UNIVERSITY OF GLOUCESTERSHIRE

CARBON MANAGEMENT PLAN

2018-2022

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Contents

Executive Summary

This Carbon Management Plan (CMP) outlines the University of Gloucestershire's approach to carbon reduction for the period 2018 to 2022, whilst also setting the direction of travel to meet longer-term targets for 2030 and 2050. It recognises the importance of adopting a long-term view on carbon management as some reductions can only be achieved by taking advantage of opportunities as other developments are planned such as changes to the estates portfolio, IT strategy, or the adoption of smart working.

Three goals are proposed to help ensure the University achieves current and future proposed targets, increases the amount of renewable energy generated on site, and frames carbon reductions in the context of appropriate key activity measures:

- Goal 1: The University of Gloucestershire will reduce scope 1 and 2 carbon emissions by 46% by 2021/22 from a 2005/06 baseline.
- Goal 2: The University of Gloucestershire will increase the amount of electricity generated from renewable sources to at least 90,000kWh by 2021/22 and will investigate options for energy storage. The University will continue to support the increased provision of renewable energy over the grid by maintaining its commitment to purchase electricity from 100% renewable sources.
- Goal 3: The University of Gloucestershire will set activity-based targets for tonnes of carbon per square metre of GIA, per FTE, and per £1m of income, at the first annual review of the CMP.

These goals will help the University meet previously identified sector targets, achieve proposed Government HE and public sector targets for 2020 and 2030, and set course to achieve the national target of reducing carbon emissions by 80% by 2050 against a 1990 baseline. The drivers for carbon reduction are set out in section 2 and the strategic direction in section 4.

Actions taken over the lifetime of the previous carbon management plan have seen impressive reductions in carbon of over 40% by 2016/17 against the 2005/06 baseline, as outlined in section 3. However, these reductions have been achieved through measures such as swapping to cleaner fuels for boilers, building insulation, partial roll out of LED lighting, better building management controls, and the disposal of older, less efficient parts of the estate. In addition, the rapid decarbonisation of grid supplied electricity as fossil fuels are increasingly replaced by energy from renewable sources has helped reduce the University's carbon emissions.

The challenge for this revised CMP is to maintain the momentum of carbon reduction as the estate grows and as solutions become more complex, sometimes more costly, and require close integration with existing systems to maximise savings. Section 5 outlines how the plan is to be implemented with appendices 1 and 2 providing more detail on specific measures proposed.

It is proposed that maximum use is made of improved metering of energy. This will allow better targeting of energy saving measures and for design solutions to be compiled when parts of the estate are developed or repurposed. This is particularly important when new buildings are developed as in-use energy use is often two to three times higher than that forecast at the design stage.

At a time of very limited funding and an increasing emphasis on value for money it is necessary to look at innovative means to fund carbon reduction projects to maximise energy savings, provide a reasonable payback period and effectively manage risk. This plan acknowledges that funding for carbon reduction projects is severely limited until at least 2020/21 and proposes taking forward carbon reduction chiefly by accessing external funding and concentrating on staff and student engagement as well as reducing energy use by IT equipment over years 2018/19 and 2019/20. There may be some opportunities to install energy saving measures but these will mostly be small scale and carried out as part of other refurbishment work. The opportunity of creating a recycling fund from which to fund carbon saving projects, topped up with Government provided zero interest funding, will be investigated in 2020. Section 6 outlines these proposals.

Primary responsibility for the CMP lies with the Estates Management Team, section 7 outlines a robust approach to estates programme management to ensure actions are reliably implemented over the duration of this plan. It includes critical factors for success such as involvement at the design stage, effective monitoring and measurement, engagement with students and staff, reporting, and communication between teams with a role to play in carbon reductions such as IT and Sustainability.

Additional benefits expected to accrue from a successful CMP include:

1. reduced exposure to energy price rises and price shocks;
2. enhancements to resilience if more energy is generated on site;
3. improved building comfort levels for students and staff;
4. reputational protection and gains for the University's sustainability profile;
5. responsiveness to student interest in renewable energy generation at the University.[1]

[1] At the 2018 Students Union AGM held on 16 April, a motion was passed to lobby the university to demonstrably show an increase in renewable energy.

1. Introduction

1.1 The University of Gloucestershire has a long-established commitment to sustainability, having pioneered the development of an institution-wide approach connecting its operational and academic activities. Sustainability is one of the University's key values and is embedded within its Strategic Plan 2017-2022 as one of the strategic enablers for the delivery of its core goals.

The Estates Strategy 2017-22 confirms the commitment of the Estates Team to the reduction in carbon emissions from buildings as well as through travel and transportation activities - and by ensuring new buildings are energy efficient and that space is used effectively.

This overall institutional commitment has been recognised externally through a consistent First Class position in the UK universities' sustainability league since it began. In 2017 the University achieved second place in this league, scoring 100% for carbon management.

An ISO 14001 compliant environmental management system has been in place for operational and academic activities since 2002 in which objectives are set to reduce waste, energy and carbon emissions. This system was upgraded to the latest 2015 version of the standard in 2017.

1.2 This CMP 2018-2022 updates the first CMP approved by the University in 2011, following the requirement from HEFCE in 2010 that all Higher Education institutions must set a target for reducing carbon emissions by 2020, monitor and report on carbon emissions, and achieve actual emissions reductions appropriate to their institution.

1.3 Carbon dioxide is produced when fossil fuels such as gas, oil or diesel are burnt in air to produce energy for heating, electricity generation, or transport[2]. Carbon emissions are categorised as:

- Scope 1 emissions: those produced directly by burning fuel on site such as gas for heating and diesel in vehicles
- Scope 2 emissions: those generated through the off-site generation of electricity
- Scope 3 emissions: those arising indirectly due to core operations, including the procurement of goods, business travel and student & staff commuting.

1.4 In 2010 HEFCE required universities to commit to reducing scope 1 and 2 emissions and to measure their scope 3 emissions. In its 2011 CMP the University committed to achieve the following reductions in scope 1 and scope 2 emissions compared to a 2005/06 baseline:

- 30% reduction by 2013/14,
- 40% reduction by 2019/20,
- Towards an overall reduction of 80% by 2049/50.

The 2011 plan provided a baseline for scope 3 emissions for activities such as waste, water use, business travel, staff and student commuting, and procurement, setting targets for reductions by 2019/20. These are summarised in section 4.6. Monitoring and measuring scope 3 emissions is a difficult process with a variety of methods available with varying

[2] Throughout this document the word carbon is used as a shorthand for carbon dioxide equivalent emissions, CO_2e.

degrees of uncertainty. However, in 2018 the Environmental Association of Universities and Colleges (EAUC) and the Association of University Directors of Estates (AUDE), with the support of the former HEFCE, produced outline guidance and key steps to allow more consistent assessment of scope 3 emissions. Scope 3 emissions will be assessed using this approach to enable consistent comparisons from year to year, and with other HEIs.

1.5 The Sustainability Strategy 2017-2022 and Estates Strategy 2017-2022 affirm the University's ongoing commitment to carbon reduction and to meeting the 40% target for 2019/20. The carbon emissions for 2016/17 and those forecast for 2017/18 show that the University is broadly on track to meet the 2019/20 target, with emissions having reduced by 46% between 2005/06 and 2016/17. The main reason for the drop is that the university has significantly reduced its use of fossil fuels for space heating and, although electricity use has also dropped, it has not shown the same level of reduction – much of this is due to lighting, cooling and increased use of IT hardware. Section 3 outlines the reductions since 2005/06.

1.6 However, whilst this performance is encouraging it must be set against a background of growth in the University's estate and in student numbers, which may lead to an increase in carbon emissions. In particular, the opening of the Business School Growth Hub at Oxstalls campus will increase electricity consumption and carbon emissions.

1.7 Three key goals are proposed to reduce absolute emissions by 2021/22, to increase the amount of renewable energy generated, and to develop activity-based indicators of carbon which better suit a growing university.

2. Context and Drivers

2.1 This CMP has been developed in response to a range of drivers, both internal and external. These are outlined in this section, taking account of their significance and the potential benefits for the University of progressing its carbon management objectives.

2.2 **Strategic**

2.2.1 ***Global developments***

Climate scientists worldwide are increasingly clear about global warming resulting from greenhouse gas emissions caused by human activity and its impact on the earth's climate system. The global average temperature has risen by 0.85° Celsius and global sea level has risen by 19cm since the late 19th century[3]. This has also resulted in acidification of the oceans, declining glaciers and sea ice, changes to weather patterns, and disruption to habitats.

The first international effort to tackle climate change was the 1992 Kyoto Protocol in which 37 industrialised countries set a target to reduce their emissions by an average of 5% below 1990 levels for the period 2008 to 2012.

2.2.2 ***Paris Agreement 2015***

In 2015, 195 countries agreed stretching carbon reduction targets to ensure that global temperatures do not rise by more than 2° Celsius above pre-industrial levels, and to pursue efforts to limit the rise to no more than 1.5° Celsius. 2°C was chosen as the maximum acceptable rise as, above this, the risks and impacts of climate change such as dramatically higher seas, changes in weather patterns, food and water crises, become unacceptable - bringing new levels of disruption and conflict for societies.

2.2.3 ***UK Climate Change Act 2008***

This Act was the first legislation in the world to set legally binding carbon reduction targets through a series of five-year carbon budgets. It requires a reduction of 80% of carbon emissions by 2050, and by 34% by 2020, both against a 1990 baseline. These carbon budgets have been set and run until 2032; the first budget has been achieved and the second and third budgets are on track to be achieved. Concerted work is now needed to achieve the required 51% reduction in carbon emissions by 2025 against a 1990 baseline as specified in the fourth budget.

2.2.4 ***UK Industrial Strategy***

In 2016 the Government published the Industrial Strategy, setting out a long-term plan to boost the productivity of the UK through five foundation approaches: ideas, people, infrastructure, business environment, and places - working with industry, academia and the civil society. Clean growth is one of the first four Grand Challenges, which encompasses the development, manufacture and use of low carbon technologies, systems and services, as well as growing GDP while cutting carbon emissions.

[3] UN Intergovernmental Committee on Climate Change: Climate Change 2014 Synthesis Report, Guidance for Policymakers http://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf

2.2.5 ***UK Clean Growth Strategy 2017***

To support the Industrial Strategy, the Government published its Clean Growth Strategy in 2017, setting out proposals around business and industrial efficiency and ensuring the public sector demonstrates leadership. Recognising that the public sector has reduced emissions by 40% since 1990, further reductions are sought by setting a voluntary carbon reduction target for the public and higher education sectors of 30% by 2020/21 against a 2009/10 baseline. Guidance published by the Department for Business, Energy and Industrial Strategy (BEIS) in April 2018 proposed that public sector organisations should voluntarily report their annual carbon emissions and invited them to sign up to the Emissions Reduction Pledge 2020. For participating universities, it is proposed that emissions data will be collected via the established Estates Management Record process starting in Spring 2019.

In 2020 the Government will review progress against the target with a view to setting a more ambitious potentially mandatory target, such as 50% by 2030 (against the same 2009/10 baseline).

2.3 Regulatory

2.3.1 ***EU Energy Performance of Buildings Directive (EPBD)***

This wide ranging directive (in force since 2006) sets out to promote improvement of the energy performance of buildings through cost effective measures and to promote the convergence of building standards across the EU

Energy performance certification is required for all new buildings and when existing buildings are rented out or sold on, known as EPCs. There is also a requirement for all public buildings with a floor area over 250m^2 to show a display energy certificate (DEC) in a prominent position within the building.

2.3.2 ***Building Regulations – Part L***

Part L of the Building Regulations sets out requirements for energy efficiency and the effective control of buildings and associated plant. These regulations apply to both new buildings and refurbishments, controlling factors such as the insulation values of building elements, air permeability of the structure, heating efficiency of boilers, and lighting efficiency. Part L guidance is currently the major driver for the increase in energy efficiency and carbon reduction in new and refurbished buildings.

2.3.3 ***HE Sector Requirements***

In 2010 sector guidance produced by HEFCE required each university to report its carbon emissions, set a carbon reduction target for 2020, and produce a CMP or strategy. These actions supported targets for the sector of a 43% carbon reduction by 2020 and an 83% reduction by 2050 against a 2005 baseline – with performance linked to capital funding. The newly formed Office for Students has not issued any guidance on carbon reduction targets and differs in focus and function to HEFCE. It is likely that in this context, HE sector reductions will now be taken forward via the Emissions Reduction Pledge outlined in section 2.2.5 above.

2.4 Financial

2.4.1 ***Climate Change Levy***

Introduced in 2001, the Climate Change Levy (CCL) is a tax on electricity and gas added to the energy bills of businesses in an effort to incentivise them to reduce energy use and to use or

generate energy from renewable sources. However, electricity generated from nuclear sources was subject to the CCL from the outset and, in the budget of 2015, CCL was expanded to apply to energy purchased from renewable sources. The abolition of the 2010 Carbon Reduction Commitment emissions trading scheme in 2019 means that the Government will seek to close the resulting shortfall in tax revenue by increasing CCL rates for all business energy users whether they were required to participate in the CRC or not.

From April 2019 the CCL will therefore rise by 45% for electricity and by 67% for gas. As the CCL is effectively a tax on energy from non-renewable sources, the impact of this rise can be partly mitigated by generating more energy from renewable sources.

2.4.2 ***Energy cost volatility***

The increasing volatility of energy prices and the level of energy costs have become growing concerns to large consumers of energy. The impact of conflicts around the world on oil prices, the reliance on imported fuels from less stable countries, and the reduction in the amount of storage capacity for gas have also made energy price volatility a major concern nationally.

In addition, the sustained reduction in the cost of renewable energy, its intermittency, and its impact on grid capacity planning, have led to new pressures on the distribution network, which will lead to additional costs in order to better balance supply and demand. These additional costs for the Electricity Market Reform are just the latest in a number of third party costs which have driven up energy prices. Since 2011 the growth in third party costs has been responsible for most of the rise in the price of energy and is expected to account for over two-thirds of energy costs by 2020.

2.4.3 ***Value for money***

As the HE sector continues to come under scrutiny in terms of value for money, it is increasingly important that all areas of expenditure are assessed for cost saving potential. Annual energy costs for the Further and Higher Education (FHE) sector are around £400 million, resulting in carbon emissions of around 3 million tonnes per year - but with the Carbon Trust estimating that these emissions can be reduced by as much as 25% potentially. In this growing sector, student numbers have increased by a factor of five over the past thirty years, bringing increased energy consumption, particularly for research-focused institutions. The sector is under increasing pressure to provide optimum learning facilities on a limited budget, with better energy management potentially enabling funds to be diverted towards improvements to learning environments.

2.5 Organisational

2.5.1 ***Strategic Alignment***

The University's Strategic Plan 2017-2022 positions sustainability as one of its six key enablers, alongside effective Estates and IT infrastructure. The Estates Strategy 2017-2022 makes a commitment to supporting the reduction of carbon emissions, including travel and transportation activities, effective management of university space, targeting the BREEAM "Excellent" standard as the minimum level for development work, and using a life cycle approach to carbon and cost implications when considering project scope and definition. The Sustainability Strategy 2017-2022 includes the commitment to develop a new CMP aligned to the Estates Strategy objectives, as part of its continual improvement approach and the setting of progression targets for all its operational sustainability parameters, including energy, carbon and water.

2.5.2 ***Performance Monitoring***

The University's ISO 14001: 2015 Environmental Management System includes specific objectives for carbon emissions reduction and provides a rigorous and transparent system for monitoring and reporting to senior management. The EMS includes internal and external audits to assure compliance, and carbon and energy targets are included in the series of performance indicators reported via the University's Annual Sustainability Report.

2.5.3 ***Organisational Resilience***

Reducing the University's reliance on externally supplied energy, as well as increasing the amount of energy generated on site, reduces the potential impact of interruptions to energy supplies for core operations and minimises exposure to price shocks. As the energy sector moves towards a low carbon future, with increasing generation of electricity from renewables, potential vulnerabilities are emerging due to the weather dependencies of these sources. Future use of battery technology with solar pv, Combined Heat and Power sources, and district energy systems, can assist in improving longer-term resilience and are considered essential to the long-term perspective of this plan.

2.6 **Reputational**

2.6.1 ***Student Interest***

There is a continuing need to meet student expectations that the University will maintain its action on sustainability and to support their learning and employability prospects in this area. The NUS Skills Survey (2017/18) revealed that 84% of University of Gloucestershire student respondents think universities should actively promote sustainability. In addition, the International Student Barometer reported that in 2017 85% of University of Gloucestershire students surveyed said they were satisfied or very satisfied with the University's eco-friendly attitude. The UN Sustainable Development Goals (SDGs) are increasingly visible and, as signatories to the tertiary sector's SDG Accord, the University annually reports its contribution to the SDGs, including goals for clean energy and climate action.

2.6.2 ***Corporate Profile***

HE institutions are increasingly ranked using public league tables and performance on carbon reduction is key to maintaining positive profile in these rankings. Carbon management elements carry significant weight in the People and Planet University League and maintenance of its established First Class position is one of the KPIs reported annually to University Council. In the wider public domain, an organisation called Brite Green publishes annual rankings of universities' performance against carbon reduction targets. In 2017 the University was ranked 24th of 126 universities for carbon emissions reduction – showing steady improvement and retaining its position in the top third of universities succeeding in delivering significant carbon reductions.

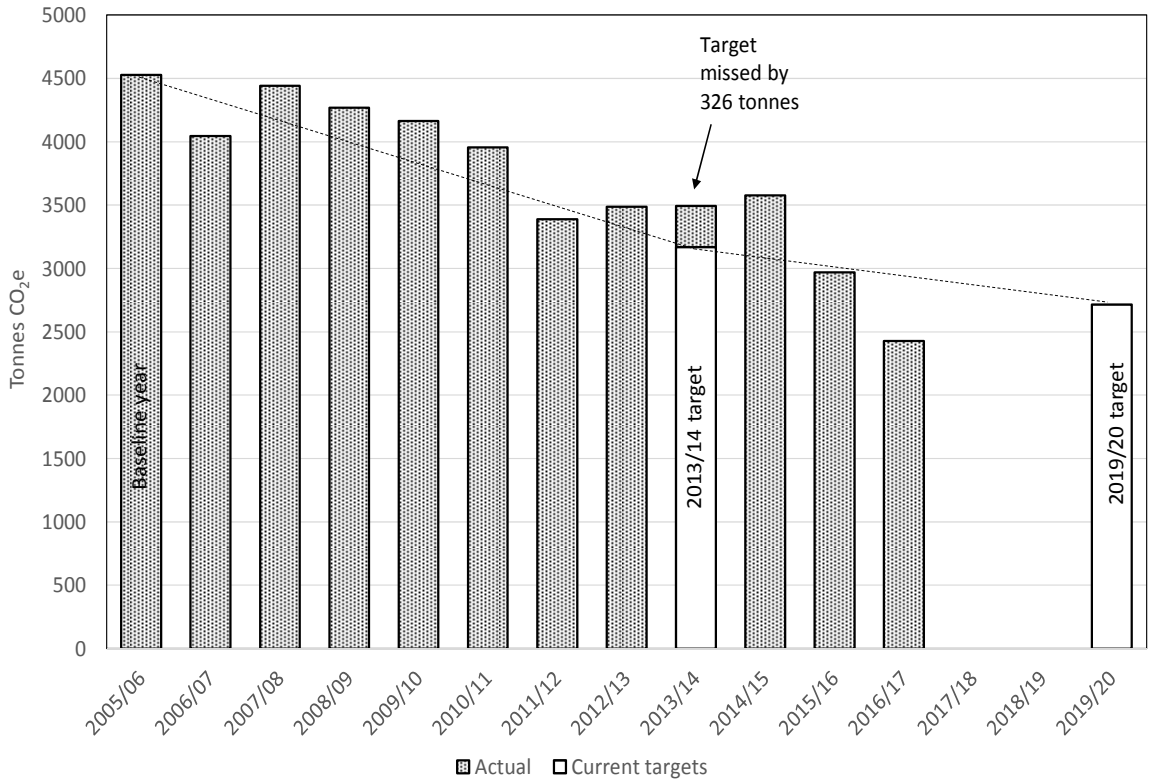
2.6.3 ***Modelling Good Practice***

The University has a clear role as an anchor institution within the region and through its established good practice can provide leadership to students, employees, suppliers, local communities and businesses on sustainability. Supported by its Growth Hub and engagement with the Local Enterprise Partnership, this can include support to, and collaboration with, other local and regional organisations to encourage the development of low carbon goods and services, assisting the sustainability ambitions of the county. There is an international element to this leadership as the University hosts the UN Regional Centre of Expertise for the Severn region in sustainability education, providing a vehicle for work to support and advise local organisations, particularly third sector actors and SMEs, on carbon management.

3. Performance to date

3.1. In 2011, following HEFCE guidance to the sector, the University agreed a CMP in which it committed to reducing scope 1 and scope 2 carbon dioxide emissions by 30% by 2013/14 and 40% by 2019/20 compared to a 2005/06 baseline. This section reviews the emissions reductions made to date.

3.2 The graph below shows the University's annual carbon dioxide emissions, with the dotted line indicating the required track to achieving the 2013/14 then 2019/20 targets.



Carbon emissions 2005/06 to 2016/17 including 2013/14 and 2019/20 targets

The 2013/14 target required earlier, steeper reductions and the graph shows that the 2013/14 target was missed. This was partly due to the estate growing by 13% between 2011/12 and 2014/15 leading to a 5.5% rise in energy use over the same period. The marked drop since 2014/15 has been due to a reduction in gas use of 15%, electricity use by 18% plus a reduction in the carbon intensity of grid supplied electricity of 11% as less coal was used for generation.

3.3 By 2016/17 the University's carbon emissions were 46% less than the 2005/06 baseline, indicating an early overachievement against the 40% target. However, this reduction is unlikely to be sustained, due to the opening of the Business School Growth Hub at Oxstalls in Autumn 2018. The effect of this development, without further improvements being made, is outlined in section 3.6.

3.4 Carbon reductions and energy efficiency improvements over the life of the 2011 CMP have mostly been achieved by switching boilers to cleaner fuels, introducing some LED lighting, using

automatic monitoring and targeting software, better building management controls, improved insulation, and matching supplied voltages to equipment needs. Although more can be done to roll out some of these solutions such as LED lighting, these measures can regarded as low hanging fruit and new strategic approaches will be required to maintain progress.

3.5 Also of note is that the last five years have seen a marked reduction in the carbon intensity of grid supplied electricity, dropping by 36% as more renewables enter the mix and coal burning declines (dropping from 0.45 to 0.28 kg CO_2e/kWh). This trend is likely to continue, although perhaps not at the same rate, so cannot be relied upon to assure delivery against the target.

3.6 The opening of the Business School Growth Hub in Autumn 2018 presents a challenge to reducing carbon emissions as the heating, lighting and operation of the building is likely to generate carbon emissions of at least 130 tonnes per year. This is despite energy efficient air source heat pumps being installed which extract energy from the outside air and concentrate it to heat the building. However, emissions could be considerably higher as there is often a large disparity between forecast energy use at the design stage and actual use once facilities are in operation, with CIBSE noting that energy use and carbon emissions are sometimes twice or three times that predicted. This could potentially affect the achievement of the current 2019/20 target and put the proposed 2021/22 target at risk unless mitigation works are undertaken elsewhere.

3.7 Performance to date indicates that the University will achieve the proposed public and HE sector target proposed by BEIS for 2020/21 outlined in section 2.2.5, as the target proposed is not unduly challenging in the context of performance to date.

4. Strategic Direction

4.1 As outlined in section 3, the University has seen considerable success in reducing its scope 1 & 2 carbon emissions and has overachieved against the 40% target for 2019/20, albeit with the risk of emissions rising as the new building at Oxstalls open in Autumn 2018.

4.2 **Direct emissions (scope 1 & 2)**
Three types of targets are proposed in order to drive progress for the duration of this CMP to 2022 and further:

4.2.1 ***Absolute target*** – following the current sector practice and proposed BEIS targets of reducing overall carbon emissions by a certain date against an agreed baseline.

4.2.2 ***Renewables target*** – a target to increase the amount of renewable energy generated by the University by a certain date.

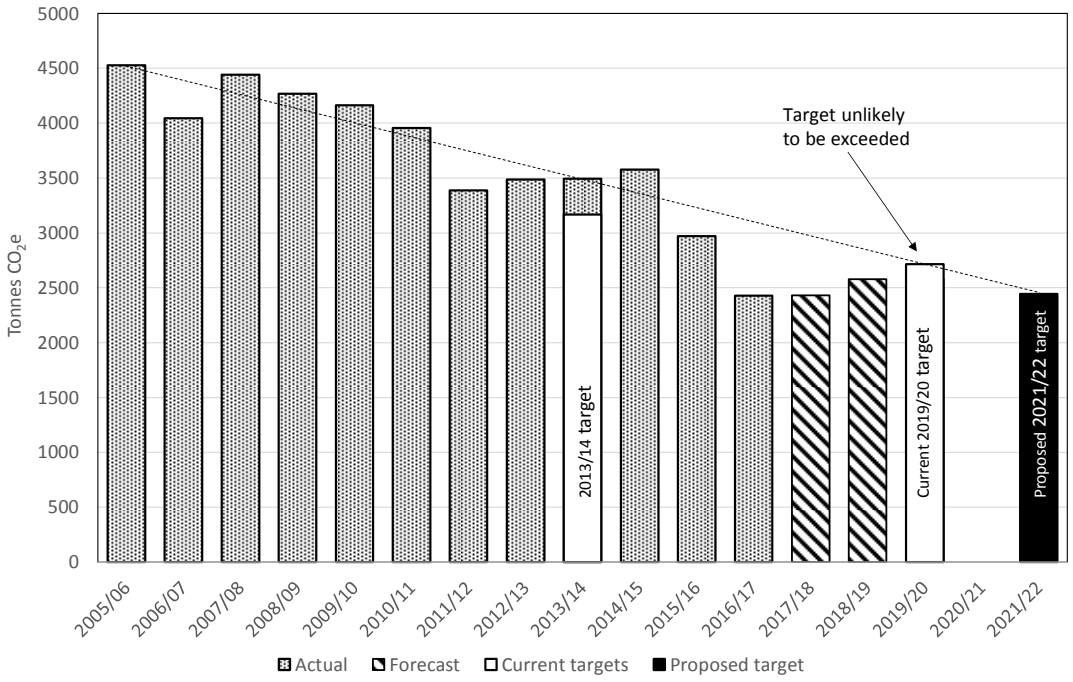
4.2.3 ***Activity based targets*** – targets proportionate to another parameter such as number of students and staff, gross internal area or income. As the HE sector grows, universities are increasingly assessing carbon emissions using activity-based targets to monitor efficiency gains. Typical measures used are tonnes of carbon per FTE, per square metre of gross internal area, or per £million of income.

4.3 **Absolute targets**
In setting a new scope 1 and 2 emissions target for the period to 2022 it is important to ensure that reasonable progress is maintained. This will ensure that the proposed BEIS target for 2020/21 is achieved and that an adequate trajectory is set to achieve the proposed BEIS 2030/31 target. As noted in 2.2.5, this target may become mandatory for the public and HE sector depending on their progress against the 30% voluntary target. A commitment to a 3% per year reduction should ensure that sufficient progress is made and allows for the impact of any future increases in energy use to be mitigated.

The Estates Strategy outlines the University's ambition to increase student numbers by at least a third, requiring the provision of additional space. It notes that some of this additional activity will be delivered away from main sites through apprenticeships, online delivery, and collaborative partnerships but some increase in space provision will be required. Unless innovative energy strategies are employed, the addition of space will lead to higher energy use and a rise in carbon emissions.

The graph below shows progress to date along with forecasts for emissions for the 2017/18 to 2019/20 period. Despite the increased use of gas for heating during the unusually cold Winter and Spring of 2017/18, carbon emissions are likely to have increased only marginally because of the reduction in carbon intensity of grid supplied electricity, as outlined in section 3.5. If the carbon intensity remains stable then the additional emissions from the Business School Growth Hub opening at the beginning of academic year 2018/19 will lead to overall emissions only approaching around 2,600 tonnes.

All other things being equal this should mean that the University achieves its 2019/20 target of a 40% reduction compared to a 2005/06 baseline, although fluctuations in energy use from year to year could put this compliance at risk. Finally, the proposed target for 2021/22 is indicated, with the dotted line showing that this is target is broadly in line with the overall trend in emissions reductions since 2005/06.



Carbon emissions 2005/06 to 2016/17 and forecast to 2019/20 showing proposed 2021/22 target

Goal 1: The University of Gloucestershire will reduce scope 1 and 2 carbon emissions by 46% by 2021/22 from a 2005/06 baseline.

4.4 **Renewables target**

In order to mitigate the rise in electricity costs, improve resilience, and embed long-term reductions in carbon emissions it is further proposed that a target for on-site renewable energy generation is set. Currently around 45,000kWh of electricity is generated from solar pv installations at Oxstalls and Park, saving circa 16 tonnes of carbon and avoiding annual grid electricity costs of approximately £5,500. A target is proposed to double the quantity of electricity produced from renewable sources and to investigate the feasibility of storing the energy produced. Renewable sources include solar pv, solar thermal, air source and ground source heat pumps. It is proposed that this additional renewables capacity would be funded using one or more power purchase agreements (see section 6.4 for details).

The University has procured electricity from 100% renewable sources since 1993 which helps strengthen the demand for renewable energy nationally, assists with the University league table scores, and provides a positive sustainability commitment. This is also important in the context of the Students' Union AGM vote in 2018 seeking an increase in the University's commitment to renewable energy.

Goal 2: The University of Gloucestershire will increase the amount of electricity generated from renewable sources to at least 90,000kWh by 2021/22 and will investigate options for energy storage. The University will continue to support the increased provision of renewable energy over the grid by maintaining its commitment to purchase electricity from 100% renewable sources.

4.5 **Activity based targets**

The University compares well to other HEIs in terms of activity-based measures with Brite Green reporting that in 2017 the University's league table position improved from 54th to 42nd for emissions relative to income and for emissions relative to floor area the position improved even further, from 63rd to 40th. However, changes in the estate and in student and staff numbers will mean these measures will vary over the next year making it difficult to set a reliable baseline upon which to assess these targets. It is proposed that activity based targets are set at the first annual review of the CMP once reliable data is obtained. Activity based indicators for carbon are included within the Annual Sustainability Report and complement joint working with space management activities within Estates.

Goal 3: The University of Gloucestershire will set activity-based targets for tonnes of carbon per square metre of GIA, per FTE, and per £1m of income, at the first annual review of the CMP.

4.6 **Indirect emissions (scope 3)**

As outlined in section 1.3, scope 3 emissions arise from the activities of the University but from sources not under its direct control such as the procurement of good and serves, business travel, and student and staff commuting. A baseline for scope 3 emissions for key activities has been set and targets agreed as follows (note that in some cases different baseline years are used depending on the availability of data and survey results):

Area of activity	Baseline (tonnes CO_2e)	Baseline year	Reduction target	Target year
Waste production and disposal	188	2005/06	75%	2019/20
Water use and treatment	52	2010/11	20%	2019/20
Business travel	983	2011/12	15%	2019/20
Staff commuting	931	2011/12	15%	2019/20
Student commuting	4,184	2010/11	15%	2019/20
Student travel from home to university	2,051	2010/11	15%	2019/20
Procurement	8,257	2010/11	12%	2019/20

Monitoring and measuring scope 3 emissions is a difficult process with a variety of methods available with varying degrees of uncertainty. However, in 2018 the Environmental Association of Universities and Colleges (EAUC) and the Association of University Directors of Estates (AUDE), with the support of the former HEFCE, produced outline guidance and key steps to allow more consistent assessment of scope 3 emissions. Scope 3 emissions will be assessed using this approach to enable consistent comparisons from year to year, and with other HEIs.

4.7 **Embedding carbon management**

There is a need to embed carbon management more effectively within the organisation to ensure that the goals are achieved and that it is resilient in the light of changing conditions over the life of the plan. The engagement matrix at appendix 3 identifies that the University can improve student and staff engagement with carbon management by enhancing communications – this will form part of the implementation plan in section 5.

4.8 **Energy procurement**

The University currently procures its energy via TEC (The Energy Consortium) which is a contracting authority owned by its members, providing energy procurement services to the HE and FE sectors as well as the wider public sector. The University works closely with TEC using a flexible energy procurement approach in order to buy energy for the lowest possible price.

In contrast to fixed energy rates this approach allows the University to take advantage of price changes in the energy market and to spread the price risk over a number of purchasing decisions throughout the year. This dynamic method of purchasing energy allows an acceptable balance to be maintained between price and budget certainty, reflecting the University's appetite for risk.

4.9 **Energy policy**

It is proposed that the current heating policy is revised to include energy used for applications other than space heating, such as cooling, lighting, and IT. This policy would help provide clarity to users of university buildings, operational and residential, support purchasing decisions for energy and equipment, identify how energy use is to be measured and monitored, inform the design stage of buildings, and raise awareness with students and staff.

5. Implementation

5.1 **Project development**

A range of projects have been developed to reduce carbon emissions by the following means:

- Discrete physical projects such as upgrading insulation or using new equipment - led by Estates Management team,
- Renewable energy projects using external funding led by Estates,
- Improvements to how IT equipment uses energy led by LTI team, and
- Engagement projects led by the Sustainability Team to encourage students and staff to use less energy.

For some of these projects the costs and savings in energy and carbon can be identified immediately but for others more work is required to set sensible baselines and to set realistic reduction targets. For example, the potential savings from improved power management of PCs cannot be assessed until a new network power management tool called SCCM is introduced in late 2018. Similarly, the potential savings from engaging with students and staff to reduce their energy use will not be known until an accurate baseline energy consumption of specific buildings within the estate can be set.

5.2 **Summary of projects**

The table below summarises the main projects proposed to achieve new carbon reductions to meet Goal 1 and to increase renewables to achieve Goal 2. Full details of current and planned projects can be found at Appendix 1 & 2. The list is not exhaustive, with all projects subject to ongoing refinement and assessment to ensure their ongoing feasibility from financial, operational and sustainability perspectives.

Type of measure	Proposed measures	Estimated carbon savings (tonnes)	Estimated cost savings pa (£)
Insulation	• Roof and wall insulation • Improvements to glazing for buildings at Park, FCH, HW • Draughtproofing at FCH, HW & Park • Radiator reflector foils	55.2	£10,570
Lighting	• LED roll out across estate • Lighting controls e.g. proximity and daylight sensors • Contingent upgrades upon refurbishments or retasking of space	78.9	£47,352
Heating /cooling	• Free cooling of server rooms (Park & FCH) • Upgrade of air con units to invertor drive versions • Upgrade of fume cupboards • Replacement of fans/motors with invertor units • Timers on catering equipment	78.5	£10,015
Building management	• BMS optimisation • Zoning of open access areas for heating & lighting	Requires investigation	Requires investigation

	• Link to space management planning		
IT	• Low energy desktop options • Improved power management via SCCM e.g. power down when inactive, auto switch off and wake for upgrades • Increasing use of cloud based resources	Requires investigation – baseline to be set in 2018/19	Requires investigation
Renewables	• Solar pv (potential PPA approach) • Air source heat pump installation on refurbishment where feasible	40.5	£5,630
Electric vehicles	• Replace proportion of fleet with EV equivalents	2.0	£200
User engagement	• Engagement with students through Live Smart programme • Engagement with staff through provision of quick guidance and online communications	Requires investigation	Requires investigation
	TOTAL	**248.5 t**	**£78,461**

Alongside these projects which directly deliver carbon savings are a number of complementary projects which will be developed to assist in the delivery of carbon savings in future:

Type of measure	Proposed measures
Metering	• Improve monitoring and metering to allow building management systems to be fine tuned
Procurement	• Life cycle costing for energy and carbon for new equipment and buildings
District energy	• Connection of Elwes heating system to Waterworth boilers upon Elwes boilers reaching the end of their lives
Combined Heat & Power	• Consider replacement when existing boilers reach end of life
Water	• Water saving features to reduce domestic hot water consumption

5.3 **Schedule for implementation**

Whilst the identification of physical projects is valuable to plan how carbon and energy reductions will be made, the current limitations on spending and borrowing (see section 6) mean that very limited funding will be available for years 2018/19 and 2019/20 with no guarantee that full funding will be available after then.

It's therefore proposed that only those projects requiring little or no internal funding are implemented in years 2018/19 and 2019/20 of this plan, as outlined below:

Team/Year	2018/19	2019/20	2020/21	2021/22
Estates team	Contingent improvements as part of planned refurbishments or repurposing of space	Contingent improvements as part of planned refurbishments or repurposing of space	Implementation of carbon reduction projects as funding allows	Implementation of carbon reduction projects as funding allows
Estates team	Development of renewable energy options using external funding	Operation of renewable energy equipment	Operation of renewable energy equipment	Operation of renewable energy equipment
LTI	Set baseline and develop power management strategy	Implement and monitor power management policy	Implement and monitor power management policy	Implement and monitor power management policy
Sustainability Team	Development and roll out of student/staff engagement programmes	Provision of ongoing support to students and staff	Provision of ongoing support to students and staff	Provision of ongoing support to students and staff

5.4 **User engagement**

While the carbon reductions for this plan will be achieved mainly through the work outlined in 5.3, effective delivery of the plan will require student and staff awareness and the active engagement of these key user groups to help reduce carbon. This helps to assure responsible energy use not just to meet these targets but as an enhancement approach to achieve future benefits.

As identified in the engagement matrix at appendix 3 communication and engagement are areas where attention is required to ensure carbon management is embedded within the University. A programme of activities for students will be developed with Student Services and the SU to ensure that, as key clients and users, they are engaged in carbon and energy reduction to help achieve the carbon targets. This has been piloted in 2018 as the Live Smart scheme and will be evaluated with a view to rolling out in academic year 2018/19. Equally important will be the way in which teams such as Estates, LTI and Sustainability work collaborate in a user-friendly and pragmatic way to ensure the plan delivers the required carbon reductions.

Similarly, the support of staff will be crucial in achieving the goals of this plan in a number of ways. For example, staff procuring goods and services have already increased their awareness of sustainable procurement procedures in which a life cycle approach is adopted. Other ways in which we must engage productively with our staff include IT use policies which affect how power use of PCs is managed, and heating and ventilation approaches within buildings.

5.5 **Communications**

Clear and effective communication is required in order to enlist the support of staff teams, students and other stakeholders in the delivery of this plan, including contractors and suppliers, whose support for energy and carbon reduction measures plays an important role in achieving our targets. In particular, suppliers of equipment and our catering contractors are important in helping cut emissions from a life cycle and day-to-day operational perspective.

Communication with external organisations will be important both in demonstrating the reductions in carbon achieved by the University, but also to signal our readiness to lead on carbon reduction for the region and collaborate to move towards a low carbon future. An example would be to promote community level generation of electricity and the introduction of district energy networks, where the involvement of motivated local anchor institutions can dramatically improve the feasibility of broader schemes, providing benefits for many local stakeholders.

Progress with the plan will be communicated to the wider University community via the University's Annual Sustainability Report, Estates webpages and newsletters as well as updates on high visibility projects. The Annual Sustainability Report is the key means by which progress is communicated externally, along with the University's Sustainability website and social media feeds, to help ensure students and staff are effectively engaged, with the RCE Severn network providing an additional external facing communication platform with local stakeholders. An infographic approach is used to effectively communicate more complex issues such as carbon management and to make it easier for stakeholders to engage.

5.6 **Information**

Detailed and timely information on energy use is vital to evaluating the results of carbon reduction projects but also to identify future opportunities for improvements. The Estates team has made significant improvements to the coverage and granularity of metering to ensure energy use is closely monitored to allow the effect of improvements to be accurately assessed. This improved metering provides many opportunities to examine energy use more forensically against other parameters such as weather, time of day, and occupancy levels. Statistical analysis techniques will be employed to model use and identify where new projects can be developed and building management systems optimised.

Enhanced metering also complements information provided by TEC (The Energy Consortium), which procures the University's energy, to provide reassurance that the optimum balance between price of energy and an acceptable level of risk is achieved throughout the year.

In the long term it is planned to begin to bring together data on energy use, occupancy, IT use and environmental variables to develop a model of our space within buildings, exploring the impact of these variables in order to further refine building management controls and to work towards developing smart spaces. This will also support smarter working practices as work can increasingly be carried out in new places and with fewer physical resources, allowing progress to be made in reducing scope 3 emissions arising from staff commuting and business travel.

5.7 **Factors for success**

Alongside the commitments to funding and staff resource there are a number of factors that are key to the success of the carbon reduction measures identified and to the embedding of continual improvements. Some are identified as areas of improvement from the engagement matrix at appendix 3. Others include:

- Some projects are only feasible if carried out at the same time as other refurbishments of buildings – it is therefore important that contingent energy and carbon measures are assessed as early as possible.
- Similarly, carbon management input is vital at the early stages of the design process of new buildings, ideally at RIBA design stage 1 when sustainability aspirations are set.
- To assess the performance of carbon and energy reduction measures it is important that effective monitoring and measurement of utilities is practised, as well as effective targeting approaches to identify new routes to reduce energy. This is especially the case if an external organisation helps deliver reductions through, for example, an energy performance contract.

- It is almost inevitable that over the life of the Estates Strategy there will be changes to estates provision as the demands of schools change with time – to ensure these changes do not detract from effective carbon management, close liaison is necessary with the Academic Leadership Group.
- An important element of sustaining carbon reductions is continued engagement with students and staff to reduce energy use as part of the wider understanding of sustainability. This will require concerted effort and innovation so it is clear that this is now routine practice and 'business as usual'".
- Finally, it is likely that new approaches to the financing of projects and a more long term aspect to funding energy savings will be required.

6. Financing

6.1 **Internal financing**

Energy and carbon reduction projects would normally be funded through the Estates Maintenance Plan budget (which forms part of the Five Year Capital Programme) as many of the projects deliver ongoing energy savings as well as savings on maintenance costs. For example, the upgrading of fluorescent lighting to an LED equivalent not only saves around 80% in energy use, but can avoid maintenance costs of around £84 for each light fitting over an average 15 year lifespan (600x600mm 4 tube ceiling fitting).

However, for years 2018/19 and 2019/20 the Maintenance Plan budget will be unable to cover energy reduction projects due to competing pressures elsewhere. Furthermore it is likely that the budget will continue to be under pressure in 2020/21 due to a backlog in maintenance issues arising from the lack of spend in the previous two years.

It is therefore likely that no carbon reduction projects can be supported in 2018/19 and 2019/20 unless they can be carried out contingent with larger refurbishment schemes.

6.2 **External sources of financing**

Given the extremely limited availability of internal funding over the next two to three years, options for external funding to assist with carbon saving projects have been explored, especially new funding models which have recently evolved. These break down into three main sources: interest free loans from Government, power purchase agreements, and energy performance contracting.

6.3 **Salix**

Salix Funding is an agency of the Department of Business, Energy and Industrial Strategy (BEIS) which provides interest free funding to the public sector to improve energy efficiency, reduce carbon emissions and lower energy bills. They provide support in two ways, either through interest free loans for prescribed energy efficiency measures paying back within five years or less, or by providing funding to organisations to set up a recycling fund. The recycling fund approach is more flexible and allows an organisation to more effectively combine projects allowing shorter payback measures to cross subsidise those with payback periods over five years.

The University accessed Salix funding to assist with the conversion of oil fired boilers to cleaner gas versions at Park campus, with the debt being repaid in September 2017. However, currently the University is operating under borrowing restrictions which means that any further borrowing will have to be closely scrutinised to ensure payback periods are short and that risk is minimised.

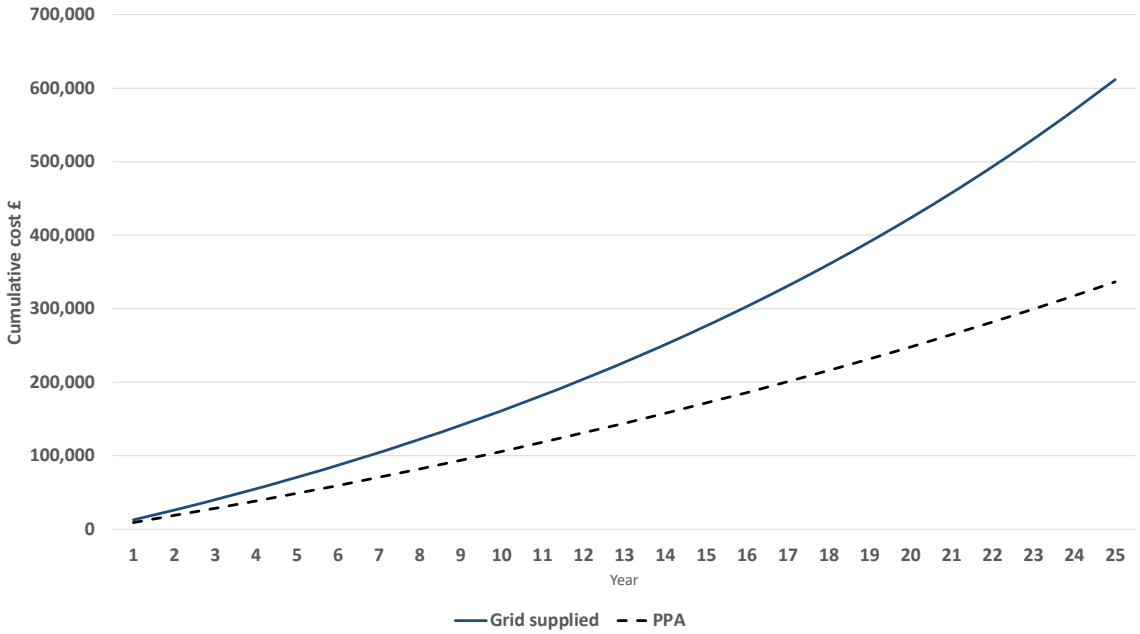
6.4 **Power Purchase Agreements**

Power purchase agreements (PPA) are increasingly being adopted to install renewable energy equipment such as solar photovoltaic panels without having to find upfront capital funding. A PPA is a long-term contract under which a business agrees to purchase electricity directly from an energy generator instead of purchasing electricity from the grid. The energy generator provides the capital funding for the renewable energy equipment, maintaining and monitoring it over the lifetime of the contract in return for the business agreeing to purchase energy at a reduced rate for typically 20 to 25 years. The rate paid for each unit of electricity is significantly less than the grid rate, typically 3 to 4 pence per kWh lower, and is indexed (usually to the RPI) to increase over the term of the contract. This provides a hedge against future electricity price rises and price shocks, especially in the light of the forecast rise in third party costs described in section 2.4.2. At the end of the contract the business can typically buy the installation for a nominal amount such as £1 or require its removal.

In addition to the free supply and installation of a renewable energy resource, advantages include financial certainty around energy costs for the long term via a fixed electricity price rising at an agreed rate, substantial energy cost savings, and reduced carbon emissions.

Appendix 4 provides further information on PPAs including the benefits and considerations as well as summarising a possible proposal submitted by an energy services company.

The graph below outlines the scale of the cumulative savings achievable using a PPA vs grid supplied electricity for a 120kW peak solar pv system, which is the typical size of array feasible for both Park and Oxstalls campuses. This array is roughly twice the size of the one currently located at Oxstalls and could supply around 100,000 kWh, approximately 2.5% of the entire University's annual electricity demand. The two lines show the cumulative cost of electricity supplied by the grid and via a PPA over a period of 25 years. Assumptions are that PPA prices are indexed to increase by 3% each year, electricity prices rise by 5% each year, and that the starting costs for grid supplied and PPA supplied electricity are 12.56 and 9.05 pence per kWh respectively. Cumulatively the PPA cost is around 55% of the cost of grid supplied electricity.



Cumulative cost of electricity supplied by grid and that supplied via a PPA over 25 years

6.5 **Energy Performance Contracting (EPC)**

EPC is a means for organisations to retrofit existing buildings with energy saving and energy generation measures. These measures improve the energy performance of their buildings, thereby reducing carbon emissions and achieving substantial annual cost savings – these savings are guaranteed by the Service Provider under the contract. EPCs form the basis of the Re:fit public sector model which originated in London and has invested £102 million in over 550 buildings realising energy savings of over £7 million per year.

The Service Provider designs and implements Energy Conservation Measures (ECMs) and guarantees the level of energy savings, thus offering a secured financial saving over the period of the agreement. This savings stream is used as the basis to fund the cost of improvements and services from the Service Provider. Once the costs have been repaid the university should be able to keep the full savings generated from the improvements. A key benefit is that the Service Provider takes on the risk of delivering the stated savings and will pay the difference in the eventuality that forecast savings are not realised, for this reason robust monitoring and

verification arrangements must be agreed and established from the outset.

However, it is unlikely that EPC is an option for the foreseeable future as these agreements are often over long time periods and involve large amounts being borrowed.

6.6 **Financing options**

The current constraints on the maintenance budget and restrictions on borrowing suggest that that only the Power Purchase Agreement approach is currently viable. Discussions with energy providers have already started to develop draft proposals for solar pv at Park and Oxstalls campuses, this information will allow an assessment to be made of the benefits and risks of a PPA approach and whether the concept proceeds to procurement.

7. Governance

7.1 **Ownership and oversight**

To ensure this CMP successfully achieves its objectives of cutting carbon, reducing energy use and saving money, it is important that it is owned and communicated effectively within the University and adequately resourced. The table below outlines the key responsibilities for the plan's successful delivery:

Key forum	Responsibilities
University Council (includes champion for sustainability)	Governing Body responsible for informing the educational character and mission of the University, approval of annual estimates of income and expenditure, ensuring the solvency of the University and safeguarding of its assets, and the appointment of senior staff.
Finance and General Purposes Committee	Responsible for monitoring and advising Council on the financial health of the University, including the financial strategy, budget setting, annual accounts, investment activity, and consideration of capital expenditure including estates and infrastructure activity.
University Executive Committee	Responsible for all matters associated with the development and management of the university including financial matters, estates matters and risk management. (Includes lead for Estates and for Sustainability)
Estates Senior Management Team	Responsible for the effective management of the University's estates to provide a high quality student experience including planned and reactive maintenance, facilities management, and space planning.
Library, Technology and Information Senior Management Team	Responsible for the delivery of IT and library services to students and staff, and contributing to the optimisation of space management and University key infrastructure.
Sustainability Committee	Advises and makes recommendations to the University Executive Committee on the governance and implementation of the Sustainability Strategy and Environmental Management System. Responsible for monitoring sustainability improvements within the University and receiving annual updates on progress against carbon reduction targets for onward reporting to University Executive Committee.

The following table identifies key individuals within the University who are responsible for ensuring this plan is delivered.

Key personnel	Responsibilities
Executive Director of Estates Strategy	Officer of University Executive Committee and Finance and General Purposes Committee responsible for the implementation of the Estates Strategy.
Director of Estates	Responsible for the delivery of the Estates Strategy and CMP, holding overall responsibility for the reduction of carbon emissions in the management, development and refurbishment of the University's estate.
Director of Sustainability	Responsible for the achievement of the Sustainability Strategy and reporting progress to Sustainability Committee and external stakeholders via the Annual Sustainability Report. Identifies alignments to other institutional issues such as wellbeing and brokers engagement with other managers and teams.
Sustainability Operations Manager	Responsible for the development of the CMP, monitoring and reporting of progress in carbon reduction. Acts as environmental manager for the ISO 14001: 2015 environmental management system, and responsible for reporting operational performance in the Annual Sustainability Report.
Students Union	Responsible for supporting students whilst at university, having a positive impact on their academic experience, and support the development of skills so they are ready for their working life. Their Sustainability Policy includes a commitment to work with the Sustainability Team and to reduce the consumption of resources such as energy.

In addition to the proposed capital expenditure and operational costs of the projects proposed, it is essential that sufficient staff time and resource is committed to properly implement these measures. At times it will be necessary to call on assistance from a number of estates colleagues from areas such as facilities management, maintenance, energy management as well as colleagues in finance, procurement, communication, and student services.

7.2 **Reporting**

Progress of the CMP will be monitored and reported through a number of routes:

7.2.1 ***Annual Sustainability Report***: this report is the key means by which institutional progress on sustainability is reported to internal and external stakeholders. The report covers the period 1 August to 31 July each year, reporting a number of academic and operational metrics including water use, waste produced, scope 1 and 2 carbon emissions, use of grid supplied energy and energy generated on site.

7.2.2 ***Estates Management Record***: energy use, water use, waste statistics and scope 1, 2 and 3 carbon emissions along with many other indicators are reported to the Higher Education Statistics Agency (HESA) in February of each year. This information is publicly available and is used by a number of organisations to evaluate the University's sustainability performance within the HE sector.

7.2.3 ***ISO 14001: 2015 environmental management system (EMS)*** : the University has operated an externally assessed EMS since 2002 which includes improvement objectives around key environmental parameters such as waste, recycling, water use and scope 1 and 2 carbon emissions. Performance against these objectives is regularly reported to top management who review progress and update targets as necessary. The EMS is regularly audited by internal and external auditors.

7.2.4 ***Webpages***: the University makes a range of environmental performance information available via a dedicated sustainability website: sustainability.glos.ac.uk. Specific links are provided to the Annual Sustainability Report as well as additional information on energy & carbon, investment & purchasing, catering, waste & water, and travel.

7.3 **Programme management**

The achievement of the carbon reduction targets will require close management of the identified projects as well as effective communication between teams such as Estates, IT, Sustainability and the Students Union. Specifically, there is a clear need for close collaboration between Estates and Sustainability Teams to ensure best possible use is made of detailed monitoring and measurement of energy use.

It is therefore proposed that the Estates Management team will monitor progress against the CMP with the Executive Director for Estates Strategy reporting progress to UEC as required. Overall progress will be reported via the annual EMS Management Review and ASR.

7.4 **Risk management**

Over the lifetime of the CMP there are likely to be risks affecting the likelihood of projects delivering the planned carbon savings due to technical, operational financial and legal changes. The Estates Management team will maintain a risk and issues register which will be reviewed and updated regularly, and will link with the risks and opportunities section of the ISO 14001 environmental management system to update on legal and political risks.

Similarly, LTI Senior Management team will be advised of any risks potentially affecting the delivery of carbon reductions from the IT related carbon reduction projects via the annual review process.

7.5 **Strategy alignment**

Strategic Plan 2017-22: sets out the vision, goals and values of the university. Sustainability is one of its 6 strategic enablers, along with the operation of an effective and efficient estate. There is also a clear acknowledgement of the University's role as an anchor organisation in supporting stakeholders to address sustainability issues, which is supported through the RCE

Severn network hosted by the University.

Sustainability Strategy 2017-22: sets the direction for improving sustainability through five key goals, one of which is through improving business operations. One of the top two indicators of delivery on this goal is the production of this new CMP linked to the Estates Strategy.

Estates Strategy 2017-22: confirms the commitment of the university to reducing carbon emissions whilst recognising that recent growth and changes to the estate may have increased emissions, requiring a detailed review of carbon management projects and targets.

Information Technology Strategy 2018-22: supports the aims of the CMP through its key goal to achieve efficiencies to enable reinvestment in information capability.

There are other strategies which also have a vital role to play in supporting this CMP such as the Waste Policy, Catering Policy, Sustainable Travel Plan, Heating Policy, and Procurement Strategy. It is through concerted alignment with these strategies that long-term, enduring carbon reductions can be achieved.

Appendix 1: Summary of current and proposed projects

2018/19 and 2019/20 summary of projects

These projects include those that will deliver their first full year of carbon savings in 2018/19 and projects which are nil cost or can be funded externally.

Ref	Description	Carbon saving pa (tonnes)	Cost saving pa (£)	Cost (£)	Simple payback period (years)
H1	Replacement of boilers at Park campus (Jenner, Cooke, Tyndale, Dowty, Grace and Fullwood) plus Clegg building at FCH	50.0	£1,000	Already installed – carbon savings in 18/19	N/A
T1	Replace diesel van with electric version (Nissan ev-200)	1.5	£812	Already purchased – carbon savings in 18/19	N/A
I1	Install loft insulation in Dunholme Villa	1.34	£1,680	Already installed – carbon savings in 18/19	N/A
IT1	Reduce on time for student PC updating	TBC	TBC	TBC	TBC
IT2	Roll out improved power management policy to all PCs and Macs to power down monitor and PC after set period.	TBC	TBC	TBC	TBC
IT3	Offer lower energy PC option 65W in place of 80W option	TBC	TBC	TBC	TBC
IT4	Upgrade PCs using SSD drives in place of mechanical disk	TBC	TBC	TBC	TBC
H3	Assessment of insulation options for valves, pipes, heat exchangers, headers in plantrooms	TBC	TBC	TBC	TBC
C2	Install timers to chilled display cabinets in refectories	TBC	TBC	TBC	TBC
I3	Install radiator reflector foil behind radiators on external walls of solid wall properties at Park	3.6	£450	£800	1.80

Ref	Description	Carbon saving pa (tonnes)	Cost saving pa (£)	Cost (£)	Simple payback period (years)
B1	Live Smart student engagement programme	TBC	TBC	TBC	TBC
CS2	Check feasibility of fitting timers to display equipment in Elwes	TBC	TBC	TBC	TBC
R2	Solar photovoltaics on additional appropriate roofs at Park or Oxstalls using PPA (120kWp)	36.00	£4,100	Nil – externally funded	TBC
CS1	Review control strategies for all BMS systems at Oxstalls	TBC	TBC	TBC	TBC
	Total	**92.4**	**£8,042**	**TBC**	**TBC**

2020/21 and 2021/22 summary of projects

The implementation of these projects is subject to sufficient funding being available within the maintenance budget from 2020/21 onwards. The following longlist contains details of all identified projects – when funding is available it is recommended that projects with the most rapid payback are implemented first.

Ref	Description	Carbon saving pa (tonnes)	Cost saving pa (£)	Cost (£)	Simple payback period (years)
L1	Replacement of CFLs with LEDs at Elwes teaching centre	12.50	£2,629	£22,513	5.6
L2	Replacement of CFLs with LEDs at Elwes communal areas, including installation	7.10	£1,190	£13,038	6.5
L3	Replacement of CFLs with LEDs at Elwes reception, including Installation	4.00	£650	£2,380	3.7
L4	Replacement of CFLs with LEDs at Reynolds building, including installation	2.53	£4,117	£15,620	3.8
L5	Replacement of CFLs with LEDs at Bedford building, including Installation	3.81	£4,764	£22,141	4.6
L6	Replacement of CFLs with LEDs at Pallas building, including installation	0.95	£1,184	£5,377	4.5
L7	Replacement of CFLs with LEDs at Broadlands Lodge, Including installation	0.24	£303	£1,450	4.8
L8	Replacement of CFLs with LEDs at Dunholme villa building, including installation	1.34	£1,680	£8,059	4.8
L9	Replacement of CFLs with LEDs at Fullwood House and Lodge building, including installation	1.03	£1,288	£5,334	4.1
L10	Replacement of CFLs with LEDs at Jones building, including installation	0.20	£249	£1,220	4.9
L11	Replacement of CFLs with LEDs at Broadlands villa, including installation	0.78	£976	£5,583	5.7

Ref	Description	Carbon saving pa (tonnes)	Cost saving pa (£)	Cost (£)	Simple payback period (years)
L12	Replacement of CFLs with LEDs at Cornerways, including installation	0.74	£922	£5,401	5.9
R1	Carry out remedial work on Oxstalls solar pv array.	4.48	£1,530	£8,581	5.6
H2	Check pump turndown settings to resolve low delta t issue for Waterworth and Elwes boilers.	5.70	£1,230	£2,000	1.63
C1	Upgrade air con units in Bedford server room to invertor versions	18.1	£5,656	£17,976	3.18
I2	Install roof insulation at Fullwood	8.70	£890	£6,500	7.30
I4	Loft insulation to Elwes Teaching Centre suspended ceiling areas, corridors and office spaces using 200mm encapsulated pads	27.00	£5,000	£15,847	3.17
I5	Ceiling void insulation to Owen building using 200mm encapsulated pads.	5.10	£1,000	£4,684	4.68
L13	LEDs at Francis Close Hall. All buildings where applicable	15.27	£20,709	£164,685	3.60
I6	Draughtproofing at Francis Close Hall	TBC	TBC	TBC	TBC
I7	Secondary glazing at Francis Close Hall	TBC	TBC	TBC	TBC
I8	Ceiling void insulation for Learning centre Park from Bedford building covered way (from refectory) to Waterworth building. Using encapsulated pads.	5.10	£1,000	£16,742	16.7
I9	Secondary glazing at Park villas (Dunholme, Pallas, Broadlands, Fullwood)	TBC	TBC	TBC	TBC
CS3	BMS improvements	TBC	TBC	TBC	TBC

Ref	Description	Carbon saving pa (tonnes)	Cost saving pa (£)	Cost (£)	Simple payback period (years)
L14	LED lighting to Hardwick accommodation blocks; A, B & C	28.36	£6,690	£38,396	5.74
L15	Upgrade to LED lighting at 6 Oxstalls halls (chiefly replacing 38W 2D CFLs)	3.00	£6,762	£40,992	6.1
	Totals	**156.03**	**£70,419**	**£424,519**	**6.02**

Appendix 2: Future projects

2022/23 onwards

These longer term projects are to be developed and assessed for feasibility as existing assets approach the end of their lives, as contingent refurbishment work is planned or as opportunities to align building management systems with IT power management strategies arise.

Ref	Description	Carbon saving pa (tonnes)
H4	Installation of district heating pipes from Waterworth to Elwes (when Elwes boilers approach end of life)	Requires further investigation
R3	Combined Heat and Power unit at Waterworth Building, Park	Requires further investigation
I10	Roof/ceiling insulation at Bedford, Owen, Reynolds, Waterworth, Jones, Hall and any feasible roofs at FCH and HW	Requires further investigation
IT5	IT power management strategy to identify PCs to be left on for student use out of hours and co-ordinate with lighting and heating strategies	Requires further investigation

Appendix 3: Carbon management engagement matrix

An internal audit of the arrangements for carbon management, carried out in January 2017, identified the need to carry out a self-assessment using the Carbon Trust engagement matrix. The table below is the Carbon Trust's carbon management engagement matrix showing the elements that must be in place to score between 1 and 5 against the seven sections with the assessed position of the University shown by using dark boxes.

In some cases the University has in place elements from a higher scoring category, these are shown by using bold text. For example, for the Data Management section, M&T is in place for buildings – this element is shown in bold for the level 5 scoring criteria.

	POLICY	RESPONSIBILITY	DATA MANAGEMENT	COMMUNICATION & TRAINING	FINANCE & INVESTMENT	PROCUREMENT	MONITORING & EVALUATION
5 **BEST**	• **SMART Targets signed off** • **Action plan contains clear goals & regular progress reviews** • **Strategy launched internally & to community**	• CM is full-time responsibility of a few people • CM integrated in responsibilities of senior managers • VC support • Part of all job descriptions	• Quarterly collation of CO_2 emissions for all sources • Data externally verified • **M&T in place for:** o **Buildings** o Waste	• All staff & students given formalised CM: o Induction o Training Plan o Communications • **CM matters regularly communicated to:** o **External community** o **Key partners**	• Granular & effective financing mechanisms for CM projects. Finance representation on CM Team • Robust task management mechanism • Ring-fenced fund for carbon reduction initiatives	• Senior purchasers consult & adhere to ICLEI's Procura+ manual & principles • **Sustainability comprehensively integrated in tendering criteria** • Whole life costing • Area-wide procurement	• **Senior management review CM process** • **Core team regularly reviews CM progress** • **Published externally on website** • **Visible board level review**
4	• SMART Targets developed but not implemented	• CM is full-time responsibility of an individual • CM integrated in to responsibilities of department managers, not all staff	• **Annual collation of CO_2 emissions for:** o **Buildings** o **Transport** o **Waste** • **Data internally reviewed**	• **All staff & students given CM:** o **Induction** o **Communications** • **CM communicated to:** o **External community** o **Key partners**	• **Regular financing for CM projects** • **Some external financing** • **Sufficient task management mechanism**	• **Environmental demands incorporated in tendering** • **Familiarity with Procura+** • **Joint procuring between HEIs**	• Core team regularly reviews CM progress: o Actions o Profile & targets o New opportunities quantification
3	• Draft policy • Climate Change reference	• **CM is part-time responsibility of a few people** • **CM responsibility of department champions**	• Collation of CO_2 emissions for limited scope i.e. buildings only	• Environmental / energy group(s) give ad hoc: o Training o Communications	• Ad hoc financing for CM projects • Limited task management • No allocated resource	• Whole life costing occasionally used • Some pooling of environmental expertise	• CM team review aspects including: o Policies / Strategies o Targets o Action Plans
2	• No policy • Climate Change aspiration	• CM is part-time responsibility of an individual • No departmental champions	• No CO_2 emissions data compiled • Energy data compiled on a regular basis	• Regular poster/ awareness campaigns • Staff & students given ad hoc CM o Communications	• Ad hoc financing for CM related projects • Limited task coordination resources	• Green criteria occasionally considered • Products considered in isolation	• Ad hoc reviews of CM actions progress
1 **WORST**	• No policy • No Climate Change reference	• No CM responsibility designation	• Not compiled: o CO_2 emissions • Estimated billing	• No communication or training	• No internal financing or funding for CM related projects	• No Green consideration • No life cycle costing	• No CM monitoring

Appendix 4: Power Purchase Agreements

Background

Power purchase agreements (PPA) are increasingly used by organisations (including universities) to install renewable energy equipment such as solar photovoltaic (pv) panels without the need for upfront capital funding. A PPA is a long-term contract under which an organisation agrees to purchase electricity directly from an energy generator instead of buying it from the grid. It's sometimes called a "behind the meter" agreement as energy is generated and used on site without using the grid, which would automatically incur significant charges for distribution, transmission, balancing and renewables obligations.

The energy generator provides the capital funding for the renewable energy equipment, maintaining and monitoring it over the lifetime of the contract in return for the business agreeing to purchase energy at a reduced rate for typically 20 to 25 years. The rate paid for each unit of electricity is significantly less than the grid rate, typically 3 to 4 pence per kWh lower, and is indexed (usually to the RPI) to increase in a predictable way over the term of the contract. This helps protect against future electricity price rises and price shocks.

At the end of the contract the business can buy the installation for a nominal amount such as £1 or ask for it to be removed. Solar pv technology is likely to have moved on after 25 years, presenting the opportunity to have the panels upgraded – equally it is also likely that the existing panels will continue to generate electricity as their expected life is around 40 years.

Long term it would be advisable to consider how to secure lower cost electricity with predictable price increases as electricity costs are forecast to increase by a third in the next five years and to double by 2030. [BEIS 2017 Updated Energy & Emissions Projections Annex M]. The bulk of this rise is driven by new third party costs levied to manage supply as more renewables come on stream – third party costs will account for 66% of the typical energy bill by 2022, compared to 17% ten years ago.

Benefits

In addition to the free supply and installation of a renewable energy resource, benefits include:

- Long term financial certainty around energy costs via a fixed electricity price rising at an agreed rate
- Substantial energy cost savings over the term of the agreement
- Avoidance of increasing third party charges on energy such as the Climate Change Levy, distribution, transmission and balancing charges
- Reduced carbon emissions
- No maintenance obligations
- Improvement in the Energy Performance Certificate ratings of buildings

Considerations

In the case of solar pv installations, an important consideration is that the building on which it is mounted is likely to stay within the ownership of the organisation for the duration of the contract, and the demand for the electricity produced remains constant. Installer companies will therefore carry out a detailed survey of the properties involved and model current and future energy use in detail – as well as researching possible storage solutions using batteries.

- Arrangements and costs for demounting the panels should roof repair work be required must be clearly identified at the outset.
- Although installation of solar pv generally falls with permitted development rights, Park campus is within the central Cheltenham conservation area requiring specific advice from the Borough

Council to be sought.

- The University's lenders may need to be consulted if modifications are made to major buildings.
- The warranty conditions of roof treatments should be consulted to ensure solar pv installation methods are compatible with their requirements.
- Two agreements are required: one to lease specified roofs of the University for 25 years and one to agree the price of electricity supplied – legal advice would be required for both agreements.

Size of system

Any solar array should be sized to ensure the entire output is used on site as far as practicable. If excess electricity is generated this can be sold to the grid but at a lower rate meaning the return on investment is reduced. The energy generator will typically offset this loss of income by raising the price per unit of electricity offered to the customer. The other option is to store the excess electricity in batteries to be used later, for example to deal with the peak in demand when students return to their halls or to run IT infrastructure throughout the night. This option is worth exploring but will add cost to the proposal and would require space to be found on campus.

University proposal

One of the big six energy providers has carried out a desktop survey of the Park campus and identified a number of suitable (mostly flat) roofs for solar pv, key points:

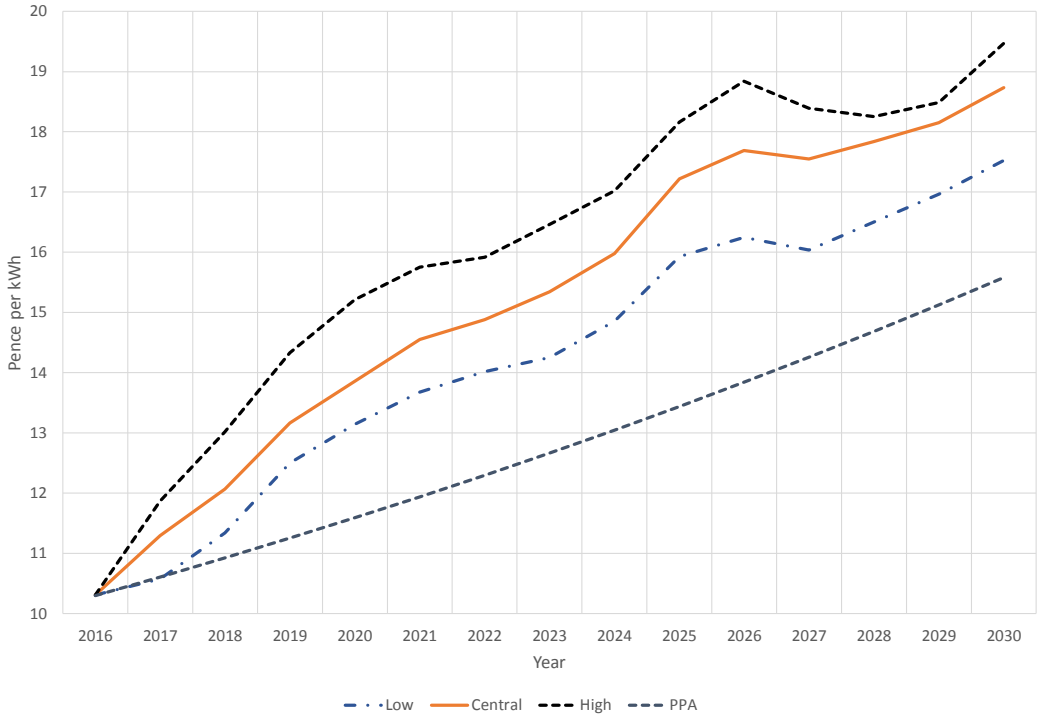
- Potential size of array: 175 kWpeak (c.3 times the size of the existing Oxstalls solar array)
- Output: 161,000 kWh per year
- PPA rate: 9.05p per kWh
- Term of contract: 25 years
- Carbon saving per year: 73 tonnes
- Savings summary:
- Year 1: £4,400
- Years 1 to 5: £31,600 (cumulative)
- Years 1 to 10: £79,900 (cumulative)
- Whole contract term of 25 years: £212,000

Two other generator companies have been asked to carry out similar surveys at Park - and at Oxstalls where the possibility exists of a larger array on residential and operational buildings.

The University's energy broker, The Energy Consortium (TEC), has experience of PPAs elsewhere and has offered to provide guidance on the possible procurement of a PPA, to supply example contracts and to provide objective advice on financial, operational and legal aspects of the PPA approach.

Forecast electricity costs

The graph below uses the forecasts of future energy prices provided by BEIS to approximate retail electricity costs per kWh out to 2030 versus the cost of energy indexed at 3% in the case of a PPA arrangement. (BEIS uses three forecasts low, central and high). The graph gives an indication of how average annual energy costs differ from a steady indexation rise such as that used by a PPA.



Forecast of electricity unit cost using BEIS low, central and high forecasts compared to a PPA supply indexed at 3%