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The University of Sheffield Carbon Management Programme

Strategy and Implementation Plan (SIP)

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Approvals

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Foreword from the Carbon Trust

Cutting CO_2 emissions as part of the fight against climate change should be a key priority for universities – it's all about getting your own house in order and leading by example. The Higher Education Carbon Management programme has been designed to assist universities like the University of Sheffield in saving money on energy and putting it to good use in other areas, whilst making a positive contribution to the environment by lowering their CO_2 emissions.

The University of Sheffield was selected in 2007, amidst strong competition, to take part in this ambitious programme. As one of the most proactive HEI's in the UK in responding to the risks that climate change presents the University of Sheffield has joined the 48 universities across the UK who have to date partnered with the Carbon Trust on this programme in order to realise vast carbon and cost savings.

This Carbon Management Strategy and Implementation Plan commits the University of Sheffield to a target of a 20% reduction on 2005-6 CO_2 emissions and underpins potential financial savings of more than £6 million per year by 2016-17. The Carbon Trust is very proud to support the University of Sheffield in their ongoing implementation of this Plan.

Richard Rugg
Head of Public Sector
The Carbon Trust

Foreword from the University of Sheffield

The reduction of carbon emissions to combat climate change is the most critical problem of our time. The University's participation in the Higher Education Carbon Management Programme demonstrates our own commitment to reducing the impact our activities have on the environment.

We have worked with the Carbon Trust and their consultants over the past ten months to develop the attached Strategy and Implementation Plan (SIP). This has enabled us to identify the carbon footprint resulting from our activities, and allowed us to analyse and identify the actions we need to take to reduce this impact.

The SIP means that effective carbon management is adopted as one of our key objectives and is a vital step in embedding the principles of sustainability across the University. It commits us to measurable targets for the reduction of carbon emissions, and to deliver these reductions through a programme of activities.

We also understand that there are many opportunities in the field of carbon management for research, teaching and knowledge transfer and that participation in the Carbon Management programme will help us realise them.

We shall make the document available to all stakeholders and publish our targets and annual progress so that the success of our corporate commitment is open to public scrutiny.

Professor Keith Burnett
The University of Sheffield Vice-Chancellor

Management summary

The University recognises the challenge posed by climate change, and as a socially responsible organisation, is committed to minimising the impact its activities place on the environment. We recognise that the adoption of the Carbon Management strategy outlined in the following Strategy and Implementation Plan (SIP) is key to improving our environmental performance over the long-term.

Awareness of sustainability and climate change is growing across all areas of society. Universities have a crucial role to play and HEFCE have stated their desire to make sustainable development a central part of their strategy for the future development of the higher education sector:

> "Our vision is that, within the next 10 years, the higher education sector in England will be recognised as a major contributor to society's efforts to achieve sustainability - through the skills and knowledge that its graduates learn and put into practice, and through its own strategies and operations."

The University of Sheffield is keen to take a lead in this area. The following Plan complements the University's plan for the future - Our Shared Vision - and will assist with the development of a CSR policy. It also offers us opportunities in a number of other important areas, including:

- Financial – climate change and the national policy response will impose significantly increased costs on the HE sector. Our energy and fuel costs alone currently exceed £6m per year and with prices set to rise it is vital that energy and fuel is used efficiently to minimise the financial impact.
- Research credibility - the University currently has energy research expertise across its engineering and science departments. The move towards a low carbon economy is likely to present opportunities for further research funding in areas such as energy supply and systems, transport fuels, nuclear energy, energy efficiency and renewable energy.
- Knowledge Transfer – leadership in this field can open up opportunities for improving the flow of ideas, expertise and skills between the academic research environment and external organisations in industry, commerce and the public sector.
- Reputation – research has shown that an institution's environmental management and performance is an important consideration in attracting students[1]. Building on the University's existing reputation in this field can help attract and retain staff and students.
- Management – by taking action now we are able to demonstrate that we are effectively controlling our carbon emissions, reducing risk and demonstrating effective environmental governance.
- Legislation – ensuring we are able to comply with current legislation and adapt and respond to future requirements.

The SIP confirms that the University's carbon footprint totalled 33,348 tonnes in 2005-6. This is the carbon dioxide associated with energy and water use in University buildings, fuel used

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[1] Forum for the Future and UCAS report 'Future Leaders'

by University fleet vehicles and waste disposal. Confirming emissions from other activities such as travel has not been possible at this stage, although it is the intention to consider how this information can be obtained.

The SIP sets a target of 20% below the 2005-6 baseline year by 2016-17. We acknowledge that this is ambitious but are confident it is achievable.

The SIP highlights the importance of embarking on this strategy. A Business as Usual scenario has been identified, estimating the likely financial and environmental impact if the University does not undertake Carbon Management activity. It is identified that by 2016-17, costs could rise to over £17m per year. Emissions could exceed 45,000 tonnes.

By estimating the effect of achieving the target, a reduced emissions scenario has been developed. By comparing the two scenarios it is possible to calculate the financial Value at Stake.

This is detailed in the SIP and confirms that by 2016-17 financial costs could be £6m lower under the reduced emissions scenario.

A number of factors key to the success of the strategy are identified in the SIP. These include

- Implementation plan financing – summarising what costs and benefits are associated with implementation and identifying appropriate funding streams.
- Stakeholder management and communications - engaging with internal and external stakeholders will be key to understanding their needs and potential impact on the programme
- Ownership and management – identifying key roles and responsibilities to ensure there is effective and ongoing ownership of the Carbon Management programme.

The University of Sheffield is committed to becoming a centre of excellence in carbon management and will strive to embed good carbon management practices across all aspects of the organisation.

Introduction

The Carbon Management Strategy and Implementation Plan

This Plan is a formal deliverable to the Carbon Trust under the HECM programme, and will be assessed by the Carbon Trust to determine how successfully we have engaged with the programme. Of particular importance are the following:

- The quantification of emissions reduction opportunities and projects, in terms of cost, financial benefit, and carbon saved.

- The balancing of projects with measurable emissions reductions alongside complementary actions that embed carbon management effectively.

- The scheduling of chosen projects and actions into a realistic, achievable plan that fits with our priorities and resourcing.

- The coordination of the plan with existing plans, policies and strategies.

- The definition of ownership and governance in the plan – defining and communicating the roles and responsibilities of individuals at all levels to ensure that the plan will be delivered and reviewed, and benefits measured.

The SIP defines the steps we will take to achieve these outcomes.

The background to the Carbon Management Programme

The University has developed separate environmental policies for managing energy, transport and waste. These have generally developed in isolation and the carbon management programme provides a convenient framework to integrate the University's approach to the environmental, social and economic aspects of these impacts.

The programme allows us to develop a consistent environmental approach and to demonstrate to all stakeholders that the University understands, and is appropriately managing its corporate responsibilities.

Timescales

The University participated in the third phase of the HECM programme, which ran from May 2007 to February 2008. The base year for calculating emissions was August 2005 to July 2006 and we have committed to a target reduction over ten years from 2007-8.

The report provides evidence to recommend implementing a comprehensive carbon management strategy across the University.

Carbon Management strategy

The University of Sheffield's activities place a huge strain on the environment, and as a socially responsible organisation we are committed to minimising this impact.

This section highlights the main drivers for change, identifies the vision, specifies objectives and targets and confirms the strategy to be followed.

Context and drivers

Carbon management is a high profile issue and is becoming increasing more so at the University of Sheffield.

Numerous individuals and groups across the University have interests and expertise in environment issues. Amongst the academic community this encompasses:

- Biodiversity & Conservation
- Plant science
- Climate Change and Carbon dynamics
- Energy Policy and Economics
- Energy
- Global Environmental Change and Identities

Within the non-academic community

- the Energy and Environment Team within the Department of Estates is responsible for reducing the University's energy and waste consumption and promoting sustainable travel
- the student body has a number of active groups focused on ethical and environmental issues

It has been a conscious decision to engage with as many interested individuals and groups in developing the Carbon Management strategy.

The University evaluates its performance by considering a handful of measures, including its market position, staff and human resource development and knowledge transfer. Under 'Institutional Sustainability' a new key performance indicator (KPI) has been introduced, assessing the University's carbon emissions against total income: the aim is to reduce the score each year. Devising and implementing our Carbon Management strategy will help ensure our performance in this important area continues to improve in the long-term.

The University's Environment Policy underpins the strategy being undertaken currently to reduce our environmental impact. The Policy states that:

"The University recognises the challenge posed by climate change, and will identify and set targets to reduce its carbon emissions and the environmental impact of its activities.
The University will set challenging environmental targets to improve continuously its environmental performance. The University will allocate sufficient staff, finances and other resources to carry out its broad environmental aims and objectives. The University recognises that reducing its environmental impact requires joint effort and commitment by staff and students, and will work in partnership with the Union of Students to do so."

The targets being set to improve environmental performance focus on the following key areas:
- Academic curriculum
- Energy and water
- Waste
- Transport
- Procurement
- Biodiversity and landscape
- Construction & the Built Environment
- Communications
- Pollution

The Carbon Management strategy will complement the work currently undertaken across the University academic and non-academic communities.

Drivers

There are a number of reasons why the development of a carbon management strategy is important to the University of Sheffield. The main drivers are identified below:

Legislative drivers

EU Energy Performance of Buildings Directive - the University must comply with the requirements of this legislation, which includes calculating the energy performance of buildings; applying performance standards on new and existing buildings; the certification of all buildings and the regular inspection and assessment of boilers and heating and cooling installations. This will have financial implications and make our buildings' energy performance highly visible to building users.

Carbon Reduction Commitment (CRC) – this is an innovative emissions trading scheme that will come into full operation in January 2010. We will be required to purchase credits to cover our expected annual carbon emissions. If we exceed our allowance, further credits will need to be purchased via an auction. Full details of this are not currently available so it is difficult to estimate the full financial impact at this stage.

Building Regulations – the requirements under Part L of the Building Regs have recently been tightened and further changes and improvements are planned.

Financial drivers

Energy costs - the University spends around £6m per year providing its buildings with power, heat and water. Utility costs have risen dramatically in recent years and this trend is likely to continue.

Vehicle fuel/waste costs – fuel costs and energy costs are linked so increases in diesel and petrol prices can be expected. A relatively small amount of our waste ends up in landfill but these costs are also moving upwards.

Climate Change Levy (CCL) – this tax on energy use cost the University £80,000 in 2005-6 and has recently increased. We avoid greater costs due to our commitment to procuring green electricity and by connecting to the energy from waste district heating scheme.

Environmental drivers

Climate change - the release of carbon dioxide and other greenhouse gases is widely believed to be a major contributor towards changes in the climate. As a leading academic institution it is important that the University reduces its own impacts, and contributes to the development of low-carbon technologies.

Transport – the impact of University staff, students and visitors places a considerable strain on the local road network, particularly at peak times. This contributes to congestion, safety, air quality and environmental issues that require concerted effort to manage. We cannot currently measure the total impact associated with commuting and business travel, but it is evident that reducing the need to travel and encouraging sustainable modes of transport are essential.

Other drivers

HEFCE sustainability strategy – HEFCE are keen to improve the environmental performance of the sector, and failure to comply with their requirements may lead to a reduction in funding.

Image - the University is a high profile institution and we are increasingly required to publish our environmental performance. We contribute to the local Business in the Community Environmental Index and were placed joint 16th in the inaugural Green League 2007 produced by People and Planet. Tackling environmental issues – and being seen to do so – will raise the University's profile and boost its image.

Student recruitment – environmental issues are becoming increasingly important in student recruitment. An UCAS survey in 2006 revealed that for 45% of those intending to study education, social sciences, architecture and building and planning "a good track record on sustainable development was important or very important in choosing where to study".

Internal links – the University's academic and non-academic communities have rarely worked closely together, but this issue offers significant opportunities for mutual benefit. The desire for a low carbon economy offers considerable research opportunities and grants are available to develop technologies that may be appropriate to be trialled on University buildings.

Our Shared Vision – the University seeks to "remain world-class, enhance its reputation, raise its profile and further develop its already significant international standing by 2020". An effective carbon management strategy can help achieve this.

Where are we now?

The following is the Carbon Trust's Carbon Management matrix. The shaded blocks identify the status of carbon management at the University of Sheffield at the beginning of the programme.

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	POLICY	ORGANISATION	INFORMATION AND DATA	COMMUNICATION AND TRAINING	FINANCE	MONITORING & EVALUATION
5	Specific sustainability / climate change policy with targets signed off and implemented. Action plan with clear goals and regular reviews to confirm actions undertaken and targets achieved/being progressed.	Accountabilities for sustainability /climate change defined at senior level, e.g. senior Sustainability / climate change responsibilities integrated into responsibilities of relevant people in different departments, e.g. Teaching, Finance, Estates	CO_2 emissions compiled for all main HEI sources for a baseline year and regular collation of annual emissions data. Data externally verified.	Formalised communication and training plan for all staff on carbon and energy related matters, including integration in induction and other normal training processes. Communication on carbon and energy related matters with the academic and student body and other key business partners	Use of innovative external funding mechanisms for carbon related projects. Development of internal financing mechanisms, e.g. self sustaining fund, specifically for carbon related projects	Management Review of carbon management process by senior management. Regular reviews by core team on progress with carbon management.
4	Specific sustainability / climate change policy with targets developed and signed off, but not implemented	Sustainability / climate change responsibilities integrated into responsibilities of relevant people in different departments, e.g Teaching, Finance, Estates	CO_2 emissions compiled for all main HEI sources for a baseline year (i.e. buildings, transport and commuting, etc. Data internally reviewed.	Formalised communication and training plan for all staff on carbon and energy related matters, including integration in induction and other training, and awareness raising	Strategic plan for developing internal financing mechanisms and obtaining funds from external sources	Regular reviews on progress with carbon management (e.g. review of actions, check against emissions profile and targets, addition of new opportunities etc.)
3	Sustainability / Climate change included in wider policy documents	Sustainability / climate change/ carbon management is part-time responsibility of moderate ranking personnel, e.g. Energy Manager, Sustainability / Environment Officer	CO_2 emissions data compiled for some sources for a baseline year (e.g. buildings) and source data available for other sources (e.g. transport)	Ad hoc communication and training delivered to all staff/students on carbon and energy related matters	Some internal financing on an ad hoc basis for carbon and/or energy efficiency related projects Review conducted on applicable external funding sources	Ad hoc assessment of all aspects of carbon/energy policies/strategies, targets and action plans
2				Communication and training to specific groups in the HEI (e.g. environment team) on carbon/energy related matters	Some internal financing on an ad hoc basis for carbon and/or energy efficiency related projects	Ad hoc reviews of specific aspects of carbon/energy policies/strategies, targets and action plans
1						

This confirms that whilst some progress has been made towards effective carbon management, there are opportunities for improvement in all areas.

Policy – this is an area that has been identified as being in need of improvement, and work is on-going to update and develop the existing Environment Policy. This will include a regularly updated action plan with clear goals and review of performance. Separate supporting documents such as the Energy Policy and Integrated Transport Policy already exist and a Sustainable Construction document is also being developed.

Organisation – currently the Energy and Environment Team have responsibility for developing the University's carbon management strategy. It is hoped that the Carbon Management Programme will help raise the profile of sustainability at the most senior level and help embed it in all areas of University business.

Information and Data – this programme has highlighted several areas where carbon emission data is missing. Plans are already in place to investigate whether the missing data exists and how it can best be collated.

Communication and Training - the Energy and Environment Team raise awareness of environmental issues via a number of channels and activities. This is usually focussed on specific groups of staff e.g. residences management, members of the Environmental Coordinators Network and the Environment Sub-Committee. A formal communications strategy is planned to heighten the awareness of carbon and energy matters to staff, students and other stakeholders.

Finance – a small budget exists for implementing carbon and energy efficiency projects, and some external funding has been sought in the past. It is hoped to take advantage of Salix funding and generate a self sustaining fund in the long-term. Staffing resources are being considered to ensure all investment opportunities are exploited, and savings delivered.

Monitoring and Evaluation – only the Energy Policy has been reviewed regularly in the past, but as carbon management increases in importance, more frequent and focussed reviews of carbon management performance will be needed.

We will report on progress towards the aim of achieving level 5 under each area of the Carbon Management matrix.

Vision

Sustainable development is seen as key to the University of Sheffield's vision for the future. Reducing carbon emissions relative to its income has been identified as one of the University's six key performance indicators and the University's website states that:

"The University is committed to managing its environmental impacts and we take environmental issues into consideration in planning our activities…the Energy and Environment team is working with the University's senior management and partner organisations within the city on innovations to safeguard and enhance the environment."

The adoption of the Carbon Management Programme is one of the key elements of the vision. Embedding low carbon issues into the Estates Strategy, other corporate and strategic plans and into the University's culture are vital components in helping the University improve its environmental performance.

The strategic objectives of the Carbon Management Programme are to:

- generate a corporate commitment to a low carbon future

- set high level objectives for managing our carbon emissions

- develop policies and actions to support the above objectives

- set challenging but achievable carbon reduction targets for the long-term

- develop management tools to ensure accurate data and reporting tools are in place

- measure the University's performance and report this to all stakeholders

Objectives and targets

In the 2003 Energy White Paper the UK government set an emission reduction target of 60% below 1990 levels by 2050 and the University will assume this as its main long-term objective.

To assist us achieve this, it is proposed to set a target of reducing emissions to 20% below 2005-6 levels by 2016-17.

It is acknowledged that this is challenging; however given the great potential for improvement across the University the target is believed to be achievable.

Energy use can be affected by issues outside the control of University building users. When considering progress towards the above target it will be important to normalise consumption to take account of factors including weather conditions and business activity.

Strategy

The following summarises the general priorities and principles that will be adopted to help deliver the vision and achieve the targets.

We will:

- Develop an environmental management system and comply with all relevant environmental legislation and regulations

- Utilise external funding streams wherever appropriate and set up a ring-fenced investment budget

- Invest in cost effective energy saving measures

- Ensure energy saving features are integrated into all new build developments

- Allocate sufficient staff, finances and other resources to carry out our environmental aims and objectives

- Ensure that the principles of sustainability are included in the academic curriculum wherever appropriate

- Reduce the amount of waste we produce and increase the percentage of waste that is reused and recycled

- Reduce the volume of hazardous materials and chemicals that we use and dispose of

- Encourage sustainable alternatives to single occupancy car travel for staff commuting to the University

- Aim to reduce business travel.

- Where business travel it is necessary we will encourage sustainable methods of transport

- Reduce the environmental impact of the products and services which the University buys by developing an environmentally responsible purchasing policy and by working in partnership with our key suppliers

- Complete construction and refurbishment building projects according to best environmental practice

- Aim to achieve a BREEAM "Excellent" rating for all new builds, and "Excellent" for major refurbishment projects

- Aim to meet current environmental best practice for the maintenance of our buildings, plant and equipment

- Work with the Union of Students to raise awareness of environmental issues amongst staff and students, and encourage participation in environmental projects and in reducing environmental impacts.

- Create and build upon partnerships with local community and national organisations to reduce our environmental impact on Sheffield and South Yorkshire.

- Investigate methods of capturing data to ensure our complete carbon footprint can be ascertained

Emissions baseline and projections

Introduction

It is important to establish the University's carbon dioxide emissions to enable cost and emission savings to be targeted. The University's emissions baseline has therefore been calculated by assembling an inventory of our emission sources. It was agreed that 2005-6 would be used as the base year for the calculations.

Having established the emissions baseline, informed assumptions on known and potential developments across the University's operations have been made. This allows us to make forecasts of future energy consumption and carbon emissions under a 'Business as Usual' (BaU) scenario.

Armed with this information it is then possible to estimate the financial implications for the University given the external drivers already identified such as the price of energy.

The difference in benefits and costs between the BaU and reduced emission scenarios allows us to calculate the Value at Stake (VaS). Calculating and communicating the financial Value at Stake (VaS) should help stakeholders understand one important aspect of the case for taking action to reduce emissions.

Scope

The baseline comprises emissions from the following sources:

- Energy use (electricity, gas, oil and district heating) from all University-managed

- Non-residential buildings and

- Residential buildings

- Vehicle use from:

- The University fleet

- Water use in all University-managed

- Non-residential buildings and

- Residential buildings

- Waste disposal

It is acknowledged that this is not a comprehensive list of all University activities impacting on carbon emissions. The lack of accurate data currently available means we are not in a position to consider the impact of

- Commuting

- Academic and business travel

- Resource consumption (e.g. paper) and

- Estates functions such as maintenance and project work.

Work is ongoing to investigate how these impacts can be accurately measured and included in the future.

Baseline

The University's monitoring and targeting database holds many years' accurate records of energy and water consumption and costs. This has allowed us to precisely measure emissions from these sources.

Electricity

In recent years the University has committed itself to procuring an increasing proportion of electricity generated from renewable sources. We therefore claim emission reduction benefit when completing other documents such as HEFCE's Estates Management Statistics. For the Carbon Management programme however, the following advice given by the Carbon Trust has been taken: "electricity purchased under a 'green tariff' should be regarded as having the same carbon weighting as general, undifferentiated grid electricity".

All electricity consumption data used in our baseline data calculations therefore has a carbon dioxide factor of 0.43kg per kilo-Watt hour applied.

District Heating

The majority of our non-residential buildings are supplied with heating and hot water from the District Energy Network, a low carbon, locally-generated energy source managed by Veolia Environmental Services (UK).

Waste from households, local authority services and some local businesses is fed into an incinerator unit at the Energy Recovery Facility. Above the incinerator, a large boiler generates superheated steam. This generates electricity for the National Grid and produces hot water for the district energy network which supplies buildings across the city centre with heat and hot water. The University is the single largest customer to benefit from this facility.

It has proved difficult to ascertain an accurate carbon emission factor for this heat. Our latest understanding is that the carbon content of district heating energy is $0.044kgCO_2$ per kilo-Watt hour so this figure has been used in the calculations.

Others

The carbon emission factors for other buildings-related fuels, water, waste and fuels used in fleet vehicles have been taken from the Carbon Trust's Emissions Baseline & Targeting Tool spreadsheet.

The following table and graph confirms the University's total carbon dioxide emissions for 2005-6:

The University of Sheffield carbon footprint 2005-6

	CO_2 (tonnes)	
Non-residential electricity	20,255	61%
Residential electricity	3,122	9%
Non-residential heating	4,315	13%
Residential heating	4,995	15%
Fuel - fleet vehicles	129	0.4%
Water	202	0.6%
Waste	330	1%
TOTAL EMISSIONS	**33,348**	**100%**

The University of Sheffield CO_2 emissions 2005-6
Total = 33,348 tonnes
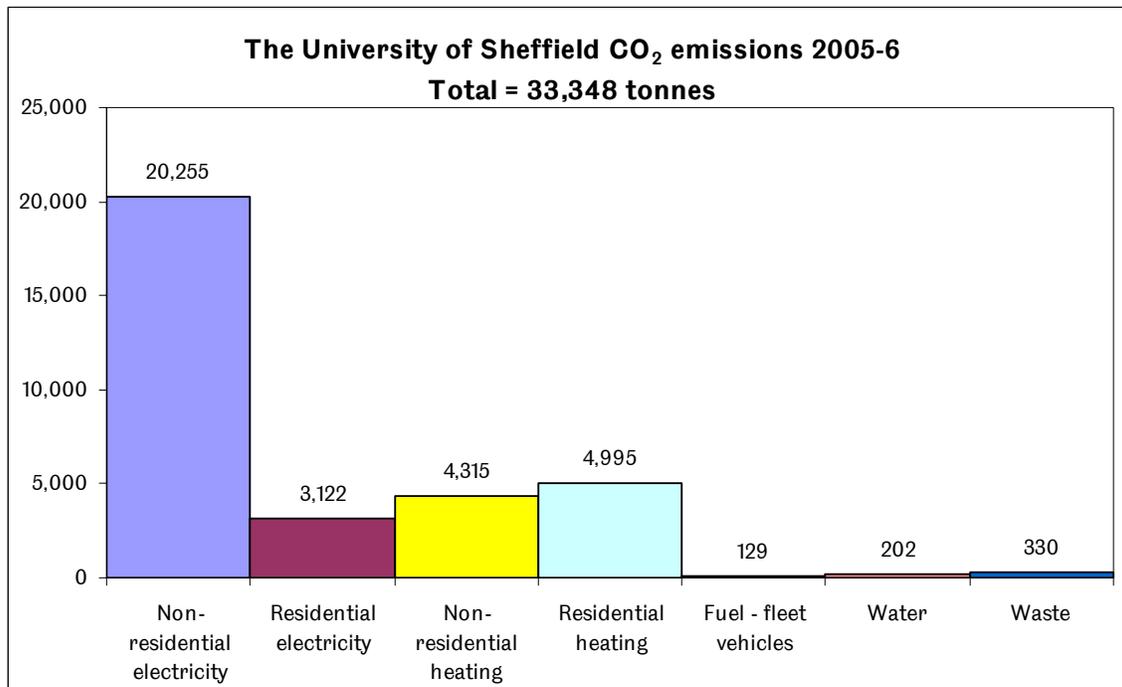
It can clearly be seen that building energy use – and electricity consumption in particular - has the greatest impact on carbon emissions.

Recent years have seen an increasing demand for power, primarily in research areas. A greater demand for 24-hour operation, tight bands of temperature and humidity and the requirement for air-conditioning goes some way to explaining why the consumption of electricity accounts for 70% of emissions. Heating our buildings is responsible for over 25% of

total emissions. The impact of fuel usage in fleet vehicles, water and waste is comparatively insignificant.

Projections

In the past five years, the University has undergone significant transformation. A major capital programme has been undertaken, with huge investment in developing the estate. Much of the focus has been on constructing new buildings such as Information Commons and the buildings on the former Jessop Hospital site. Major refurbishment has also been undertaken, primarily at Western Bank and North Campus and this will continue at the Arts Tower.

Less efficient buildings are being disposed of, to be replaced by buildings constructed to modern standards and therefore with a lower environmental impact. It should be noted however, that the activities undertaken in the buildings, the requirements for longer opening hours and the impact of additional floor space result in greater energy use and consequently a larger carbon footprint.

It is currently believed that activity levels and student and staff numbers are unlikely to change dramatically in the short- and medium-term, and the University's non-residential estate is likely to be generally space neutral for the foreseeable future.

Redevelopment has not been confined to the non-residential estate. The £160m Student Residences Strategy has resulted in the disposal and demolition of some buildings and the construction and refurbishment of others. This is likely to result in a slight reduction in total floor space and an improvement in energy efficiency. Utility costs may not reduce however, as there are a greater number of small supplies on the main Endcliffe site, meaning the loss of economies of scale enjoyed when the site was served with very large electricity and gas supplies.

The redevelopment will not be completed until the autumn of 2009 so the overall impact on emissions will only be confirmed in 2010-11. It is therefore important to appreciate that any projection made now is our best guess at present. Annual reviews will be needed so that a better understanding of the actual picture can be made.

Business as usual (BAU) scenario

The above allows us to make estimates of future energy consumption and carbon emissions, and it is clear that these are likely to increase. It is also necessary to consider changes to the cost of energy over the period so that the financial impact can be properly considered.

Making forecasts of future energy costs is extremely difficult so the advice of the Carbon Trust has been taken. They advise that the increases witnessed in previous years are likely to continue.

The above has informed the following tables and graphs that show projected financial costs and emissions under the Business as Usual scenario over the ten years to 2016-17. It should be noted that the tables and graphs include the likely changes to both the rate per unit of energy and amounts of energy consumed.
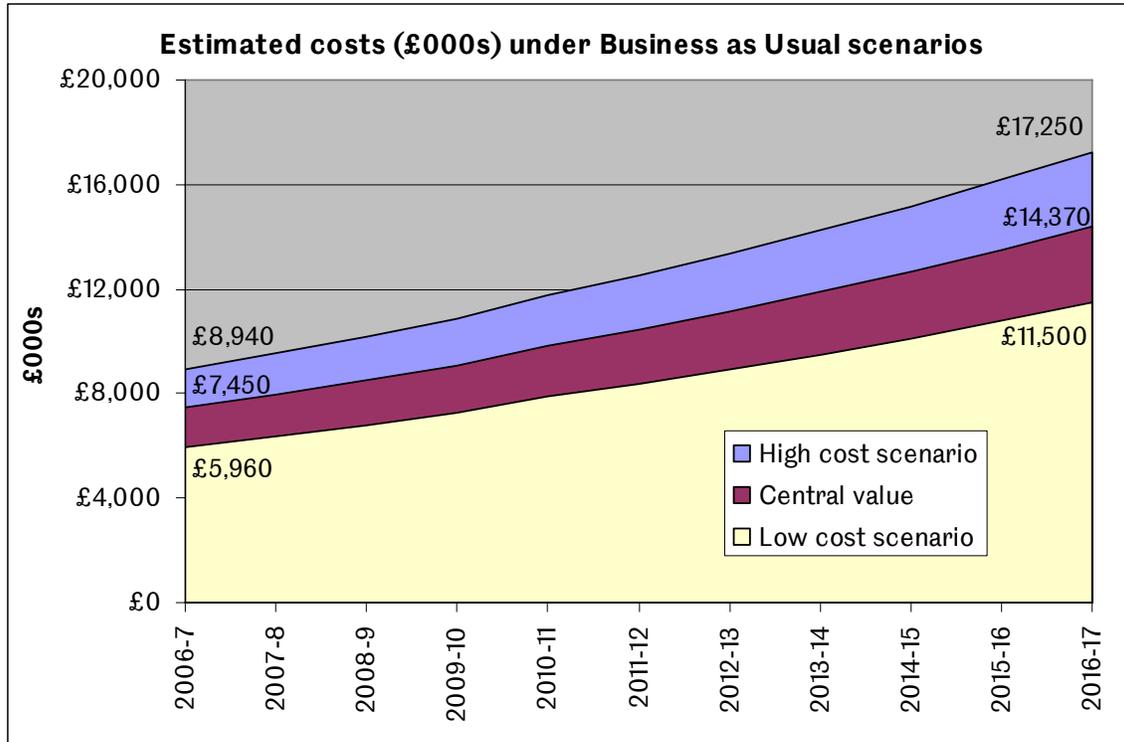
Projected costs (£000s) under Business as Usual scenario (i.e. including projected consumption and unit rate changes)

	2005-6	2006-7	2007-8	2008-9	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
Electricity	3,780	4,030	4,300	4,580	4,890	5,310	5,660	6,040	6,430	6,860	7,310	7,800
Gas	920	980	1,050	1,120	1,190	1,290	1,380	1,470	1,570	1,670	1,780	1,900
Oil	20	30	30	30	30	30	40	40	40	40	50	50
District Heating	1,060	1,130	1,200	1,280	1,370	1,490	1,580	1,690	1,800	1,920	2,050	2,180
Vehicles	40	50	50	50	60	60	70	70	80	80	90	90
Water	910	960	1,030	1,100	1,170	1,270	1,350	1,440	1,540	1,640	1,750	1,860
Waste	250	260	300	330	350	370	380	400	420	450	470	490
TOTALS	**£6,980**	**£7,440**	**£7,960**	**£8,490**	**£9,060**	**£9,820**	**£10,460**	**£11,150**	**£11,880**	**£12,660**	**£13,500**	**£14,370**

The data in the above table is based on the latest information available. It is likely that costs will fluctuate over the period covered, so to account for this a 'low' and 'high' scenario has been considered:

	2005-6	2006-7	2007-8	2008-9	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
Low scenario	**£6,980**	**£5,952**	**£6,368**	**£6,792**	**£7,248**	**£7,856**	**£8,368**	**£8,920**	**£9,504**	**£10,128**	**£10,800**	**£11,496**
High scenario	**£6,980**	**£8,928**	**£9,552**	**£10,188**	**£10,872**	**£11,784**	**£12,552**	**£13,380**	**£14,256**	**£15,192**	**£16,200**	**£17,244**

This information is illustrated graphically on the next page

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Estimated costs (£000s) under Business as Usual scenarios

Growth in the University's estate, an increase in energy intensive activity and continuing volatility in energy markets are likely to have a significant impact on University costs. If no additional carbon management initiatives are undertaken, then costs could double in the ten years from 2006-7. By 2016-17 they could exceed £17m per annum.

In addition to the financial costs, the increases in carbon emissions are also likely to be considerable as demonstrated overleaf.

Projected CO_2 emissions under Business as Usual scenario (tonnes)

|	2005-6	2006-7	2007-8	2008-9	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
Electricity	23,376	24,078	24,800	25,544	26,310	27,626	28,455	29,308	30,188	31,093	32,026	32,987
Gas	7,473	7,697	7,928	8,166	8,411	8,831	9,096	9,369	9,650	9,940	10,238	10,545
Oil	196	202	208	214	221	232	239	246	253	261	269	277
District Heating	671	692	712	734	756	794	817	842	867	893	920	948
Vehicles	128	132	136	140	144	152	156	161	166	171	176	181
Water	202	208	214	221	227	239	246	253	261	269	277	285
Waste	330	340	351	361	372	390	402	414	427	439	453	466
TOTALS	**32,378**	**33,349**	**34,350**	**35,380**	**36,442**	**38,264**	**39,412**	**40,594**	**41,812**	**43,066**	**44,358**	**45,689**

This information is illustrated graphically overleaf.

Estimated CO2 emissions under Business as Usual
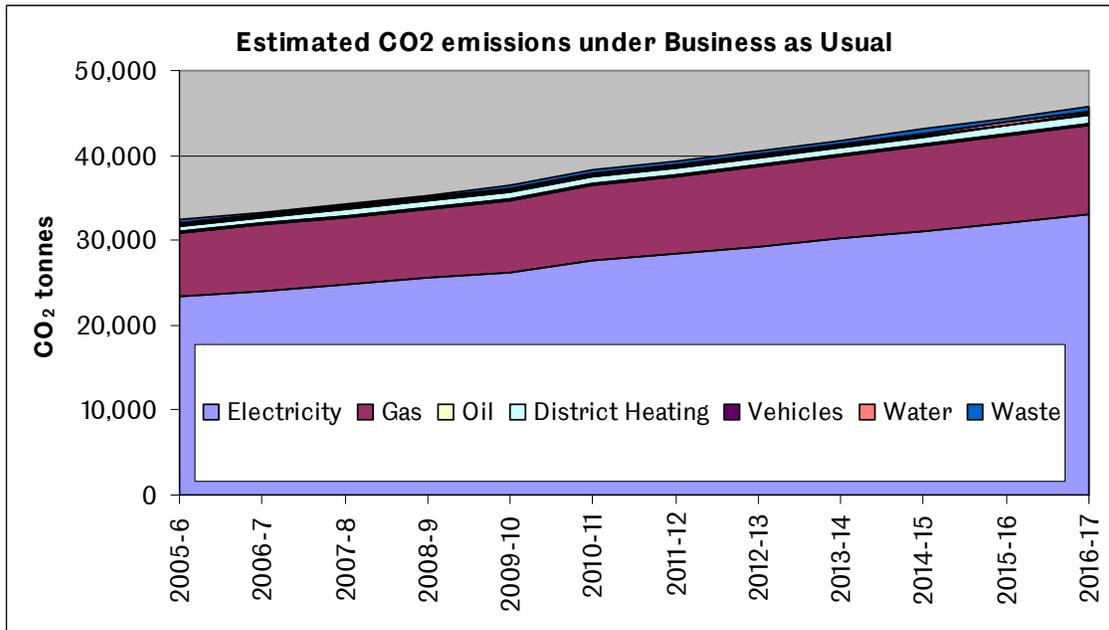
Reduced emissions scenario

Achieving the University's proposed target of 20% below 2005-6 emissions by 2016-17 will impact on consumption, costs and our carbon emissions. The following graphs demonstrate how costs and emissions will be affected under the reduced emissions scenario.

Estimated costs (£000) under Reduced Emissions scenarios

Estimated CO2 emissions under Reduced Emissions scenario
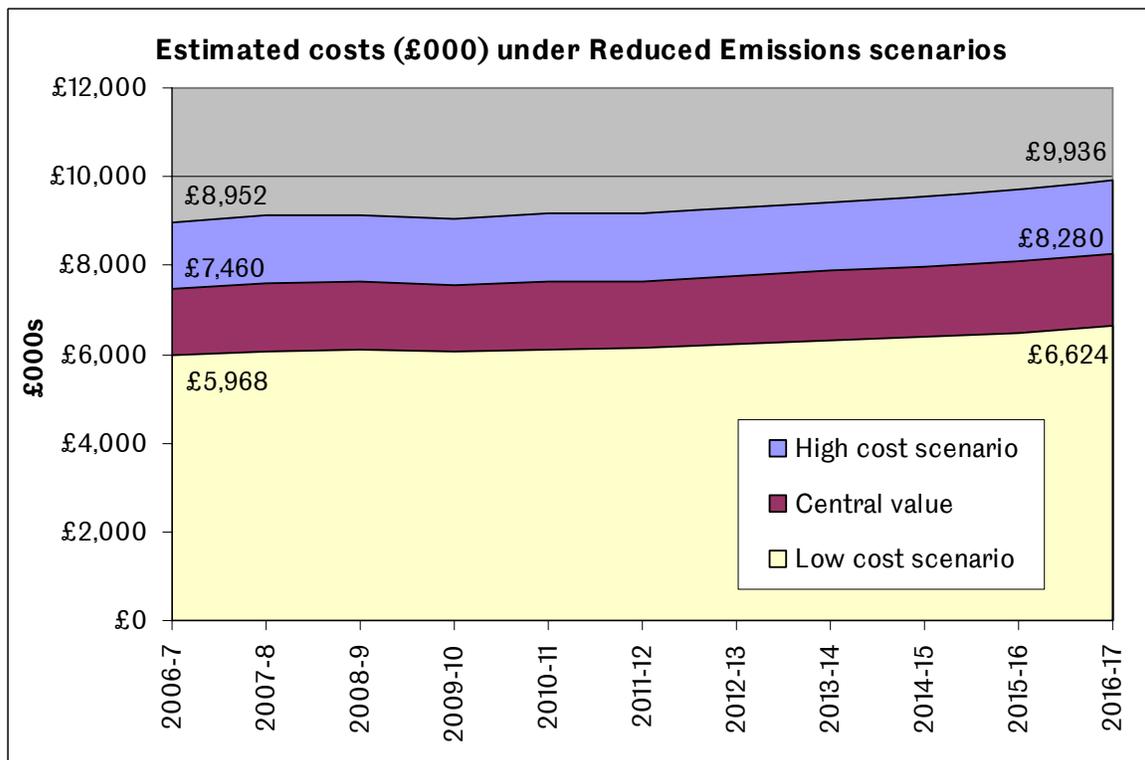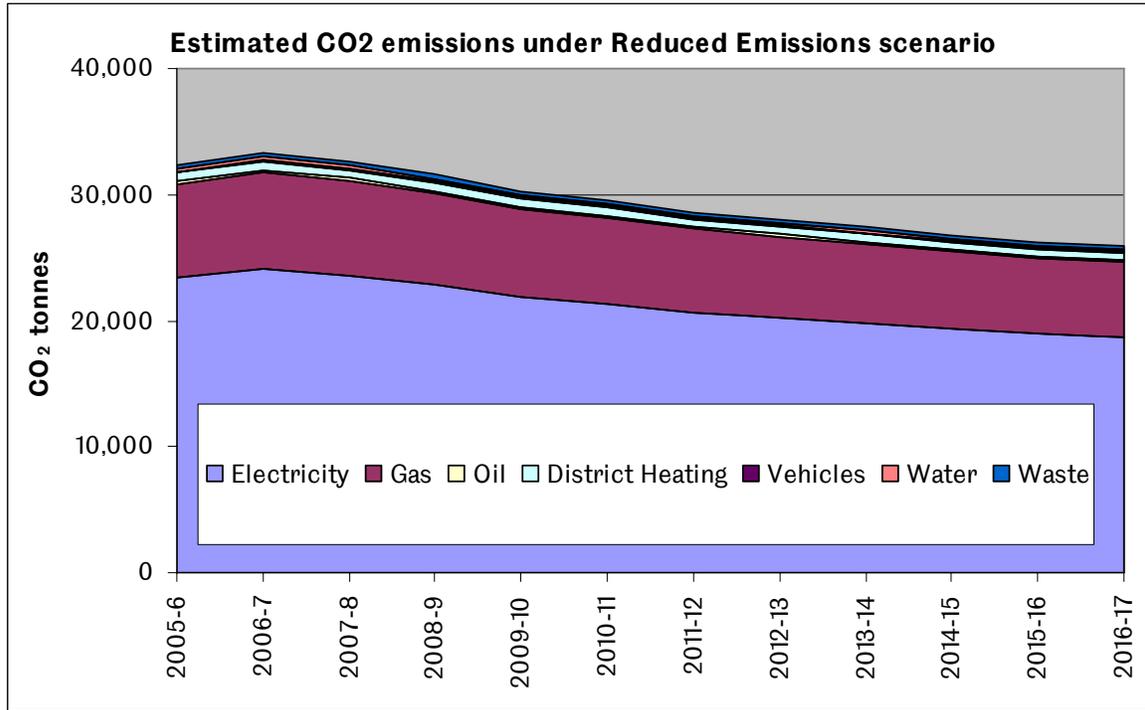
It can clearly be seen that an absolute reduction in emissions is forecast. This is important because maintaining emissions at their existing level will not deliver significant environmental benefit in the long-term.

The University's energy consumption should fall, but the price of energy is likely to increase at a greater rate than emissions are forecast. Whilst this reduction in consumption is to be welcomed, an absolute reduction in costs is not expected.
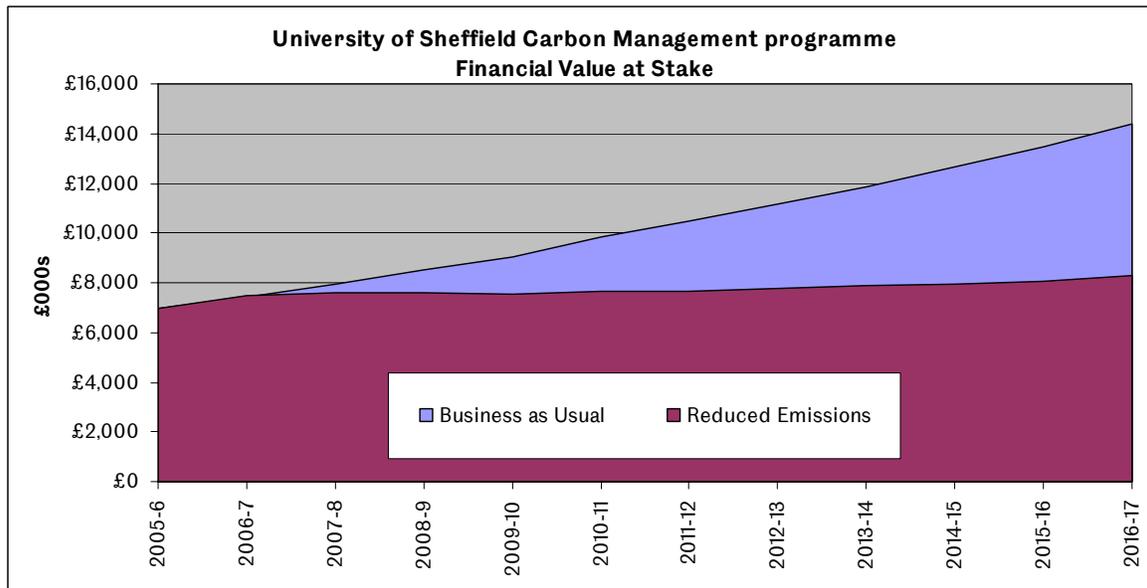
Value at Stake

The Value at Stake is the difference between the Business as Usual and reduced emissions scenarios i.e. the potential value to the University of adopting the Carbon Management strategy.

This can be measured in a number of ways. The initial financial value considers the savings available by reducing our consumption of energy and water in buildings; our vehicle fuel use and waste generation. This has been calculated at around £2.0 million by 2010-11 and over £6.0 million by 2016-17. This is illustrated below.

Costs (£000s)

	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
Business as Usual	7,450	7,960	8,500	9,050	9,830	10,470	11,150	11,880	12,660	13,490	14,370
Reduced Emissions	7,450	7,600	7,620	7,560	7,640	7,660	7,760	7,870	7,970	8,080	8,280
Value At Stake	**0**	**360**	**880**	**1,490**	**2,190**	**2,810**	**3,390**	**4,010**	**4,690**	**5,410**	**6,090**

University of Sheffield Carbon Management programme
Financial Value at Stake

In addition to the financial value at stake, the adoption of a Carbon Management strategy will impact on our carbon dioxide emissions: The following table and graph illustrate that achieving the target reduction by 2016-17 will reduce the University's emissions by over 20,000 tonnes per annum.

Carbon dioxide emissions (tonnes)

	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
Business as Usual	34,348	35,379	36,440	37,533	39,410	40,592	41,810	43,064	44,356	45,687	47,057
Reduced Emissions	34,348	33,610	32,541	31,171	30,438	29,470	28,837	28,217	27,610	27,017	26,714
Value At Stake	**0**	**1,769**	**3,899**	**6,362**	**8,971**	**11,122**	**12,973**	**14,847**	**16,746**	**18,670**	**20,343**
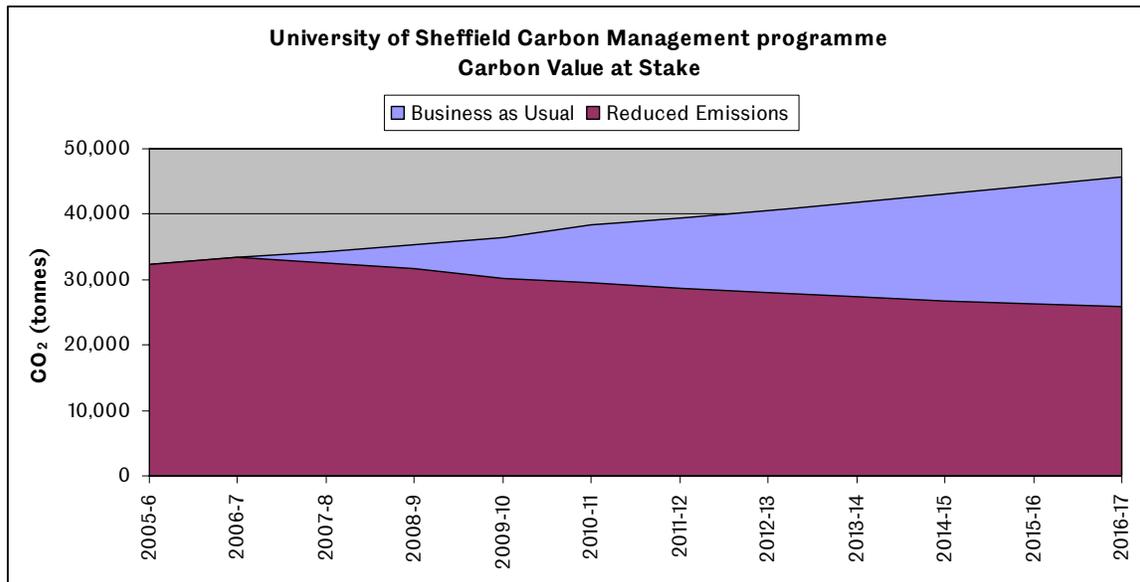
As well as the compelling financial and environmental case, there are risks associated with not adopting the Carbon Management strategy. These are not easily measurable but if the University is not considered a leader in this area the future for the University departments reliant on carbon-related research could be in doubt.

Past actions and achievements

Various climate change activities have been undertaken at the University in previous years. This work has informed the development of the Carbon Management strategy. The improvement of the Environment Policy has been mentioned previously, and some of the other key actions undertaken to date are identified below:

Energy Management

An Energy Manager post was created in 1997 and the University's first Energy Policy was introduced a year later. Reviewed regularly since this date, the Policy corporately commits the University to reducing energy consumption; increasing the efficient use of resources and reducing the impact our activities have on the environment. The Policy is authorised by the Vice-Chancellor.

Commitment to reducing our environmental impact has been achieved through the purchase of an increasing proportion of the University's electricity's needs from renewable sources. In addition we have supported the development and extension of the local energy from waste district heating scheme. The majority of buildings on main campus benefit from this facility.

Significant financial and environmental savings have been achieved. Accurate monitoring and targeting systems have been introduced to greatly improve the identification of faulty invoicing, building user awareness has been raised; advice on the procurement of low energy equipment has been provided and numerous schemes to improve energy and water efficiency have been implemented. These include improving heating, air-conditioning and ventilation controls, the installation of insulation, relighting, a scheme to reduce PC power wastage, improving BEMS controls and the installation of over a thousand water-saving devices.

Transport

The University's first Integrated Transport Policy was introduced in 1997. This and later reviews committed the University to encourage and promote sustainable travel, reduce the need to travel and work in partnership with local authorities and public transport operators.

Various schemes have been implemented. Discounted public transport tickets are available for staff; cycling to work is encouraged through a scheme to purchase a bicycle and safety accessories directly from staff salaries, and a Car Share Scheme allows those who have to travel by car to save money and time by finding people to share the journey with.

Waste:

A new post has been created within the Energy and Environment Team to coordinate the management of waste and recycling. The major success story in this area has been the paper recycling facility. Significant volumes of paper that would otherwise have been incinerated or taken to landfill are sent for recycling.

Awareness raising

It is acknowledged that the small Energy and Environment Team cannot deliver the University's aims without support from others. Numerous activities have therefore taken place to raise awareness of the team and the broader University aims. The most successful of these is in the setting up of a network of enthusiasts from across the University to assist in identifying opportunities for environmental improvement. Over 100 Environmental Coordinators have joined the scheme and are helping to report problems and raise awareness of environmental and sustainability issues amongst staff and students.

In 2007 the University set up the first Annual Environmental Champion Award. Nominations were invited for anyone who had "gone beyond the call of duty to promote environmental issues." This generated significant interest and Richard Hudson from the Office of Corporate Partnerships was selected as the inaugural winner.

Carbon Management Implementation Plan

To help achieve the savings identified above and embed Carbon Management into the University's day to day operations, a systematic programme of initiatives must be implemented.

The following section describes the individual actions and projects that will be undertaken. Governance, ownership and management of this vital area are identified under section 8, and whilst a fine level of detail will be necessary to manage each individual project, it is felt this level of resolution is not appropriate to this document.

Shortlisted actions and emission reduction opportunities

The following is a summary of shortlisted emission reduction initiatives and the criteria taken into account in selecting these. More detail on each project is included at Annex A.

Long-term enablement actions

These are actions that it is hoped will lead to future emissions reduction:

- Consider budget devolution – to incentivise building users to be more aware of the need to use energy wisely

- Develop a Sustainability Policy – to assist embedding sustainability across the University's operations

- Web site promotion – develop and promote the University's environment pages to reflect their importance

- Green purchasing policy

- Carbon neutrality/carbon neutral degree

- Offsetting

- Business travel/teleconferencing

- Appointment of Energy Engineer and Environmental Controls Engineer

- Installation of automated meter reading (AMR) system - replacing all sub-meters that have reached the end of their useful life and installing an automatic meter reading system. Ensure connectivity with refurbishment and new build projects

No- and low-cost emissions reduction actions

- Awareness – it is planned to provide training, checklists and other supporting documentation to implement "people solutions". Improved energy awareness materials will be incorporated into staff and student induction packs & events. Thermal comfort will be addressed as an essential element of energy awareness programme.

- Procurement - corporate-level procurement policies will be improved to include a requirement to take energy efficiency into account for all relevant purchases. Procedures will be produced to ensure IT power-save and other efficiency features are utilised.

- Maintenance – priority will be given to requisitions that reduce energy use or improve thermal comfort and maintenance tasks that stop energy waste, such as cleaning filters & condensers, repairing windows and replacing aging luminaries.

- Building Energy Management System - BMS setpoints and time schedules will be adjusted to avoid heating buildings to excessive temperatures, or when they are unoccupied

Emissions reduction actions requiring investment

The following are summaries of the main emissions reduction actions requiring investment that are known at this time. These schemes have been considered in some depth and greater detail including costs and benefits is given in the appendices.

- Insulation

  - Pipework - particularly on steam network

  - Valves - jackets on valves in plant rooms. Valve jackets should be easy to fit and remove, e.g. with Velcro fastenings

- Draught-proofing - Install on windows throughout the majority of buildings, with the exception of those with secondary glazing, or existing draught-proofing;

- Cavity wall insulation – add to the Chemical Engineering building and others

- Roof insulation - Frederick Mappin, Central Wing and the Amy Johnson Annexe

- Lighting controls - Install combined sensors for presence detection and daylight measurement to switch off lights in areas that are vacated, or inhibit lights from coming on when there is sufficient natural light, especially Lecture Theatres.

- Standalone control - Install local controls, such as TRVs for radiators; presence sensors and timeswitches for lecture theatre extract fans; install one BMS outstations for heating and ventilation systems currently under local control with excessive operating hours.

- Kitchenettes - Install motor controllers to reduce refrigeration motors' electricity use. Install water boilers in kitchenettes and remove kettles. Install timeswitches to control point of use electric domestic water heaters.

The following are other emissions reduction actions requiring investment that are known at this time. These schemes have not been considered in as much detail as the ones above so are only summarised here. This is a work in progress and many other opportunities are being identified. It is intended to develop these to maintain the fully costed and prioritised list of opportunities.

- Chilled water - consider installing a chilled water distribution system to provide cooling for process and environmental requirements at both St. George's campus and Hicks C floor

- Supply voltage - consider installing a voltage controller on the incoming electricity supply to

  - St. George's Campus and

  - North Campus to reduce the supply voltage

- Building Energy Management System

  - Allow exiting Sauter system in Chemistry to interface with Invensys

  - Allow exiting Gibson control of ventilation system in Edwardian block to interface with Invensys

  - Allow exiting system in Information Commons to interface with Invensys

- Boiler replacement

  - Crookesmoor Building

  - Regent Court

- Motors

  - replace with high efficiency type where appropriate

  - introduce inverter control where appropriate

- Lighting fittings - install 'Retrolux' T5 fluorescent lamps in T8 and T12 fittings

- Heating controls – improve wherever inadequate, but especially on single pipe systems e.g. Hicks

- Heating – consider gas-fired systems or connection to district heating network where electric heating exists

- Hot water – point of use heaters to be installed where appropriate

- Radiator reflective foil – to be installed across estate

- Ventilation – improvements to be brought forward from LTM especially at Hicks

- Compressed air – upgrade of all compressors

- Computers – install power saving devices from IPEM

Site-specific issues:

- North Campus

  - Connect all North Campus to BEMS, with the priority being the George Porter building's supply and extract system

  - Provide a dedicated chiller to the Sorby Centre in the Kroto building to avoid the need for running four chillers in winter.

- Replace all inefficient pumps and motors

- Investigate opportunities for draught proofing around windows, pipework insulation (particularly cooling pipework), roof and cavity wall insulation

- Goodwin Sports Centre

  - Improve ventilation,

  - Replace inefficient glazing

  - Connect to BEMS connection

  - Investigate roof insulation

Implementation Plan financing

It is acknowledged that significant investment will be required to undertake the main emissions reduction actions identified above. The identification of appropriate internal and external investment streams will be essential to ensure for the schemes are implemented and the emission target reductions achieved.

Internal Financing

In the past few years the utilities budget has included a figure in excess of £90,000 for energy conservation measures. This has been used to fund a variety of schemes in non-residential buildings, including insulation measures, controls improvements and water saving devices. It is important that this fund continues to exist to ensure schemes continue to be implemented. This is particularly important with the introduction of Salix funding (see below).

The residences utilities budget does not have a separate budget for such measures. It is hoped that such a budget can be created to allow investment in energy efficiency measures across the residential building stock.

External financing

To allow us to achieve the reduction in emissions identified, it is recognised that external funding will be necessary.

We have improved links between the University's academic and non-academic communities and this may open up funding streams for research that could benefit University buildings. It is planned to take advantage of the next – and future rounds - of the Science Research Investment Fund (SRIF).

Various funding streams are managed by the Carbon Trust, including the Low Carbon Buildings Programme. It is our intention to keep aware of all such opportunities, particularly the fund managed by Salix.

Salix is an independent not-for-profit company set up by the Carbon Trust in 2004.   They will provide funding that is matched by the University, to set up a ring-fenced sustainable fund. We have applied to join this scheme which will fund investment in energy-saving schemes with a short payback period. A proportion of the savings achieved will be recycled back to the fund to ensure it is a sustainable, ring-fenced fund for the long-term.

We have applied for a Salix grant of £200,000 and it is currently proposed to draw the funds in four equal tranches over a two year period as detailed below.

	April 2008	October 2008	April 2009	October 2009	Totals
Salix fund	£50,000	£50,000	£50,000	£50,000	**£200,000**
University	£50,000	£50,000	£50,000	£50,000	**£200,000**
Total	**£100,000**	**£100,000**	**£100,000**	**£100,000**	**£400,000**

The suitability of this proposed release of funds will need to be assessed as schemes are implemented. Depending on the success of the implementation programme, it is possible that a bid for further grant aid will be made.

We will also investigate any further opportunities for exploiting external funding streams. One such scheme is the Revolving Green Fund which is being developed by HEFCE and Salix. At the time of writing this is out for consultation, and we will consider taking advantage of this if it is deemed appropriate.

Stakeholder management and communications

Stakeholder management

There are a number of existing groups of key stakeholders across the University. These include members of the Environmental Coordinators Network, the Environment Sub-Committee, management within Accommodation and Campus Services, the Students' Union and other student groups.

Other individuals and departmental groups exist and we will regularly communicate with all stakeholders to keep them abreast of carbon management activity that has taken place. The aim will be to maintain the profile of active consultation and ensure that all stakeholders are aware of the breadth of the activity being undertaken.

Communications Plan

The University's Student Recruitment Admissions and Marketing department is currently devising a formalised Communications Plan. This work is not yet complete but the principles are to

- communicate the purpose, process and successes of the programme
- ensure the appropriate stakeholders are engaging in the process
- maintain momentum towards achieving the programme's objectives.

The communications plan will identify the messages and media that will maximise support for the programme and ensure that appropriate communications are considered at every stage of the process.

Key communications will be with senior managers, directors and academics, who will be made aware of the value of managing carbon, and kept aware of the success of the programme.

Whilst it is felt important to liaise with stakeholders by exploiting existing communication channels, it is also intended to establish a specific Carbon Management group. This will comprise representation from Finance, Estates, Procurement, the academic community and student body. The main role of the group would be to review and propose updates to the Implementation Plan. Further detail is given in section 8.

SIP governance, ownership and management

This section describes how the Implementation Plan will be owned and driven at a high level, and the leadership and management activities that must take place to keep the whole programme fresh and on-track.

Main roles and responsibilities

To ensure there is effective and ongoing ownership of the Carbon Management programme it is important to define a governance or accountability structure for the programme. The University's structure for management accountability is as follows:

- Professor Peter Fleming Pro Vice-Chancellor for External Relations - responsible for setting the strategic direction for Carbon Management, agreeing the resources to be devoted to the Implementation Plan and reviewing the progress against the objectives outlined in the Plan.

- Phil Riley, Energy Manager – to assume 'Carbon Manager' role, being responsible for evolving and implementing the Carbon Management Plan and for achieving the Carbon Management targets. It is appreciated that this role could be much broader than that of a traditional Energy Manager.

- Carbon Management group – when established, this core group will be responsible for

  - Reviewing and updating of the Implementation Plan on an annual basis

  - Monitoring and reporting progress against plan

  - Monitoring and reporting emissions performance

  - Overseeing the maintenance of the opportunity database

  - Overseeing Internal and external communication; and

  - Overseeing engagement with sustainability and environment champions on awareness raising initiatives

- Environment Sub-Committee – progress reports will be sent to each meeting of this group and made available to all staff, students and external stakeholders where appropriate.

This is summarised in the following table:

Carbon Management Implementation Plan: Responsibility Table.

Activity	Responsible person			
	Project Sponsor	**Carbon Manager**	**CM core group**	**Others** (eg Env Sub-Committee)
Carbon Management Implementation Plan	✓			
Set objectives			✓	
Manage implementation plan		✓		✓
Monitor and review progress		✓	✓	✓
Manage risks and issues	✓			
Manage stakeholders and communication		✓		
Report		✓		
Financing of Carbon Management Activities			✓	
Carbon Management - Buildings		✓		
Carbon Management - Transport				✓ **note 1**
Carbon Management - Waste				✓ **note 2**
Maintenance of the opportunity database		✓		
Purchasing			✓	✓

Note
1 – Transport issues are the responsibility of Rob Bettison the University's Travel Plan Coordinator
2 – Waste issues are the responsibility of Charlotte Winnert the University's Environment Officer

Risks and issues management

Any implementation programme must address the management of risks - things that may happen at some point in the future and require positive management to reduce their likelihood of happening, their impact on the programme, or both - and issues - things happening now that are affecting the programme in some way and need to be actively dealt with and resolved.

This will be an ongoing process comprising the identification of all risks associated with intended actions, or to the programme as a whole, and the identification of the methods for their mitigation. This may include the development of a contingency plan.

The following table identifies the main risks that may affect the plan and their proposed mitigation.

Carbon Management Implementation Plan: Risk management table.

Risk	Mitigation plan
Initial senior level enthusiasm for Carbon Management is not maintained	Reinforce the benefits of the Plan via the Project Sponsor
Corporate changes (e.g. the move to Faculties) prove to be a distraction	Emphasize the link between Carbon Management and financial efficiency
Insufficient capital to invest in carbon reduction opportunities	Update and promote Value at Stake calculation Bring forward the implementation of opportunities with the shortest paybacks Investigate and secure additional external funding, initially from Salix
Energy prices rise significantly	Opportunity to strengthen the case for supporting and implementing the Carbon Management strategy
The introduction of new legislation (e.g. DECs - Display Energy Certificates)	Energy labelling of our buildings will make our performance publicly available and will strengthen the case for implementing the strategy
Lack of available data means accurate carbon footprint cannot be calculated	Identify where gaps in data exist and set up appropriate methodologies for ensuring the missing data can be collated.
Carbon management issues are not considered as part of capital developments	Ensure requirements for appropriate standards (e.g. BREAAM) are incorporated in specifications
Departments believe there is little incentive to engage with the process	Senior management should communicate what is expected of all building users. Consider devolving budgets to departmental or Faculty level.

Benefits management

It will be important to communicate the quantitative and qualitative benefits arising from the programme. These will be measured and reported at appropriate times.

The annual review report taken to the Environment Sub-Committee each year will comprise an assessment of the University's carbon footprint. Initially this will be compared to the base year use the same methodology. This will allow a direct comparison to be made and allow the success to be measured.

In future years it is expected that improvements will be made to the calculation of our carbon footprint and it will be important to ensure that like-with-like comparisons are made.

The University's Key Performance Indicator relating to carbon emissions and income allows another opportunity for the benefits of the programme to be discussed at the most senior level. In addition we shall report each year on a number of other performance indicators including:

- Electricity consumption, costs and emissions
- Heating fuel consumption, costs and emissions
- Water consumption, costs and emissions
- Fleet vehicle fuel consumption, costs and emissions
- Waste generated, recycled, costs and emissions

Reporting and evaluation

Progress reporting is likely to be most effective if it is integrated into the University's existing management reporting structures. It is therefore recommended that update reports from the Carbon Manager are taken to every Environment Sub-Committee meeting.

These reports will comprise a review of performance and a SIP update each year. The Sub-Committee will be responsible for updating the plan and for agreeing annual targets.

The Sub-Committee will also advise on the procedures for reporting the achievements of the plan and communicating these to all appropriate stakeholders.

Appendix A: Individual actions

This section describes some of the main actions that we plan to implement as part of the Carbon Management plan. Sufficient detail is provided so as to be credible to those responsible for reviewing and approving the SIP.

Project / Action 1: Plant room pipework insulation – St George's site	
Description and notes	Install insulation over pipework & jackets over valves in plant rooms. Valve jackets should be easy to fit & remove, e.g. with Velcro fastenings
Quantified costs and benefits	Financial investment, operational costs - £9,000 Emissions reduction – 33 tonnes per year Financial savings - £7,000 per year Payback period – 1.3 years
Resources	Funding source – Salix/University fund Management – project to be undertaken within Department of Estates
Ownership and accountability	Lead officer: Clive Hutchinson, Energy Engineer Supported by: Barry Whittles, Head of Estates Maintenance and Phil Riley, Energy Manager
Ensuring success	Known key success factors – measured reduction in non weather-related heating fuel consumption. This will be confirmed through analysis of metered consumption and local degree days. Principal risks – few risks are expected as this scheme is neither technically complex nor financially onerous. It is possible that the insulation will be discarded when future maintenance of the pipework and valves is undertaken Main means of risk mitigation – raise awareness amongst maintenance staff of the need to replace any insulation removed
Performance / success measure	Reduction in heating energy consumption.
Timing	This is a straightforward scheme so will be undertaken in the summer of 2008.

Project / Action 2: Reduce heat loss – St George's site	
Description and notes	Install draught-proofing on windows throughout the majority of buildings, with the exception of those with secondary glazing, or existing draught-proofing; insulate the cavity walls of the Chemical Engineering building and the roofs of Frederick Mappin, Central Wing and the Amy Johnson Annexe.
Quantified costs and benefits	Financial investment - £75,000 Emissions reduction – 101 tonnes per year Financial savings - £25,000 per year Payback period – 3 years
Resources	Funding source – Salix/University fund Management – project to be undertaken within Department of Estates
Ownership and accountability	Lead officer: Clive Hutchinson, Energy Engineer Supported by: Barry Whittles, Head of Estates Maintenance and Phil Riley, Energy Manager
Ensuring success	Known key success factors – measured reduction in weather-related heating fuel consumption. This will be confirmed through analysis of metered consumption and local degree days. Success can also be measured by the building users who should detect significant thermal comfort improvements Principal risks – the work will be disruptive for building users, which may lead to delays in implementation. Some of the proposed cavity wall insulation work may not be technically feasible. Main means of risk mitigation – consult with building users at all stages of the process. Carry out in depth site surveys prior to starting the works.
Performance / success measure	Reduction in heating energy consumption and positive feedback from building users. A reduction in the number of heating complaints received by Estates HelpDesk..
Timing	This is a complex scheme that will ideally need to be undertaken in the warmer months to minimise disruption and inconvenience to building users. It is likely that the scheme will be started in the spring or summer of 2009.

Project / Action 3: Improve the control of lighting – Campus-wide	
Description and notes	Install combined sensors for presence detection and daylight measurement to switch off lights in areas that are vacated, or inhibit lights from coming on when there is sufficient natural light. The sensors should be installed in spaces of intermittent use with lighting circuit loads of ~400W or more, e.g. offices, student study areas, common rooms, computer laboratories. They should not generally be installed in corridors unless they are well lit by natural light. Rooms with small lighting loads, but mainly vacated (kitchenettes, toilets, common rooms) should also be included. Seminar Rooms and Lecture Theatres should be treated with care as lights may be required to be off during occupancy. They should be assessed on a case by case basis, with inclusion of manual over-ride facilities.
Quantified costs and benefits	Financial investment - £71,000 Emissions reduction – 134 tonnes per year Financial savings - £29,000 per year Payback period – 2.4 years
Resources	Funding source – Salix/University fund Management – project to be undertaken within Department of Estates
Ownership and accountability	Lead officer: Clive Hutchinson, Energy Engineer Supported by: Barry Whittles, Head of Estates Maintenance and Phil Riley, Energy Manager
Ensuring success	Known key success factors – measured reduction in electricity consumption. This will be confirmed through analysis of metered consumption. Success can also be measured by the reduction in reports of wasteful lighting from building users Principal risks – it is not economically viable to install lighting controls in all locations, so there is potential for staff, students and visitors to become confused as to which areas are under automatic and manual control. The work will be disruptive for building users, and has the potential for delays if, for example, unexpected problems with the electrical infrastructure are experienced Main means of risk mitigation – ensure manually controlled lighting areas are clearly identified. Consult with building users at all stages of the process. Carry out in depth site surveys prior to starting the works.

Performance / success measure	Reduction in electricity energy consumption and positive feedback from building users. A reduction in the number of lighting complaints received by Estates.
Timing	This is a campus-wide scheme that will require careful management. A detailed survey has been completed at the St George's site so it is possible that work in this area can be started in the summer of 2008.

Project / Action 4: Improve standalone control of HVAC systems – St George's site	
Description and notes	Install local controls, such as thermostatic radiator valves for radiators; presence sensors and timeswitches for lecture theatre extract fans; install one BMS outstations for heating and ventilation systems currently under local control with excessive operating hours.
Quantified costs and benefits	Financial investment - £28,000 Emissions reduction – 54 tonnes per year Financial savings - £12,000 per year Payback period – 2.3 years
Resources	Funding source – Salix/University fund Management – project to be undertaken within Department of Estates
Ownership and accountability	Lead officer: Clive Hutchinson, Energy Engineer Supported by: Barry Whittles, Head of Estates Maintenance and Phil Riley, Energy Manager
Ensuring success	Known key success factors – measured reduction in heating fuel and electricity consumption. This will be confirmed through analysis of metered consumption and local degree days. Success can also be measured by the building users who should detect thermal comfort improvements Principal risks – the work will be disruptive for building users, which may lead to delays in implementation Controlled items may run continuously if inappropriately programmed. Main means of risk mitigation – consult with building users at all stages of the process. Set up procedures to carry out regular analysis of systems to ensure controlled items continue to operate efficiently.
Performance / success measure	Reduction in heating and electricity consumption and positive feedback from building users. A reduction in the number of complaints received by Estates HelpDesk..
Timing	This is a complex scheme, which will ideally need to be spread throughout the year – disruption to heating systems in winter and cooling systems in the summer should be avoided. It is likely that the scheme will be started in the spring or summer of 2009.

Project / Action 5: Improve energy use in kitchenettes – Campus-wide	
Description and notes	Install motor controllers to reduce refrigeration motors' electricity use; install water boilers in kitchenettes and remove kettles; install timeswitches to control point of use electric domestic water heaters.
Quantified costs and benefits	Financial investment - £51,000 Emissions reduction – 97 tonnes per year Financial savings - £21,000 per year Payback period – 2.4 years
Resources	Funding source – Salix/University fund Management – project to be undertaken within Department of Estates
Ownership and accountability	Lead officer: Clive Hutchinson, Energy Engineer Supported by: Barry Whittles, Head of Estates Maintenance and Phil Riley, Energy Manager
Ensuring success	Known key success factors – measured reduction in electricity consumption. This will be confirmed through analysis of metered consumption. These are highly visible measures that will help to promote energy efficiency to staff and students. Principal risks – Some refrigeration equipment is not suitable for the installation of motor controllers. There may be academic staff concerns with controllers failing and the potential for losing valuable contents of the fridges and freezers. There may also be some resistance to the removal of kettles. Main means of risk mitigation – detailed surveys to determine suitable applications. Identify similar installations at other research-led universities and carry out consultation with building users at all stages of the process. .
Performance / success measure	Reduction in electricity consumption and increased awareness of energy and carbon management activity at the University.
Timing	This is a campus-wide scheme that will require careful management. A detailed survey has been completed at the St George's site so it is possible that work in this area can be started in late-2008 or early-2009.