedly, there will be challenges along the way. So we will need to innovate and adapt to ensure we are up to the task that we face. However, by being focused and showing dedication and enthusiasm, I am confident that we can maintain our position as a leader in effective environmental management.

Sir David Bell KCB

Vice Chancellor

## EXECUTIVE SUMMARY

The University of Reading has committed to reducing its carbon emissions by **45% by July 2021**, with a further aspirational target of **50% by July 2026**, demonstrating continued leadership in reduction of its environmental impacts.

These ambitious targets build on the excellent performance of our original carbon management programme, which has **delivered** in the region of **£17.1 million cumulative savings**, from an energy efficiency investment of approximately £4 million.

This new programme of work will require further significant **investment of £6.2 million by 2021**, which is anticipated to return **cumulative savings to the University of £10.4 million** over this time. Whilst a large proportion of this funding is expected to come from internal revenue streams, alternative funding options will also need to be explored to ensure the programme is resilient.

The scope of the carbon target has been subject to final review to ensure it remains relevant, with a slight net increase in overall emissions covered, due to the expansion of the scope in relation to air travel emissions, and the removal of properties which are not under the University's operational control.

The programme will continue to exploit technical opportunities to improve efficiency, increasingly in IT solutions as well as through improved building plant. Ensuring an ethos of sustainability is embedded throughout the University will be an increasing focus, both for this programme and the wider sustainability agenda. Ensuring local as well as central ownership for reducing the University's environmental impacts will also be crucial.

# INTRODUCTION

Over the last few years, the University of Reading has established itself as a leader in reducing carbon emissions from its operations, complementing its long-established research reputation for the impacts of rising carbon emissions on the global climate.

This document details the University's plans for reducing its carbon emissions up to 2021, as well as outlining its longer-term 10 year ambition, in line with the wider University Strategy to 2026.

Set out here is the business case for continued action in financial terms. The University's original 35% carbon reduction target has now been met, delivering cumulative savings for the University of around £17.1 million, from an energy efficiency investment of close to £4 million.

Of course, financial savings are not the only driver for continued action. Strong leadership in sustainability supports the University's 2026 strategy for 'Securing and sustaining societies'<sup>1</sup>. The need for, and commitment to, tackling carbon emissions globally has recently been underlined with 177 countries ratifying the new Paris Agreement, recognising the need to "...limit global average temperature rises to well below 2 °C above pre-industrial levels... to reduce the risks and impacts of climate change"<sup>2</sup>. The University's commitment to action demonstrates to our own students, our own staff, and on a much wider scale the importance it places on taking action to reduce its environmental impacts.

The University's Sustainability vision is to be:

*"...a leader in reducing its impacts on the local as well as global environment, by embedding a culture of sustainability throughout its teaching, research and operations."*

This plan, and its associated targets, are a core part of realising this vision.

## TARGETS

### Target milestones

In 2011, the University set at an ambitious 35% carbon reduction target by July 2016 against a 2008/09 baseline. This target was met in December 2016, and it is therefore timely to take stock and consider the University's future ambition and associated targets for carbon reduction. The next key target years will be 2021 and subsequently 2026, which ensure regular 5-year milestones and align with both the current 2026 Estates Strategy and the overarching University Strategy.

The University's original 2011 Carbon Management plan had proposed a 45% target for 2020, aligned to sector wide targets from HEFCE to achieve 43% absolute reductions collectively by this date<sup>3</sup>. However, 2021 is now considered a more appropriate target date for the University as it aligns better with the major capital development programme. Progress against this target will continue to be reported annually.

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<sup>1</sup> "University Strategy 2026", University of Reading, available at: <https://www.reading.ac.uk/web/FILES/us2012/Vision-Ambition-Strategy-2026.pdf>

<sup>2</sup> "Paris Agreement", United Nations 2015 – available at: [http://unfccc.int/files/essential\\_background/convention/application/pdf/english\\_paris\\_agreement.pdf](http://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf)

<sup>3</sup> "Carbon reduction target and strategy for higher education in England", Jan 2010, HEFCE (Higher Education Funding Council for England) – available at: <http://www.hefce.ac.uk/pubs/year/2010/201001/>

# Targets

## *Absolute targets*

Compared to the baseline year of 2008/09:

- **The University will target a 45% absolute carbon reduction by July 2021.** This will be a challenging target in what is expected to be a period of sustained growth for the University, but as the following pages demonstrate, a target which is also achievable with the investment and right management. Achieving the target will to some extent depend on how the University's capital development programme progresses in the coming years. Reductions of 42% - 47% are believed to be achievable by 2021, depending on the timing of specific projects, and 45% is therefore seen as an appropriate target.
- **The University has set an aspirational target of 50% absolute carbon reduction by 2026.** Further work and review will be required to ensure this remains appropriate and deliverable in the coming months and years.

## *Relative targets*

Whilst the University is committed to reducing its carbon emissions in absolute terms, it is also appropriate to set further relative metrics, to enable measurement of our performance in a number of different ways.

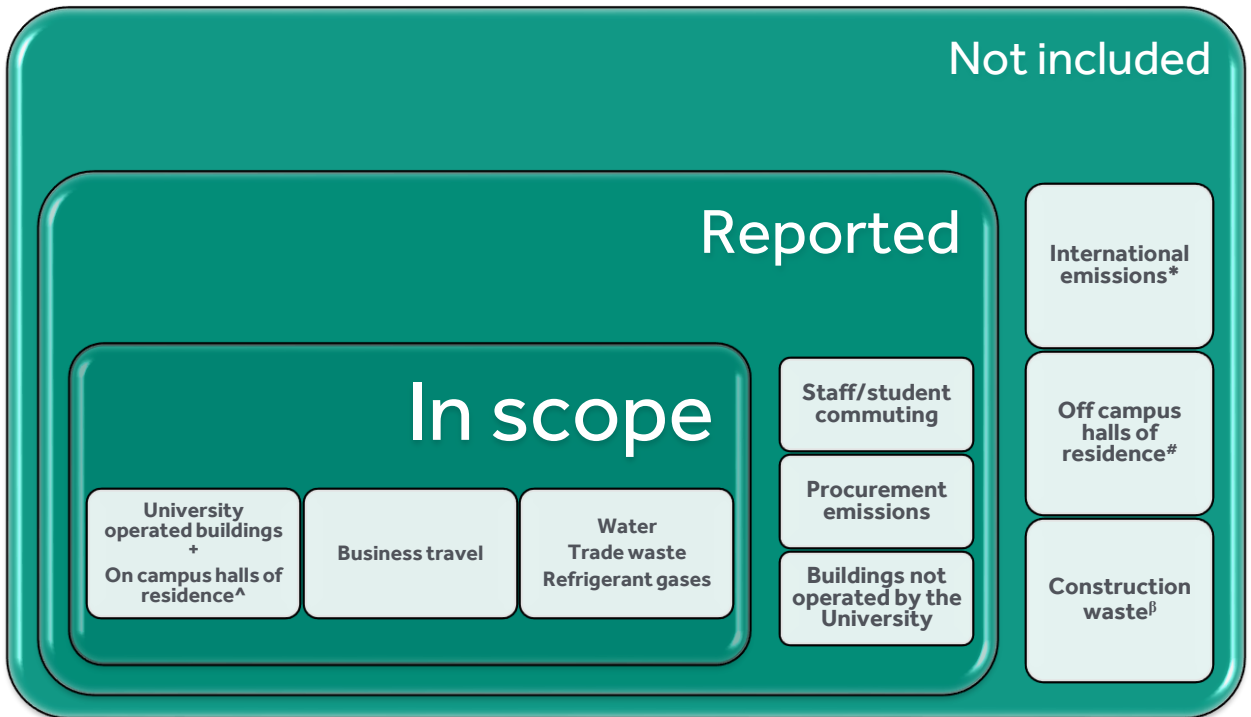
Relative targets will be further developed to ensure that appropriate measures are introduced which relate performance to other key metrics for the University, such as:

- Reduction in CO<sub>2</sub>/m<sup>2</sup> floor space
- Reduction in CO<sub>2</sub> per student
- Reduction in our CO<sub>2</sub>/£ income

Sources of such data will need to be clearly identified and defined to ensure consistency and transparency in measurement.

# SCOPE

It is important to establish what is, and what is not included within the scope of the carbon reduction target. The University aims to comply with the International Greenhouse Gas (GHG) Protocol, and has established the following scope for its emissions reporting:



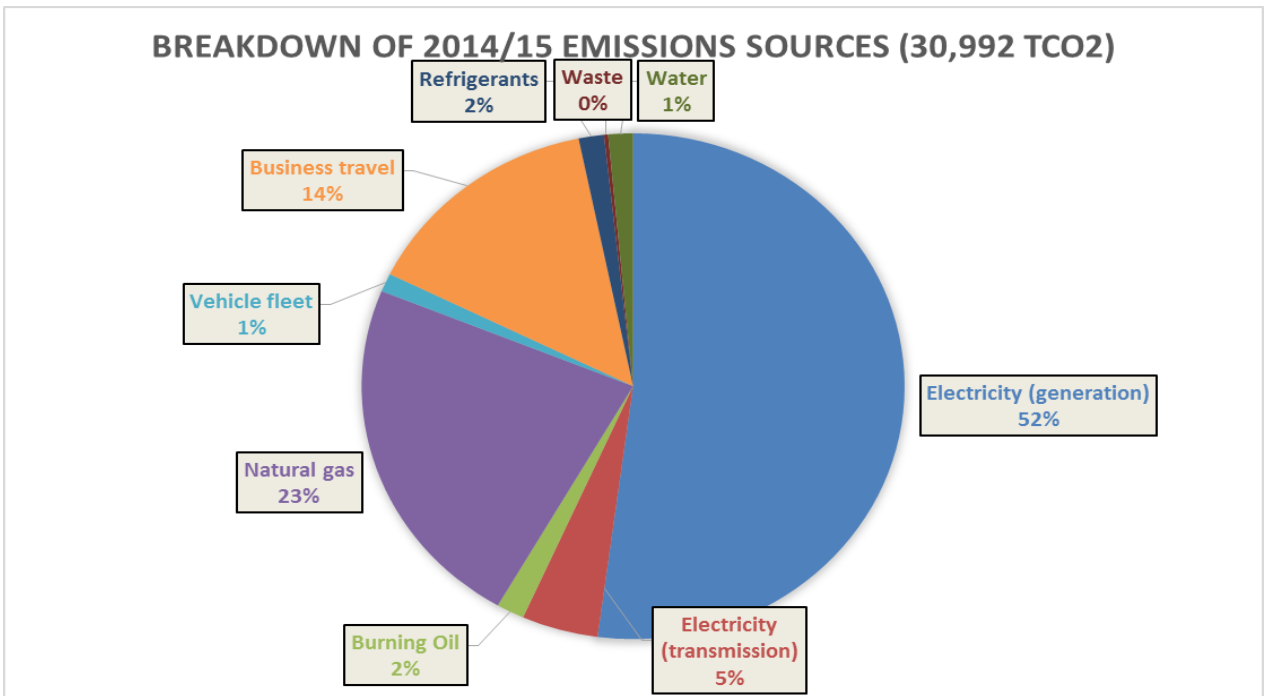
\*Travel emissions in relation to UK operations are included as 'in scope' business travel

#UPP, who own the halls, have committed to pro-actively help the University reach its carbon targets

βThe removal of mandatory Site Waste Management Plans means construction waste is no longer centrally recorded

^Including Wantage Hall, which is part of the central Whiteknights' supply

To put this into perspective, the graph below shows how these 'in scope' emissions breakdown:

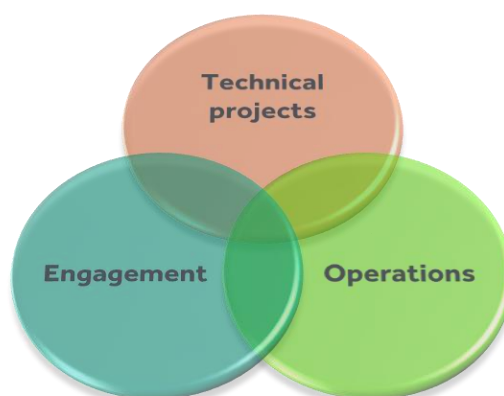


It should be noted that the scope reflects a change to that set out in the original 2011 Carbon Management Plan, to exclude properties which are not under the University's operational control and include the impacts of 'radiative forcing' from air travel. This has been agreed in order to more appropriately reflect the scope of emissions over which the University has influence. Care must be taken to ensure that any reporting of progress compares data on a like-for-like basis, and for this reason, the 2008/09 emissions baseline has been re-baselined as follows:

Source	Scope <sup>4</sup>	tCO <sub>2</sub>	Comments
Electricity (generation)	Scope 2	17,764	
Electricity (transmission/distribution)	Scope 3	1,381	<i>n/a to onsite generation (e.g. CHP, solar)</i>
Burning Oil	Scope 1	1,544	
Natural Gas	Scope 1	12,937	
Vehicle Fleet	Scope 1	138	
Business Travel	Scope 3	5,036	<i>Inc international travel relating to UK operations</i>
Business Travel - radiative forcing	Scope 3	4,045	<i>A measure of the additional environmental impact of aviation emissions at high altitude</i>
Refrigerant gases	Scope 1	207	
Water	Scope 3	711	
Trade waste	Scope 3	220	
<b>Total</b>		<b>43,983</b>	

## THEMES & PROJECTS

The carbon reduction programme is designed around 3 inter-connected themes, explored in turn over the following pages:



<sup>4</sup>'The Greenhouse Gas Protocol – A Corporate Account and Reporting Standard, Revised Edition', World Resources Institute - available at: <http://www.ghgprotocol.org/files/ghgp/public/ghg-protocol-revised.pdf>

## Technical Projects

There are many technical solutions to reduce the University's carbon emissions and water consumption, and new technologies continue to emerge offering increased efficiency at lower cost. This section details the projects currently identified as feasible to deliver the University's 2021 targets. Whilst this will form the basis of the delivery programme, a degree of flexibility is essential to recognise that some solutions may not be as effective as currently forecast, whilst new solutions may emerge.

Appendix 1 provides a tabular summary of the proposed projects.

### *Heating & hot water plant*

Heating and hot water accounts for 50% of the University's energy consumption, therefore delivering lower carbon heating solutions is a key focus for continued carbon reduction. With this in mind, a feasibility study is already underway to assess low carbon heating opportunities across the 3 main campuses.

At Whiteknights, the University's new district heating network already feeds 16 buildings on the Whiteknights campus. Extending this network to other campus buildings, to provide lower carbon heating, hot water and potentially cooling solutions, provides a significant opportunity for further carbon savings.

The Henley Business School's Greenlands campus is heated by local oil-fired boilers, a particularly carbon intensive and expensive system to run. With no mains gas supply nearby, alternative low-carbon heating solutions are being considered to maximise carbon savings. The Government's Renewable Heat Incentive (RHI) make this a potentially attractive solution to prioritise early.

The London Road campus was substantially refurbished in 2011, so any opportunities for carbon savings from different heating systems are likely to be considered as longer-term potential projects.

A further high-impact opportunity with short paybacks is a comprehensive review and upgrade programme for pumps to heating systems across the estate.

**Target annual carbon savings by 2021:** 700 tCO<sub>2</sub>

**Target annual £ savings:** £237,000 (*including potential RHI income for Greenlands*)

**Anticipated investment:** £2,100,000

### *Heating & BMS controls*

An ongoing programme for recommission existing HVAC (heating, ventilation and air conditioning) systems is delivering significant energy and carbon savings, ensuring the systems operate in as efficient manner as possible for the current use of the buildings. This ranges from simple control adjustments, to complex reprogramming of the BMS (building management system) and installing additional sensors to provide closer system controls. Rolling out this programme estate-wide will be an important early project to deliver.

Aligned to this is the need to ensure buildings are continuously commissioned, so that their energy performance does not deteriorate over time. There are now a number of software solutions on the market which can combine energy data with BMS data to provide intelligent solutions for continuous commissioning, and are expected to be able to help maintain delivered savings as well as identify new savings opportunities in the future.

Further control improvement opportunities exist, in particular to improve heating zoning in buildings, and to reduce instances where heating and cooling systems are competing with each other. This work is best carried out as part of wider upgrade works through the Planned Maintenance Programme.



Finally, ensuring all heating and ventilation systems are connected and controlled by the central BMS, and closely matched to actual occupancy demands (e.g. through the use of occupancy and CO<sub>2</sub> sensors) is important for optimal use.

**Target annual carbon savings by 2021:** 575 tCO<sub>2</sub>

**Target annual £ savings:** £158,000

**Anticipated investment:** £565,000

## ***Ventilation***

The University's fume cupboard efficiency upgrade programme is largely ventilation related, and an early priority will be to complete that programme of work, in line with the funding support from HEFCE's Revolving Green Fund. An efficiency review of LEV (local exhaust ventilation) systems in science laboratories offers a further opportunity to reduce energy consumption in the future.

Motors, pumps and fans are the core energy-using elements of ventilation systems. Motor technology and efficiency standards have improved significantly in recent years, and a programme of upgrades can deliver further savings with short paybacks.

**Target annual carbon savings by 2021:** 305 tCO<sub>2</sub>

**Target annual £ savings:** £101,000

**Anticipated investment:** £320,000

## ***Air Conditioning***

Significant savings can be delivered by ensuring air conditioning systems more closely match the usage of the spaces they cool, both through further BMS connections as well as intelligent occupancy and CO<sub>2</sub> level controls. A comprehensive audit of all systems was completed in 2015, and an energy efficiency improvement programme is now being developed.

Alternative technical solutions are also increasingly available for mechanical cooling, including the potential for linking large-scale cooling provision with the district heating network, or the use of phase change materials within cooling systems. These can provide additional saving opportunities in the future.

**Target annual carbon savings by 2021:** 350 tCO<sub>2</sub>

**Target annual £ savings:** £118,000

**Anticipated investment:** £350,000

## ***Lighting & controls***

There are opportunities for lighting and control improvement across the estate, building on a number of projects implemented through the Carbon Management programme to date. Lighting technology continues to develop rapidly, and LED solutions are increasingly become the default solution for lighting.

Sustainability Services' Research Engineer has specifically been looking at the design of lighting control systems in the context of real-life control behaviour, and we will be looking to capitalise on this knowledge to improve the solutions for lighting controls in the future. Making better use of existing control systems is an opportunity for cost-effective savings.

Sustainability Services are increasingly joint-funding lighting improvement projects, particularly with the Maintenance team and these opportunities are expected to increase in the future.

**Target annual carbon savings by 2021:** 550 tCO<sub>2</sub>

**Target annual £ savings:** £208,000

**Anticipated investment:** £1,270,000 *(including contributions to jointly-funded projects)*

## Energy Supply & Low/Zero Carbon Technologies

The continuously evolving Government policy support for renewable energy has hampered the University's ambition for wider adoption of renewable energy technologies. Nevertheless, future opportunities for solar photovoltaics in particular are anticipated, especially where other work is planned, including new buildings and major refurbishments.

There is expected to be increasing pressure on large energy consumers such as the University to reduce their energy use during peak hours of demand and this is resulting in a whole host of emerging opportunities for energy and financial savings. A review of opportunities for peak demand reduction is planned for 2016/17, including through load shedding and automated demand response. The resulting opportunities may not only save energy and carbon but could also potentially provide an additional income stream for the University, through new Government incentive schemes.

**Target annual carbon savings by 2021: 300 tCO<sub>2</sub>**

**Target annual £ savings: £103,000 (including income streams)**

**Anticipated investment: £700,000**

## Monitoring, Measurement & Targeting

The University has invested in significantly improved metering in recent years, and its standard metering specification is now applied to all new projects. This provides significantly improved opportunities to identify energy and water wastage, as well as to measure and verify the impacts of investment initiatives.

Whilst many buildings are now separately metered, further opportunities will be sought to ensure all suitable buildings have separately meter utilities supplies. In addition, where this is considered cost-effective, temporary or permanent building sub-metering will be installed as part of energy and water saving projects.

There are an increasing number of software solutions which can combine BMS and utilities data to intelligently identify opportunities for energy savings. This may well align with solutions for continuous optimisation, and suitable solutions will be trialled and implemented.

**Target annual carbon savings by 2021: 500 tCO<sub>2</sub>**

**Target annual £ savings: £120,000**

**Anticipated investment: £250,000**

## Water Efficiency

A review of water consumption across the Whiteknights campus was carried out in 2016. This has highlighted opportunities for water savings in 2 broad areas; washroom provision and science laboratory equipment. Water reduction targets, compared to a 2011/12 baseline, have been agreed for July 2021 as follows:

	Non-residential	Residential*	Combined
<b>Base target</b>	30% reduction	5% per capita vs 2015/16	5% increase
<b>Stretch target</b>	35% reduction	5% per capita vs 2015/16	0% increase

*\*Halls of residence operated by UPP*

Base and stretch targets are defined, depending on the available funding. Further details on the basis for these targets, and the proposed projects to deliver them, are published in the separate "Water reduction plan 2017-2021".

Reducing water consumption can have a mixed impact on carbon emissions. The treatment of both supply water and waste water requires energy, so reducing water consumption can therefore reduce its associated emissions. However, solutions to reduce water may sometimes involve technologies which use more energy; therefore a balance needs to be struck to deliver solutions which have the lowest overall environmental impact.

# Operational Projects

## *IT*

IT is an ever growing part of modern life, yet there are potentially a number of ways in which IT can deliver energy savings, from more efficient hardware, to different data housing solutions.

Initially, some exploratory work is proposed to investigate opportunities for long-term energy savings, as well as to better understand the likely increasing demands for IT solutions in the coming years. The work will need to take account of existing and planned programmes of work within IT, as well as considering new opportunities.

**Target annual carbon savings by 2021:** 300 tCO<sub>2</sub>

**Target annual £ savings:** £66,000

**Anticipated investment:** £300,000

## *Business Travel*

Business travel emissions account for 14% of the University's total carbon footprint. As the built estates' emissions shrink, business travel takes increasing prominence for carbon reduction initiatives. The University's internationalisation strategy means international business travel is likely to increase.

Ensuring viable alternatives to travel are available, when practical, will be important, with a particular focus on opportunities for improved video, telephone and online conference facilities. This will require close working with IT, as well as with potential users of such technologies to ensure they are 'fit for purpose'.

Wider opportunities for promoting low carbon alternative travel options will also continue to be sought. The 2016 biennial travel survey will help inform suitable opportunities for improvement.

**Target annual carbon savings by 2021:** 200 tCO<sub>2</sub>

**Target annual £ savings:** £43,000

**Anticipated investment:** £100,000

## *Commuter travel*

Commuter emissions are excluded from the scope of the University's carbon reduction targets. Nevertheless, the University will continue to report on its commuter-related emissions, and continue its work in promoting more sustainable transport options for both staff and students.

## *Procurement*

Procurement decisions across the University inevitably impact energy use, whether through the equipment bought, services supplied or contracts awarded. Many of these areas are already covered under the technical and engagement projects, however the University's understanding of sustainable procurement is still developing, and it will be important for Sustainability Services to continue to work closely with Procurement.

Whilst being excluded from the scope of the carbon reduction targets, the University will continue to report on its procurement-related emissions, and work to improve its understanding of these emissions for the future.

# Engagement Projects

## *Behaviour change and departmental equipment*

Engagement and behaviour change initiatives are essential elements in delivering sustained carbon and water savings. With a constant turnover of students, and staff, behaviour change at the University can never be considered 'completed'. However, delivering a combination of long-term change as well as short-term interventions are important to strike a balance between sparking people's interest and delivering sustained savings.

A behaviour change plan is being developed, which is likely to include opportunities to:

- Reduce out of hours energy and water consumption
- Save energy and water in science laboratories
- Incentivise departments to save energy and water
- Increase consultation and visibility on Sustainability investments, including with Heads of School
- Ensure capital investments are complimented by user engagement
- Review and refresh well-supported initiatives such as NUS Green Impact and Blackout events

In addition, there will be an increased focus on improving the efficiency of departmental equipment, including potentially part-funding more efficient equipment alongside behaviour change initiatives. This is particularly opportune in science laboratories with a large range of plug in equipment, which can account for 15% - 25% of total energy consumption<sup>5</sup>. This overlaps with the Procurement theme above.

**Target annual carbon savings by 2021:** 450 tCO<sub>2</sub>

**Target annual £ savings:** £100,000

**Anticipated investment:** £235,000

## *Research and teaching*

Sustainability Services works closely with academic colleagues, particularly in the School of the Built Environment, delivering occasional lectures and supporting numerous undergraduate and post graduate projects and dissertations.

There are clear synergies with the team's work and the University's wider teaching and research agendas. Opportunities will be sought to ensure existing relationships are cemented, and wider relationships developed as the carbon management programme progresses.

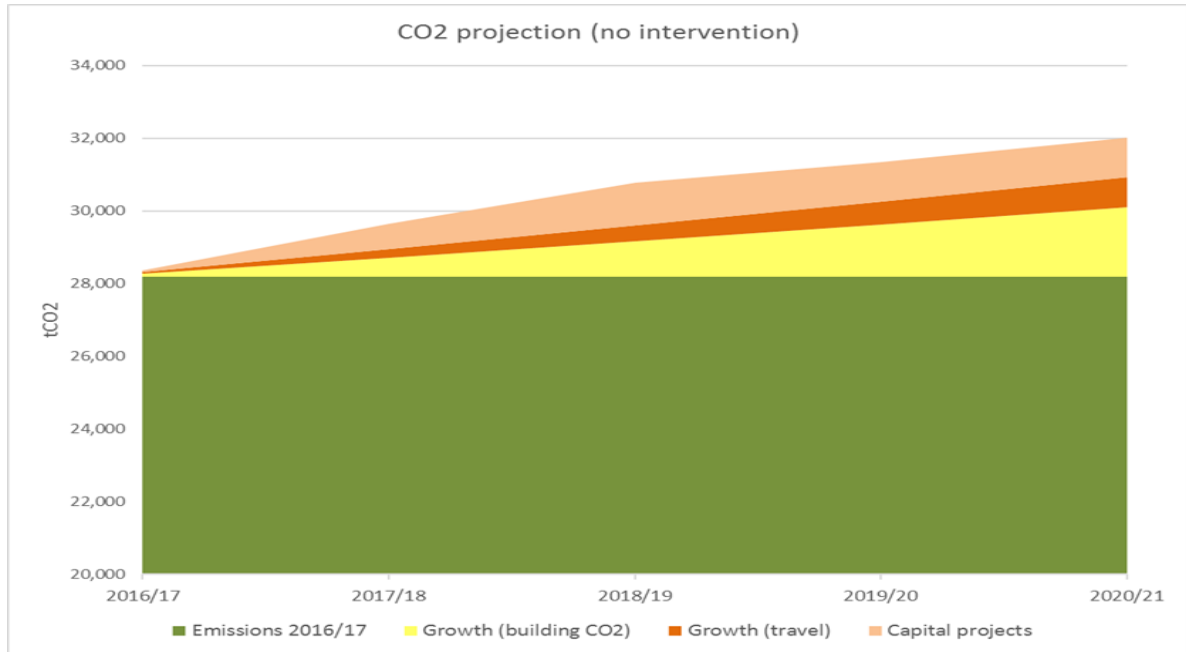
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<sup>5</sup> 'Laboratories: Detailed Results from S-Lab Audits', S-Lab, July 2011 – available at: <http://www.effectivelab.org.uk/publications.html>

# CARBON PATHWAY

## Business As Usual

The University has ambitious growth plans for the coming years. Without intervention, this is likely to result in a significant increase in the University's carbon emissions. The graph below shows anticipated carbon emissions to 2021 without further intervention:

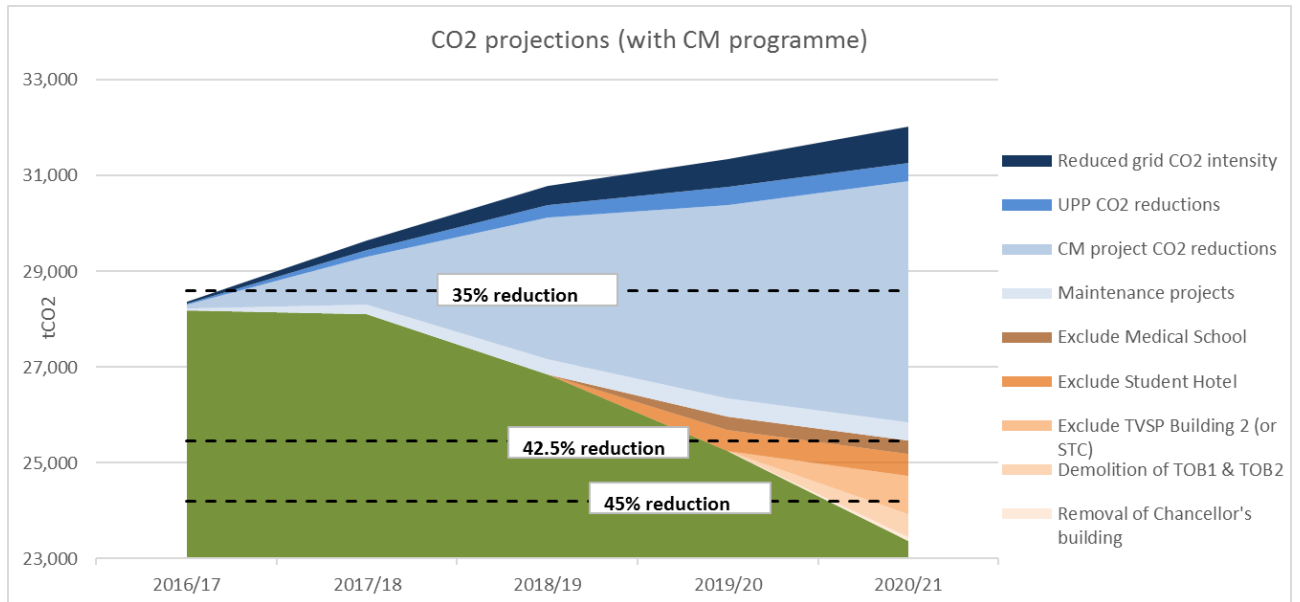


Assumptions:

- Major capital estate developments are:
  - Health & Life Science building replacing AMS, Knight & Harborne (and Engineering)
  - Library refurbishment complete
  - URS refurbishment not progressed and building remains operational 8am-10pm
  - TOB1, TOB2 and Chancellors remain in operation
  - No Henley Business School extension
  - Student Hotel, and one additional building of 3,500 m<sup>2</sup> built
  - 2 Thames Valley Science Park buildings open under University operational control
- Including all UK premises under operational control of the University, plus on-campus halls of residence
- Unabated building emissions growth of 2%/annum (*allowing for student growth in addition to that already accounted for in capital building projects*)
- Unabated travel emissions growth of 3%/annum (*based on current trend and internationalisation goals*)
- Grid electricity decarbonises at average 1.5%/annum

# Reduced Emissions Scenario

The 'Business As Usual' scenario sets the basis from which the University needs to reduce its carbon emissions if it is to meet its ambition 45% carbon reduction target by 2021. The graph below shows how the proposed carbon management programme can deliver this target.

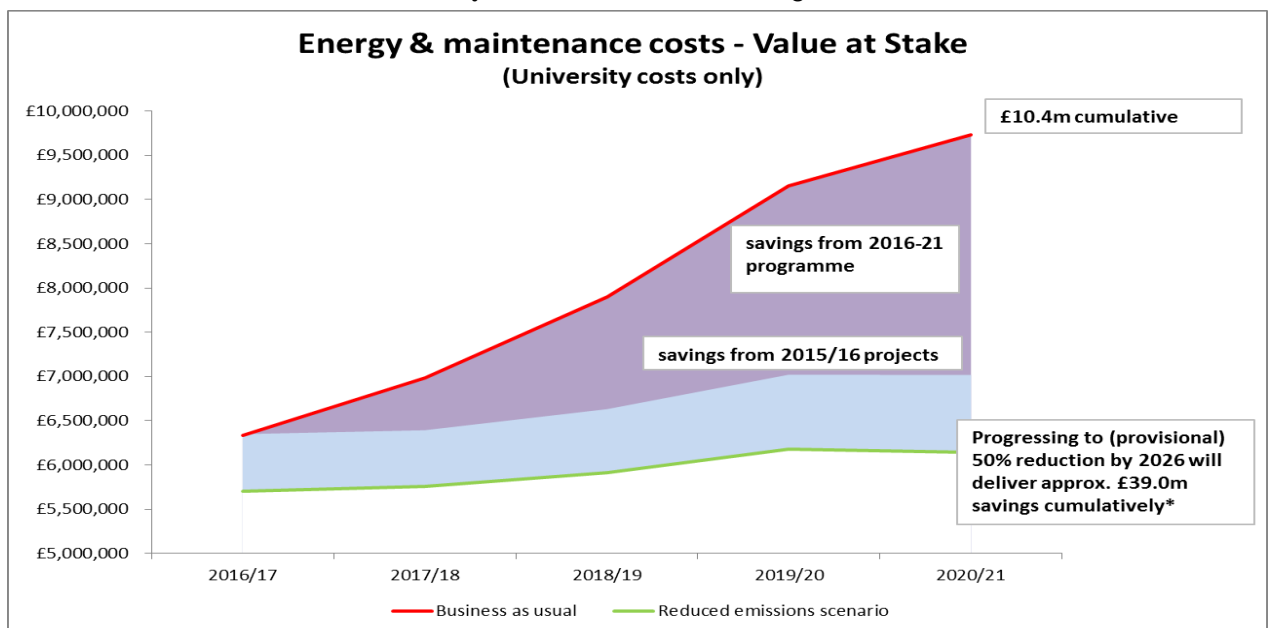


As the above graphic shows, the delivery of the 45% target is to some extent dependent on how the University's capital development programme pans out in the coming years, and the impact of different scenarios are shown above. This suggests a range between 42% - 47% absolute reduction under a variety of different estate scenarios, and 45% is therefore seen as an appropriate target.

# PROGRAMME BUSINESS CASE

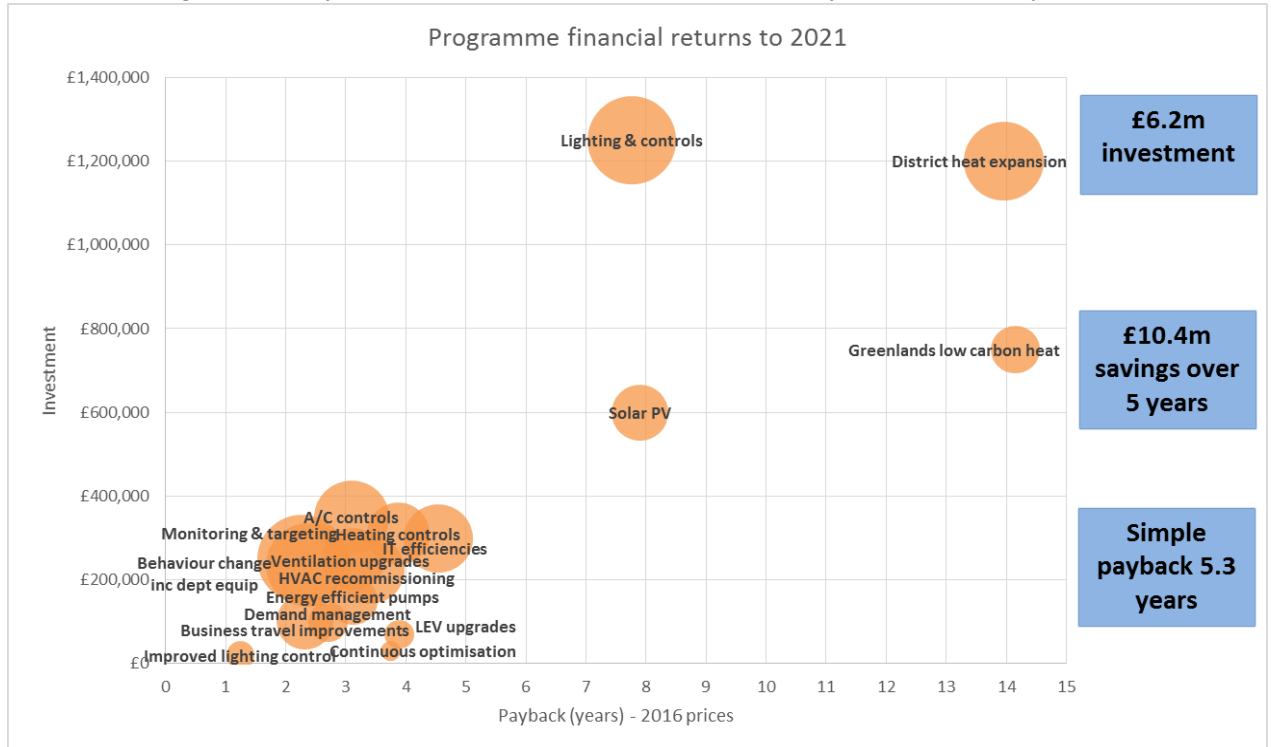
## Financial benefits

There is a very strong financial case for the 2021 carbon reduction programme. The graph below illustrates the financial case for delivery of the 45% reduction target:



\*An associated, costed programme of work to be delivered 2021-26 is yet to be established

The 'Value at Stake' is the difference in projected energy costs between a 'Business As Usual' scenario and delivering the 45% carbon reduction target, amounting to £10.4 million by 2021. This compares favourably to the required investment of £6.2 million. The graph below illustrates the importance of taking a holistic programme approach, with some large potential carbon saving opportunities complimenting quicker payback opportunities to deliver a simple payback of just 5.3 years.



(Circle sizes represent size of CO2 savings)

Of course, the savings from projects delivered through the original 2011-2016 Carbon Management Plan will also continue to accrue; with a further **£30.6 million** of cumulative savings amassing compared to a 'business as usual' scenario by July 2021.

## Non-financial benefits

The University is a leader in climate change research, low carbon building design and environmental studies, and strives deliver strong environmental as well as financial sustainability in its operations.

By July 2016, cumulative carbon emissions had been reduced by approximately 58,500 tCO<sub>2</sub> since 2008/09, and delivering a 45% reduction target by 2021 will have increased this cumulative reduction to approximately 175,000 tCO<sub>2</sub>. This is equivalent to emissions from all the households in Reading Borough for 9 months<sup>6</sup>. The time for action on climate change has never been more pressing, and the recent Paris Agreement on global emissions reductions has demonstrated a renewed international commitment to delivering a lower carbon future.

The higher education sector as a whole is struggling to deliver against its ambitious targets to reduce its carbon emissions by 43% by 2020, for a variety of reasons. Against this background the University of Reading is well-placed to demonstrate what can be achieved in the right circumstances and with the right programme. Delivering the target 45% reduction in emissions by 2021 will confirm our position as one of the leading universities in this field.

<sup>6</sup> Source: "2005 to 2015 UK local and regional CO2 emissions – data tables.xlsx" – available at: <https://www.gov.uk/government/statistics/uk-local-authority-and-regional-carbon-dioxide-emissions-national-statistics-2005-2015>



At a local level, the University continues to be an active member of the Reading Climate Change Partnership, and delivering sustained savings through cost-effective action can help be a catalyst for action in the local region.

Saving carbon, energy and water has wider benefits within the University which should not be overlooked. Often, delivering more efficient operations goes hand in hand with delivering more comfortable work and study environments.

## FUNDING

There are a number of funding options available, as outlined in the table below. As for the 2011-16 programme, a combination of funding routes will be used to fund the programme. Funding streams to complement the available internal revenue funding will be fully investigated now that the carbon reduction targets have been agreed for 2021.

Funding option	Benefits	Drawbacks
Internal revenue funding	Straightforward Low administration burden University gets maximum benefits	Competition for revenue funding University-wide
In-year revenue savings	Very short payback opportunities funded from associated savings achievable in year	Generally only applies to limited, small-scale opportunities
Salix Finance funding	0% interest loan Independent verification of projected savings Opportunities for funding 'programmes of work' are expanding No revenue investment for University	Potential 5-year payback limit Potential limited time to implement
HEFCE Revolving Green Funds	Similar to Salix Finance but with extended delivery times and allowable paybacks	Existence of future funding streams uncertain and sporadic
Community-benefit funding	No revenue investment for University Good publicity and potential to involve staff/students Could involve wide range, or specific focussed projects beyond traditional paybacks Independent verification of savings will be an integral part	Complex negotiations Considerations of long-term ownership of plant University will share savings achieved with community organisation for prescribed time Independent verification of savings will be essential
ESCo funding	No revenue investment for University Good publicity and potential to involve staff/students Independent verification of savings will be an integral part	Complex negotiations Considerations for long-term ownership of plant University will share savings achieved with ESCo for prescribed time Independent verification of savings will be essential

# **GOVERNANCE**

The Carbon Management Programme, ratified by the Vice Chancellor, Sir David Bell, is overseen at a senior level by Professor Robert Van de Noort, Pro-Vice Chancellor for Academic Planning and Resource. Professor Van de Noort chairs the Estates & Facilities Committee to which the Programme reports, which in turn reports to the University Executive Board. The programme is managed operationally by the University's Energy Manager, Dan Fernbank.

The University is one of only a handful to currently have its energy management system certified to the international ISO50001 Energy Management standard, providing external assurance of the robustness of the programme's governance.

## **Project Prioritisation**

A comprehensive Opportunity Log is maintained of all identified potential carbon and water reduction initiatives, with individual opportunities ranked in 4 categories to help develop prioritised annual programmes of work. This is informed by the University's Energy Review Tool, which rates buildings' energy efficiency across a range of different technologies, helping to understand the potential for carbon savings in each building and further informing the prioritised programme of work.

This is integral to the University's ISO50001 energy management system and ensures a robust approach to the prioritisation of initiatives. Approval of the annual programme of works rests with the Estates & Facilities Committee.

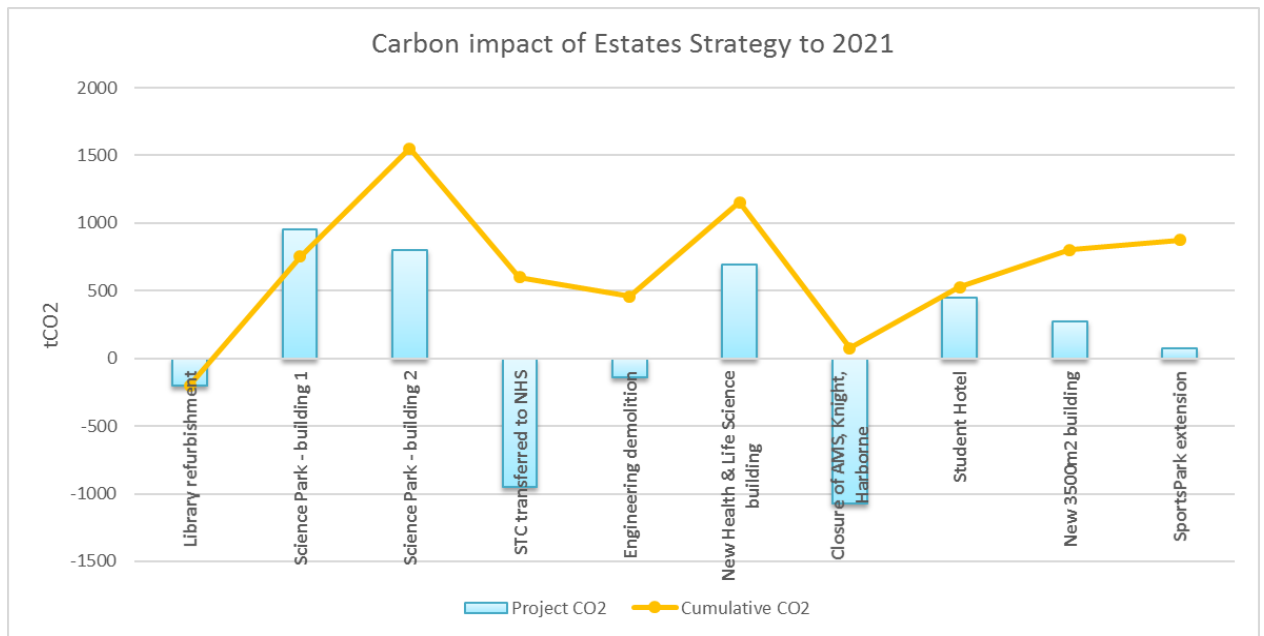
## **Progress Reporting**

Progress of the programme is formally reported on annually, after the end of each financial year. Internal tools have also been developed to help keep track of emissions through the year and ensure any issues are identified and mitigated at an early stage.

# INTERFACES

## Estates Strategy

The University has a large development programme in the coming years. Taking steps to minimise the impacts of, and maximising the potential from this programme of works is an important factor in delivering the 45% carbon reduction target for 2021 and moving towards halving the University's emissions by 2026. The graph below shows the estimated net impact of the key projects to 2021, which is also factored into the Business As Usual graph on page 14.



As well as ensuring good design of new/refurbished buildings, it will be equally important to ensure that the buildings perform as well 'in use' as in design. This will be explored further through the 'Soft Landings' approach where this is adopted, or through more bespoke approaches where required.

## Halls of Residence

In 2011, the University transferred management of its halls of residence to UPP on a 125 year lease. Whilst the University no longer has operational control of these buildings, both organisations are keen to continue to actively manage the halls' environmental impacts, and UPP have committed to proactively helping the University to delivering a 45% carbon reduction by 2021.

Target annual carbon savings by 2021: 470 tCO<sub>2</sub>

# RISK MANAGEMENT

Listed below are the currently identified key risks to delivering the 45% carbon reduction target by 2021. This Risk Matrix will be actively managed to ensure programme risks are reviewed and responded to on an ongoing basis.

Risk	Impact (H/M/L)	Probability (H/M/L)	Actions taken/proposed
UK's grid electricity decarbonises less than anticipated	H	L	Conservative view taken. 2016 emission factors already show further significant drop. Specifically reported as a separate line within Plan to be able to report against
Student numbers grow faster than anticipated	M	M	Student growth built into model, along with anticipated carbon impact of additional buildings to accommodate
Delays to major capital project works	M	M	Carbon milestone year moved from 2020 to 2021 to mitigate potential impacts. Carbon Trajectory Tool enables impacts to be simply monitored and tracked
Failure to close TOB1, TOB2 in timescales anticipated	M	H	Carbon milestone year moved from 2020 to 2021 to mitigate potential impacts listing.
Temporary Chancellor's building retained longer than anticipated	H	H	Key risk to delivery of 2021 target. Noted separately on Reduced Emissions Scenario to note potential impact.  Carbon milestone year moved from 2020 to 2021.
Travel emissions grow faster than anticipated	M	M	Annual growth factored in, and projects proposed to address growing travel emissions
Severe hot/cold weather impacts carbon emissions adversely	M	L	Improved HVAC controls and continuous commissioning programme should limit impacts. Consumption is weather-adjusted
Required funding for programme is not available	H	M	Range of funding options are available and are being actively explored
Savings from proposed projects are not realised	H	L	Project verification already improving with improved metering and further improvements planned to move towards IPMVP approach to verification
Major new builds/refurbishments do not perform as well as expected in energy/carbon terms	M	L	Conservative view of carbon benefits from new projects taken.  Review of approach to BREEAM proposed into 'Sustainability Briefs' for projects
University's emissions to July 2016 are below anticipated 33%	M	M	Conservative view of future project savings mitigates potential impact. Large tranche of projects completing summer 2016 will see further savings delivered quickly

## Planning for Change

The University's Carbon Trajectory Tool is used to help identify the potential carbon impacts of University initiatives beyond the specific control of the Carbon Management Programme, such as major construction projects illustrated by the graph on page **Error! Bookmark not defined.**, changes to working patterns or changes in the University's anticipated student numbers.

This helps determine what a 'Business As Usual' scenario will look like in terms of carbon emissions and ensure that the Carbon Management Programme can continue to deliver against its targets.

The programme must be sufficiently flexible to evolve as the University changes, technology evolves and government policies change, therefore this report presents the best current projection of how the target can be delivered, and forms the framework through which an evolving programme will be managed.

## APPENDIX 1 – PROJECT LIST – DIRECT REDUCTIONS

### Headline plans to 2021

Project	Category	Buildings	Install cost	Est tCO <sub>2</sub> savings	Est energy £ saving (5 yr average)	Est Maint £ saving	Payback (years)
Whiteknights district heating expansion (Energy Centre side)	Heating Plant	Chemistry research, Hopkins, RUSU, Park House, Cedars, Eat @ Square	£1,200,000	400	£86,000	£40,000	14.0
Greenlands low carbon heating	Heating Plant	Main House complex	£750,000	150	33000+ RHI £20,000	£8,000	14.2
Energy efficient pumps on heating systems	Heating Plant	Whole estate	£150,000	150	£48,000	£2,000	3.1
HVAC recommissioning (tranche 2)	Heating & BMS controls	Maths, Eat @ Square, Whiteknights House, Henley Business School, Cedar Hotel, Archaeology, Foxhill House, Carrington, Minghella, MERL, STC, Ent Centre, Palmer, Greenlands, London Rd	£225,000	300	£66,000	£2,000	3.4
Heating control improvements	Heating & BMS controls	Whiteknights, Greenlands, London Rd	£310,000	250	£80,000	£2,000	3.9
Continuous optimisation	Heating & BMS controls	Whiteknights, Greenlands, London Rd	£30,000	25	£8,000	£0	3.8
Local Exhaust Ventilation (LEV) system upgrades	Ventilation	Chemistry, Hopkins, Food Bioscience, Russell, JJ Thomson, Wager, Meteorology	£70,000	55	£18,000	£1,000	3.9
Ventilation system upgrades	Ventilation	Whole estate	£250,000	250	£80,000	£2,000	3.1
Improved control of a/c systems	Air conditioning	Whole estate	£350,000	350	£113,000	£5,000	3.1
Lighting & control upgrades	Lighting	Whole estate	£1,250,000	500	£161,000	£30,000	7.8
Improved control of existing lighting systems	Lighting	Whiteknights, Greenlands, London Rd	£20,000	50	£16,000	£1,000	1.3
Behaviour change/ dept equipment	Behaviour	Whiteknights, Greenlands, London Rd	£235,000	450	£99,000	£1,000	2.4
Monitoring & targeting	Metering	Whole estate	£250,000	500	£110,000	£1,000	2.3

Project	Category	Buildings	Install cost	Est tCO <sub>2</sub> savings	Est energy £ saving (5 yr average)	Est Maint £ saving	Payback (years)
IT energy efficiencies	IT	Whiteknights, Greenlands, London Rd	£300,000	300	£66,000	£1,000	4.5
Business travel improvements	Travel	Whiteknights, Greenlands, London Rd	£100,000	200	£43,000		2.3
Solar PV	Renewables	Whiteknights, Greenlands, London Rd, Cedar Farm	£600,000	200	64000+ £12,000 FiT	£0	7.9
Demand management	Supply	Whiteknights, Greenlands, London Rd, Cedar Farm	£100,000	100	£32000+£5,000 income	£0	2.7
<b>Total</b>			<b>£6,190,000.00</b>	<b>4230</b>	<b>£1,160,000</b>	<b>£96,000</b>	<b>4.9</b>

## APPENDIX 2 – INDIRECT REDUCTIONS

### Headline plans to 2021

Project	Category	Buildings	Install cost	Est tCO <sub>2</sub> savings
UPP CO <sub>2</sub> reductions	Various	Halls of residence	n/a	470
Electricity Grid Decarbonisation	Supply	Whole estate	n/a	1700
<b>Total</b>			<b>n/a</b>	<b>2170</b>

## APPENDIX 3 – POTENTIAL PROJECTS BEYOND 2021

Noted below are potential future projects which could help the University continue to reduce its emissions beyond 2021. This will require further work to identify additional opportunities for a full programme of work to deliver a 50% emissions cut for 2026.

Project	Category	Buildings	Install cost (2016 prices)	Est tCO2 savings	Est Utility £ saving (2016 prices)	Est Maint £ saving
Whiteknights district heating expansion (Energy Centre side)	Heating Plant	TBC	£1,200,000	400	£75,000	£40,000
Whiteknights low carbon heating (Earley Gate side)	Heating Plant	TBC	£1,200,000	400	£75,000	£40,000
Greenlands low carbon heating	Heating Plant	TBC	£250,000	100	£25,000	£5,000
London Road low carbon heating	Heating Plant	TBC	£400,000	150	£30,000	£5,000
<b>Total</b>			<b>£3,050,000.00</b>	<b>1050</b>	<b>£205,000.00</b>	<b>£90,000.00</b>